



# Trawl Manual

To Support Samson High-Performance  
Trawl Working Lines

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# Table of Contents

## PRODUCT INFORMATION

AmSteel®Blue [CODE 872]	9
AmSteel® [CODE 870]	10
FN-16 Nylon [CODE 819]	11
Proton-8 [CODE 830]	12
PTS-3 Nylon [CODE 188]	13
Quantum-8 [CODE 863]	14
Quantum-12 [CODE 873]	15
RP-12 Nylon [CODE 323]	16
RP-12 Nylon TC [CODE 824]	17
Saturn-12 [CODE 882]	18
Tenex [CODE 826]	19
TrawlSteel [CODE 878]	20
TrawlSteel-Blue [CODE 879]	21
TS-II [CODE 877]	22
TS-II Premium [CODE 880]	23
TS-II Turbo [CODE 881]	24
Turbo-75 [CODE 864]	25
Turbo Nylon Head Rope [CODE 541]	26
Turbo Polyester Head Rope [CODE 542]	27
UB-16 Jacketed Trawl Twine [CODE 712]	28
Ultra Blue-8 [CODE 252]	29
<b>CHAFE PROTECTION</b>	
DC Gard — Cover Only [CODE 706]	30

## SPLICING & REPAIR INSTRUCTIONS

<b>3-STRAND</b>	Eye Splice – Class I	33
<b>8-STRAND</b>	Eye Splice – Class I	34
	Eye Splice – Class II	37
<b>12-STRAND</b>	Eye Splice – Class II	40
	End-for-End Splice – Class II	42
	Modified Tuck-Bury Splice – Class II	44
<b>DOUBLE BRAID</b>	Eye Splice TS-II / TS-II Premium – Class II	47
	Eye Splice TS-II Turbo – Class II	52
	Eye Splice Turbo-75 – Class II	60
	Jacketed Dyneema® Line Cover Repair	64

## TECHNICAL BULLETINS

Rope Measurement	67
How Cold Can You Go	68
HMPE Ropes: Design vs. Performance	70

## ROPE SELECTION, USAGE & RETIREMENT

Rope Selection	73
Rope Handling and Usage	75
Bending Radius	76
Rope Inspection and Retirement	77
Rope Inspection Checklists (Single / Double Braids)	78
Elastic Elongation / Components of Stretch	80
Fiber Characteristics / Fiber Elongation at Break	81
Glossary	82



### **SAMSON'S TS-II TURBO:**

*Developed to be lightweight and easy to handle, TS-II Turbo will help pelagic trawl vessel operations improve safety, increase stability, lower fuel costs, and increase efficiency. As an excellent replacement for steel wire rope, TS-II Turbo is comprised of a firm non-collapsing Dyneema® fiber construction that is abrasion and cut resistant, spliceable, and works exceptionally well on winch drums, following in the tradition set by the Samson TS-II product offering.*

# Introduction

## THE STRENGTH OF SAMSON IN YOUR TRAWL OPERATIONS



Thank you for purchasing Samson's high-performance ropes for your vessel(s). You have made a wise investment in performance technology, which will ultimately lead to lower operating costs and heightened vessel safety. To ensure that you get the best performance and longest service life from your ropes, please review this manual carefully.

This manual covers standard rope usage and handling, and provides a background of the characteristics of synthetic fibers. You will find it helpful for gaining the knowledge required to get the longest life possible from your new Samson mooring lines.

The manual is divided into sections to guide you through all the details you need to become familiar with: Splicing and Repair Instructions, Technical Bulletins, and Rope Selection, Usage and Retirement.

At Samson we are confident that our products will provide you with the working tools you need to get the job done efficiently and safely. Our lines are backed by years of rope-making experience, and extensive field and laboratory testing. We are confident that our products will provide you with a long service life.

Sincerely, *The Commercial Fishing Technical Sales Team*

### THE SAMSON COMMERCIAL FISHING ADVANTAGE: SETTING SAMSON APART

Adding value with The Samson Commercial Fishing Advantage is what sets us apart. Improving safety and performance, and reducing line failure is the hallmark of our success in this industry. Supported by Samson's considerable experience and the most advanced R&D team in the cordage industry, our commercial fishing products lead the way.

#### Products and Experience

- > *Application specific product line modified over the years through market experience*

#### Service

- > *Field support by application engineers*
- > *Equipment surveys, crew training, line handling, inspections, repair, splicing, and use of chafe protection*
- > *Extensive technical resources available, including splicing manuals and videos*

**The Samson Advantage is our commitment to ensuring safe and long-term operational benefits from all our products- from installation to retirement.**

## FAQs: Samson High-Performance Working Lines

**QUESTION:** What are the benefits of Dyneema® fiber working lines?

**ANSWER:** Dyneema® fiber is an ultra high molecular weight polyethylene material that can be constructed as a torque-free 12-strand braided rope. Size-for-size, ropes constructed of Dyneema® fiber have comparable strength to steel wire rope. For example, AmSteel®Blue is only 1/7th the weight of steel wire rope yet it has superior wear, is flexible, and it floats. Ropes constructed of Dyneema® fiber also have a proprietary Samthane coating which enhances rope wear life, provides snag resistance, and allows color compatibility.

**QUESTION:** What characteristics does a Dyneema® fiber rope exhibit as it starts to wear?

**ANSWER:** As the rope is used, it will develop surface wear on the outer fibers. This individual fiber abrasion will give the line a fuzzy appearance. Care should be taken to protect the working line from sharp and rough surfaces where it could be worked against or over. Due to the normal external wear from use, the line will also gradually begin to lose its original color.

**QUESTION:** Can Dyneema® fiber working lines be repaired on board the vessel?

**ANSWER:** Yes. The 8-strand and 12-strand constructions are some of the easiest to repair. Quantum-8, Proton-8, AmSteel®Blue and Quantum-12 can all be spliced with new eyes by following the instructions available on our website or in this manual.





# Samson Research and Development

## A LEGACY OF INNOVATION BUILT ON A COMMITMENT TO TECHNOLOGY



Samson has dedicated more resources than any other rope manufacturer to the continued development of high-performance synthetic rope products.

A close relationship with DSM, makers of Dyneema® fiber, ensures Samson will remain at the forefront of new fiber.



### Residual Strength Testing

Samson has helped companies create safe line retirement criteria by performing residual strength testing. Lab inspection and destructive testing of used lines, which can be matched to towline lifetime data (e.g. number of jobs), can be performed at Samson's Ferndale, Washington facility. Contact your Samson field representative for further details or to discuss setting up such a program.



Samson's research and development team travels to our customers where on-site product performance can be observed. This hands-on approach and field experience assists our engineers in developing products specific to application needs.

### We maintain one of the most advanced research and development organizations in the industry

Samson is fully equipped with the latest laboratory facilities, abrasion testing equipment, and one of the highest capacity tensile testers (1.1 million pounds) of any rope manufacturer worldwide. Staffed by fiber technologists and engineers dedicated to the development of more efficient and stronger ropes, Samson continues to lead the industry in technological developments of fibers, coatings, and constructions. The staff works directly with the leading fiber manufacturers to explore and assess the properties of new fibers in development. This partnership with our fiber suppliers is a key to innovation, research, and development.

The engineering team works closely with field sales personnel and application engineers. This interactive relationship allows us to be responsive to the operational concerns of our customers. From on-site assistance with installation of new products, to evaluation of product performance, and the development of safety standards, the application engineer is an integral part of the field sales team.

All new product development, as well as production of existing products, is subject to stringent inspection, testing, and documentation. Our plants are equipped with certified test equipment to assess the characteristics of both raw materials and finished goods.

### SAMSON'S TESTING METHODOLOGY COVERS

- > Determination of diameter
- > Determination of lay/pitch, picks per inch
- > Linear density
- > Breaking force
- > Initial elongation (uncycled elongation)
- > Cycled elongation
- > Wet testing
- > Stiffness
- > Abrasion resistance
- > Sampling of test specimens
- > Reporting procedures

More information on testing of high-performance ropes is available for download at [SamsonRope.com](http://SamsonRope.com). Go to the Technical Resources section directly from the home page.



ISO 9001  
QMI-SAI Global

### Samson was one of the first U.S. rope manufacturers to receive ISO 9001 certification, a natural progression of our existing quality assurance program that incorporates:

- > Integrated product development and production software that translates engineering specifications into production orders for manufacturing
- > Standardized procedures for inspection, analysis, and testing of in-process product as well as finished goods
- > Individual Certificates of Compliance for all products

As part of our quality assurance program, Samson has received product type approval certifications from:

**ABS** American Bureau of Shipping  
**NK** Nippon Kaiji Kyokai  
**DNV** Det Norske Veritas

As a long-standing, active member of the Cordage Institute, Samson has been a major contributor in developing standards and specifications on behalf of the Cordage Institute.



# Certificate of Compliance

## EXPLANATION AND SAMSON'S GUARANTEE

**samson**  
THE STRONGEST NAME IN ROPE

CORPORATE: 2000 Thornton Street, Ferndale, WA 98248 (T) 360.384.4669 / (F) 360.384.0572

### CERTIFICATE OF COMPLIANCE

It is hereby certified that the products described herein have been produced in accordance with the design, performance and quality standards stated in our Quality Assurance Manual and as cited in the Catalog. In addition, it is certified that the product has been inspected and found to conform to all requirements of the customer's order or to our documentation cited herein.

This document certifies only that the product has been manufactured and inspected as described herein and no implication, certification or warranty that this product is suitable for a particular use is made.

Product Name:	EPX-75
Product Type:	Double Braid
Size/Length/Accessories:	1 5/8" dia. x 900ft OAL, with RI eye one end, other end seized
Approx. Weight (Lbs/100ft)(Kg/100m):	60 / 89.3
Approx. Average Strength (Lbs)(Kg):	250000 / 113000
Minimum Strength (Lbs)(Kg):	225000 / 102000
Test Method:	SRT Test Method 100-02

Customer: SAMPLE      MII Order No.: A01234  
Customer Order/Contract No.: 1234567

Certificate No.: A01234-1      June 1, 2005

General description of rope construction

Detailed description of the product/system

As measured relaxed, under no tension

Rope strength as measured per testing method specified

The lowest permissible break strength for rope per testing method specified

DOMESTIC: Standard testing method in conformance with ASTM and CI Standards

INTERNATIONAL: Standard testing method in conformance with ISO Standards

### BREAKING STRENGTH DETERMINATION

Understanding your Certificate of Compliance with regard to breaking strength and test methods can be somewhat confusing. Breaking strength, like many other properties, is a function of both the testing method and data interpretation. The same rope can have different breaking strengths depending on the test method used. Most test methods are created by "standards organizations," and since most of these committees are regionalized, these standards are normally designed to meet regional needs. Recognized international committees such as International Standards Organization (ISO), British Standards Institute (BSI), and European Committee for Standardization (EN) have developed the widely used test methods ISO-2307, BS-5053, and EN-919, respectively. In the U.S., the Cordage Institute (CI) and the American Society for Testing and Materials (ASTM) have also developed the common test methods CI-1500 and ASTM D-4268, respectively. Most test methods are quite similar; however, different interpretations of results can and do lead to different presentations of specifications.

Unless a different method is requested, Certificates of Compliance from Samson will list either "Samson Test Method" (SRT latest revision) or "ISO-2307/BS-919" (latest revision).

### SAMSON TEST METHOD (SRT)

Samson has prepared a comprehensive test method to determine pertinent physical characteristics of fiber ropes. The reasoning behind this is to allow our customers to fully understand how the products they purchase are tested. The SRT Test Method was built around the CI-1500 method, but also complies with ASTM D-4268. The CI method was chosen as the foundation of the SRT Test Method because the Cordage Institute's sole purpose is rope/cordage standards. The Cordage Institute is made up of representatives from all areas of the cordage industry. Rope manufacturers, fiber producers, cordage equipment manufacturers, and engineers/consultants who specialize in rope and cordage all contribute to and adapt comprehensive standards for the cordage industry. Samson chose to create the SRT Test Method to include additional test methods that we perform every day. Methods such as the determination of lay lengths (PPI for braids), linear density under relaxed conditions, and specifically stating cycle loads that are dependent on fiber type are crucial to the construction of our products and are the basis for the information provided in our literature. Samson recommends the SRT Test Method because it does not interpret or compute results based on empirical factors. Listed strengths, using the SRT Test Method, are terminated strengths.

### ISO-2307, BS-5053 AND EN-919

ISO-2307, BS-5053, and EN-919 test standards (as referenced in OCIMF) are widely accepted internationally, and have some similarities with U.S. standards. What separates these standards from U.S. standards is the interpretation of breaking strength. ISO-2307, BS-5053, and EN-919 standards allow a deduction in breaking strength due to the effects of splicing (or other means of termination). Terminating any rope will distort the construction, thereby reducing its breaking strength. A rope tested using these methods only has to achieve 90% of the rated strength and is still deemed to be compliant with the manufacturer's specifications, provided the rupture occurs within the splice or termination. Listed strengths using the ISO-2307, BS-5053, and EN-919 testing methods are unterminated strengths.

### NEW-ROPE TENSILE STRENGTHS

New-rope tensile strengths are based on tests of new and unused spliced rope in accordance with the applicable test method. It can be expected that strengths will decrease as soon as a rope is put to use. Because of the wide range of rope use, changes in rope conditions, and exposure to many other factors affecting rope strength, it is recommended that all care, handling, and inspection guidelines are followed in accordance with this manual, and that the estimation of residual rope strength be made by a qualified person.

# Line Tagging System

## EXPLANATION OF YOUR LINE LABEL

### EXPLANATION OF YOUR LINE LABEL (if applicable)

This tag will be visible near the splice of a towing line or working line and indicates the quarter and the year that the rope was manufactured. This labeling system coincides directly with your Certificate of Compliance.

### LABEL FEATURES

- > Highly visible exterior type tag
- > Material is UV, moisture, and corrosion resistant, and is sealed from the elements

### METHOD OF ATTACHMENT TO THE ROPE

- > Permanently attached (leg of splice near throat)
- > Will not impede rope's performance
- > Able to withstand a harsh marine environment
- > Attachment method is UV, moisture, and corrosion resistant

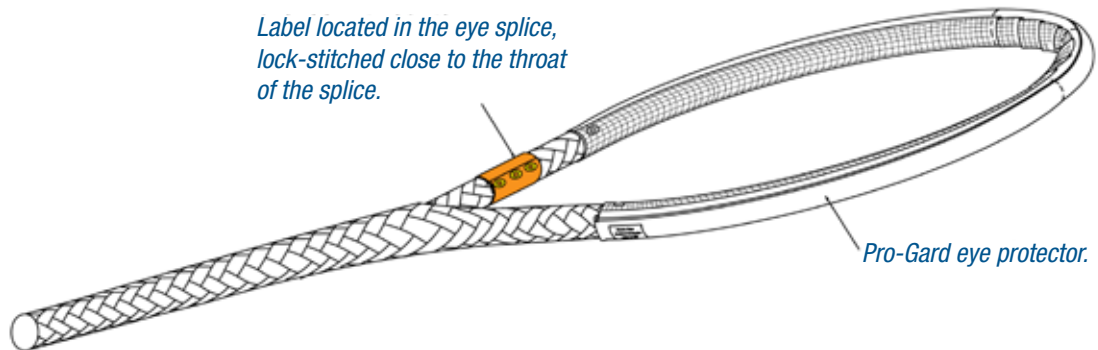


### INFORMATION SHOWN ON LABEL

- > Certificate number
- > Product type and size
- > Minimum break strength
- > Company logo
- > Date of manufacture
- > Mill order number

	TYPE:	AmSteel-Blue, 44mm dia
	ISO/BS:	152.0 mt
	MANUFACTURE DATE:	3/15/12
	MILL ORDER #:	A33442
	CERTIFICATION #:	F5608

*Label located in the eye splice, lock-stitched close to the throat of the splice.*





# Product Introduction

## ROPE CONSTRUCTION

There are many variables to consider when choosing the appropriate rope for your application. Most operators will immediately consider fiber type, however, equal consideration should be given to rope construction. For example, an 8-strand rope made of the same fiber as a 12-strand will have more constructional elongation than the 12-strand rope.

Rope construction can also affect ease of handling, and ease of splicing and repairability. A few examples are listed below.

- > If your application is highly abrasive, you may choose a construction that is easily repaired with an added anti-chafe material versus choosing a jacketed construction that protects the strength member but is difficult to repair.
- > A soft 12-strand may be very easy to handle, but may jam easily on a winch, costing time and efficiency in your operation.
- > A firm, core-dependent construction may perform well on a winch, but will not render well on a capstan or H-bitt.
- > An 8-strand will typically wear more severely than a 12-strand due to the pronounced surface crowns, but may be easier to repair for a crew that is accustomed to working on 8-strand ropes.



Vessel operators should weigh each of these characteristics independently when selecting the appropriate rope for any application.



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

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

Class I ropes are produced with non-high-modulus fibers that impart the strength and stretch characteristics to the rope that have tenacities of 15 grams per denier (GPD) or less and a total stretch at break of 6%.

Class I ropes are produced with traditional fibers such as: olefin (polypropylene or polyethylene), nylon, and polyester.

Class II ropes are produced with high-modulus fibers that impart the strength and stretch characteristics to the rope that 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®), aramid (Technora® or Kevlar®), liquid crystal polymers (LCP, Vectran®), PBO (Zylon®), and carbon fibers.

## DESCRIPTION

AmSteel®Blue is a proven cost-saving replacement for steel wire rope in key applications where strength, weight, and safety are important.

Recognized worldwide as the standard for single braid HMPE ropes, AmSteel®Blue is easily spliced and inspected. These features, with the superior wear and tension fatigue of Dyneema® fiber and Samthane coating, are combined in a torque-free, 12-strand, single braid design. The result is an industry leading braided synthetic rope that outlasts steel wire rope and has proven operator cost saving benefits.

AmSteel®Blue, at only 1/7th the weight of wire, requires less committed crew for most operations and improves crew safety. The reduced weight, high strength, and low stretch also make it ideal for tug assist/maneuvering lines, resulting in quick, efficient connections and controlled response. AmSteel®Blue is proven to provide a longer service life and reduced costs when compared to wire in a variety of applications.

AmSteel®Blue is recommended for split drum winch applications, but is not recommended for use on H-bitts, capstans, or cleats if surging or rendering the rope is required.



Sizes 7/64", 1/8" and 3/16"  
made in Canada.

## FEATURES & BENEFITS

- > Uses Dyneema® fiber
- > A size-for-size strength replacement for wire rope at only 1/7th the weight
- > Torque-free, very flexible, easy to handle
- > Similar elastic elongation to steel wire rope
- > Easily inspected and spliced in the field
- > Floats

## APPLICATIONS

- > Trawl or bridle line
- > Gilson wire rope replacement
- > Other fishing line
- > Door legs
- > Winch lines
- > Framing ropes

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* METRIC TONS	ISO 2307 STRENGTH** METRIC TONS
7/64"	5/16"	0.30 lb	1,400 lb	2.5 mm	0.45 kg	0.65 t	0.73 t
1/8"	3/8"	0.50 lb	2,300 lb	3 mm	0.74 kg	1.0 t	1.1 t
5/32"	15/32"	0.75 lb	3,600 lb	4 mm	1.1 kg	1.6 t	1.8 t
3/16"	9/16"	1.0 lb	4,900 lb	5 mm	1.5 kg	2.2 t	2.4 t
1/4"	3/4"	1.6 lb	7,700 lb	6 mm	2.4 kg	3.5 t	3.9 t
5/16"	1"	2.7 lb	12,300 lb	8 mm	4.0 kg	5.6 t	6.2 t
3/8"	1-1/8"	3.6 lb	17,600 lb	9 mm	5.4 kg	8.0 t	8.9 t
7/16"	1-1/4"	4.2 lb	21,500 lb	11 mm	6.2 kg	9.8 t	10.8 t
1/2"	1-1/2"	6.4 lb	30,600 lb	12 mm	9.5 kg	13.9 t	15.4 t
9/16"	1-3/4"	7.9 lb	36,500 lb	14 mm	11.8 kg	16.5 t	18.4 t
5/8"	2"	10.2 lb	47,500 lb	16 mm	15.2 kg	21.6 t	24.0 t
3/4"	2-1/4"	13.3 lb	58,000 lb	18 mm	19.8 kg	26.3 t	29.2 t
13/16"	2-1/2"	17.0 lb	73,800 lb	20 mm	25.3 kg	33.5 t	37.2 t
7/8"	2-3/4"	19.6 lb	81,700 lb	22 mm	29.2 kg	37.1 t	41.2 t
1"	3"	21.8 lb	98,100 lb	24 mm	32.4 kg	44.5 t	49.4 t
1-1/16"	3-1/4"	27.5 lb	118,000 lb	26 mm	40.9 kg	53.6 t	59.6 t
1-1/8"	3-1/2"	31.9 lb	133,000 lb	28 mm	47.5 kg	60.4 t	67.1 t
1-1/4"	3-3/4"	36.2 lb	149,000 lb	30 mm	53.9 kg	67.5 t	75.0 t
1-5/16"	4"	41.8 lb	166,000 lb	32 mm	62.2 kg	75.2 t	83.6 t
1 3/8"	4-1/8"	45.0 lb	185,000 lb	34 mm	67.0 kg	83.9 t	93.2 t
1-1/2"	4-1/2"	51.7 lb	205,000 lb	36 mm	76.9 kg	93.0 t	103 t
1 9/16"	4-3/4"	57.6 lb	229,000 lb	38 mm	85.7 kg	104 t	115 t
1-5/8"	5"	65.2 lb	255,000 lb	40 mm	97.0 kg	116 t	128 t
1-11/16"	5-1/4"	71.0 lb	276,000 lb	42 mm	106 kg	125 t	139 t
1-3/4"	5-1/2"	78.4 lb	302,000 lb	44 mm	117 kg	137 t	152 t
2"	6"	87.0 lb	343,000 lb	48 mm	129 kg	155 t	173 t
2-1/16"	6-1/4"	95.0 lb	376,000 lb	50 mm	141 kg	171 t	190 t
2-1/8"	6-1/2"	109 lb	411,000 lb	52 mm	162 kg	186 t	207 t
2-1/4"	7"	116 lb	484,000 lb	56 mm	173 kg	219 t	244 t
2-1/2"	7-1/2"	148 lb	529,000 lb	60 mm	220 kg	240 t	267 t
2-5/8"	8"	167 lb	595,000 lb	64 mm	248 kg	270 t	300 t
2-3/4"	8-1/2"	187 lb	662,000 lb	68 mm	278 kg	300 t	333 t
3"	9"	206 lb	749,000 lb	72 mm	307 kg	340 t	377 t
3-1/8"	9-1/2"	228 lb	828,000 lb	76 mm	339 kg	376 t	417 t
3-1/4"	10"	240 lb	906,000 lb	80 mm	357 kg	411 t	457 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

## SPECIFICATIONS<sup>†</sup>

FIBER: Dyneema®

SPECIFIC GRAVITY: 0.98 (floats)

STANDARD COLOR: Blue (also available by special order in red, green, and orange)

### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.46%

20% ..... 0.70%

30% ..... 0.96%

SPLICE/CLASS: 12-strand Class II

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to SamsonRope.com.

WITH  
Dyneema®

Dyneema® is a registered trademark of Royal DSM N.V. Dyneema® is DSM's high-performance polyethylene product.



## CLASS II

### FEATURES & BENEFITS

- > Flex-fatigue resistant
- > Lightweight
- > Excellent abrasion resistance
- > Non-rotational
- > High strength / low stretch
- > Samthane coated
- > Easy to splice

### APPLICATIONS

- > Gilson wire rope replacement
- > Purse Seine lines
- > Door legs
- > Winch lines
- > Framing ropes
- > Other fishing line

### DESCRIPTION

AmSteel® is a non-rotational, Samthane-coated 12-strand single braid that yields high strength and low stretch, and is equivalent to steel wire rope, but only 1/7th the weight. In addition, the product is flexible, spliceable, and resists flex-fatigue and abrasion.



### SPECIFICATIONS†

FIBER: Dyneema®-Innegra™S Blend

SPECIFIC GRAVITY: 0.98 (floats)

STANDARD COLOR: Gray  
(some sizes also available by special order in red, black, green, yellow, blue, and orange)

#### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.46%

20% ..... 0.70%

30% ..... 0.96%

SPLICE/CLASS: 12-strand Class II

†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to SamsonRope.com.

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
1/4"	3/4"	1.6 lb	6,700 lb	6 mm	2.4 kg	3,400 kg	3.0 t
5/16"	1"	2.7 lb	9,500 lb	8 mm	4.0 kg	4,800 kg	4.3 t
3/8"	1-1/8"	3.6 lb	14,000 lb	9 mm	5.4 kg	7,000 kg	6.3 t
7/16"	1-1/4"	4.2 lb	16,200 lb	11 mm	6.2 kg	8,200 kg	7.3 t
1/2"	1-1/2"	6.4 lb	24,800 lb	12 mm	9.5 kg	12,500 kg	11.2 t
9/16"	1-3/4"	7.9 lb	30,600 lb	14 mm	11.8 kg	15,400 kg	13.9 t
5/8"	2"	10.2 lb	36,600 lb	16 mm	15.2 kg	18,500 kg	16.6 t
3/4"	2-1/4"	13.3 lb	46,800 lb	18 mm	19.8 kg	23,600 kg	21.2 t
13/16"	2-1/2"	15.8 lb	54,900 lb	20 mm	23.5 kg	27,700 kg	24.9 t
7/8"	2-3/4"	19.6 lb	66,600 lb	22 mm	29.2 kg	33,600 kg	30.2 t
1"	3"	21.8 lb	81,000 lb	24 mm	32.4 kg	40,800 kg	36.7 t
1-1/16"	3-1/4"	29.5 lb	90,000 lb	26 mm	43.9 kg	45,400 kg	40.8 t
1-1/8"	3-1/2"	31.9 lb	99,000 lb	28 mm	47.5 kg	49,900 kg	44.9 t
1-1/4"	3-3/4"	36.2 lb	113,000 lb	30 mm	53.9 kg	56,700 kg	51.0 t
1-5/16"	4"	41.8 lb	122,000 lb	32 mm	62.2 kg	61,200 kg	55.1 t
1-1/2"	4-1/2"	51.7 lb	158,000 lb	36 mm	76.9 kg	79,400 kg	71.4 t
1-5/8"	5"	65.2 lb	185,000 lb	40 mm	97 kg	93,000 kg	83.7 t
1-3/4"	5-1/2"	78.4 lb	216,000 lb	44 mm	117 kg	109,000 kg	98 t
2"	6"	87 lb	252,000 lb	48 mm	129 kg	127,000 kg	114 t
2-1/8"	6-1/2"	109 lb	306,000 lb	52 mm	162 kg	154,000 kg	139 t
2-1/4"	7"	116 lb	360,000 lb	56 mm	173 kg	181,000 kg	163 t
2-1/2"	7-1/2"	148 lb	405,000 lb	60 mm	220 kg	204,000 kg	184 t
2-5/8"	8"	167 lb	450,000 lb	64 mm	248 kg	227,000 kg	204 t
2-3/4"	8-1/2"	187 lb	509,000 lb	68 mm	278 kg	256,000 kg	231 t
3"	9"	206 lb	581,000 lb	72 mm	307 kg	293,000 kg	263 t
3-1/4"	10"	240 lb	702,000 lb	80 mm	357 kg	354,000 kg	318 t
3-5/8"	11"	324 lb	828,000 lb	88 mm	482 kg	417,000 kg	376 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.



Dyneema® is a registered trademark of Royal DSM N.V.  
Dyneema® is DSM's high-performance polyethylene product.

### DESCRIPTION

FN-16 Nylon is a 16-strand single braid, with Samthane coating, for a firm, high strength rope, that has good abrasion resistance, memory, and shock-load capacities. This product is not spliceable.



### FEATURES & BENEFITS

- > Samthane coated
- > Non-spliceable
- > Significant hang weight
- > Good shock-load capacity

### APPLICATIONS

- > Trawl or bridle lines
- > Large mesh front end material

SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS
6 mm	2.5 kg	820 kg	0.91 t	1.7 lb	1,800 lb
8 mm	4.2 kg	1,400 kg	1.6 t	2.8 lb	3,200 lb
10 mm	6.2 kg	2,000 kg	2.2 t	4.2 lb	4,300 lb
12 mm	9.2 kg	2,300 kg	2.6 t	6.2 lb	5,100 lb
15 mm	12.6 kg	3,200 kg	3.6 t	8.5 lb	7,100 lb
17 mm	15.6 kg	3,800 kg	4.3 t	10.5 lb	8,500 lb
19 mm	18.6 kg	4,500 kg	5.0 t	12.5 lb	9,900 lb

\*Unspliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS<sup>†</sup>

FIBER: Nylon

SPECIFIC GRAVITY: 1.14

STANDARD COLOR: Coated clear, red, blue or green

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 4.5%

20% ..... 7.9%

30% ..... 9.8%

SPLICE/CLASS:

Non-spliceable Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

## CLASS II

### FEATURES & BENEFITS

- > High strength-to-weight ratio
- > Grips winches, bitts, and capstans
- > Heat resistant
- > Low water absorption
- > Flexible
- > Torque free
- > Firm cross section
- > Easy to splice in the field

### APPLICATIONS

- > Trawl or bridle lines
- > Tie-up lines
- > Framing lines
- > Winch lines
- > Foot ropes

### SPECIFICATIONS<sup>†</sup>

FIBER: Dyneema®-Polyester Blend

SPECIFIC GRAVITY: 1.09

STANDARD COLOR: Yellow

#### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.58%

20% ..... 0.87%

30% ..... 0.96%

SPLICE/CLASS: 8-strand Class II

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

### DESCRIPTION

Proton-8 is a high strength, low weight line that has excellent heat resistance and the grip necessary for use on bitts and capstans. Its firm, flexible, torque-free construction performs well on both single- and split-drum winches.

Proton-8 provides substantially better service life, is almost neutrally buoyant, and has low water absorption for ease and speed of handling during deployment and retrieval. The yellow Samthane coating ensures maximum wear resistance and service life while making Proton-8 highly visible.

Proton-8 is designed for use on H-bitts and capstans under surging and rendering conditions.



SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* METRIC TONS	ISO 2307 STRENGTH** METRIC TONS
1"	3"	25.0 lb	54,900 lb	24 mm	37.2 kg	24.9 t	27.7 t
1-1/8"	3-1/2"	30.5 lb	68,900 lb	28 mm	45.4 kg	31.3 t	34.7 t
1-1/4"	3-3/4"	38.5 lb	86,900 lb	30 mm	57.3 kg	39.4 t	43.8 t
1-5/16"	4"	41.5 lb	104,000 lb	32 mm	61.8 kg	47.2 t	52.4 t
1 3/8"	4-1/8"	46.0 lb	108,000 lb	34 mm	68.4 kg	48.8 t	54.3 t
1-1/2"	4-1/2"	55.4 lb	125,000 lb	36 mm	82.4 kg	56.7 t	63.0 t
1-5/8"	5"	68.0 lb	140,000 lb	40 mm	101 kg	63.5 t	70.6 t
1-3/4"	5-1/2"	74.8 lb	190,000 lb	44 mm	111 kg	86.1 t	95.7 t
2"	6"	99.0 lb	238,000 lb	48 mm	147 kg	108 t	120 t
2-1/8"	6-1/2"	112 lb	277,000 lb	52 mm	167 kg	126 t	140 t
2-1/4"	7"	125 lb	316,000 lb	56 mm	186 kg	143 t	159 t
2-3/8"	7-1/8"	140 lb	383,000 lb	57 mm	208 kg	174 t	193 t
2-1/2"	7-1/2"	149 lb	396,000 lb	60 mm	222 kg	180 t	200 t
2-5/8"	8"	172 lb	436,000 lb	64 mm	257 kg	198 t	220 t
2-3/4"	8-1/2"	188 lb	468,000 lb	68 mm	280 kg	212 t	236 t
3"	9"	198 lb	542,000 lb	72 mm	294 kg	246 t	273 t
3-1/4"	10"	254 lb	628,000 lb	80 mm	378 kg	285 t	317 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

WITH  
Dyneema®

Dyneema® is a registered trademark of Royal DSM N.V.  
Dyneema® is DSM's high-performance polyethylene product.

### DESCRIPTION

PTS-3 Nylon is a premium, 3-strand rope that is heat-set by our exclusive thermo-set process. This process coats the rope with our Samthane coating and sets the fibers, bonding them to create working firmness and extend wear life. The result is less than 1% shrinkage with excellent energy absorption, improved splicing, and a long wear life.



### FEATURES & BENEFITS

- > Premium heat-set nylon
- > Excellent energy absorption
- > Low shrinkage—less than 1%
- > Samthane coated
- > Tough and durable

### APPLICATIONS

- > Trawl or bridle lines
- > Big mesh twine
- > Utility lines

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAM	ISO 2307 STRENGTH** METRIC TONS
1/4"	3/4"	2.0 lb	1,900 lb	6 mm	3.0 kg	860 kg	0.95 t
5/16"	1"	2.7 lb	2,700 lb	8 mm	4.0 kg	1,200 kg	1.4 t
3/8"	1-1/8"	3.9 lb	4,700 lb	9 mm	5.8 kg	2,100 kg	2.4 t
7/16"	1-1/4"	5.3 lb	5,900 lb	11 mm	7.9 kg	2,700 kg	2.9 t
1/2"	1-1/2"	6.8 lb	7,200 lb	12 mm	10.1 kg	3,300 kg	3.6 t
9/16"	1-3/4"	8.7 lb	9,000 lb	14 mm	12.9 kg	4,100 kg	4.5 t
5/8"	2"	10.6 lb	10,800 lb	16 mm	15.8 kg	4,900 kg	5.4 t
3/4"	2-1/4"	15.3 lb	13,100 lb	18 mm	22.8 kg	5,900 kg	6.6 t
7/8"	2-3/4"	20.1 lb	16,000 lb	22 mm	29.9 kg	7,300 kg	8.1 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS<sup>†</sup>

FIBER: Nylon

SPECIFIC GRAVITY: 1.14

STANDARD COLOR: Clear

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 7.8%

20% ..... 11.3%

30% ..... 15.9%

SPLICE/CLASS: 3-strand Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

## CLASS II

### FEATURES & BENEFITS

- > Floats
- > Abrasion resistant
- > Excellent grip

### APPLICATIONS

- > Other fishing lines
- > Foot ropes
- > Framing lines

### DESCRIPTION

Quantum-8 is a lightweight, high-strength, torque-free 8-strand rope that utilizes Samson's patented DPX™ fiber technology, which provides superior abrasion and cut resistance with a higher coefficient of friction than other high modulus polyethylene ropes. It floats, grips on hardware, and has excellent durability. Quantum-8 has an orange urethane coating for high visibility as well as additional abrasion resistance.



### SPECIFICATIONS†

FIBER: Dyneema®-Polyester Blend

SPECIFIC GRAVITY: 1.00

STANDARD COLOR: Orange

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.97%

20% ..... 1.15%

30% ..... 1.29%

SPLICE/CLASS: 8-strand Class II

*†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to SamsonRope.com.*

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* METRIC TONS	ISO 2307 STRENGTH** METRIC TONS
1"	3"	23.0 lb	57,600 lb	24 mm	34.2 kg	26.1 t	29.0 t
1-1/8"	3-1/2"	29.1 lb	76,500 lb	28 mm	43.3 kg	34.7 t	38.6 t
1-1/4"	3-3/4"	35.9 lb	103,000 lb	30 mm	53.4 kg	46.5 t	51.7 t
1-5/16"	4"	39.7 lb	116,000 lb	32 mm	59.1 kg	52.7 t	58.5 t
1-3/8"	4-1/8"	43.5 lb	123,000 lb	34 mm	64.7 kg	55.9 t	62.1 t
1-1/2"	4-1/2"	51.8 lb	165,000 lb	36 mm	77.1 kg	74.7 t	83.0 t
1-5/8"	5"	60.7 lb	198,000 lb	40 mm	90.3 kg	89.8 t	99.8 t
1-3/4"	5-1/2"	70.4 lb	228,000 lb	44 mm	105 kg	103 t	115 t
2"	6"	92.0 lb	290,000 lb	48 mm	137 kg	131 t	146 t
2-1/8"	6-1/2"	104 lb	324,000 lb	52 mm	155 kg	147 t	163 t
2-1/4"	7"	116 lb	356,000 lb	56 mm	173 kg	161 t	179 t
2-3/8"	7-1/8"	130 lb	396,000 lb	57 mm	193 kg	180 t	200 t
2-1/2"	7-1/2"	144 lb	437,000 lb	60 mm	214 kg	198 t	220 t
2-5/8"	8"	158 lb	477,000 lb	64 mm	235 kg	216 t	240 t
2-3/4"	8-1/2"	174 lb	522,000 lb	68 mm	259 kg	237 t	263 t
3"	9"	207 lb	617,000 lb	72 mm	308 kg	280 t	311 t
3-1/4"	10"	243 lb	720,000 lb	80 mm	362 kg	327 t	363 t
3-5/8"	11"	289 lb	850,000 lb	88 mm	430 kg	385 t	428 t
4"	12"	369 lb	1,079,000 lb	96 mm	549 kg	489 t	544 t
4-1/4"	13"	435 lb	1,259,000 lb	104 mm	647 kg	571 t	635 t
4-5/8"	14"	503 lb	1,452,000 lb	112 mm	748 kg	658 t	732 t
5"	15"	580 lb	1,658,000 lb	120 mm	863 kg	752 t	836 t
5-1/4"	16"	663 lb	1,895,000 lb	128 mm	987 kg	860 t	955 t
5-1/2"	16-1/2"	760 lb	2,129,000 lb	134 mm	1,131 kg	966 t	1,073 t
6"	18"	856 lb	2,354,000 lb	152 mm	1,274 kg	1,068 t	1,186 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.



Dyneema® is a registered trademark of Royal DSM N.V. Dyneema® is DSM's high-performance polyethylene product.



### DESCRIPTION

Quantum-12 is a lightweight, high-strength, floating rope that grips hardware. The patented DPX™ fiber technology provides superior abrasion and cut resistance, but with a higher coefficient of friction than other high modulus polyethylene ropes. The 12-strand construction provides added flexibility, improved handling, and easy splicing. The vivid green Samthane coating provides excellent visibility and additional abrasion resistance.



### FEATURES & BENEFITS

- > Wire replacement
- > Abrasion resistant
- > Flexible
- > Excellent grip
- > Lightweight
- > Floats
- > Easy to handle
- > Easy to inspect
- > Easy to splice

### APPLICATIONS

- > Other fishing lines

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* METRIC TONS	ISO 2307 STRENGTH** METRIC TONS
3/4"	2-1/4"	11.8 lb	40,800 lb	18 mm	17.6 kg	18.5 t	20.5 t
7/8"	2-3/4"	15.2 lb	56,300 lb	22 mm	22.6 kg	25.5 t	28.4 t
1"	3"	21.0 lb	74,300 lb	24 mm	31.2 kg	33.7 t	37.4 t
1-1/8"	3-1/2"	25.5 lb	94,500 lb	28 mm	37.9 kg	42.9 t	47.6 t
1-1/4"	3-3/4"	31.0 lb	118,000 lb	30 mm	46.1 kg	53.5 t	59.4 t
1-5/16"	4"	33.0 lb	131,000 lb	32 mm	49.1 kg	59.6 t	66.2 t
1-3/8"	4-1/8"	37.5 lb	146,000 lb	34 mm	55.8 kg	66.1 t	73.5 t
1-1/2"	4-1/2"	44.7 lb	172,000 lb	36 mm	66.5 kg	78.0 t	86.6 t
1-5/8"	5"	50.0 lb	203,000 lb	40 mm	74.4 kg	92.3 t	103 t
1-3/4"	5-1/2"	60.8 lb	239,000 lb	44 mm	90.5 kg	108 t	120 t
2"	6"	79.4 lb	314,000 lb	48 mm	118 kg	142 t	158 t
2-1/8"	6-1/2"	89.6 lb	357,000 lb	52 mm	133 kg	162 t	180 t
2-1/4"	7"	100 lb	403,000 lb	56 mm	149 kg	183 t	203 t
2-3/8"	7-1/8"	112 lb	453,000 lb	57 mm	167 kg	205 t	228 t
2-1/2"	7-1/2"	125 lb	506,000 lb	60 mm	186 kg	229 t	255 t
2-5/8"	8"	138 lb	563,000 lb	64 mm	205 kg	255 t	284 t
2-3/4"	8-1/2"	155 lb	614,000 lb	68 mm	231 kg	278 t	309 t
3"	9"	179 lb	726,000 lb	72 mm	266 kg	329 t	366 t
3-1/4"	10"	213 lb	849,000 lb	80 mm	317 kg	385 t	428 t
3-5/8"	11"	266 lb	1,050,000 lb	88 mm	396 kg	476 t	529 t
4"	12"	324 lb	1,272,000 lb	96 mm	482 kg	577 t	641 t
4-1/4"	13"	366 lb	1,428,000 lb	104 mm	545 kg	648 t	720 t
4-5/8"	14"	447 lb	1,682,000 lb	112 mm	665 kg	763 t	848 t
5"	15"	523 lb	1,956,000 lb	120 mm	778 kg	887 t	986 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.  
Larger sizes available, contact customer service for details.

### SPECIFICATIONS<sup>1</sup>

FIBER: Dyneema®Polyester Blend

SPECIFIC GRAVITY: 0.99 (floats)

STANDARD COLOR: Vivid Green

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.65%

20% ..... 0.75%

30% ..... 0.90%

SPLICE/CLASS: 12-strand Class II

<sup>1</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

WITH  
Dyneema®

Dyneema® is a registered trademark of Royal DSM N.V.  
Dyneema® is DSM's high-performance polyethylene product.

# RP-12 Nylon

Product Code: 323



## CLASS I

### FEATURES & BENEFITS

- > Excellent strength
- > Excellent shock-mitigation
- > Extreme wear resistance
- > Excellent energy absorption

### APPLICATIONS

- > Trawl or bridle lines
- > Rib lines

### DESCRIPTION

RP-12 Nylon is a round-plaited, 12-strand construction of nylon, treated with our proprietary Pro-Gard Marine Finish. This combination provides reduced wet-strength loss, improved abrasion resistance, and high energy-absorbing properties. This firm, flexible rope provides superior handling and maximum wear. RP-12 Nylon offers excellent shock mitigation for peak dynamic loads during towing or mooring operations, and it is easily spliced using Samson's standard tuck-splice.



### SPECIFICATIONS<sup>†</sup>

FIBER: Nylon

SPECIFIC GRAVITY: 1.14

STANDARD COLOR: White

ELASTIC ELONGATION PERCENTAGE

*At % of break strength*

10% .....4.20%

20% .....6.30%

30% .....8.00%

SPLICE/CLASS: Round Plait Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* METRIC TONS	ISO 2307 STRENGTH** METRIC TONS
3/4"	2-1/4"	15.0 lb	16,600 lb	18 mm	22.3 kg	7.5 t	8.3 t
7/8"	2-3/4"	22.6 lb	24,800 lb	22 mm	33.6 kg	11.3 t	12.5 t
1"	3"	26.3 lb	29,000 lb	24 mm	39.1 kg	13.1 t	14.6 t
1-1/8"	3-1/2"	33.8 lb	37,300 lb	28 mm	50.3 kg	16.9 t	18.8 t
1-1/4"	3-3/4"	39.5 lb	43,500 lb	30 mm	58.8 kg	19.7 t	21.9 t
1-5/16"	4"	45.1 lb	49,700 lb	32 mm	67.1 kg	22.5 t	25.0 t
1-1/2"	4-1/2"	56.4 lb	62,100 lb	36 mm	83.9 kg	28.2 t	31.3 t
1-5/8"	5"	67.7 lb	74,500 lb	40 mm	101 kg	33.8 t	37.6 t
1-3/4"	5-1/2"	79.0 lb	86,900 lb	44 mm	118 kg	39.4 t	43.8 t
2"	6"	95.9 lb	105,000 lb	48 mm	143 kg	47.8 t	53.1 t
2-1/8"	6-1/2"	113 lb	124,000 lb	52 mm	168 kg	56.3 t	62.6 t
2-1/4"	7"	135 lb	149,000 lb	56 mm	201 kg	67.8 t	75.3 t
2-1/2"	7-1/2"	152 lb	167,000 lb	60 mm	226 kg	75.9 t	84.4 t
2-5/8"	8"	169 lb	186,000 lb	64 mm	251 kg	84.5 t	93.9 t
2-3/4"	8-1/2"	192 lb	212,000 lb	68 mm	286 kg	95.9 t	107 t
3"	9"	220 lb	242,000 lb	72 mm	327 kg	110 t	122 t
3-1/4"	10"	271 lb	284,000 lb	80 mm	403 kg	129 t	143 t
3-5/8"	11"	321 lb	335,000 lb	88 mm	478 kg	152 t	169 t
3-3/4"	11-1/4"	355 lb	364,000 lb	92 mm	528 kg	165 t	183 t
4"	12"	389 lb	404,000 lb	96 mm	579 kg	183 t	204 t
4-1/4"	13"	457 lb	473,000 lb	104 mm	680 kg	214 t	238 t
4-5/8"	14"	525 lb	542,000 lb	112 mm	781 kg	246 t	273 t
5"	15"	658 lb	596,000 lb	120 mm	979 kg	270 t	300 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths. Larger sizes available, contact customer service for details.

### DESCRIPTION

This 12-strand round plait is preshrunk, thermo-set, and Samthane coated to create a stabilized, firm, durable rope that is fully spliceable.



### FEATURES & BENEFITS

- > Preshrunk round plait
- > Samthane coated
- > Durable
- > Fully spliceable

### APPLICATIONS

- > Trawl or bridle lines
- > Rib lines

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
3/4"	2-1/4"	18.0 lb	15,800 lb	18 mm	26.8 kg	7,100 kg	7.9 t
7/8"	2-3/4"	25.5 lb	24,100 lb	22 mm	37.9 kg	10,900 kg	12.2 t
1"	3"	32.0 lb	32,400 lb	24 mm	47.6 kg	14,700 kg	16.3 t
1-1/8"	3-1/2"	40.0 lb	36,000 lb	28 mm	59.5 kg	16,300 kg	18.1 t
1-1/4"	3-3/4"	45.0 lb	43,200 lb	30 mm	67.0 kg	19,600 kg	21.8 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS<sup>†</sup>

FIBER: Nylon

SPECIFIC GRAVITY: 1.14

STANDARD COLOR: Coated clear, red, green, or blue. Also available with black longitudinal line.

#### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 4.2%

20% ..... 6.3%

30% ..... 8.0%

#### SPLICE/CLASS:

12-Strand Round Plait Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).



## CLASS II

### FEATURES & BENEFITS

- > Samthane Type E coating increases residual strength as much as 15–20%
- > Improved performance over other standard HMPE ropes
- > Replaces wire rope size for size at 1/7th the weight
- > Flexible
- > Easy to handle, inspect, and splice in the field
- > Floats

### APPLICATIONS

- > Gilson wire rope replacements
- > Door legs
- > Winch lines
- > Framing ropes
- > Trawl or bridle lines

### DESCRIPTION

Saturn-12 has an enhanced coating that improves abrasion resistance and increases residual strength as much as 15–20% when compared with other HMPE lines and their conventional coatings. Its light weight, high strength, and low stretch make it ideal for quick, efficient connections and controlled response. Saturn-12 has been tested in extreme conditions and is proven to provide a longer service life while reducing costs when compared to standard HMPE ropes available today.

A complement to other Samson working lines such as AmSteel®-Blue and Quantum-12, Saturn-12 is recommended for tug working lines on drums and as a pendant in ship-assist work. It is not recommended for use on H-bitts, capstans, or cleats due to its very low coefficient of friction.



### SPECIFICATIONS†

FIBER: Dyneema®

SPECIFIC GRAVITY: 0.98 (floats)

STANDARD COLOR: Orange, sizes 13/16" and above have black longitudinal line

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.46%

20% ..... 0.70%

30% ..... 0.96%

SPlice/CLASS:

For sizes 1/4"–1-1/4"  
12-strand Class II

For sizes above 1-1/4"  
12-strand Class II  
Modified Tuck Bury

†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* METRIC TONS	ISO 2307 STRENGTH** METRIC TONS
1-1/8"	3-1/2"	31.9 lb	133,000 lb	28 mm	47.5 kg	60.4 t	67.1 t
1-1/4"	3-3/4"	36.2 lb	149,000 lb	30 mm	53.9 kg	67.4 t	74.8 t
1-5/16"	4"	41.8 lb	166,000 lb	32 mm	62.2 kg	75.1 t	83.5 t
1-3/8"	4-1/8"	45.0 lb	185,000 lb	34 mm	67.0 kg	83.7 t	93 t
1-1/2"	4-1/2"	51.7 lb	205,000 lb	36 mm	76.9 kg	93.1 t	103 t
1-5/8"	5"	65.2 lb	255,000 lb	40 mm	97.0 kg	116 t	128 t
1-3/4"	5-1/2"	78.4 lb	302,000 lb	44 mm	117 kg	137 t	152 t
2"	6"	87.0 lb	343,000 lb	48 mm	129 kg	156 t	173 t
2-1/8"	6-1/2"	109 lb	411,000 lb	52 mm	162 kg	187 t	207 t
2-1/4"	7"	116 lb	483,000 lb	56 mm	173 kg	219 t	244 t
2-1/2"	7-1/2"	148 lb	529,000 lb	60 mm	220 kg	240 t	267 t
2-5/8"	8"	167 lb	596,000 lb	64 mm	248 kg	270 t	300 t
2-3/4"	8-1/2"	187 lb	662,000 lb	68 mm	278 kg	300 t	333 t
3"	9"	206 lb	749,000 lb	72 mm	307 kg	340 t	377 t
3-1/8"	9-1/2"	228 lb	828,000 lb	76 mm	339 kg	376 t	417 t
3-1/4"	10"	240 lb	906,000 lb	80 mm	357 kg	411 t	457 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.



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## CLASS I

### DESCRIPTION

Tenex is a 12-strand single braid that offers high strength with low stretch and outstanding abrasion resistance. It is Samthane coated to provide abrasion resistance, enhance wear life, snag resistance, and increase ease of splicing. It is a viable alternative to using double braids when easy field splicing and economy are major considerations.



### FEATURES & BENEFITS

- > High-tenacity polyester fiber
- > Samthane coating
- > Firm round construction
- > Outstanding abrasion resistance
- > Easy to splice

### APPLICATIONS

- > Purse seine lines
- > Other fishing lines
- > Pulling lines
- > Rib lines
- > Utility cordage

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
3/16"	9/16"	1.3 lb	1,600 lb	5 mm	1.9 kg	730 kg	0.82 t
1/4"	3/4"	2.1 lb	2,900 lb	6 mm	3.1 kg	1,300 kg	1.5 t
5/16"	1"	3.2 lb	4,200 lb	8 mm	4.8 kg	1,900 kg	2.1 t
3/8"	1-1/8"	4.2 lb	5,200 lb	9 mm	6.2 kg	2,400 kg	2.6 t
7/16"	1-1/4"	6.3 lb	8,100 lb	11 mm	9.4 kg	3,700 kg	4.1 t
1/2"	1-1/2"	8.5 lb	10,600 lb	12 mm	12.6 kg	4,800 kg	5.4 t
9/16"	1-3/4"	10 lb	13,500 lb	14 mm	14.9 kg	6,100 kg	6.8 t
5/8"	2"	13.1 lb	15,400 lb	16 mm	19.5 kg	7,000 kg	7.8 t
3/4"	2-1/4"	17.2 lb	20,200 lb	18 mm	25.6 kg	9,100 kg	10.2 t
7/8"	2-3/4"	25.8 lb	29,300 lb	22 mm	38.4 kg	13,300 kg	14.8 t
1"	3"	34.5 lb	38,400 lb	24 mm	51.3 kg	17,400 kg	19.4 t
1-1/8"	3-1/2"	43 lb	45,000 lb	28 mm	64.0 kg	20,400 kg	22.7 t
1-1/4"	3-3/4"	52.2 lb	51,500 lb	30 mm	77.7 kg	23,400 kg	25.9 t
1-5/16"	4"	59.7 lb	62,600 lb	32 mm	88.8 kg	28,400 kg	31.5 t
1-1/2"	4-1/2"	71.5 lb	73,500 lb	36 mm	106 kg	33,400 kg	37.1 t
1-5/8"	5"	90.3 lb	84,600 lb	40 mm	134 kg	38,400 kg	42.6 t
1-3/4"	5-1/2"	105 lb	98,100 lb	44 mm	157 kg	44,500 kg	49.4 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS<sup>†</sup>

FIBER: Polyester

SPECIFIC GRAVITY: 1.38

STANDARD COLOR: Coated clear, black, yellow, red, orange, blue, and green

#### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 1.4%

20% ..... 2.3%

30% ..... 3.0%

SPLICE/CLASS: 12-strand Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to SamsonRope.com.





## CLASS II

### FEATURES

- > Low stretch
- > Exceptional resistance to wear and flex-fatigue
- > Samthane coated

### APPLICATIONS

- > Trawl or bridle lines
- > Door legs
- > Wire rope replacement requiring non-flattening core

### DESCRIPTION

TrawlSteel is a strong, low-stretch, Samthane-coated 12-strand single braid that has exceptional resistance to wear and flex-fatigue. A nonload-bearing control core is in the center of the rope to maximize its cross-sectional firmness.



### SPECIFICATIONS†

FIBER: Polyester (Control Core) / Dyneema®

SPECIFIC GRAVITY: 1.03

STANDARD COLORS:  
Charcoal and yellow

#### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.46%

20% ..... 0.70%

30% ..... 0.96%

SPlice/CLASS: 12-strand Class II

†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
1/2"	1-1/2"	8.0 lb	18,000 lb	12 mm	11.9 kg	8,200 kg	9.1 t
9/16"	1-3/4"	9.6 lb	22,100 lb	14 mm	14.3 kg	10,000 kg	11.2 t
5/8"	2"	13.3 lb	29,300 lb	16 mm	19.8 kg	13,300 kg	14.7 t
3/4"	2-1/4"	16.7 lb	34,600 lb	18 mm	24.8 kg	15,700 kg	17.4 t
7/8"	2-3/4"	23.7 lb	48,800 lb	22 mm	35.3 kg	22,100 kg	24.6 t
1"	3"	29.0 lb	57,600 lb	24 mm	43.2 kg	26,100 kg	29.0 t
1-1/16"	3-1/4"	32.6 lb	64,800 lb	26 mm	48.5 kg	29,400 kg	32.7 t
1-1/8"	3-1/2"	43.5 lb	73,400 lb	28 mm	64.7 kg	33,300 kg	37.0 t
1-1/4"	3-3/4"	47.9 lb	82,100 lb	30 mm	71.3 kg	37,200 kg	41.4 t
1-1/2"	4-1/2"	69.9 lb	113,000 lb	36 mm	104 kg	51,300 kg	57.0 t
1-5/8"	5"	83.5 lb	134,000 lb	40 mm	124 kg	60,700 kg	67.5 t
1-3/4"	5-1/2"	96.8 lb	158,000 lb	44 mm	144 kg	71,900 kg	79.8 t
2"	6"	113 lb	180,000 lb	48 mm	169 kg	81,600 kg	90.7 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.



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### DESCRIPTION

TrawlSteel-Blue is a high-strength, low-stretch Samthane coated, 12-strand, single braid with exceptional resistance to wear and flex-fatigue. A nonload-bearing control core is in the center of the rope to maximize its cross-sectional firmness.



### FEATURES

- > High-strength
- > Low stretch
- > Size-for-size strength replacement for wire rope
- > Torque free
- > Easily inspected or field spliced
- > Very easy to handle
- > Similar elastic elongation to rope

### APPLICATIONS

- > Trawl or bridle lines
- > Door legs
- > Wire rope replacement requiring non-flattening core

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
1/2"	1-1/2"	8.0 lb	26,100 lb	12 mm	11.9 kg	11,800 kg	13.2 t
9/16"	1-3/4"	9.6 lb	32,100 lb	14 mm	14.3 kg	14,600 kg	16.2 t
5/8"	2"	13.3 lb	42,500 lb	16 mm	19.8 kg	19,300 kg	21.4 t
3/4"	2-1/4"	16.7 lb	50,100 lb	18 mm	24.8 kg	22,700 kg	25.3 t
7/8"	2-3/4"	23.7 lb	70,700 lb	22 mm	35.3 kg	32,100 kg	35.7 t
1"	3"	29.0 lb	83,500 lb	24 mm	43.2 kg	37,900 kg	42.1 t
1-1/16"	3-1/4"	32.6 lb	94,500 lb	26 mm	48.5 kg	42,900 kg	47.6 t
1-1/8"	3-1/2"	43.5 lb	106,000 lb	28 mm	64.7 kg	48,300 kg	53.7 t
1-1/4"	3-3/4"	47.9 lb	119,000 lb	30 mm	71.3 kg	54,000 kg	60.0 t
1-5/16"	4"	59.7 lb	133,000 lb	32 mm	88.8 kg	60,100 kg	66.8 t
1-1/2"	4-1/2"	69.9 lb	164,000 lb	36 mm	104 kg	74,300 kg	82.6 t
1-5/8"	5"	83.5 lb	194,000 lb	40 mm	124 kg	88,100 kg	97.9 t
1-3/4"	5-1/2"	96.8 lb	230,000 lb	44 mm	144 kg	104,000 kg	116 t
2"	6"	113 lb	261,000 lb	48 mm	169 kg	118,000 kg	132 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS<sup>†</sup>

FIBER: Dyneema®

SPECIFIC GRAVITY: 1.03

STANDARD COLOR: Blue

#### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.46%

20% ..... 0.70%

30% ..... 0.96%

SPLICE/CLASS: 12-strand Class II

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

WITH  
Dyneema®

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## CLASS II

### FEATURES

- > Firm for trawl applications
- > Samthane coated
- > Abrasion resistant

### APPLICATIONS

- > Trawl or bridle lines
- > Door legs
- > Wire rope replacement requiring non-flattening core

### DESCRIPTION

TS-II is a core-dependent double braid with a Dyneema® braided core with a polyester cover that has the firmness required for trawl-system applications. The polyester jacket protects the strength member from abrasion. The Samthane coating applied to the cover further enhances abrasion resistance and allows for specific rope identification within the trawl net system. TS-II requires specific splicing instructions, which are available upon request.



### SPECIFICATIONS<sup>†</sup>

FIBER (CORE/COVER): Polyester (Control Core) / Dyneema®

SPECIFIC GRAVITY: 1.20

STANDARD COLORS:

Charcoal, yellow and orange

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 1.30%

20% ..... 1.60%

30% ..... 2.00%

SPICE/CLASS:

Product Specific Class II

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
1/2"	1-1/2"	9.6 lb	17,900 lb	12 mm	14.3 kg	8,100 kg	9.0 t
9/16"	1-3/4"	11.5 lb	19,600 lb	14 mm	17.1 kg	8,900 kg	9.9 t
5/8"	2"	15.5 lb	33,200 lb	16 mm	23.1 kg	15,000 kg	16.7 t
3/4"	2-1/4"	20.5 lb	39,100 lb	18 mm	30.5 kg	17,700 kg	19.7 t
7/8"	2-3/4"	29.3 lb	54,400 lb	22 mm	43.6 kg	24,700 kg	27.4 t
1"	3"	38.0 lb	63,800 lb	24 mm	56.5 kg	28,900 kg	32.1 t
1-1/8"	3-1/2"	46.4 lb	77,400 lb	28 mm	69.0 kg	35,100 kg	39.0 t
1-1/4"	3-3/4"	58.5 lb	84,200 lb	30 mm	87.0 kg	38,200 kg	42.4 t
1-1/2"	4-1/2"	83.5 lb	117,000 lb	36 mm	124 kg	53,200 kg	59.1 t
1-5/8"	5"	92.5 lb	136,000 lb	40 mm	138 kg	61,700 kg	68.5 t
1-3/4"	5-1/2"	112 lb	166,000 lb	44 mm	167 kg	75,200 kg	83.5 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

WITH  
Dyneema®

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### DESCRIPTION

TS-II Premium has a Dyneema® core strength member encased in a Dyneema® fiber jacket. The jacket is further enhanced with Samthane coating, allowing for specific rope identification within the trawl net system. This firm, abrasion resistant line has excellent wear characteristics and performs well on winch drums. Applicable splicing instructions are available upon request.



### FEATURES

- > Samthane coated
- > Abrasion resistant
- > Firm and excellent on winch drums
- > Excellent wear characteristics

### APPLICATIONS

- > Trawl or bridle lines
- > Door legs
- > Wire rope replacement requiring non-flattening core

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
1/2"	1-1/2"	8.1 lb	17,900 lb	12 mm	12.1 kg	8,100 kg	9.0 t
9/16"	1-3/4"	9.8 lb	19,600 lb	14 mm	14.6 kg	8,900 kg	9.9 t
5/8"	2"	12.5 lb	33,200 lb	16 mm	18.6 kg	15,000 kg	16.7 t
3/4"	2-1/4"	16.5 lb	39,100 lb	18 mm	24.6 kg	17,700 kg	19.7 t
7/8"	2-3/4"	24.0 lb	54,400 lb	22 mm	35.7 kg	24,700 kg	27.4 t
1"	3"	30.5 lb	63,800 lb	24 mm	45.4 kg	28,900 kg	32.1 t
1-1/8"	3-1/2"	39.0 lb	77,400 lb	28 mm	58.0 kg	35,100 kg	39.0 t
1-1/4"	3-3/4"	46.0 lb	84,200 lb	30 mm	68.4 kg	38,200 kg	42.4 t
1-1/2"	4-1/2"	66.8 lb	117,000 lb	36 mm	99.4 kg	53,200 kg	59.1 t
1-5/8"	5"	74.0 lb	136,000 lb	40 mm	110 kg	61,700 kg	68.5 t
1-3/4"	5-1/2"	90.0 lb	158,000 lb	44 mm	134 kg	71,700 kg	79.7 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS†

FIBER (CORE/COVER): Dyneema®  
(Polyester Control Core) /  
Dyneema®

SPECIFIC GRAVITY: 1.00

STANDARD COLORS:

Charcoal, yellow and orange

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 1.30%

20% ..... 1.60%

30% ..... 2.00%

SPLICE/CLASS:

Product Specific Class II

†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).



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# TS-II Turbo

Product Code: 881



## CLASS II

### FEATURES

- > Cut resistant
- > Abrasion resistant
- > Lightweight
- > Non-rotational
- > Steel wire replacement
- > Spliceable
- > Works well on winch drums
- > Net opens wider and floats

### APPLICATIONS

- > Trawl warp / main lines
- > Wire rope replacement requiring non-flattening core

### DESCRIPTION

TS-II Turbo is a unique high-performance trawl warp line constructed with Dyneema® fiber and a firm non-load-bearing polyester control core. As a lightweight steel wire rope replacement, TS-II Turbo is both cut and abrasion resistant and it floats. The neutral buoyancy allows for greater net control in shallow depths while also achieving wider openings at the front end of the nets to increase catch yield ratios.

During its trial, TS-II Turbo reduced the overall weight of the winch system by approximately 80%, based on replacing 1" steel wire rope. This significant weight reduction improves vessel stability and enables the "hold" capacity to increase the catch volume. The reduced weight also equated to fewer round trips and increased fuel savings. TS-II Turbo is expected to remain in service significantly longer than the steel wire rope it replaces.



### SPECIFICATIONS†

FIBER (CORE/COVER):  
Dyneema® (Polyester  
Control Core) / Dyneema®

SPECIFIC GRAVITY: 1.0

STANDARD COLOR: Orange

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.45%

20% ..... 0.60%

30% ..... 0.90%

SPLICE/CLASS:

Product Specific Class II

SIZE DIAMETER INCHES	REPLACES WIRE DIAMETER INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON AVG. BREAK* STRENGTH POUNDS	SAMSON MIN. BREAK* STRENGTH POUNDS	SIZE DIAMETER MILLIMETERS	REPLACES WIRE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS
7/8"	3/4"	18.1 lb	49,300 lb	41,900 lb	22 mm	20 mm	26.9 kg
1"	7/8"	24.7 lb	65,000 lb	55,200 lb	24 mm	22 mm	36.8 kg
1-1/8"	1"	34.4 lb	86,300 lb	73,400 lb	28 mm	26 mm	51.2 kg
1-3/8"	1-1/8"	40.9 lb	120,000 lb	102,000 lb	34 mm	28 mm	60.9 kg
1-1/2"	1-1/4"	57.6 lb	153,000 lb	130,000 lb	36 mm	32 mm	85.7 kg
1-5/8"	1-3/8"	67.4 lb	181,000 lb	154,000 lb	40 mm	36 mm	100 kg

\*Spliced strength

†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).



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Dyneema® is DSM's high-performance polyethylene product.



## CLASS II

### DESCRIPTION

Turbo-75 has the firmness and low stretch of wire, yet only 1/6th the weight. The durable "turbo" braided jacket is very cut and abrasion resistant, and protects the 12-strand single braid strength-member core. Turbo-75 spools on winches easily, does not rust or "fish hook" like wire rope, and it floats. Both cover and core are coated with a proprietary Samthane coating.

This product design requires a specialized splicing technique. A standard cover repair kit is available and easy to use in the field.



### FEATURES

- > Samthane coated
- > Abrasion resistant
- > Firm and excellent on winch drums
- > Excellent wear characteristics

### APPLICATIONS

- > Gilson wire rope replacement
- > Trawl or bridle lines

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
3/4"	2-1/4"	14.0 lb	53,100 lb	18 mm	20.8 kg	24,100 kg	26.8 t
7/8"	2-3/4"	19.0 lb	73,800 lb	22 mm	28.3 kg	33,500 kg	37.2 t
1"	3"	25.0 lb	87,300 lb	24 mm	37.2 kg	39,600 kg	44.0 t
1-1/16"	3-1/4"	27.0 lb	102,000 lb	26 mm	40.2 kg	46,100 kg	51.3 t
1-1/8"	3-1/2"	29.5 lb	113,000 lb	28 mm	43.9 kg	51,000 kg	56.7 t
1-1/4"	3-3/4"	38.5 lb	135,000 lb	30 mm	57.3 kg	61,200 kg	68.0 t
1-5/16"	4"	43.0 lb	149,000 lb	32 mm	64.0 kg	67,400 kg	74.8 t
1-3/8"	4-1/8"	48.0 lb	167,000 lb	34 mm	71.4 kg	75,500 kg	83.9 t
1-1/2"	4-1/2"	59.5 lb	189,000 lb	36 mm	88.5 kg	85,700 kg	95.3 t
1-5/8"	5"	67.0 lb	225,000 lb	40 mm	99.7 kg	102,000 kg	113 t
1-11/16"	5-1/4"	70.0 lb	252,000 lb	42 mm	104 kg	114,000 kg	127 t
1-3/4"	5-1/2"	80.5 lb	275,000 lb	44 mm	120 kg	125,000 kg	138 t
1-7/8"	5-5/8"	85.0 lb	293,000 lb	46 mm	126 kg	133,000 kg	148 t
2"	6"	93.0 lb	329,000 lb	48 mm	138 kg	149,000 kg	166 t
2-1/8"	6-1/2"	105 lb	351,000 lb	52 mm	156 kg	159,000 kg	177 t
2-1/4"	7"	120 lb	405,000 lb	56 mm	179 kg	184,000 kg	204 t
2-1/2"	7-1/2"	140 lb	514,000 lb	60 mm	208 kg	233,000 kg	259 t
2-5/8"	8"	156 lb	540,000 lb	64 mm	232 kg	245,000 kg	272 t
2-3/4"	8-1/2"	170 lb	572,000 lb	68 mm	253 kg	259,000 kg	288 t
2-7/8"	8-5/8"	188 lb	612,000 lb	70 mm	280 kg	278,000 kg	308 t
3"	9"	205 lb	675,000 lb	72 mm	305 kg	306,000 kg	340 t
3-1/4"	10"	200 lb	779,000 lb	80 mm	298 kg	353,000 kg	392 t
3-3/8"	10-1/8"	220 lb	855,000 lb	82 mm	327 kg	388,000 kg	431 t
3-1/2"	10-1/2"	240 lb	923,000 lb	86 mm	357 kg	418,000 kg	465 t
3-5/8"	11"	263 lb	992,000 lb	88 mm	391 kg	450,000 kg	500 t
4"	12"	295 lb	1,103,000 lb	96 mm	439 kg	500,000 kg	556 t
4-1/4"	13"	385 lb	1,260,000 lb	104 mm	573 kg	572,000 kg	635 t
4-5/16"	13-1/8"	400 lb	1,305,000 lb	106 mm	595 kg	592,000 kg	658 t
4-1/2"	13-1/2"	428 lb	1,395,000 lb	110 mm	637 kg	633,000 kg	703 t
4-5/8"	14"	460 lb	1,481,000 lb	112 mm	684 kg	672,000 kg	746 t
5"	15"	540 lb	1,750,000 lb	120 mm	804 kg	794,000 kg	882 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS<sup>†</sup>

FIBER (CORE/COVER):

Dyneema® / Dyneema®

SPECIFIC GRAVITY: 0.98 (floats)

STANDARD COLORS: Yellow or orange with a black longitudinal line and charcoal with a red longitudinal line

ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 0.30%

20% ..... 0.50%

30% ..... 0.80%

SPLICE/CLASS:

Product Specific Class II

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to SamsonRope.com.



Dyneema® is a registered trademark of Royal DSM N.V.  
Dyneema® is DSM's high-performance polyethylene product.

# Turbo Nylon Head Rope

Product Code: 541



## CLASS I

### FEATURES

- > Allows for swaged eyes
- > Good abrasion resistance
- > Excellent shock loading characteristics
- > Excellent elongation characteristics

### APPLICATIONS

- > Trawl or bridle lines
- > Rib lines
- > Foot ropes

### DESCRIPTION

A firm, knobby nylon double braid, Turbo Nylon Head Rope has a parallel nylon core. This construction allows for swaged eyes, and has good abrasion resistance and excellent shock loading and elongation characteristics.



### SPECIFICATIONS†

FIBER (CORE/COVER): Nylon / Nylon

SPECIFIC GRAVITY: 1.14

STANDARD COLOR: White with one red and green ID. Also available with black longitudinal line.

SPLICE/CLASS:

Non-spliceable Class I

†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
5/8"	2"	11.3 lb	9,200 lb	16 mm	16.8 kg	4,200 kg	4.6 t
3/4"	2-1/4"	15.0 lb	13,800 lb	18 mm	22.3 kg	6,200 kg	6.9 t
7/8"	2-3/4"	21.0 lb	14,900 lb	22 mm	31.2 kg	6,700 kg	7.5 t
1"	3	26.5 lb	16,800 lb	24 mm	39.4 kg	7,600 kg	8.5 t
1-1/16"	3-1/4"	28.3 lb	20,900 lb	26 mm	42.1 kg	9,500 kg	10.5 t
1-1/8"	3-1/2"	32.0 lb	22,300 lb	28 mm	47.6 kg	10,100 kg	11.2 t
1-1/4"	3-3/4"	40.5 lb	31,700 lb	30 mm	60.3 kg	14,400 kg	16.0 t
1-1/2"	4-1/2"	59.0 lb	43,200 lb	36 mm	87.8 kg	19,600 kg	21.8 t

\*Unspliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

## DESCRIPTION

A firm, knobby polyester double braid, Turbo Polyester Head Rope has a parallel polyester core. This construction allows for swaged eyes, and has good abrasion resistance and excellent shock loading and elongation characteristics.



## FEATURES

- > Allows for swaged eyes
- > Good abrasion resistance
- > Excellent shock loading characteristics
- > Excellent elongation characteristics

## APPLICATIONS

- > Trawl or bridle lines
- > Rib lines
- > Framing lines
- > Foot ropes

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS
5/8"	2"	13.0 lb	13,600 lb	16 mm	19.3 kg	6,200 kg	6.9 t
3/4"	2-1/4"	18.0 lb	17,000 lb	18 mm	26.8 kg	7,700 kg	8.6 t
7/8"	2-3/4"	26.0 lb	22,100 lb	22 mm	38.7 kg	10,000 kg	11.1 t
15/16"	2-7/8"	30.5 lb	25,500 lb	23 mm	45.4 kg	11,600 kg	12.9 t
1"	3	34.0 lb	27,200 lb	24 mm	50.6 kg	12,300 kg	13.7 t
1-1/16"	3-1/4"	36.0 lb	30,600 lb	26 mm	53.6 kg	13,900 kg	15.4 t
1-1/8"	3-1/2"	40.0 lb	32,300 lb	28 mm	59.5 kg	14,700 kg	16.3 t
1-1/4"	3-3/4"	48.0 lb	36,600 lb	30 mm	71.4 kg	16,600 kg	18.4 t
1-1/2"	4-1/2"	59.0 lb	46,800 lb	36 mm	87.8 kg	21,200 kg	23.6 t

\*Unspliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

## SPECIFICATIONS<sup>†</sup>

FIBER (CORE/COVER):

Polyester / Polyester

SPECIFIC GRAVITY: 1.38

STANDARD COLOR: White with two variegated red and green ID markers and black longitudinal hanging line.

SPLICE/CLASS:

Non-spliceable Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).



# UB-16 Jacketed Trawl Twine

Product Code: 712



## CLASS I

### FEATURES

- > Excellent knot holding characteristics
- > Performs well for front-end material in mid-water trawl twine applications
- > Non-spliceable

### APPLICATIONS

- > Trawl or bridle lines
- > Large mesh front end material

### DESCRIPTION

UB-16 Jacketed Trawl Twine is a 16-strand, single braid nylon core with an Ultra Blue protective braid-over-braid jacket, which adds additional wear resistance to the trawl twine offerings. The jacket material provides excellent knot-holding characteristics and performs well for front-end material in mid-water trawl twine applications.

### SPECIFICATIONS<sup>†</sup>

#### FIBER (CORE/COVER):

Nylon / Ultra Blue Polyolefin

#### SPECIFIC GRAVITY: 1.00

#### STANDARD COLORS:

Red, blue, green, and yellow

#### ELASTIC ELONGATION PERCENTAGE

##### At % of break strength

10% ..... 2.80%

20% ..... 5.20%

30% ..... 6.70%

#### SPLICE/CLASS:

Non-spliceable Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).

SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* KILOGRAMS	ISO 2307 STRENGTH** METRIC TONS	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS
6 mm	2.1 kg	780 kg	0.86 t	1.4 lb	1,700 lb
8 mm	3.9 kg	1,300 kg	1.5 t	2.6 lb	3,000 lb
10 mm	6.4 kg	2,200 kg	2.4 t	4.3 lb	4,900 lb
12 mm	8.9 kg	3,100 kg	3.4 t	6.0 lb	6,800 lb
15 mm	13.4 kg	4,500 kg	5.0 t	9.0 lb	9,900 lb
17 mm	17.9 kg	5,700 kg	6.4 t	12.0 lb	12,600 lb

\*Unspliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.



### DESCRIPTION

In this 8-strand construction, high-strength Ultra Blue fiber creates a rope that is 30–35% higher in strength than the equivalent polypropylene construction, giving Ultra Blue-8 up to three times more wear life than polypropylene. The unique fiber surface develops excellent grip capability while adding to the surface wear life.



### FEATURES

- > 30–35% stronger than standard polypropylene
- > More durable than polypropylene
- > Excellent grip
- > UV resistant
- > Floats
- > Easy to splice

### APPLICATIONS

- > Purse seine lines
- > Trawl or bridle lines
- > Tie-up lines
- > Rib lines
- > General utility lines

SIZE DIAMETER INCHES	SIZE CIRC. INCHES	WEIGHT PER 100 FT. POUNDS	SAMSON MBS* POUNDS	SIZE DIAMETER MILLIMETERS	WEIGHT PER 100 m KILOGRAMS	SAMSON MBS* METRIC TONS	ISO 2307 STRENGTH** METRIC TONS
1"	3"	19.2 lb	21,400 lb	24 mm	28.6 kg	9.7 t	10.8 t
1-1/8"	3-1/2"	23.7 lb	26,200 lb	28 mm	35.3 kg	11.9 t	13.2 t
1-1/4"	3-3/4"	28.8 lb	31,500 lb	30 mm	42.9 kg	14.3 t	15.9 t
1-5/16"	4"	31.6 lb	33,800 lb	32 mm	47.0 kg	15.3 t	17.0 t
1-1/2"	4-1/2"	41.2 lb	39,900 lb	36 mm	61.3 kg	18.1 t	20.1 t
1-5/8"	5"	52.6 lb	52,200 lb	40 mm	78.3 kg	23.7 t	26.3 t
1-3/4"	5-1/2"	61.9 lb	62,100 lb	44 mm	92.1 kg	28.2 t	31.3 t
2"	6"	73.2 lb	73,800 lb	48 mm	109 kg	33.5 t	37.2 t
2-1/8"	6-1/2"	86.6 lb	81,000 lb	52 mm	129 kg	36.7 t	40.8 t
2-1/4"	7"	101 lb	98,100 lb	56 mm	150 kg	44.5 t	49.4 t
2-1/2"	7-1/2"	116 lb	113,000 lb	60 mm	172 kg	51.0 t	56.7 t
2-5/8"	8"	131 lb	126,000 lb	64 mm	195 kg	57.2 t	63.5 t
2 3/4"	8-1/2"	149 lb	142,000 lb	68 mm	222 kg	64.5 t	71.7 t
3"	9"	168 lb	158,000 lb	72 mm	250 kg	71.9 t	79.8 t
3-1/8"	9-1/2"	188 lb	176,000 lb	76 mm	280 kg	80.0 t	88.9 t
3-1/4"	10"	208 lb	194,000 lb	80 mm	310 kg	88.2 t	98.0 t
3-5/8"	11"	250 lb	231,000 lb	88 mm	371 kg	105 t	117 t
4"	12"	294 lb	275,000 lb	96 mm	437 kg	125 t	138 t
6"	18"	645 lb	583,000 lb	152 mm	960 kg	265 t	294 t

\*Spliced strength \*\* This standard replaces BS EN 919 and ISO 2307:1995 and is for unspliced strengths.

### SPECIFICATIONS<sup>†</sup>

FIBER (CORE/COVER):  
Ultra Blue Polyolefin

SPECIFIC GRAVITY: 0.94 (floats)

STANDARD COLOR:  
Blue with red and green ID

#### ELASTIC ELONGATION PERCENTAGE

At % of break strength

10% ..... 1.70%  
20% ..... 3.50%  
30% ..... 4.20%

SPLICE/CLASS: 8-Strand Class I

<sup>†</sup>Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to [SamsonRope.com](http://SamsonRope.com).



# DC Gard

## CHAFE PROTECTION SOLUTION

Product Code: 706

**COVER  
ONLY  
CONSTRUCTION**

### CLASS II

#### FEATURES

- > Light and flexible
- > Floats
- > Can be removed for rope inspection
- > Cut resistant
- > Superior durability

#### APPLICATIONS

- > Eye protection
- > Replacement cover for TS-II and TS-II Premium
- > Chafe protection

#### DESCRIPTION

DC Gard is a tightly braided cover construction of Dyneema® fiber that is spliced onto the strength member to protect it from wear and abrasion in specific areas. Designed for use in applications such as tug operations, where frequent handling and use put a premium on rope protection and resistance to snagging. For vessels where frequent mooring operations are the norm, DC Gard provides maximum protection for working ropes. PATENT PENDING.



#### SPECIFICATIONS†

FIBER (COVER ONLY):

Dyneema®

STANDARD COLOR:

Gray

*†Due to our continued research and development of product performance, the specifications listed herein are subject to change. For the most current sizes, weights, and strengths, go to SamsonRope.com.*

#### DC GARD SPECIFICATIONS

SIZE DESIGNATION	FITS ROPE DIAMETER		COVERS SPLICE DIAMETER	
	INCHES	MILLIMETERS	INCHES	MILLIMETERS
Size C	1" – 1-1/4"	24 – 30 mm	9/16" – 5/8"	14 – 16 mm
Size D	1-5/16" – 1-3/4"	32 – 44 mm	3/4" – 1"	18 – 24 mm
Size E	1-7/8" – 2-1/2"	45 – 60 mm	1-1/8" – 1-3/8"	28 – 34 mm
Size F	2-5/8" – 3-1/8"	64 – 76 mm	1-1/2" – 1-3/4"	36 – 44 mm
Size G	3-1/4" – 4-1/4"	80 – 104 mm	1-7/8" – 2-3/8"	45 – 57 mm
Size H	4-1/2" – 5-3/4"	110 – 146 mm	2-1/2" – 3-1/4"	60 – 80 mm
Size I	6" – 6-3/4"	152 – 172 mm	3-1/2" – 3-3/4"	86 – 92 mm
Size J	7" – 7-3/4"	178 – 196 mm	4" – 4-1/2"	96 – 110 mm
Size K	8"	204 mm	4-5/8" – 5"	112 – 120 mm

SIZE DESIGNATION	FITS ROPE CIRCUMFERENCE		COVERS SPLICE CIRCUMFERENCE	
	INCHES	MILLIMETERS	INCHES	MILLIMETERS
Size C	3" – 3-3/4"	72 – 90 mm	1-3/4" – 2"	42 – 48 mm
Size D	4" – 5-1/2"	96 – 132 mm	2-1/4" – 3"	54 – 72 mm
Size E	5-5/8" – 7-1/2"	136 – 180 mm	3-1/2" – 4-1/8"	84 – 100 mm
Size F	8" – 9-1/2"	192 – 228 mm	4-1/2" – 5-1/2"	108 – 132 mm
Size G	10" – 13"	240 – 312 mm	5-5/8" – 7-1/8"	136 – 174 mm
Size H	13-1/2" – 17-1/4"	328 – 438 mm	7-1/2" – 10"	180 – 240 mm
Size I	18" – 20-1/4"	456 – 516 mm	10-1/2" – 11-1/4"	254 – 272 mm
Size J	21" – 23-1/4"	534 – 588 mm	12" – 13-1/2"	288 – 328 mm
Size K	24"	612 mm	14" – 15"	336 – 360 mm

WITH  
Dyneema®

Dyneema® is a registered trademark of Royal DSM N.V.  
Dyneema® is DSM's high-performance polyethylene product.

# SPLICING INSTRUCTIONS

# Tools and Materials for Splicing

## FID

Samson Tubular, Wire or Selma fids are available in a variety of sizes depending on the rope type and diameter you're splicing.

## PUSHER

Helpful for extracting cores or pushing a fid through the rope.

## TAPE

Masking tape, electrical tape or a similar plastic tape can be used during splicing.

## SCISSORS OR KNIFE

For cutting away strands — must be sharp.

## TWINE

Good quality nylon braided or twisted twine in a size adequate for the rope diameter being spliced.

## RULER OR TAPE MEASURE

## MARKING PEN



# Fid Information

## FID LENGTH DEFINITION

The "fid length" for a rope is calculated as 21 times the rope diameter. As the rope diameter increases, so does the fid length. For example the fid length for a 4" diameter rope is 84".

The length of the splicing tool, called a "fid", may or may not have a 1:1 correlation with the fid length for a given rope diameter. Refer to the example above and imagine trying to splice a 4" diameter rope with an 84" fid. To keep fids to a manageable length, they may be scaled to the actual fid length of a given rope diameter. Our tubular fids are 100% scale, meaning that the overall length of the tool is equal to the actual fid length for the corresponding rope diameter. Our wire fids are 1/2 scale, meaning that the length of the tool is 1/2 the actual fid length for the corresponding rope diameter.

## ALUMINUM TUBULAR FIDS

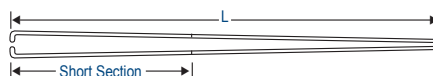
A different sized splicing fid is required for each size of rope.

Short Section  
of Fid

Fid Size = Rope Diameter	TOTAL FID LENGTH	SHORT FID SECTION
1/4"	5-1/2"	2-1/16"
5/16"	6-3/4"	2-1/2"
3/8"	7-3/4"	2-7/8"
7/16"	9-1/2"	3-9/16"
1/2"	11"	4-1/8"
9/16"	12-1/4"	3-5/8"
5/8"	14"	4-1/8"
3/4"	16"	4-3/4"
7/8"	19"	4-3/4"
1"	21"	5-1/4"

## WIRE FIDS

For rope sizes above 3" circumference (1" diameter), use a wire fid. Fid scale: 1/2 (for rope diameters between 1" and 2").



Fid Size = Rope Diameter	TOTAL FID LENGTH "L"	SHORT FID SECTION
1"	10-1/2"	2-5/8"
1-1/8"	12-1/4"	3"
1-1/4"	13-1/4"	3-1/4"
1-5/16"	14"	3-1/2"
1-1/2"	16"	4"
1-5/8"	17-1/2"	4-1/2"
1-3/4"	19"	4-3/4"
2"	21"	5-1/4"

## CALCULATING FID SHORT SECTION

1/4" – 1/2" short section is 37.5% of fid length

9/16" – 3/4" short section is 30% of fid length

7/8" and up short section is 25% of fid length



# SAMSON SPLICING INSTRUCTIONS

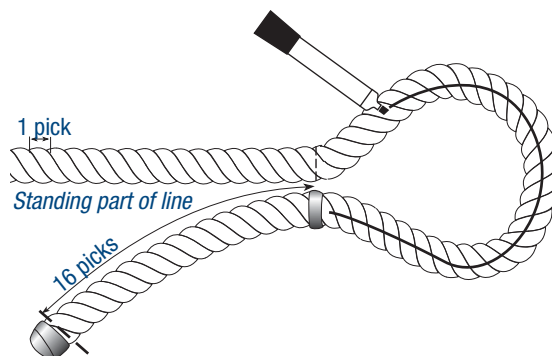
## 3-Strand Class I EYE SPLICE

Class I ropes are made from any or all of the following fibers: olefin, polyester, or nylon.

The eye splice is used to place a permanent loop in the end of a rope, generally for attachment purposes to a fixed point. An eye is also used to form the rope around a thimble, which is used to protect the rope, especially when it is to be attached to a shackle, chain, or wire rope.

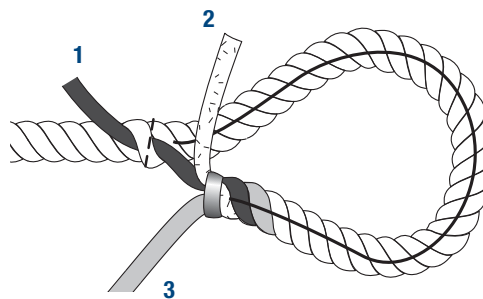
Although the 3-strand splice is the most common splice, and simple to perform, technique is important to preserve splice strength. Take care that the tucks lie neatly, as rope strength can be lost if the strands are twisted incorrectly.

Getting Started: From one end of the rope, count back 16 picks. Tape this section. Unlay the rope up to the tape then tape the end of each strand. Form the eye and mark a line around the standing part of the rope that will touch all 3 strands. Your individual taped strands will tuck under these marks. Draw a line on the eye for visual reference (optional).



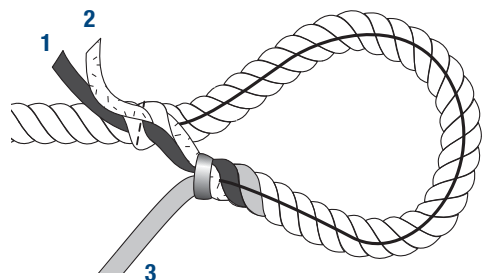
### STEP 1 TUCKING FIRST STRAND

Note the mark around the standing part of the rope that touches all 3 strands. Your individual taped strands will tuck under these marks. Tuck the middle strand (Strand 1) under the nearest marked pick.



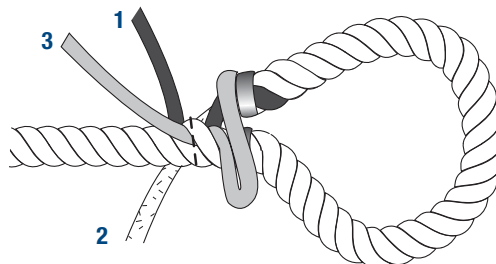
### STEP 2 TUCKING SECOND STRAND

Tuck Strand 2 under the marked pick behind Strand 1.



### STEP 3 TUCKING THIRD STRAND

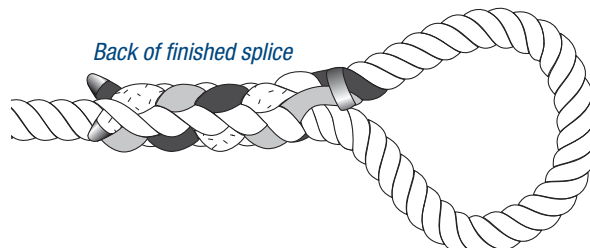
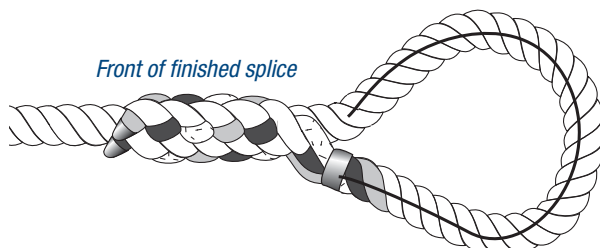
Turn the entire piece over. There is 1 working strand left to tuck and there is 1 strand left in the standing part of the rope that does not have a working strand under it. Make this tuck, continuing to tuck counter to the lay or twist of the rope. The first round of tucks is complete. Remove the tape, then tighten if necessary by pulling on the strand ends.



### STEP 4 FINISHING THE SPLICE

Continue tucking the taped strands down the body of the rope. A tuck consists of skipping over the strand below and tucking under the next 1. When all 3 strands are tucked in this manner, 1 round of tucks is complete.

To finish the splice, perform 4 more complete tucks. Both the front and back of the splice should resemble the illustrations shown.



# SAMSON SPLICING INSTRUCTIONS

## 8-Strand Class I EYE SPLICE

Class I ropes are made from any or all of the following fibers: olefin, polyester, or nylon.

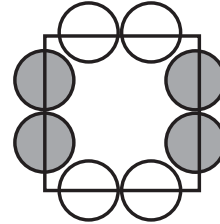
The eye splice is used to place a permanent loop in the end of a rope, generally for attachment purposes to a fixed point. An eye is also used to form the rope around a thimble, which is used to protect the rope, especially when it is to be attached to a shackle, chain, or wire rope.

### GETTING STARTED

8-strand ropes, also known as plaited ropes, are composed of 8 strands grouped into 4 pairs. 2 of these pairs turn to the left (shown in gray), and 2 pairs turn to the right (shown in white.) Seen in this cross-section, the 4 strand pairs form the sides of a square. The strands that are on opposite sides of the square will rotate in the same direction.

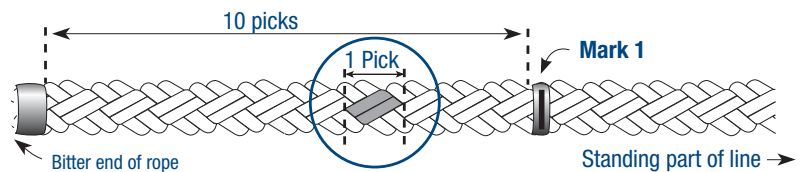
#### TOOLS REQUIRED

A splicing fid or marlinspike, sharp knife or scissors, plastic or masking tape, marking pen.



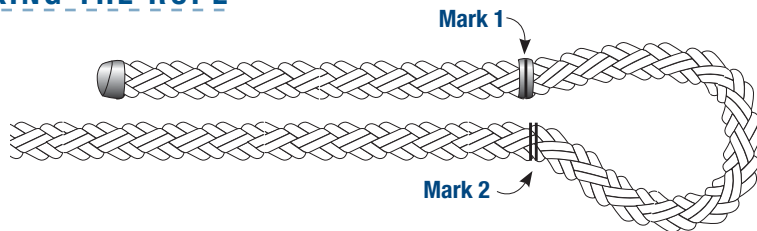
### STEP 1 COUNTING AND MARKING

From the end of the rope, count a distance of 10 picks and apply tape securely around the rope immediately after the 10th pick, as shown in the illustration. This is Mark 1. Apply the tape securely enough so that it will not move during the splicing procedure.



### STEP 2 MAKING THE EYE AND MARKING THE ROPE

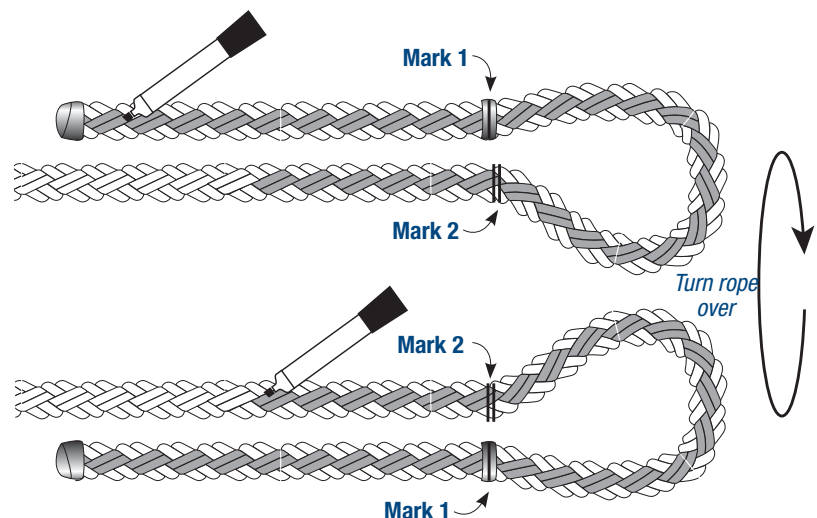
Form the desired size of the eye being careful not to add twist to the rope. Mark the rope adjacent to the tape. This is Mark 2.



### STEP 3 MARKING THE LEFT-ROTATING STRANDS

From the end of the rope; mark the first 10-picks up to the tape at Mark 1. Continue marking the length of the eye and at least an additional 6 picks past Mark 2. Mark all strands that rotate left on both sides of the braided rope.

**Note:** The strands that rotate left (gray) can be marked for improved visual reference. 8-strand ropes are composed of 4 pairs of 2 strands each. 2 of the strand pairs rotate to the left, and 2 pairs rotate to the right. When marking the left-rotating strands, be sure to turn the rope over and mark the left-rotating strands on the opposite side of the braid.



# SAMSON SPLICING INSTRUCTIONS

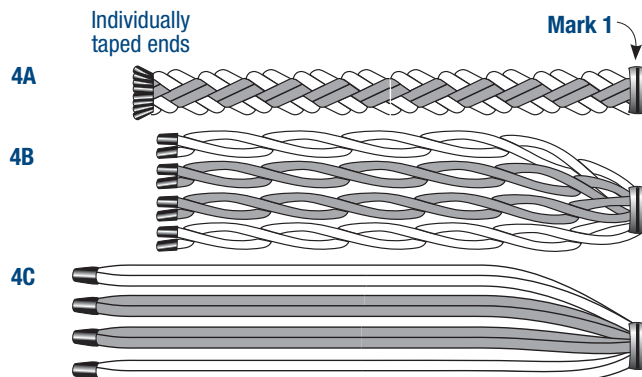
## 8-Strand Class I EYE SPLICE

### STEP 4 TAPING THE ENDS AND UNLAYING THE ROPE

**4A** Tape the ends of each of the 8 strands individually.

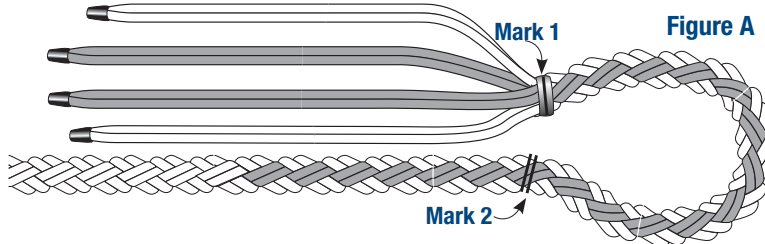
**4B** Unlay the strand pairs all the way back to the tape at Mark 1. Keep the pairs of strands together while unbraiding.

**4C** When unlayed, the strands in a pair will be twisted around each other. Untwist each strand pair so the 2 strands lie parallel to each other, rather than twisting around each other. Tape the ends of each pair together.



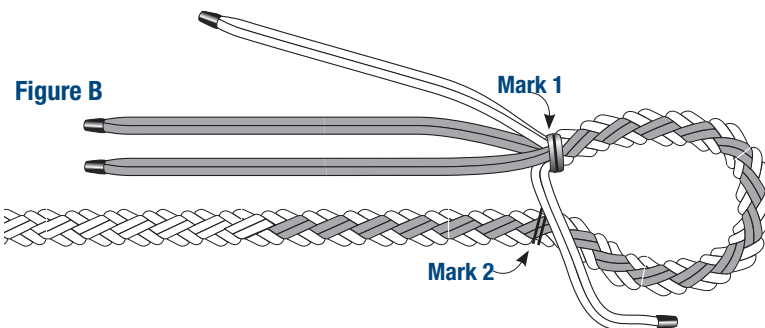
### STEP 5 POSITIONING THE STRANDS

Arrange the strand pairs as shown in Fig. A. One set of the marked (gray) strands is on the top; and the other marked (gray) strands are on the bottom. The unmarked (white) pair will be on the left and right.



### STEP 6 FORMING THE EYE

Physically form the eye, making certain there is no twist in the rope. Place the (white) pair that is closest to the standing part of the rope over the rope, at Mark 2, as shown in Fig. B; being careful not to add twist to the rope.

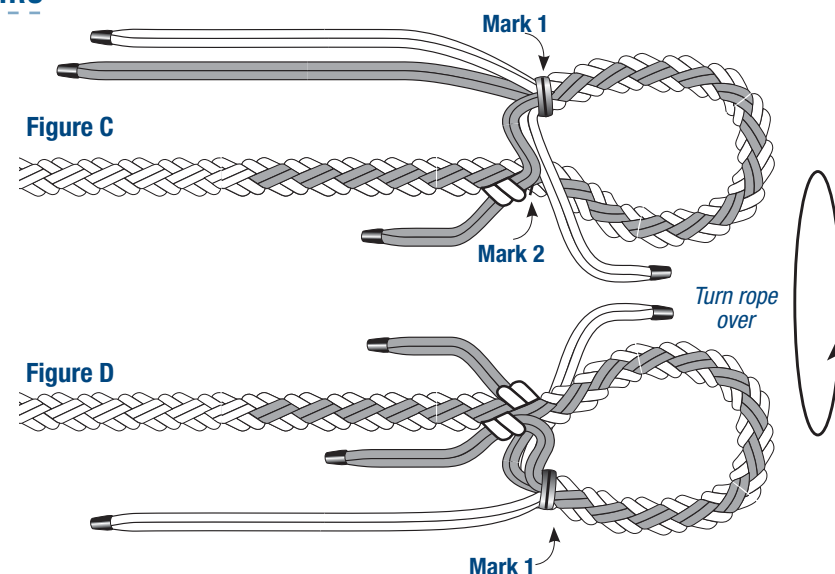


### STEP 7 ROUTE TUCKING THE STRAND PAIRS

**Note:** If necessary, use a fid or marlinspike to loosen the strands. The left rotating (gray) strands will be tucked under the right rotating (white) strands, and vice versa.

**7A** Beginning with the left rotating marked (gray) pair of strands on top, make your first tuck under the right rotating (white) pair of strands closest to Mark 2. Pull the strands completely through, making sure that the strands don't twist (Fig. C).

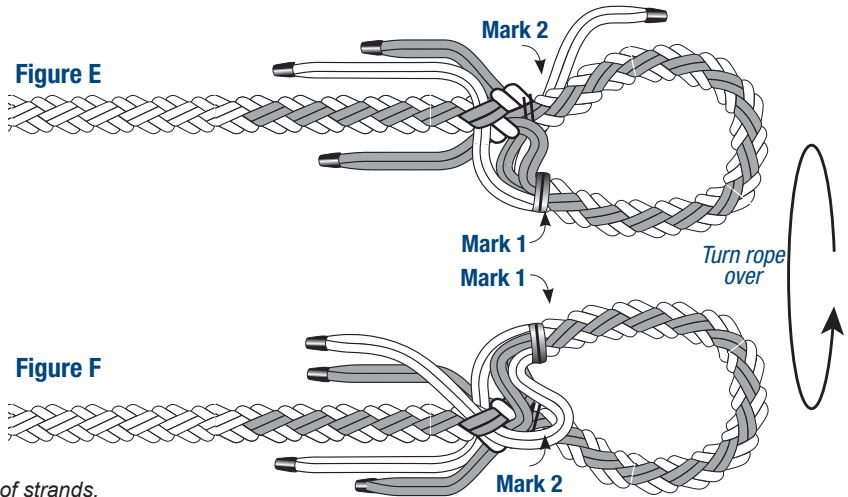
**7B** Turn the eye over and tuck the other marked (gray) pair of strands under the (white) pair of strands directly opposite the previous tuck (Fig. D).



# SAMSON SPLICING INSTRUCTIONS

## 8-Strand Class I EYE SPLICE

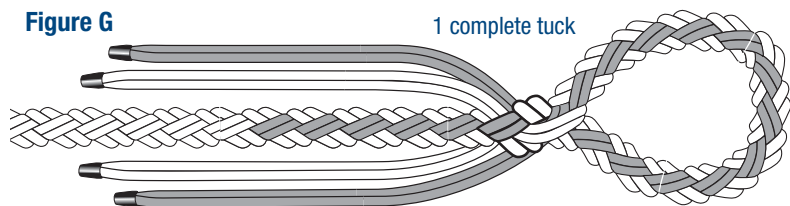
**7C** Tuck the (white) pair of strands under the (gray) pair of strands closest to the first 2 tucks. Pull the strands snug, but not tight to avoid distorting the strands in the eye area. Again, make sure there is no twist in the strands (Fig. E).



**7D** Turn the eye over and tuck the remaining (white) pair of strands under the remaining (gray) pair of strands in the standing part of the rope (Fig. F).

**Note:** A full tuck includes all 4 pairs of strands.

**7E** Remove tape and pull all 8 strands snug and correct any twist that may have been introduced during the tucking procedure. The first tuck is now complete (Fig. G).



## STEP 8 COMPLETING THE TUCKS AND FINISHING THE SPLICE

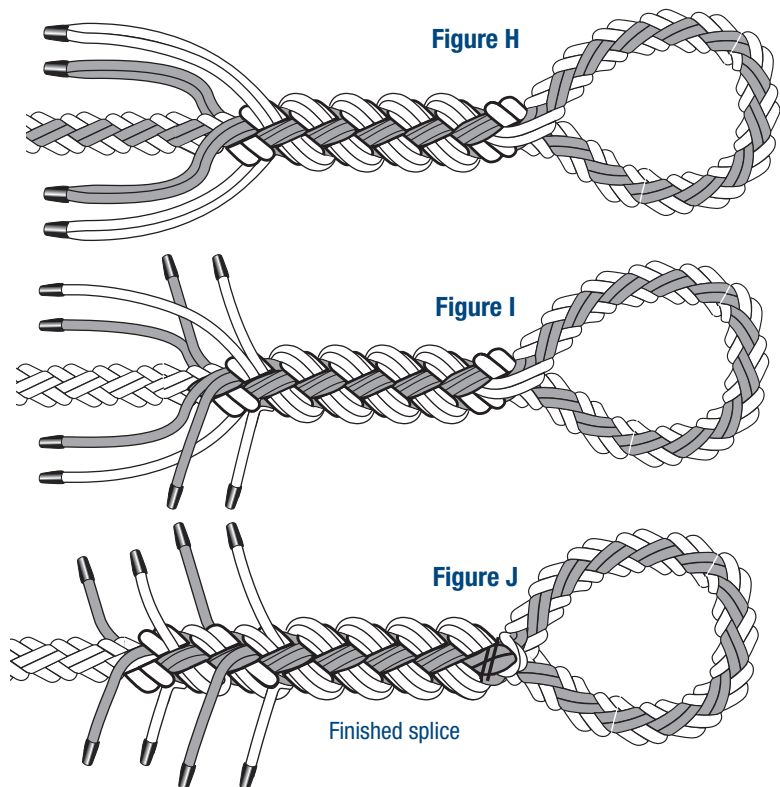
**8A** Continue tucking the (gray) strands under the (white) strands and the (white) strands under the (gray) strands until at least 4 full tucks (with all 4 strand pairs) have been completed.

**8B** After each round of tucks, pull each strand to make sure they are snug and there is no twist. The splice should look like Fig. H.

**8C** Locate the strand closest to the eye in each strand pair. Tape and cut off, leaving enough of the end protruding so it does not slip back into the rope when loaded. The splice should look like Fig. I.

**8D** Continue tucking the remaining strands, with the (gray) strands under the (white) strands, and vice versa, for 2 more full tucks.

**8E** Tape and cut off the remaining strands. The finished splice should look like Fig. J.



**Note:** The 8 ends can be heat fused so they don't fray, but be careful not to damage any of the strands.



# SAMSON SPLICING INSTRUCTIONS

## 8-Strand Class II EYE SPLICE

Class II ropes are made in whole or part from any of the following high modulus fibers: Dyneema®, Vectran®, Technora®, and Zylon®.

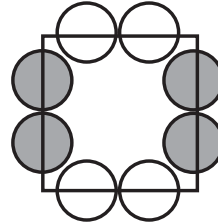
The eye splice is used to place a permanent loop in the end of a rope, generally for attachment purposes to a fixed point. An eye is also used to form the rope around a thimble, which is used to protect the rope, especially when it is to be attached to a shackle, chain, or wire rope.

### GETTING STARTED

8-strand ropes, also known as plaited ropes, are composed of 8 strands grouped into 4 pairs. 2 of these pairs turn to the left (shown in gray), and 2 pairs turn to the right (shown in white.) Seen in this cross section, the 4 strand pairs form the sides of a square. The strands that are on opposite sides of the square will rotate in the same direction.

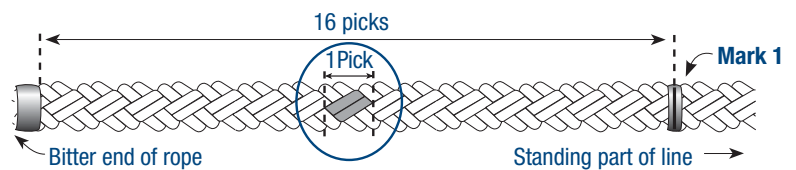
#### TOOLS REQUIRED

A splicing fid or marlinspike, sharp knife or scissors, plastic or masking tape, marking pen.



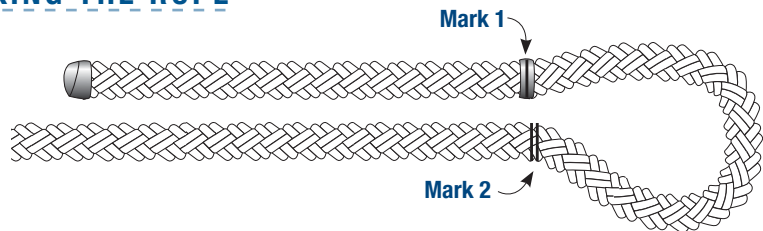
### STEP 1 COUNTING AND MARKING

From the end of the rope, count a distance of 16 picks and apply tape securely around the rope immediately after the 16th pick, as shown in the illustration. This is Mark 1. Apply the tape securely enough so that it will not move during the splicing procedure.



### STEP 2 MAKING THE EYE AND MARKING THE ROPE

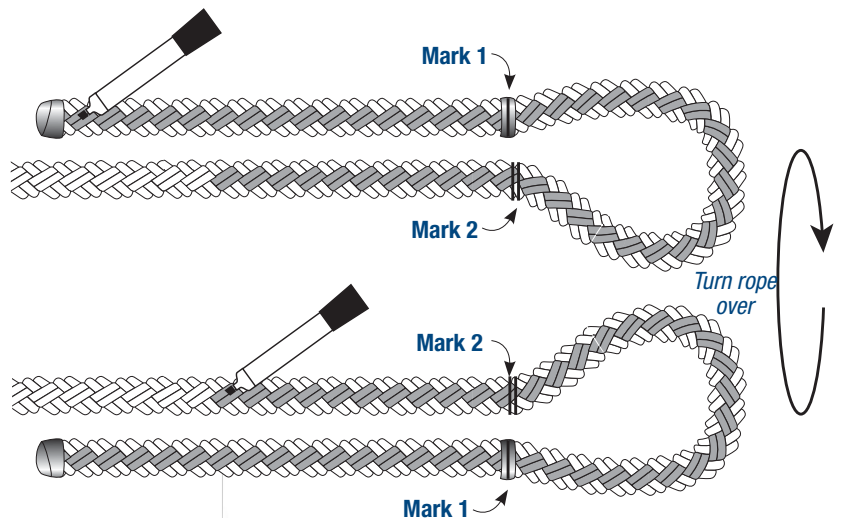
Form the desired size of the eye, being careful not to add twist to the rope. Mark the rope adjacent to the tape. This will be Mark 2.



### STEP 3 MARKING THE LEFT-ROTATING STRANDS

From the end of the rope, mark the first 16 picks up to the tape at Mark 1. Continue marking the length of the eye and at least an additional 6 picks past Mark 2. Mark all strands that rotate left on both sides of the braided rope.

**Note:** The strands that rotate left (gray) can be marked for improved visual reference. 8-strand ropes are composed of 4 pairs of 2 strands each. 2 of the strand pairs rotate to the left, and 2 pairs rotate to the right. When marking the left-rotating strands, be sure to turn the rope over and continue to mark the left-rotating strands on the opposite side of the braid.



# SAMSON SPLICING INSTRUCTIONS

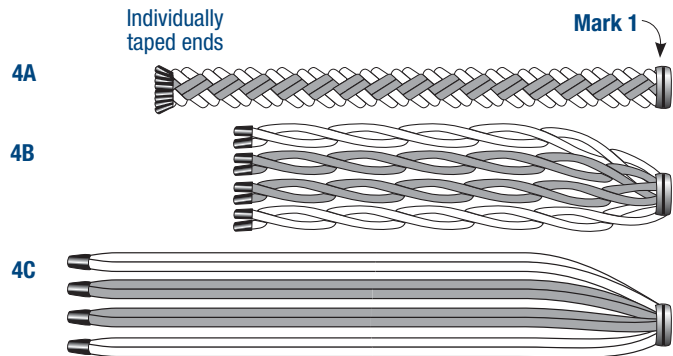
## 8-Strand Class II EYE SPLICE

### STEP 4 TAPING THE ENDS AND UNLAYING THE ROPE

**4A** Tape the ends of each of the 8 strands individually.

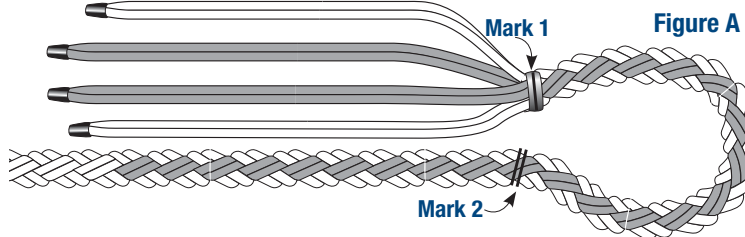
**4B** Unlay the strand pairs all the way back to the tape at Mark 1. Keep the pairs of strands together while unbraiding.

**4C** When unlayed, the strands in a pair will be twisted around each other. Untwist each strand pair so the 2 strands lie parallel to each other, rather than twisting around each other. Tape the ends of each pair together.



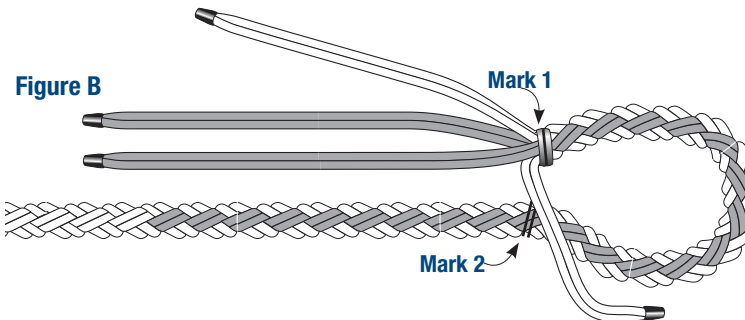
### STEP 5 POSITIONING THE STRANDS

Arrange the strand pairs as shown in Fig. A. One set of the marked (gray) strands is on the top and the other marked (gray) strands are on the bottom. The unmarked (white) pair will be on the left and right.



### STEP 6 FORMING THE EYE

Physically form the eye. Make certain there is no twist in the rope. Place the (white) pair that is closest to the standing part of the rope over the rope at Mark 2, as shown in Fig. B; be careful not to add twist to the rope.

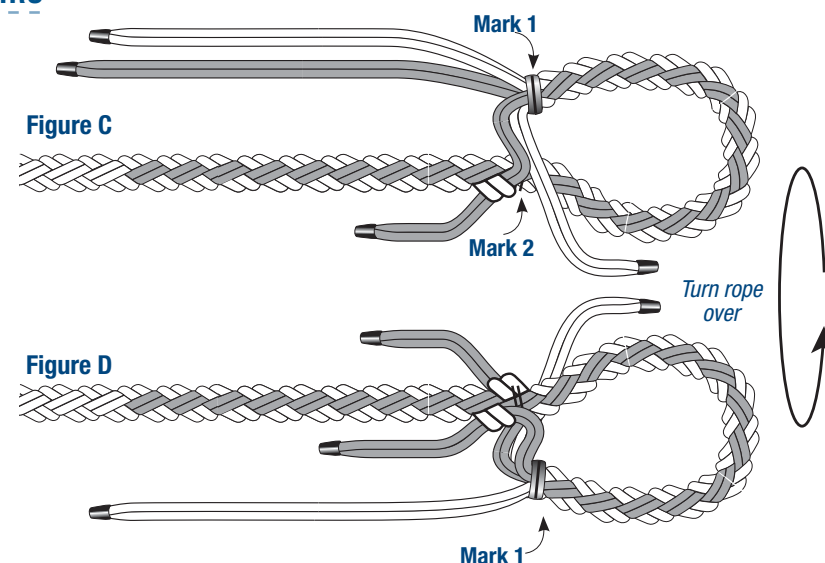


### STEP 7 ROUTE TUCKING THE STRAND PAIRS

**Note:** If necessary, use a fid or marlinspike to loosen the strands. The left rotating (gray) strands will be tucked under the right rotating (white) strands, and vice versa.

**7A** Beginning with the left rotating marked (gray) pair of strands on top, make your first tuck under the right rotating (white) pair of strands closest to Mark 2. Pull the strands completely through, making sure that the strands don't twist (Fig. C).

**7B** Turn the eye over and tuck the other marked (gray) pair of strands under the (white) pair of strands directly opposite the previous tuck (Fig. D).

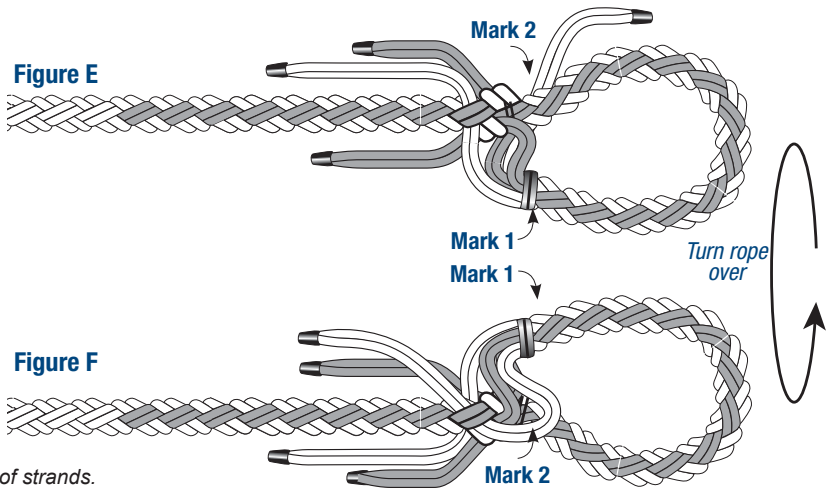


PAGE 2 OF 3

# SAMSON SPLICING INSTRUCTIONS

## 8-Strand Class II EYE SPLICE

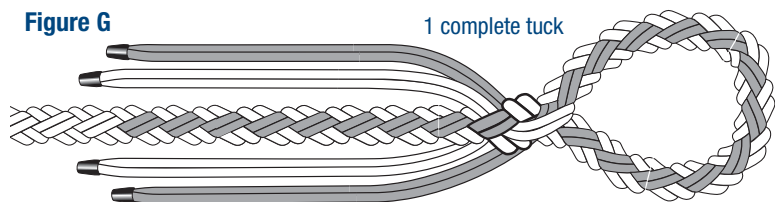
**7C** Tuck the (white) pair of strands under the (gray) pair of strands closest to the first 2 tucks. Pull the strands snug, but not tight to avoid distorting the strands in the eye area. Again, make sure there is no twist in the strands (Fig. E).



**7D** Turn the eye over and tuck the remaining (white) pair of strands under the remaining (gray) pair of strands in the standing part of the rope (Fig. F).

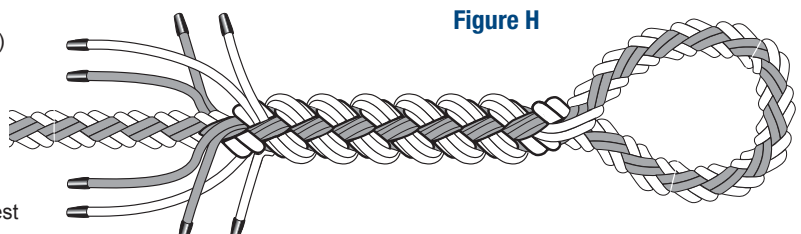
**Note:** A full tuck includes all 4 pairs of strands.

**7E** Remove tape and pull all 8 strands snug and correct any twist that may have been introduced during the tucking procedure. The first tuck is now complete (Fig. G).



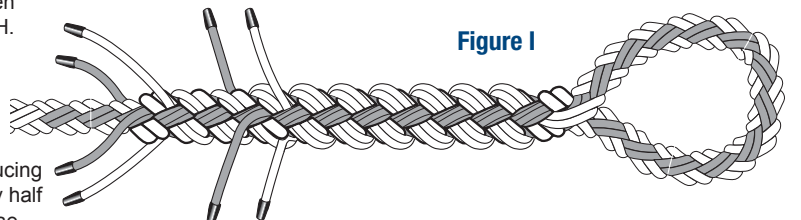
## STEP 8 COMPLETING THE TUCKS AND FINISHING THE SPLICE

**8A** Continue tucking the (gray) strands under the (white) strands and the (white) strands under the (gray) strands until at least 6 full tucks (with all 4 strand pairs) have been completed.



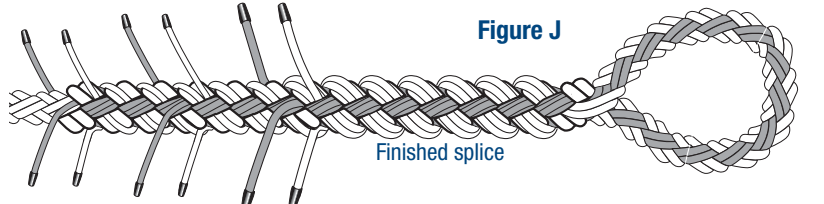
**8B** After each round of tucks, pull each strand to make sure they are snug and there is no twist. Locate the strand closest to the eye in each strand pair. Tape and cut off, leaving enough protruding so the end does not slip back into the rope when loaded. The splice should look like Fig. H.

**8C** Continue tucking the remaining strands 3 full tucks. The splice should look like Fig. I.



**8D** The tapering process continues by reducing the volume of each remaining strand by half (count the number of yarns that comprise each strand and divide as evenly as possible.) Select the divided half of each of the 4 strand yarns closest to the eye. Tape and cut off.

**8E** With the remaining 4 half-volume single strands, perform 3 full tucks. Tape the strands after they have been tucked and cut them off as done with previous strands. The completed splice should look like Fig. J.



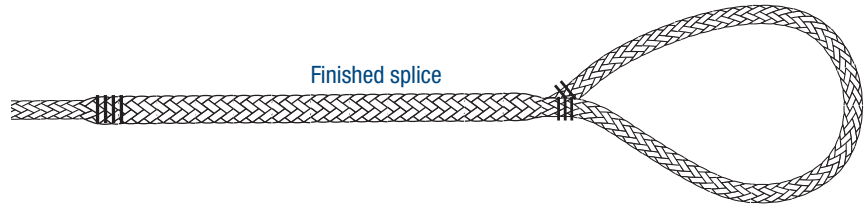
**Note:** The 8 ends can be heat fused so they don't fray, but be careful not to damage any of the strands.

# 12-Strand Class II EYE SPLICE

Class II ropes are made in whole or part from any of the following high modulus fibers: Dyneema®, Vectran®, Technora®, and Zylon®.

The eye splice is used to place a permanent loop in the end of a rope, generally for attachment purposes to a fixed point. An eye is also used to form the rope around a thimble, which is used to protect the rope, especially when it is to be attached to a shackle, chain, or wire rope.

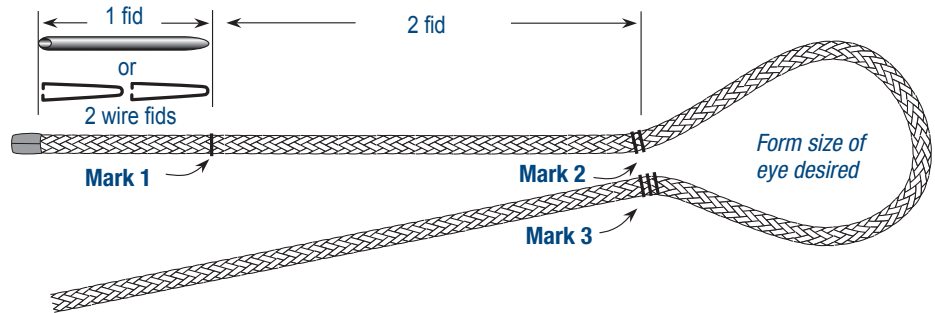
This eye splice may be performed on new or used rope. This is an all-purpose splice technique designed for people who generally splice used rope as frequently as new rope. By following the procedure below, the splice can retain from 90% to 100% of average new rope strength and in used rope up to the same proportion of residual used rope strength.



## STEP 1 MEASURING

Tape end of line to be spliced and measure 1 tubular fid length (or 2 wire fid lengths) from taped end of line and make Mark 1.

From Mark 1 measure 2 tubular fid lengths (or 4 wire fid lengths) and make Mark 2. Now form size of eye desired and make Mark 3.

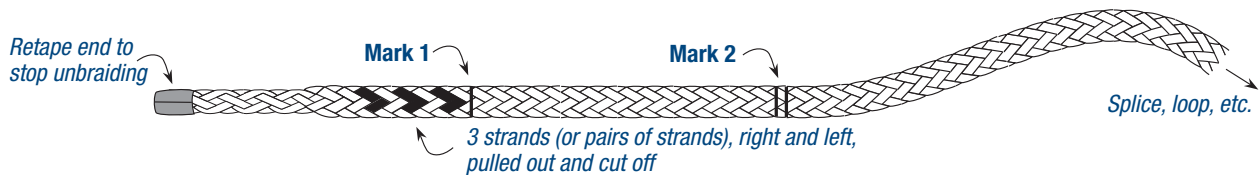


## STEP 2 MAKING TAPER

From Mark 1, in the direction of the taped end of the line, mark every second right and left strand\* for 3 strands.\*\* Pull every marked strand out of line and cut (tape at end can cause resistance and may have to be removed in order to pull out cut strands.) Tapered end will now have only 6 strands remaining (or 4 strands for an 8-strand braid.) Tape tapered tail tightly to keep from unbraiding.

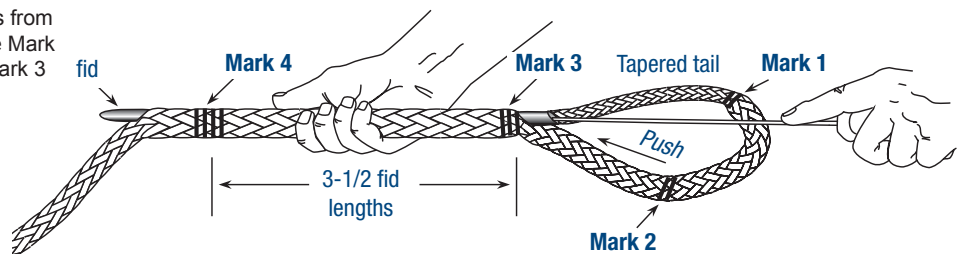
*\*Some rope diameters may have pairs of strands in right and left direction. In this case, treat the pairs of strands as a single strand, marking and cutting both in each direction as described above.*

*\*\*Some very small diameter ropes may be 8-strand. For an 8-strand construction, mark every 3rd left and right strand for 2 strands.*



## STEP 3 BURYING TAIL INTO STANDING PART OF LINE

Measure 3-1/2 tubular fid lengths from Mark 3 (7 wire fid lengths), make Mark 4. Insert fid and tapered tail at Mark 3 and bring fid out beyond Mark 4. Pull fid and tapered tail out. Do not let the line twist.





# SAMSON SPLICING INSTRUCTIONS

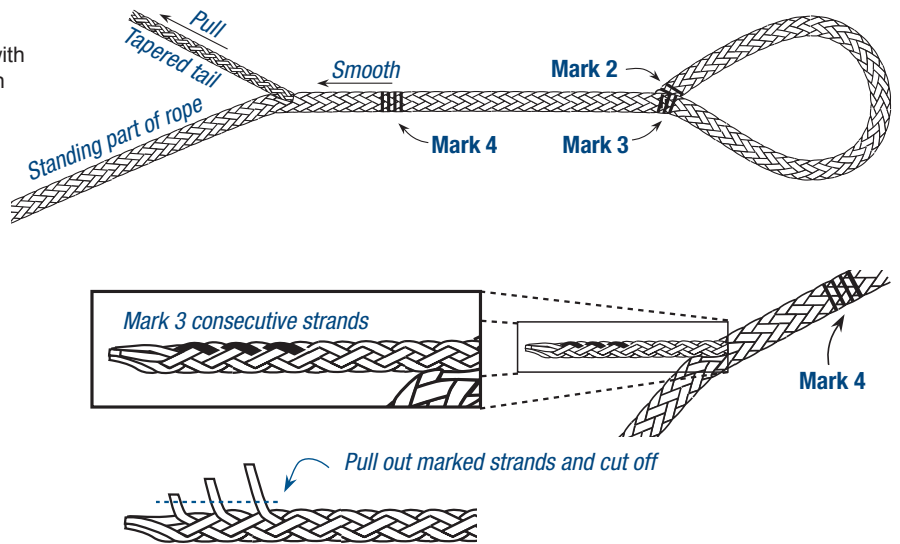
## 12-Strand Class II EYE SPLICE

### STEP 4 FINISHING BURYING

Remove fid. Pull hard on tapered tail with one hand. With the other hand, smooth bunched line towards eye splice until Marks 2 and 3 converge.

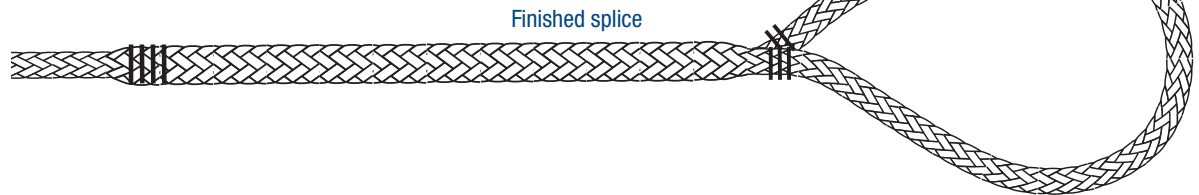
**4A** Remove the fid and any tape at the end of the tail. From the end of the tail, mark 3 consecutive strands, as shown. Pull them out of the braid and cut off close to the body of the rope.

**4B** Now, using both hands and the weight of your body, smooth the cover slack from Mark 3 towards Mark 4. The tail will disappear into the rope, and a smooth, gradual taper should result.



### STEP 5 FINISHING EYE SPLICE

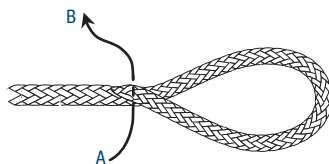
When finished, Mark 2 and Mark 3 should be at the same point at the vertex of the eye—which, yields desired eye size. To finish eye splice, the splice must be lock stitched (procedure follows).



## Lock Stitching Procedure

#### STEP 1

Pass stitching twine through spliced area near throat of eye as shown.



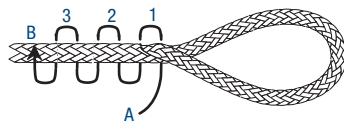
#### STEP 2

Reinsert twine through the rope. The twine should cover 2 strands from the exit point. Pull the twine snug, but not tight.



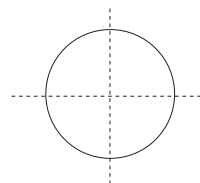
#### STEP 3

Continue to reinsert as shown until you have at least 3 complete stitches on each side of the rope. Each stitch should cross over 2 strands in the rope.



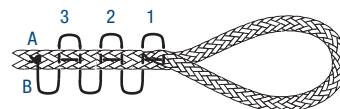
#### STEP 4

After completing Step 3, rotate spliced part of rope 90° and reinsert end A into spliced area in the same fashion as in Steps 1, 2 and 3. The splice will now be stitched on 2 planes perpendicular to each other. Make sure you do not pull the stitching too tight.



#### STEP 5

After stitching at least 3 complete stitches as in Step 3, extract both ends of the twine together through the same opening in the braid. Tie them together with a square knot and reinsert back into braid. For double braids, re-insert the knot between the cover and core.

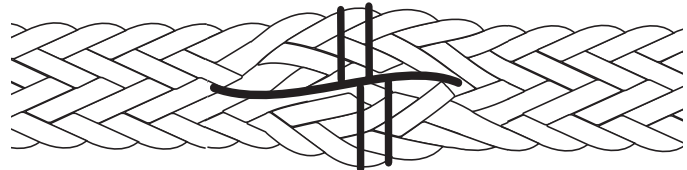


# 12-Strand Class II END-FOR-END SPLICE

Class II ropes are made in whole or part from high modulus fibers: Dyneema®, Vectran®, Technora®, and Zylon®.

This end-for-end splice may be performed on new or used rope. This is an all-purpose splice technique designed for people who generally splice used rope as frequently as new rope. By following the procedure below, the splice can retain from 90% to 100% of average new rope strength and in used rope up to the same proportion of residual used rope strength.

**Note:** Some small sizes of 12-strand products have been converted to an 8-strand single braid.



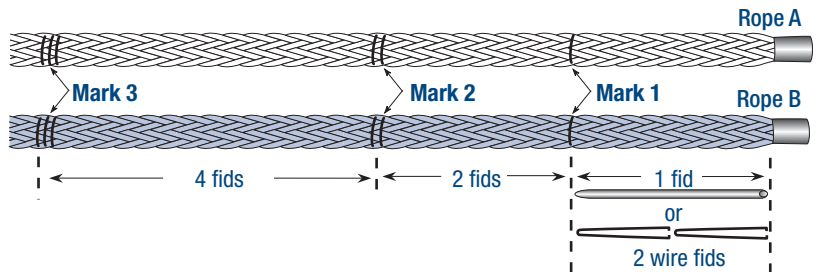
Finished splice

## STEP 1 MEASURING AND MARKING

Tape ends of line to be spliced. Lay 2 ropes to be spliced side by side and measure 1 tubular fid length, (2 wire fid lengths) from taped end of each line and make a mark. This is Mark 1.

From Mark 1, measure 2 tubular fid lengths (4 wire fid lengths from end of rope) and make Mark 2 on both lines.

From Mark 2, measure 4 tubular fid lengths (8 wire fid lengths from end of rope) and make Mark 3 on both lines.



## STEP 2 TAPERING TAIL

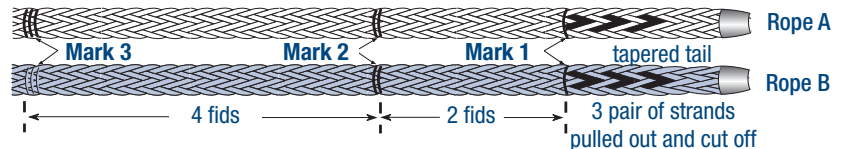
From Mark 1, in the direction of the taped end of the line, mark every second right and left strand\* for 3 strands.\*\*

Pull every marked strand out of line and cut off (tape at end can cause resistance and may have to be removed in order to pull out cut strands.)

Tapered end will now have only 6 strands remaining (or 4 strands if the rope is an 8-strand construction.) Re-tape tapered tail tightly to keep from unbraiding.

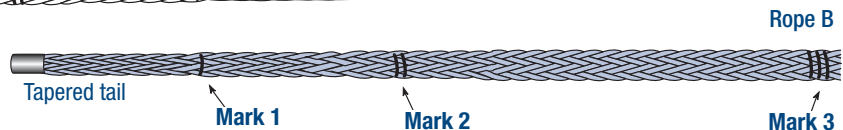
*\*Some rope diameters may have pairs of strands in right and left direction. In this case, treat the pairs of strands as a single strand, marking and cutting both in each direction as described below.*

*\*\*Some very small diameters may be 8-strand construction. For an 8-strand construction, mark every 3rd left and right strand for 2 strands.*



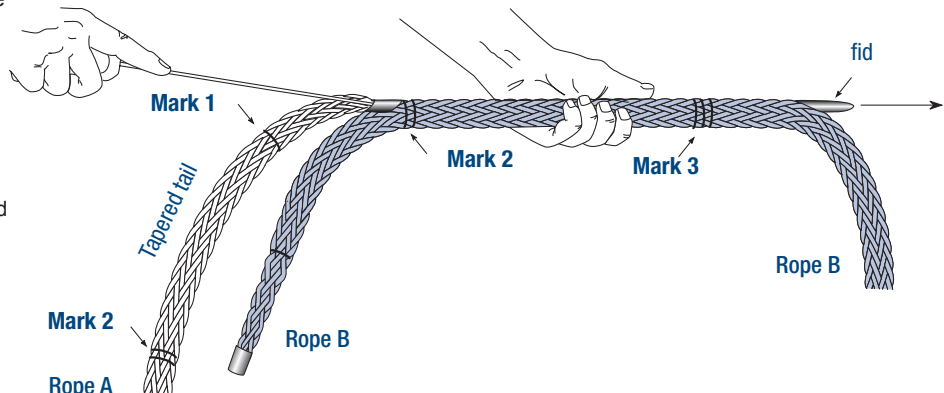
## STEP 3 REPOSITIONING ROPES

Reposition ropes for splicing according to diagram below.



## STEP 4 BURYING ROPE A INTO ROPE B

Attach fid to tapered end of Rope A and insert fid into Rope B at Mark 2. Bring out past Mark 3, then remove fid.



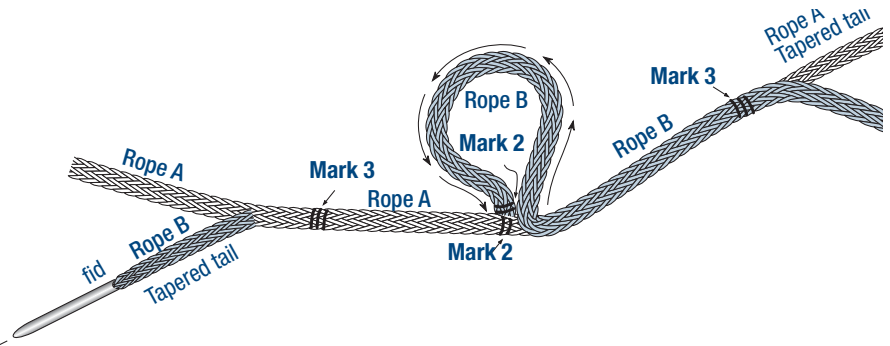
**4A** Tie off the tail of Rope A to a stationary object, then use both hands and weight of your body to smooth Rope B toward Rope A to bury Rope A up to its own Mark 2. Leave tail sticking out.

# SAMSON SPLICING INSTRUCTIONS

## 12-Strand Class II END-FOR-END SPLICE

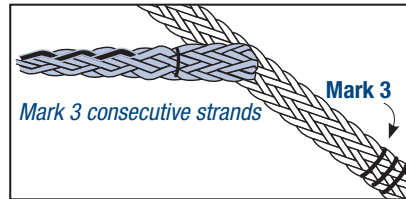
### STEP 5 FINISH BURYING

Attach tapered tail of Rope B to fid. Insert the fid into Rope A at Mark 2, approximately the diameter of the line away from insertion point of Rope A into Rope B. Bring fid and tail out at Mark 3 of Rope A. Following same procedures as Step 4A bury Rope B up to its own Mark 2. Leave tail sticking out.



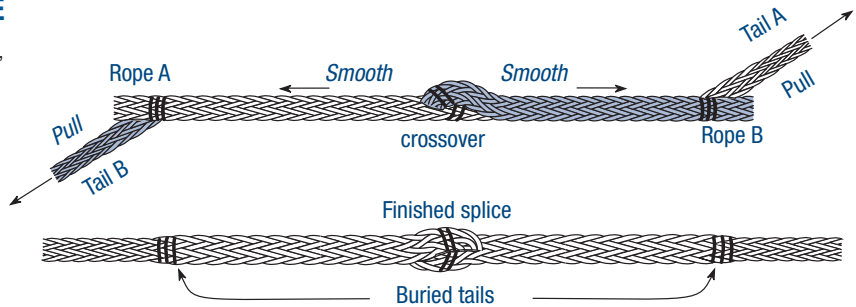
### STEP 6 TAPERING SECOND TAIL

Mark 3 consecutive strands as shown. Pull out all 3 and cut off. Repeat for other rope's tail.



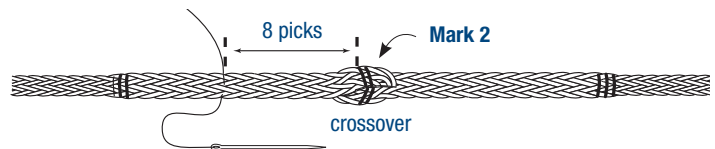
### STEP 7 SMOOTHING OUT SPLICE

Pull both tails to tighten crossover. Next, smooth braid in both directions away from the crossover, stroking rope firmly. Tails should bury inside cover.



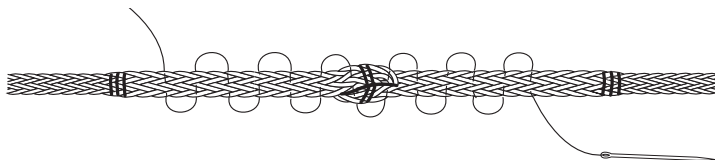
### STEP 8 LOCK STITCHING PROCEDURE

From Mark 2 at crossover, count 8 picks in either direction and insert stitching twine.

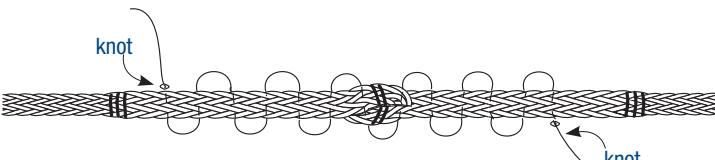


### STEP 9

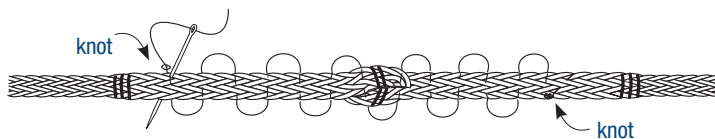
Working towards the crossover, stitch twine back and forth through splice until a minimum of 3 complete stitches have been made on each side of crossover.



**9A** Tie an overhand knot in each end of the twine, as close to its exit point as possible.



**9B** Insert tail of stitching twine at exact location where twine emerges. Using needle or small fid, pull (or push) through rope at a slight angle. Pull hard on the end of the twine so that the knot disappears inside the rope. Trim off the remaining twine close to the rope. Repeat on other end of the twine.



# 12-Strand Class II MODIFIED TUCK-BURY SPLICE

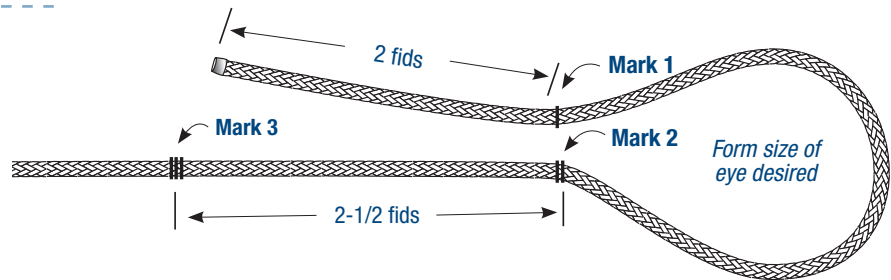
This is a modification to the standard HMPE Tuck-Bury 12-strand splice to increase splice length on Saturn-12. This modification must be used on Saturn-12 products larger than 1-1/2" in diameter.

## STEP 1 MEASURING AND MARKING

Tape end to be spliced. Then measure 2 fid lengths from the bitter end and mark. This is Mark 1. Wrap tape tightly around the rope at Mark 1.

**1A** From Mark 1, form a loop the size of the eye desired and mark. This is Mark 2.

**1B** From Mark 2, measure down the rope 2-1/2 fid lengths and mark. This is Mark 3.



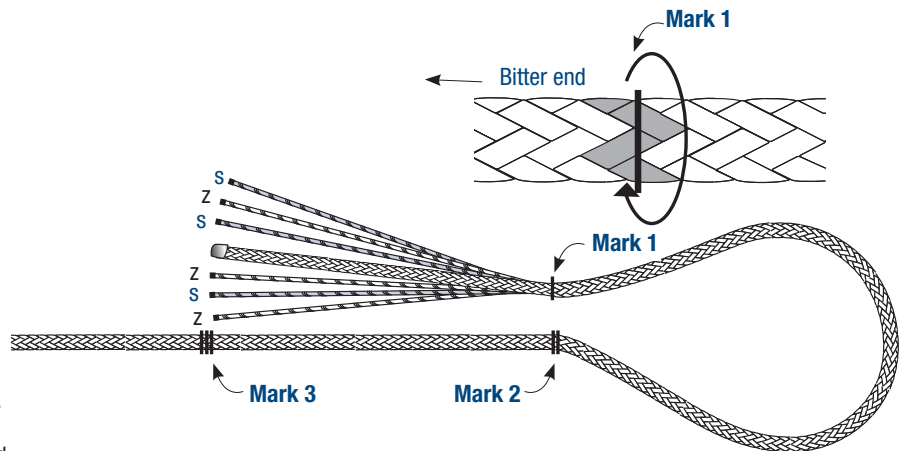
## STEP 2 TAPERING THE TAIL

At Mark 1, pull out half the strands (3 "S" and 3 "Z") by rotating around the rope and pulling out strands in the pattern shown:

Z strand = counter-clockwise twist  
S strand = clockwise twist

This should leave 6 strands still braided down the middle. Tightly tape the ends of the 6 individual strands, as well as the end of the remaining braided portion.

On 1 side you should have 2 S strands and 1 Z strand. On the other side, you should have 2 Z strands and 1 S strand.

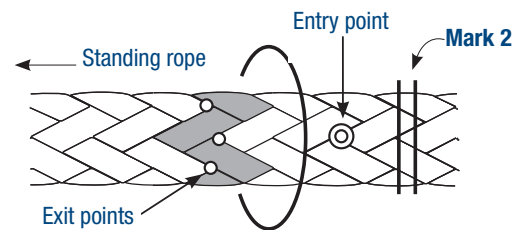


## STEP 3 ROUTING THE STRANDS

### 3A MARKING ENTRY AND EXIT POINTS

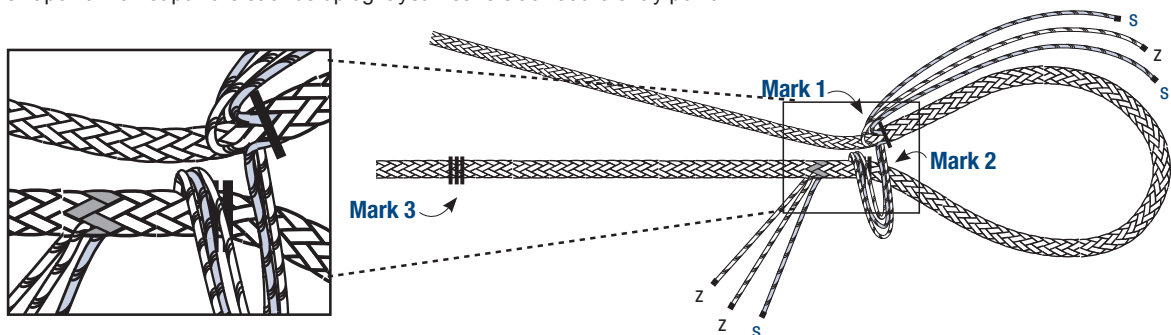
At Mark 2, make a mark at the intersection of an S and a Z strand. This will be the entry point for all 6 strands and the tail when it is buried. The entry point should be on the side of the rope facing the opposite leg of the eye.

From the entry point, count 2 picks down the rope and mark 6 strands around the circumference of the rope. There will be 3 S strands and 3 Z strands marked. At each intersection of an S and a Z strand, mark an exit point. There will be 6 exit points marked.



### 3B ROUTING 3 STRANDS

The first 3 strands are now routed from the entry point at Mark 2 to the exit point. Each strand is routed separately, entering at the entry point and exiting at its own exit point. Do not pull the strands up tight yet. Leave slack at the entry point.

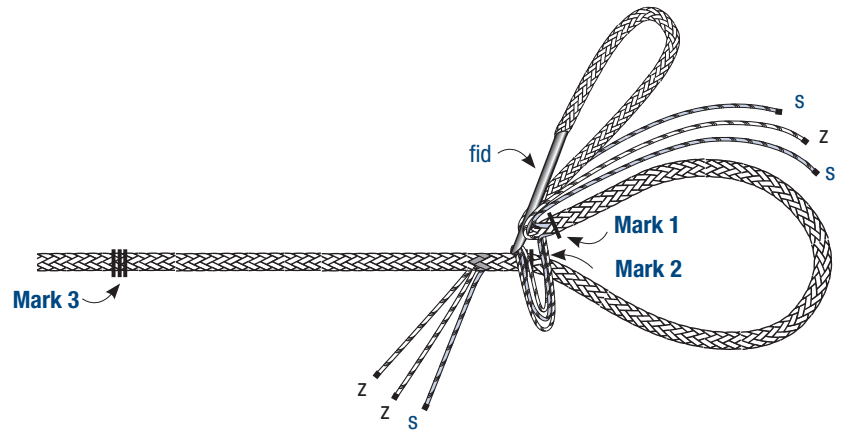




# 12-Strand Class II MODIFIED TUCK-BURY SPLICE

## 3C BURYING THE TAIL

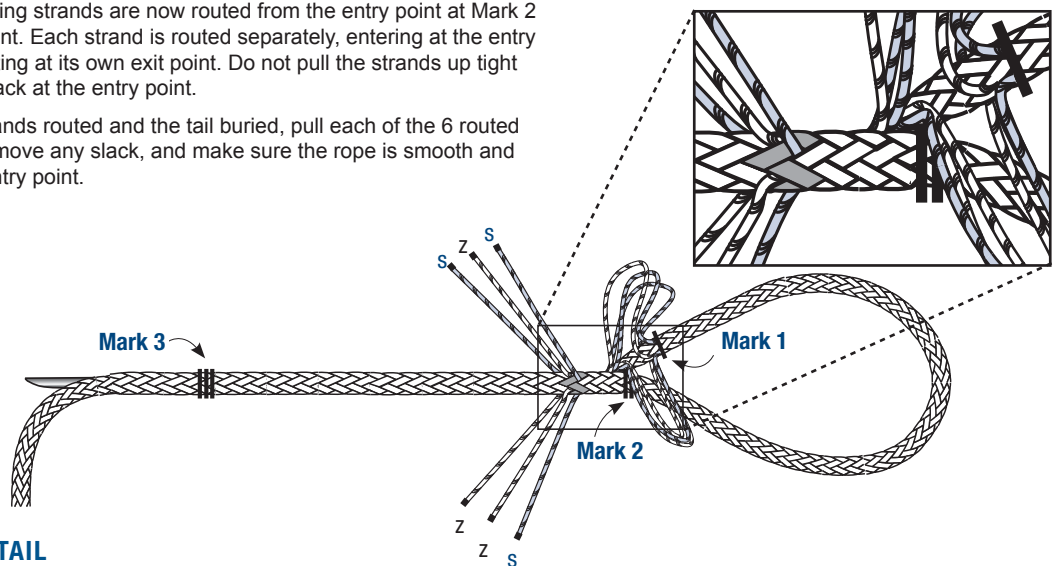
Attach a fid to the end of the tapered tail and bury it from the entry point through the rope to exit beyond Mark 3. Pull the tail until Marks 1 and 2 meet. Leave the tail exposed.



## 3D ROUTING LAST 3 STRANDS

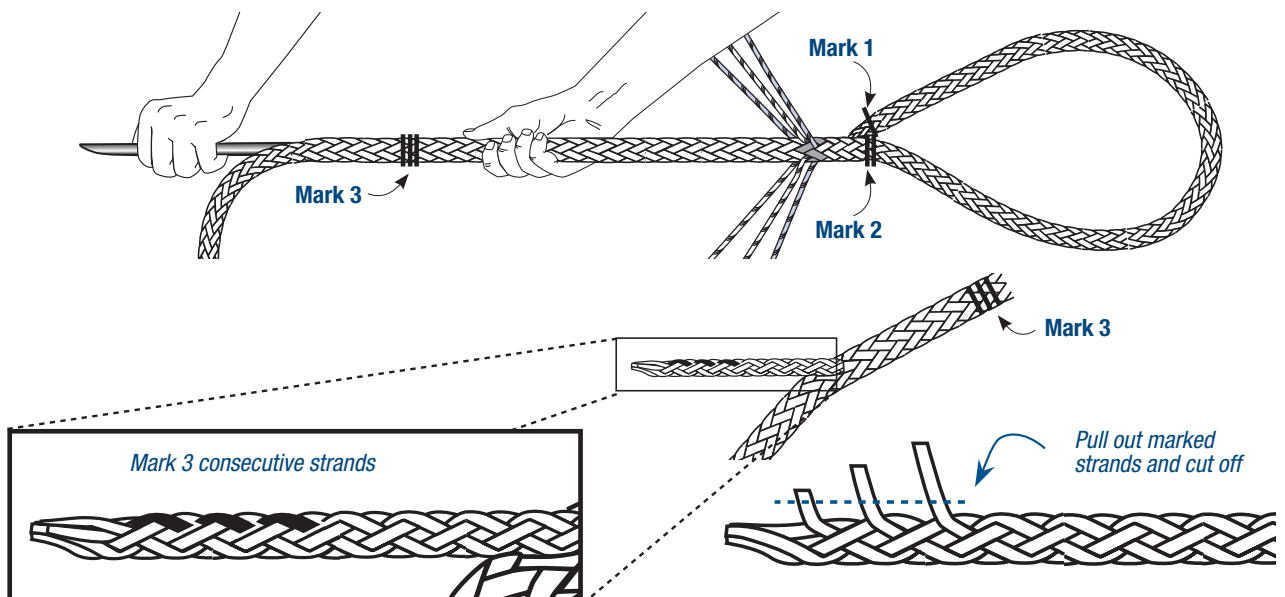
The 3 remaining strands are now routed from the entry point at Mark 2 to the exit point. Each strand is routed separately, entering at the entry point and exiting at its own exit point. Do not pull the strands up tight yet. Leave slack at the entry point.

With all 6 strands routed and the tail buried, pull each of the 6 routed strands to remove any slack, and make sure the rope is smooth and tight at the entry point.



## 3E TAPERING TAIL

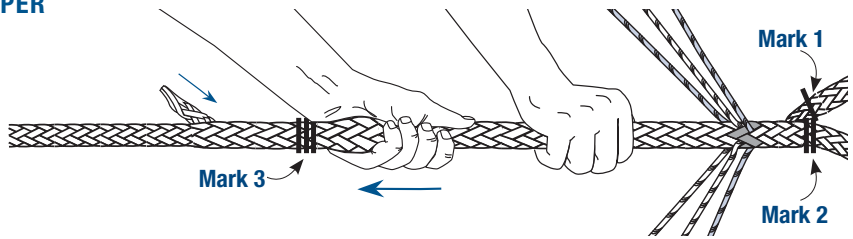
At Mark 3, pull the tail out until Marks 1 and 2 meet. Pull any slack out of the 6 strands that are routed. Pull out the tail and mark 3 consecutive strands as shown. Pull out all 3 and cut off.



# 12-Strand Class II MODIFIED TUCK-BURY SPLICE

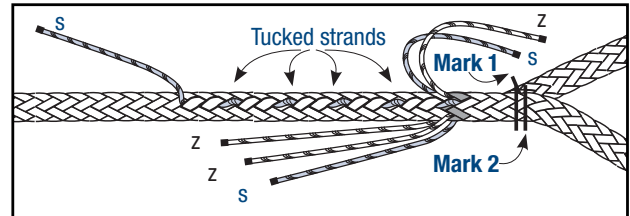
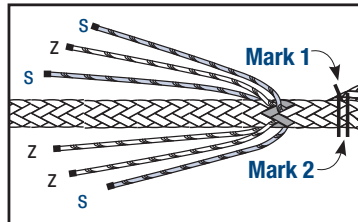
## 3F SMOOTHING SLACK OVER TAPER

Remove the tape from the end of the tail. Now smooth the rope from the eye towards Mark 3. The tail will disappear into the rope. Smooth the rope to remove any remaining slack. Check that the 6 routed strands are snug.

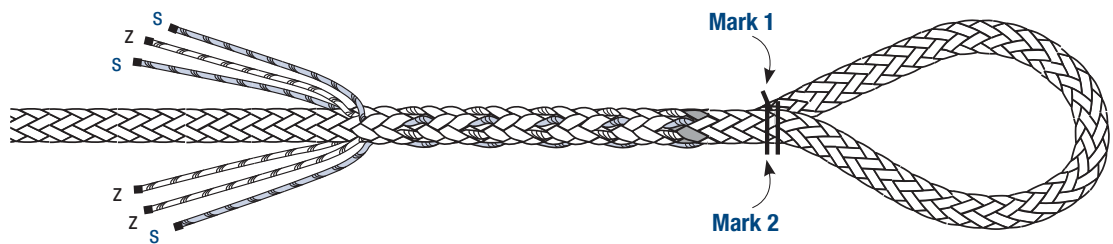


## STEP 4 TUCKING THE STRANDS

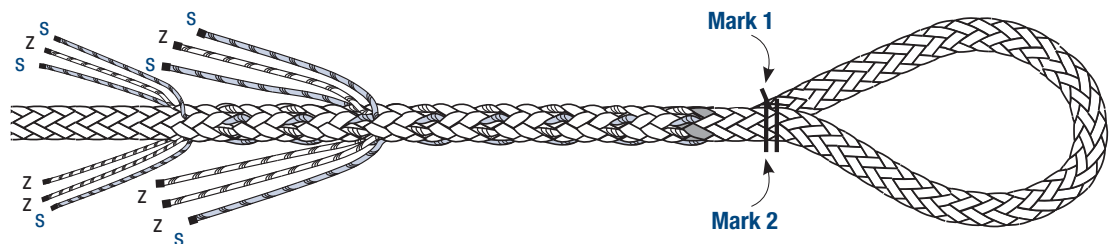
The strands are now tucked into the braid of the rope. 1 complete tuck consists of passing a strand over 1 strand and under 2 strands. The tucks proceed down the same row of picks straight down the body of the rope.



**4A** Do 5 complete tucks for all 6 strands. Each strand is always tucked under the same line of the braid so that the tucks progress straight down the body of the rope.

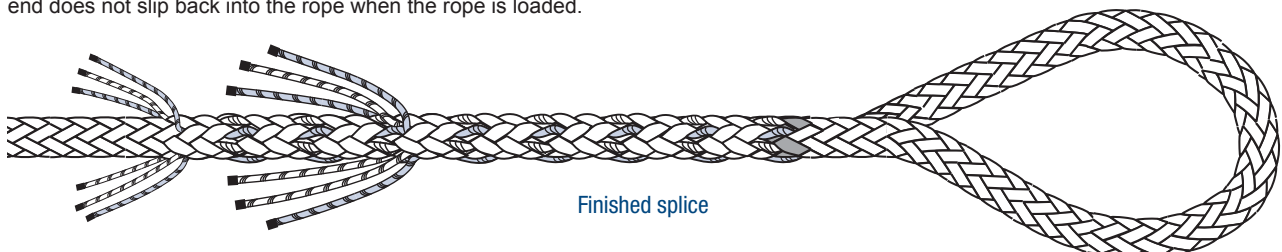


**4B** After completing the first 5 tucks, remove 1/2 of the volume of the twisted yarns. Cut yarns from each of the 6 strands near the taped ends and complete 3 more tucks with the reduced volume strands.



## STEP 5 FINISHING THE SPLICE

After completing the second set of 3 tucks, cut off the excess strands and tape the ends. Leave enough of an end protruding so that the end does not slip back into the rope when the rope is loaded.



# Double Braid Class II TS-II / TS-II Premium EYE SPLICE

For all measurements use fid 1 size larger than rope.

**Note:** For 1/2" use 9/16" fid, for 5/8" use 3/4" fid, etc.

**Note:** Fid length for measurement purposes is 21 x rope diameter.

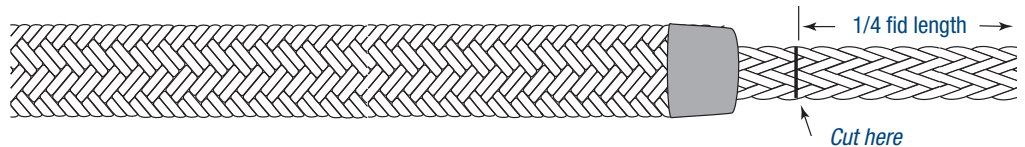
**Example:** For 5/8" rope use 3/4" fid.  
Fid length = .75 x 21 or 15.75"

STEP 1

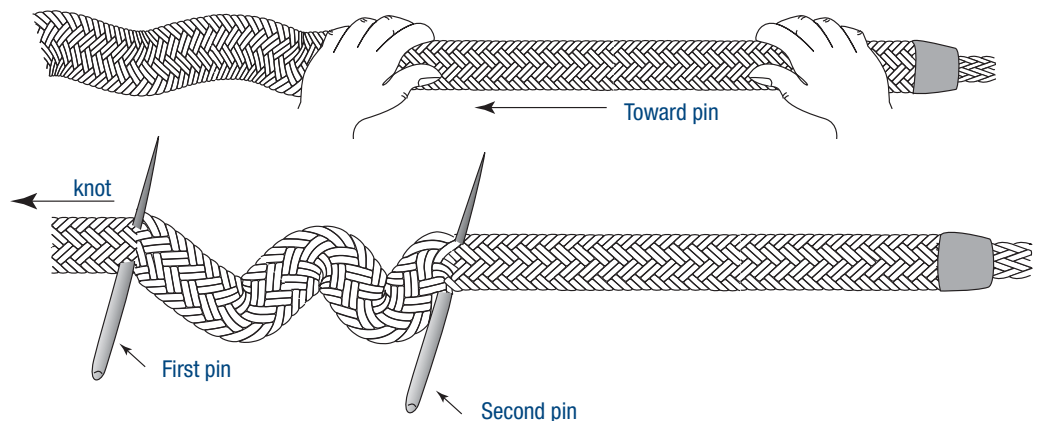
## PREPARING THE ROPE

Tie the rope to a fixed object approximately 12 fid lengths from the end, then place pin through cover and core near knot.

- 1A** Slide taped end of cover back from end of core. Measure 1/4 fid length from end of exposed core and make a mark. Cut core off at mark.



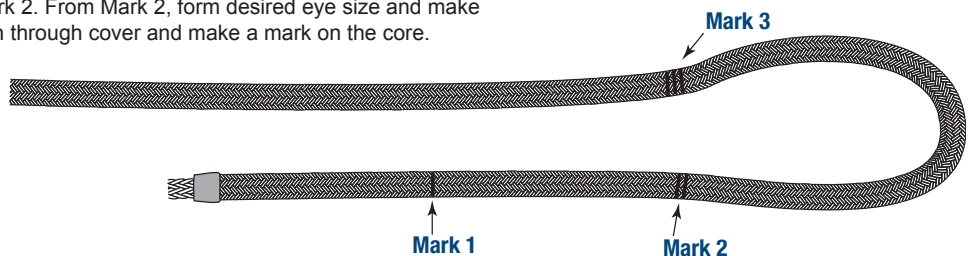
- 1B** Leaving a small amount of core protruding from cover, grasp the taped end tightly with one hand, and with the other hand milk the cover back towards the pin. Pin back cover slack. Place second pin to hold back cover slack.



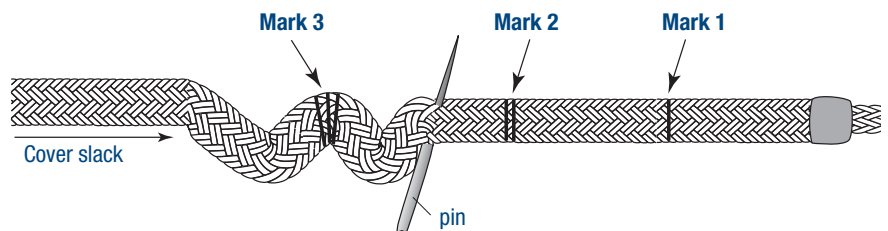
STEP 2

## MEASURING AND MARKING

From taped end, measure 1 fid length and make Mark 1. From Mark 1, measure another fid length and make Mark 2. From Mark 2, form desired eye size and make Mark 3. At Mark 3, press felt pen through cover and make a mark on the core.



- 2A** Straighten the rope out and place a pin through cover and core between Marks 2 and 3. Remove the pin holding back the extra cover slack and milk the cover slack back towards Mark 3.

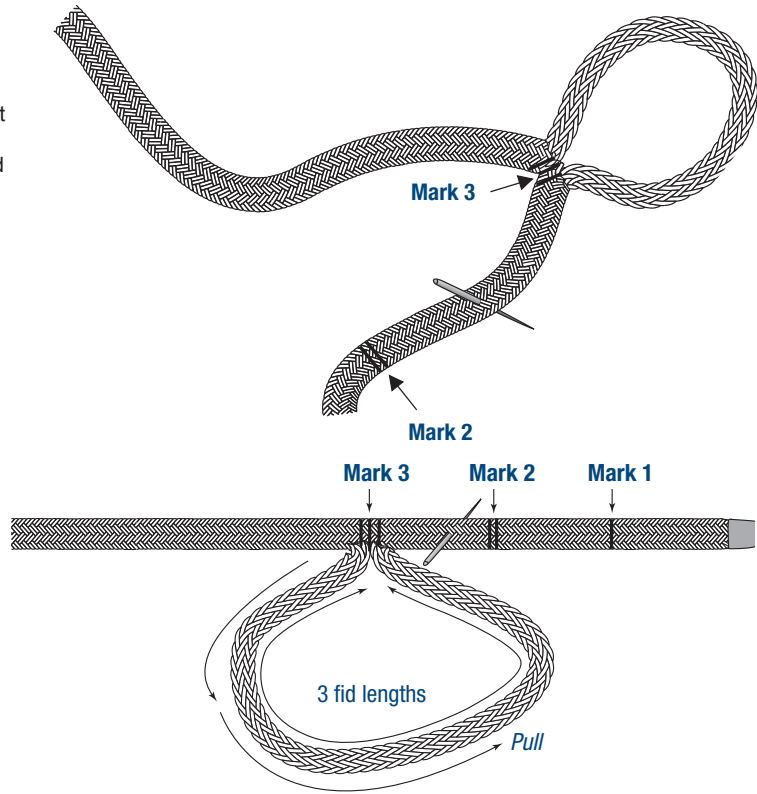


# Double Braid Class II TS-II / TS-II Premium EYE SPLICE

## STEP 3 EXTRACTING THE CORE

Bend rope sharply at Mark 3. Using an awl or similar device, carefully pry the cover strands apart to create an opening. Using the awl, carefully pry the core out of the cover. Make sure the pin placed between Marks 2 and 3 stays in place.

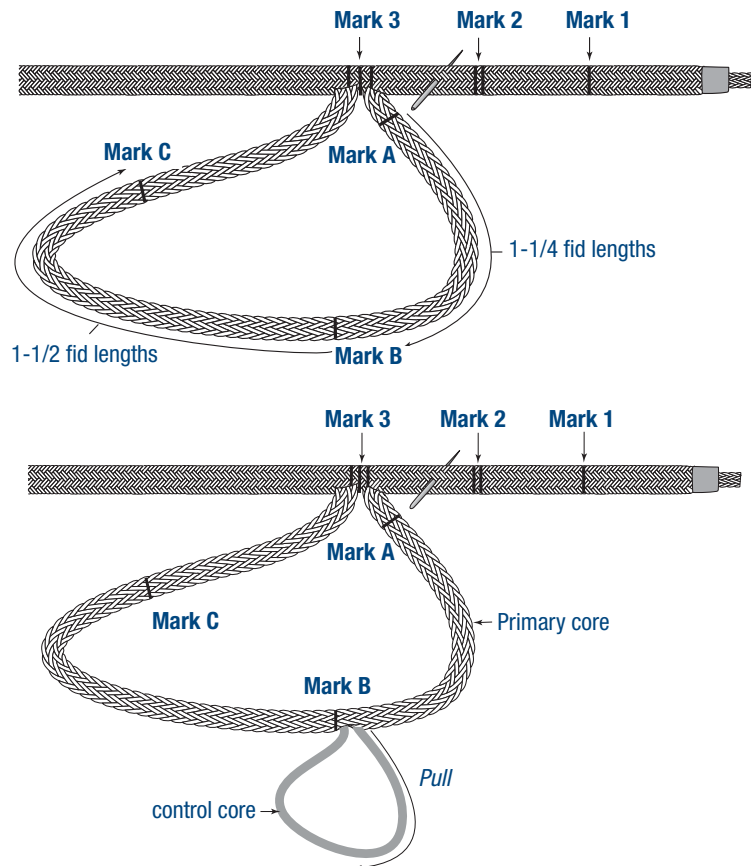
**3A** With rope positioned as shown, pull on core in the direction shown. You will need to expose a minimum of 3 fid lengths of core.



## STEP 4 MARKING THE CORE

Find the mark on the core made previously through the cover at Mark 3. This is Mark A. From Mark A, measure back a distance of 1-1/4 fid lengths, make Mark B. From Mark B, measure back a distance of 1-1/2 fid lengths and make Mark C.

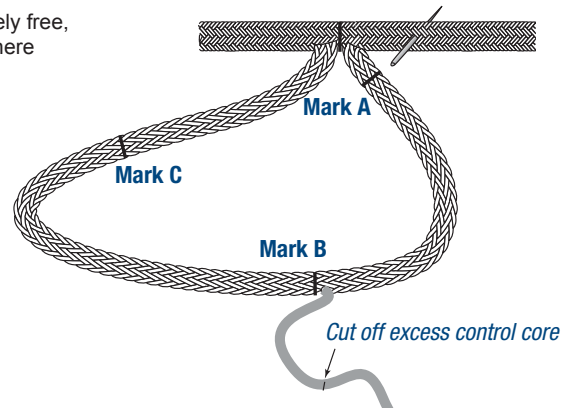
**4A** Bend the primary (load bearing) core sharply at Mark B. Carefully pry the strands apart to expose the control (inner) core. Carefully pry the control core out of the primary core, and pulling in the direction shown, completely remove it.





# Double Braid Class II TS-II / TS-II Premium EYE SPLICE

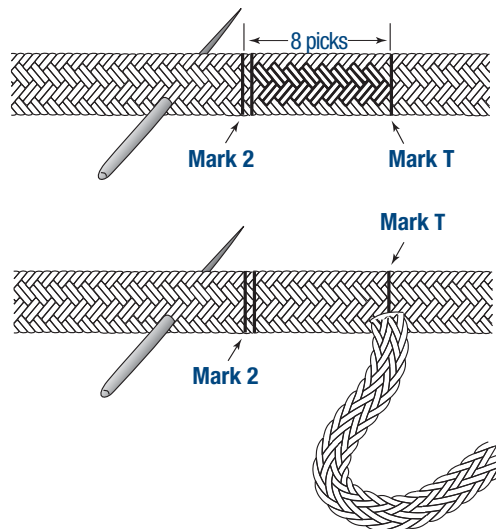
- 4B** After the control core has been pulled completely free, cut off the excess approximately 1 foot from where it protrudes from the primary core.



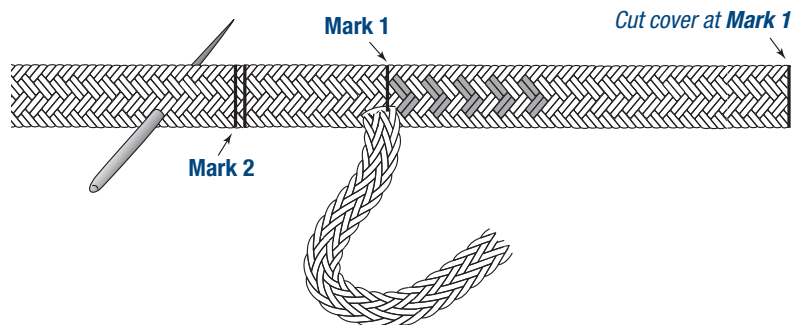
## STEP 5 TAPERING THE COVER

From Mark 2 on cover, count 8 picks (pairs of right and left laid strands) in the direction of Mark 1 and make Mark T.

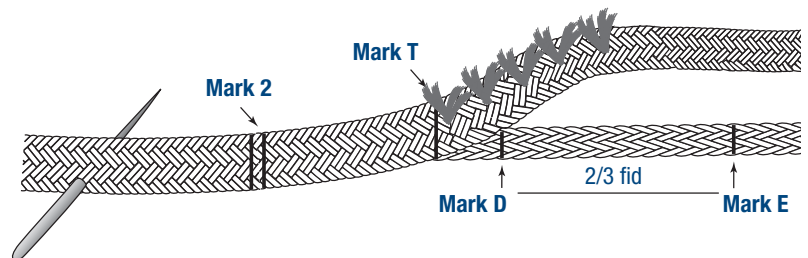
Extract core from cover at Mark T and pull completely free.



- 5A** Cut cover at Mark 1. Starting at Mark T on the side of the cover opposite from the core extraction point, mark every other right and left laid strand pair for a distance of 5, 6, or 8 pairs, depending on rope diameter (1/2" through 5/8" diameter, mark 5 pairs, 3/4" through 1-1/2" diameter, mark 6 pairs, 1-5/8" diameter and above mark 8 pairs.)



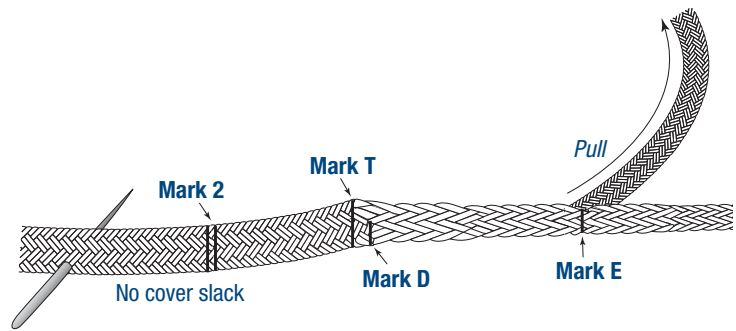
- 5B** Reduce cover tail to 1/2 volume by cutting and removing the marked strand pairs. Milk cover from pin placed between Marks 2 and 3 towards exit point of core tail. Make Mark D on the core at its exit point. From Mark D, measure down the core a distance of 2/3 fid length, and make Mark E.



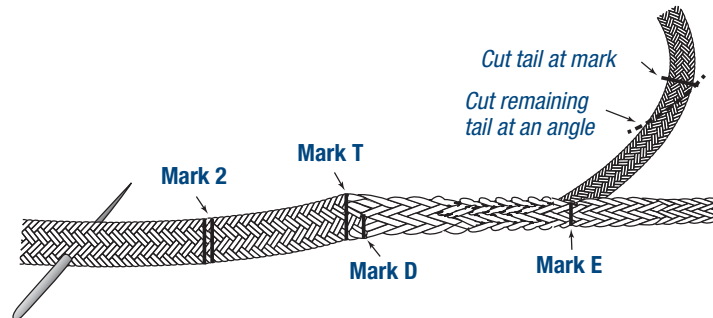
# Double Braid Class II TS-II / TS-II Premium EYE SPLICE

## STEP 6 INSERTING COVER INTO CORE

Using a tubular fid, insert 1/2 volume cover tail into core tail at Mark D, and exit at Mark E. Make sure there is no cover slack between the pin and Mark T, then pull cover tail to tighten up cover/core crossover.



**6A** Thoroughly milk core tail from Mark D to Mark E. Make a mark on the 1/2 volume cover tail where it exits the core tail. Pull on cover tail to expose several inches. Cut cover tail off at the exit mark and perform angle taper.



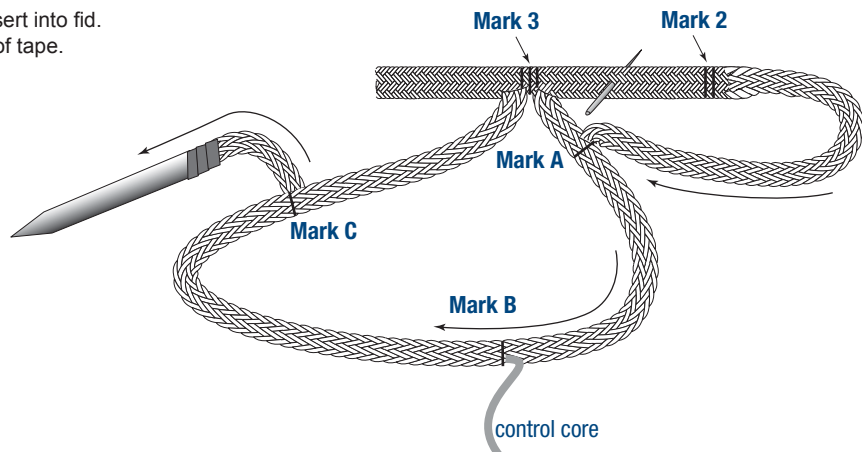
**6B** Re-milk core tail from Mark D to Mark E. Cover tail should disappear inside core tail. You are now ready to bury the core tail into the core loop.

## STEP 7 BURYING CORE TAIL INTO CORE LOOP

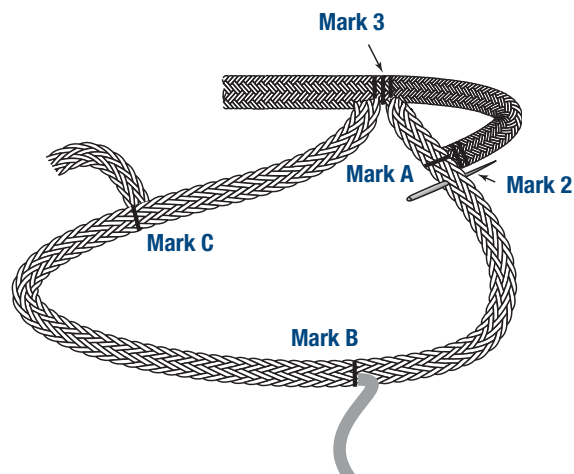
Tightly tape the end of the core tail and insert into fid. Secure the core tail to the fid with a wrap of tape.

**Note:** When splicing thimble eye, slide thimble in place between Marks 2 and 3 before attaching fid.

**7A** Insert the fid into the core loop at Mark A. By alternately pushing the fid forward and milking the core loop back towards Mark A, feed the fid and core tail through the core loop past Mark B, alongside of the control core and bring out at Mark C.



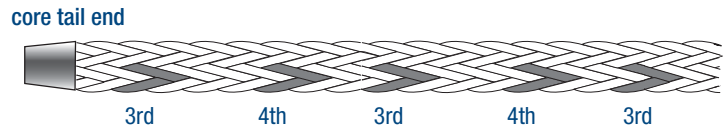
**7B** Pull core tail through core loop until Mark 2 on cover meets Mark A on core loop. Remove pin between Marks 2 and 3, and place through core loop at junction of Mark 2 and Mark A.



# Double Braid Class II TS-II / TS-II Premium EYE SPLICE

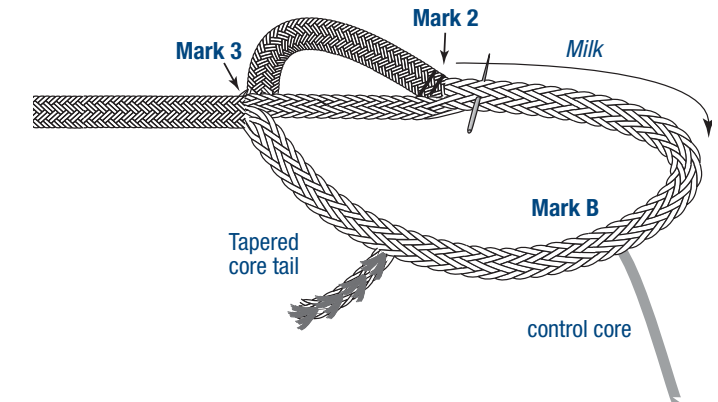
## STEP 8 TAPERING THE CORE

Pull end of core tail to expose approximately 2/3 fid length of core tail. Remove fid and all tape from end of tail. From end of core tail, count 3 strands and mark a right and a left strand. From marked strands, count 4 strands and mark a right and left strand. Alternately mark third right and left strands then 4th right and left strands until a total of 5 right and left pairs have been marked. Taper core by cutting and removing marked strands.

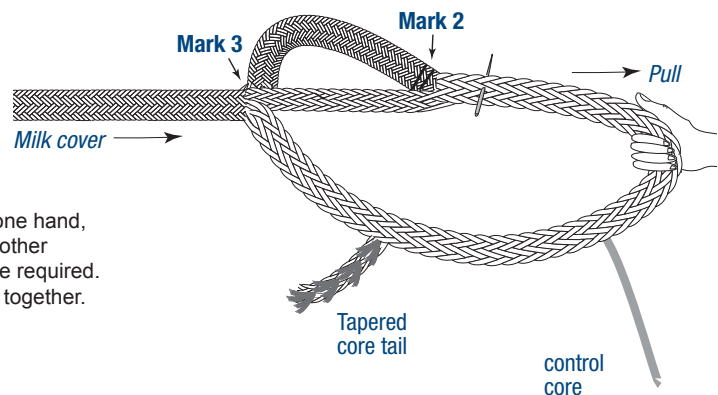


## STEP 9 FINISHING THE SPLICE

With rope positioned as shown, milk core loop away from pin, working slack beyond Mark B where control core exits primary core. Hold core loop as shown and pull sharply. This will set the position of the control core and cause the core tail to disappear inside the core loop. Repeat milking and pulling until all slack is removed from core loop.

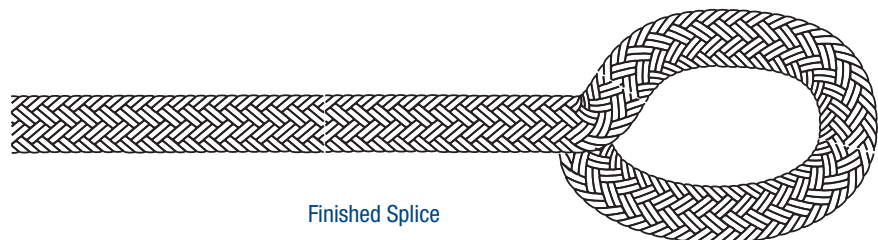


**9A** Mark control core right where it exits the core loop. Pull control core out slightly, then cut off just short of the mark. Repeat previous step one final time to seat control inside of core loop. Remove the pin.



**9B** Create tension on core loop by pulling on it with one hand, then begin to milk cover up over splice area with other hand. On larger sizes, mechanical tension may be required. Continue cover milking until Marks 2 and 3 come together.

**9C** After the cover is completely milked and the core loop is fully buried, there may be a small loop of core material protruding from the cover at Mark 3. Milk the cover around the eye towards the core material and pull sharply on eye. Excess core material should disappear inside of eye.

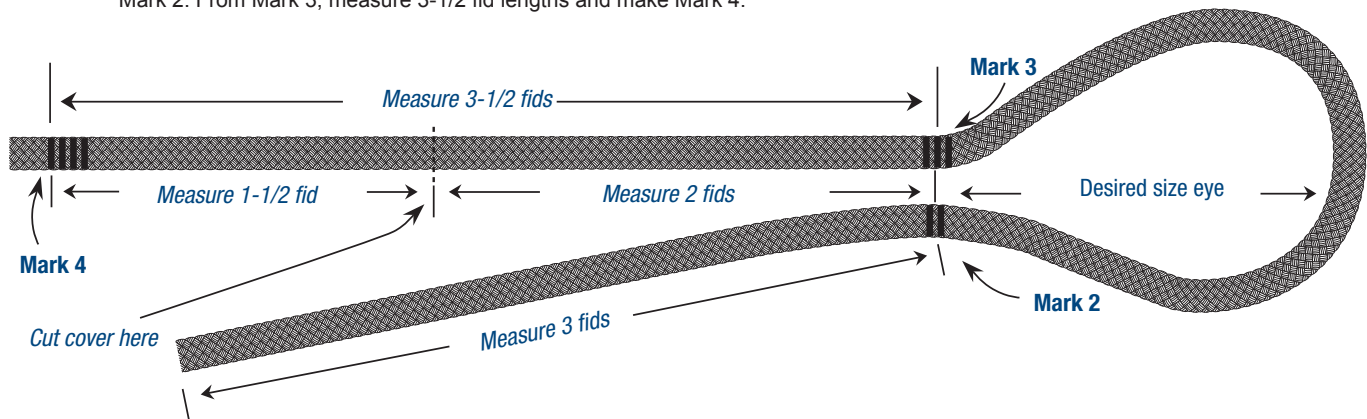


# Double Braid Class II TS-II Turbo EYE SPLICE

## STEP 1 MEASURING AND MARKING

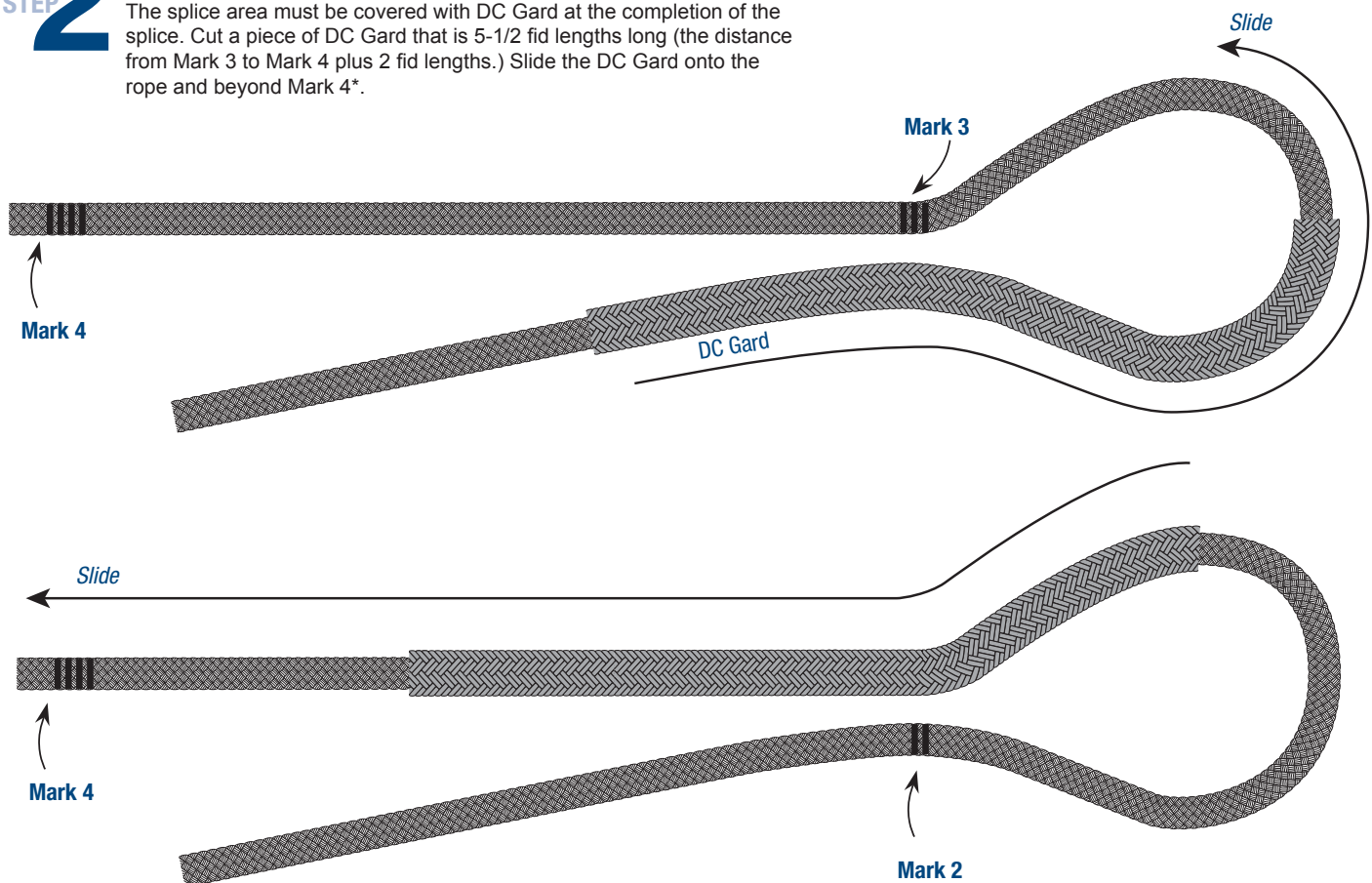
The measurements are the same as those for the direct bury eye splice for Class II ropes. Measure 3 fid lengths from the end and make Mark 2.

Form the desired size of the eye, and make Mark 3 adjacent to Mark 2. From Mark 3, measure 3-1/2 fid lengths and make Mark 4.



## STEP 2 INSTALLING DC GARD FOR SPLICE AREA

The splice area must be covered with DC Gard at the completion of the splice. Cut a piece of DC Gard that is 5-1/2 fid lengths long (the distance from Mark 3 to Mark 4 plus 2 fid lengths.) Slide the DC Gard onto the rope and beyond Mark 4\*.





# Double Braid Class II TS-II Turbo EYE SPLICE

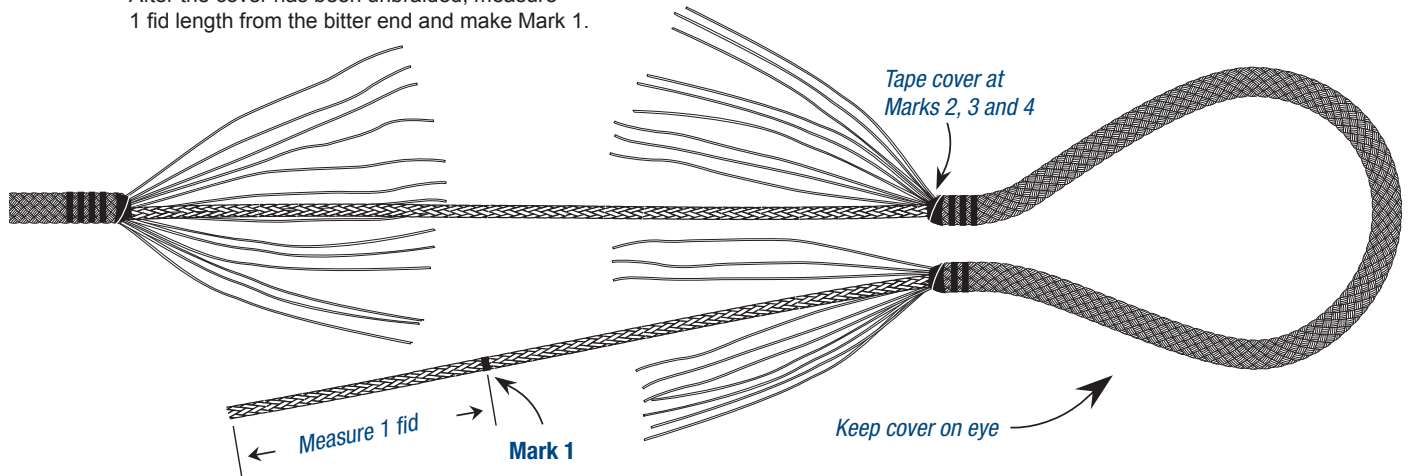
## STEP 3 UNBRAIDING COVER

Tape the rope at Marks 2, 3 and 4. From Mark 3, measure 2 fid lengths towards Mark 4. Mark this point, then cut the cover completely around the circumference of the rope. Be careful not to cut any of the core strands or yarns.

Unbraid the cover from the cut towards Mark 4, and from the cut towards Mark 3. The cover is left intact around the eye, from Mark 2 to Mark 3. With the cover unbraided, transfer Mark 2 and 3 to the core.

Unbraid the cover from the bitter end to Mark 2.

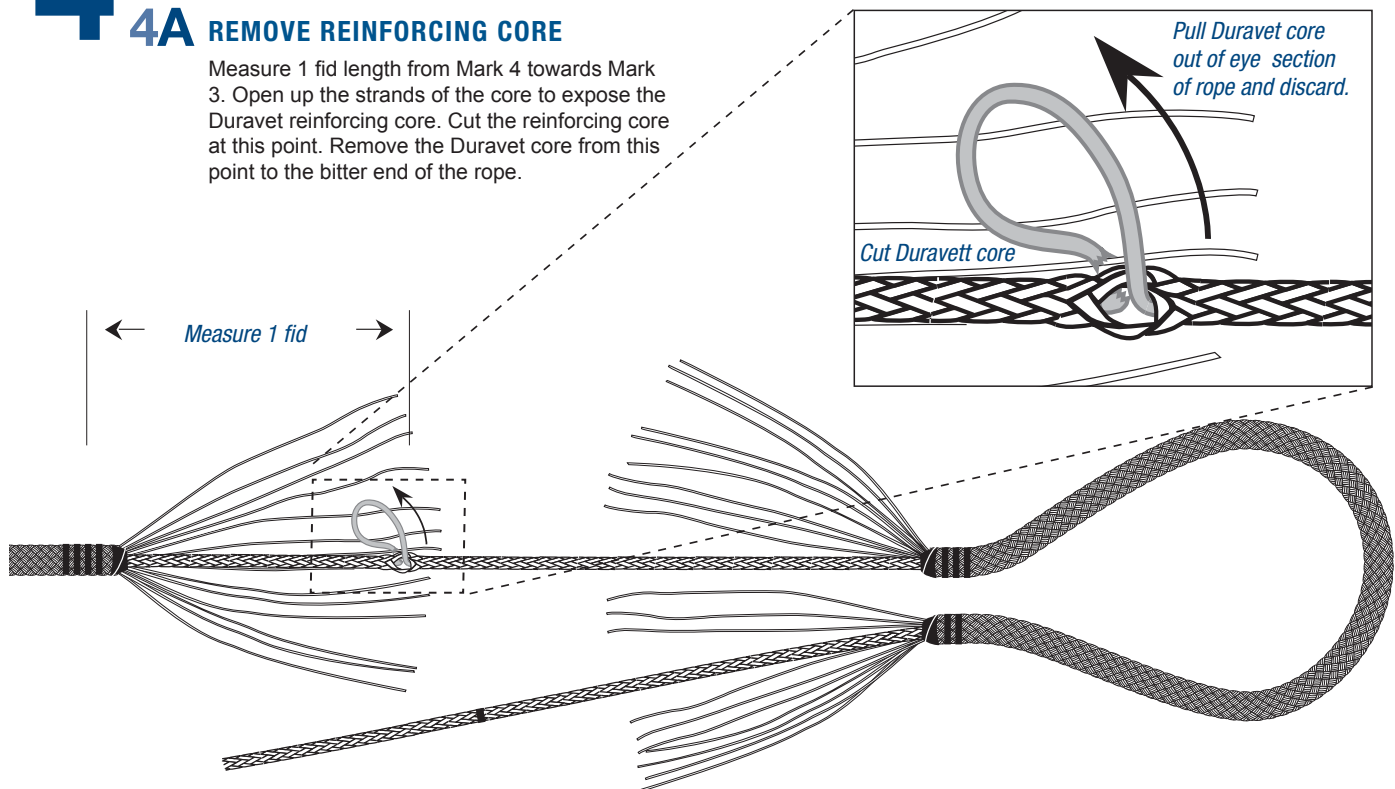
After the cover has been unbraided, measure 1 fid length from the bitter end and make Mark 1.



## STEP 4 PERFORMING EYE SPLICE

### 4A REMOVE REINFORCING CORE

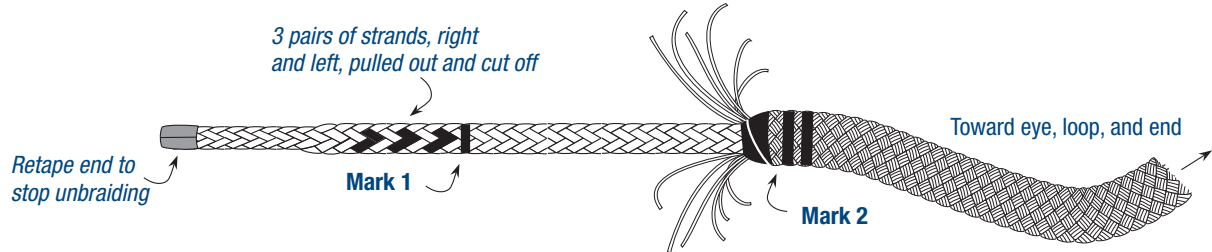
Measure 1 fid length from Mark 4 towards Mark 3. Open up the strands of the core to expose the Duravet reinforcing core. Cut the reinforcing core at this point. Remove the Duravet core from this point to the bitter end of the rope.



# Double Braid Class II TS-II Turbo EYE SPLICE

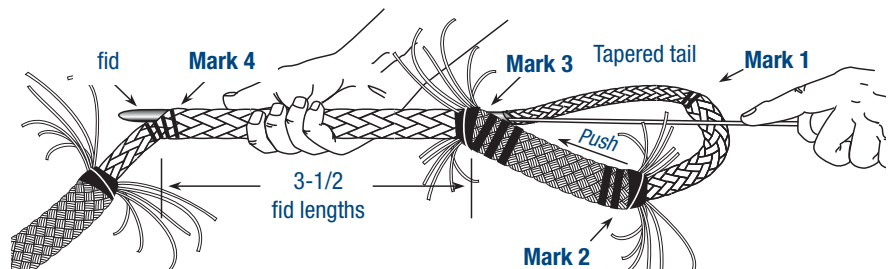
## 4B MAKING TAPER

From Mark 1, in the direction of the bitter end of the line, mark every second right and left strand for 3 strands. Cut every marked strand and pull out of line (tape at end can cause resistance and may have to be removed in order to pull out cut strands.) Tapered end will now have only 6 strands remaining. Tape tapered tail tightly to keep from unbraiding.



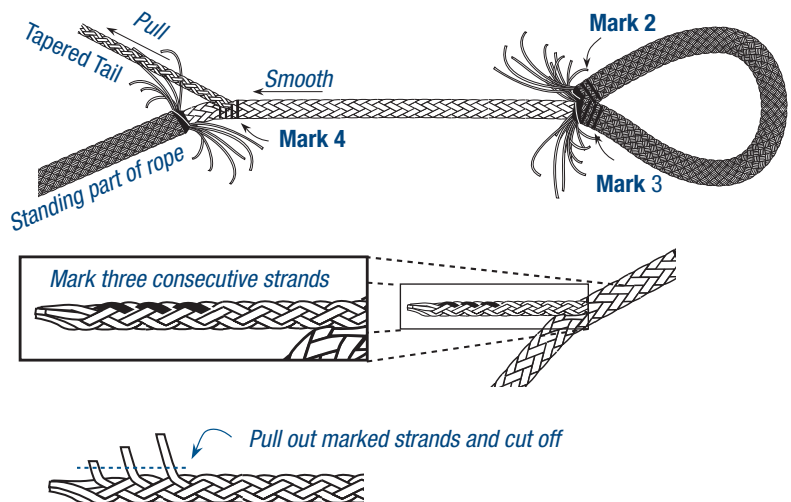
## 4C BURYING TAIL INTO STANDING PART OF LINE

Measure 3-1/2 tubular fid lengths from Mark 3 on the core and make Mark 4 on the core. Insert fid and tapered tail at Mark 3 and bring fid out at Mark 4. You may need to slide the cover back at Mark 4 slightly. Pull fid and tapered tail out. Don't let the line twist. Use care when the tail passes the cut end of the Duravet core.



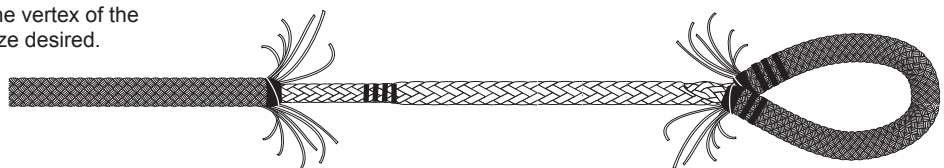
## 4D FINISH BURYING TAIL

Pull tail out of the rope to expose the previously tapered area. Remove the fid and any tape at the end of the tail. From the end of the tail, mark 3 consecutive strands, as shown. Pull them out of the braid and cut off close to the body of the rope. Now, using both hands and the weight of your body, smooth the cover slack from Mark 3 towards Mark 4. The tail will disappear into the rope, and a smooth, gradual taper should result.



## 4E FINISHING EYE SPLICE

When finished, Mark 2 and Mark 3 should be at the same point in the vertex of the eye—which yields eye size desired.

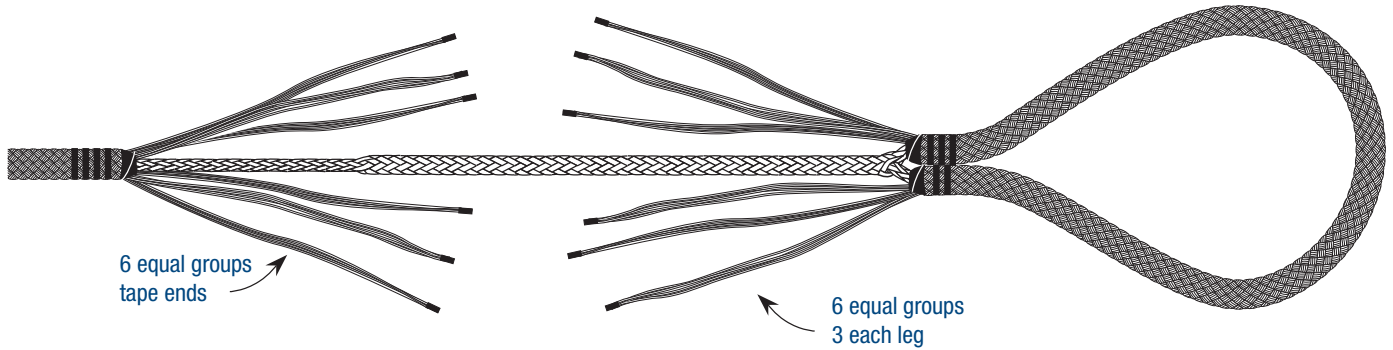


# Double Braid Class II TS-II Turbo EYE SPLICE

## STEP 5 GROUPING COVER STRANDS

At Mark 4, divide the cover strands into 6 equal groups. Tape the ends securely.

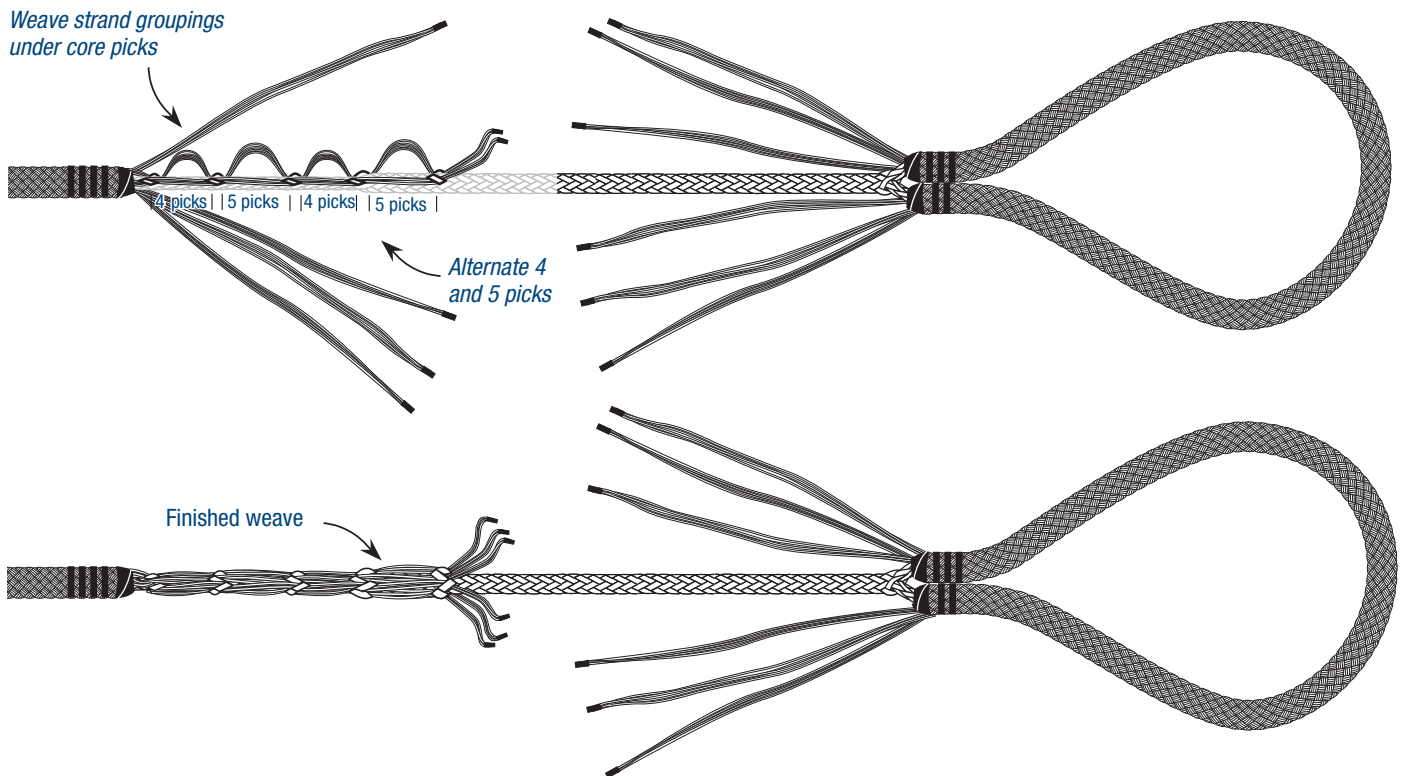
At the vertex of the eye, group the cover strands at Mark 3 into 3 equal groups, and group the strands at Mark 2 into 3 equal groups. Tape the ends of each strand.



## STEP 6 WEAVING COVER GROUPINGS: WORKING END

Now, working from Mark 4 towards Mark 3, make 5 tucks with the cover strands into the core in the following pattern: under 1 strand, over 4 strands, under 1 strand, over 5 strands, under 1 strand, over 4 strands, under 1 strand, over 5 strands, under 1 strand.

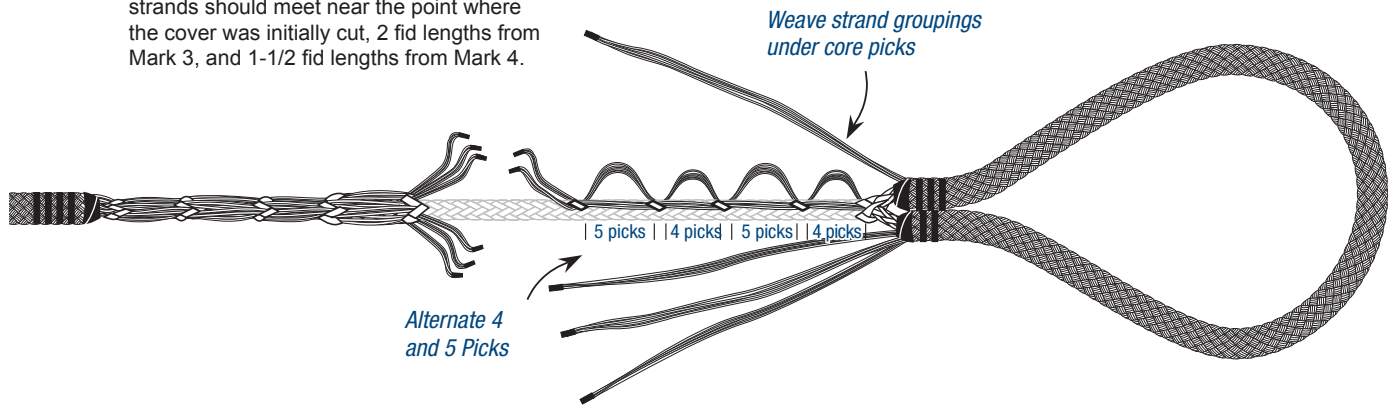
These tucks proceed straight down the axis of the rope. Tuck all 6 strand groups in the same pattern



# Double Braid Class II TS-II Turbo EYE SPLICE

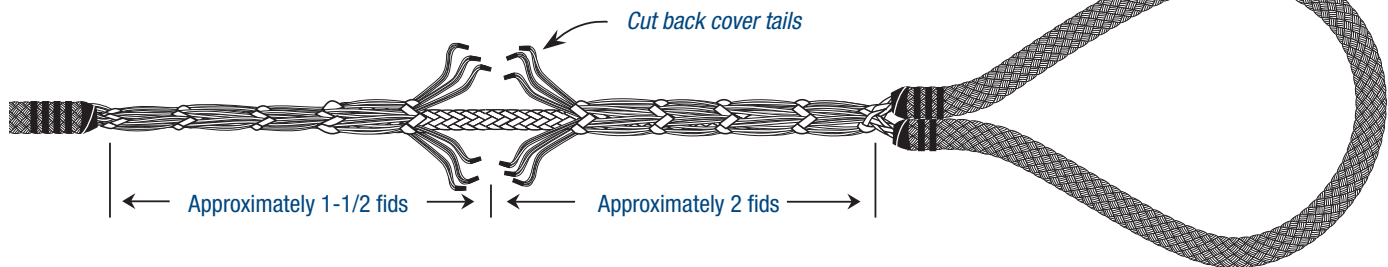
## STEP 7 WEAVING COVER GROUPINGS: EYE END

Working from the eye towards Mark 4, perform 5 tucks of the cover strands in the same alternating pattern; over 1 and under 4, over 1, under 5. The 2 groups of cover strands should meet near the point where the cover was initially cut, 2 fid lengths from Mark 3, and 1-1/2 fid lengths from Mark 4.



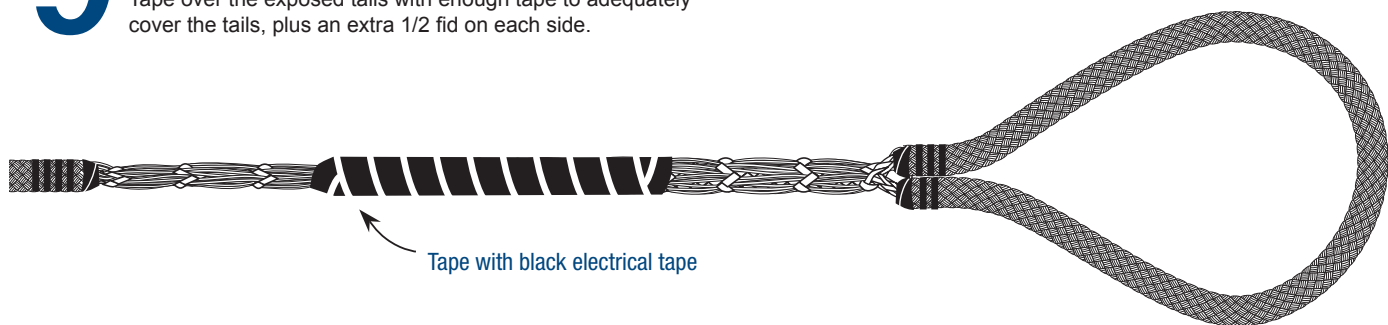
## STEP 8 TRIMMING BACK TAPED TAILS

Cut back the cover tails leaving a 1/2 fid length of tail exposed and arrange them so they lay as close to the body of the rope as possible. Tape them down.



## STEP 9 TAPING TAILS

Tape over the exposed tails with enough tape to adequately cover the tails, plus an extra 1/2 fid on each side.

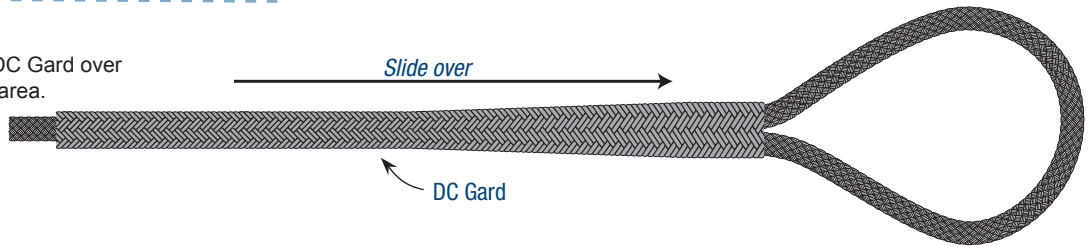




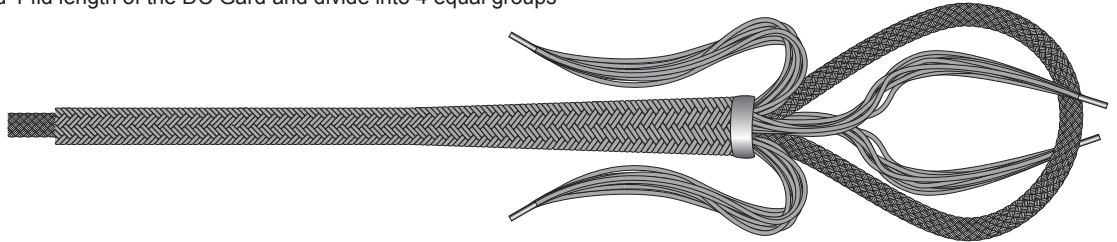
# Double Braid Class II TS-II Turbo EYE SPLICE

## STEP 10 ATTACHING DC GARD COVER

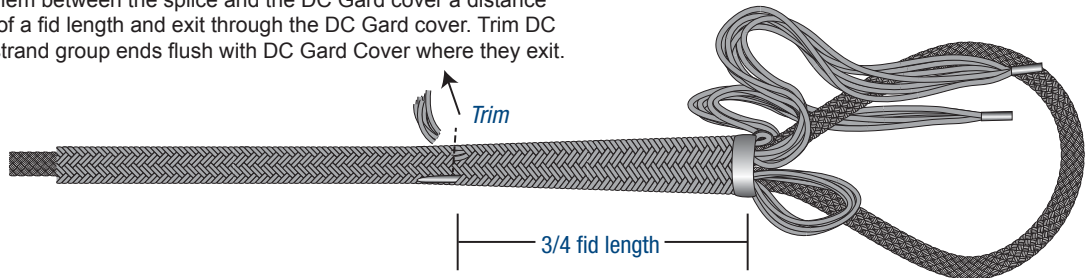
**10A** Slide DC Gard over splice area.



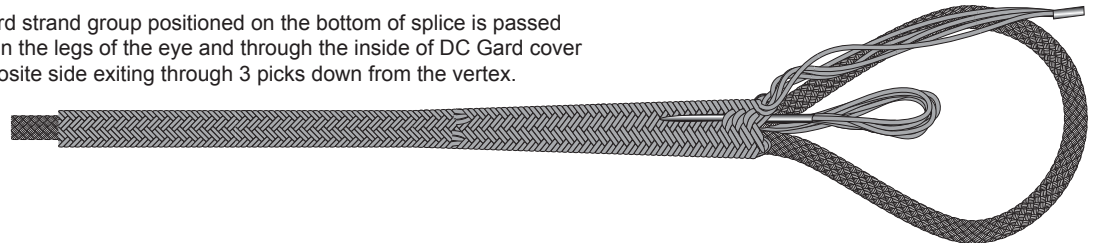
**10B** Unbraid 1 fid length of the DC Gard and divide into 4 equal groups



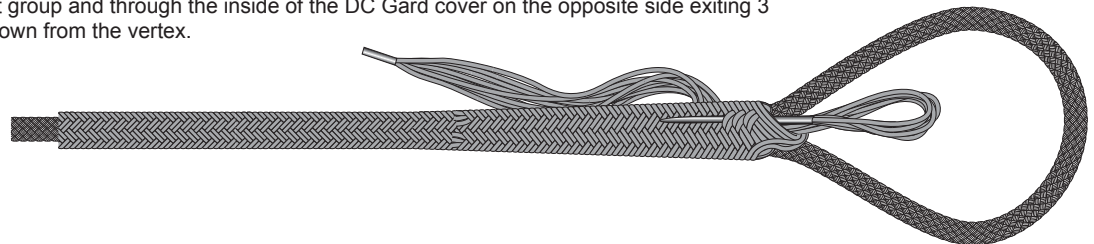
**10C** Insert the strand groups on the sides of the splice into a tubular fid pass them between the splice and the DC Gard cover a distance of 3/4 of a fid length and exit through the DC Gard cover. Trim DC Gard strand group ends flush with DC Gard Cover where they exit.



**10D** DC Gard strand group positioned on the bottom of splice is passed between the legs of the eye and through the inside of DC Gard cover on opposite side exiting through 3 picks down from the vertex.

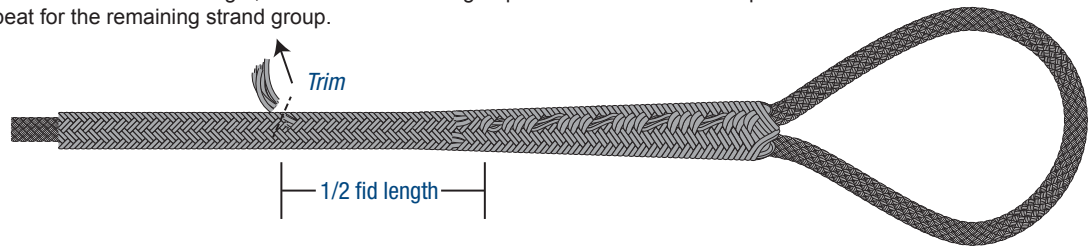


**10E** Remaining DC Gard strand group will pass through the eye in the opposite direction from the first group and through the inside of the DC Gard cover on the opposite side exiting 3 picks down from the vertex.

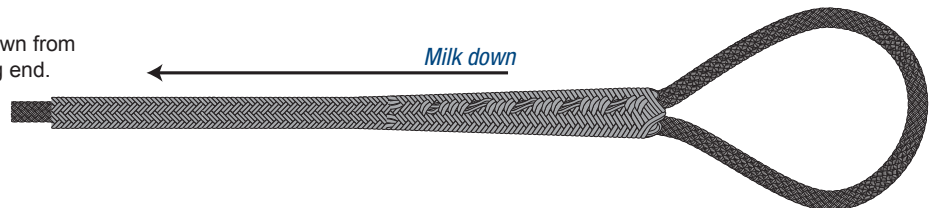


# Double Braid Class II TS-II Turbo EYE SPLICE

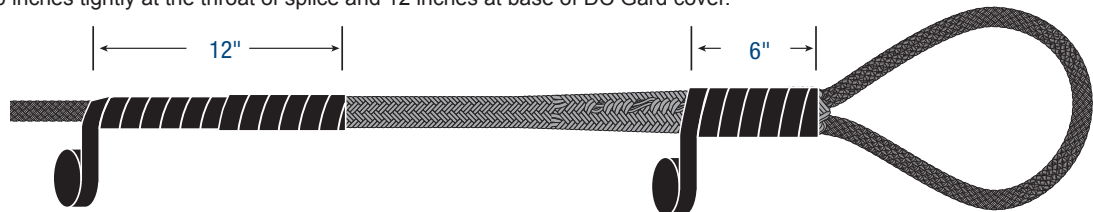
- 10F** Begin tucking DC Gard strand groups over 2 strands and under 3 strands (1 tuck) and complete 4 tucks. Bury the remaining length of strand groups between DC Gard cover and rope a minimum of 1/2 a fid length, trim DC Gard strand group flush with cover. Turn rope over and repeat for the remaining strand group.



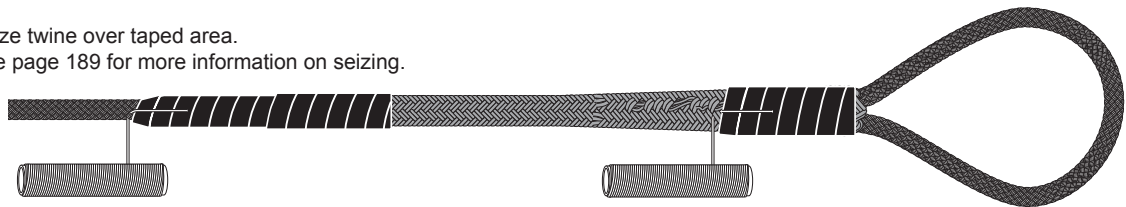
- 10G** Milk DC Gard cover down from eye the toward working end.



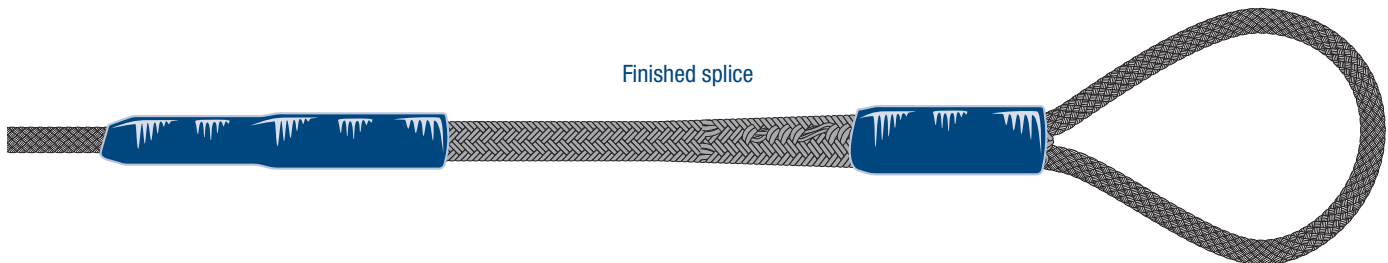
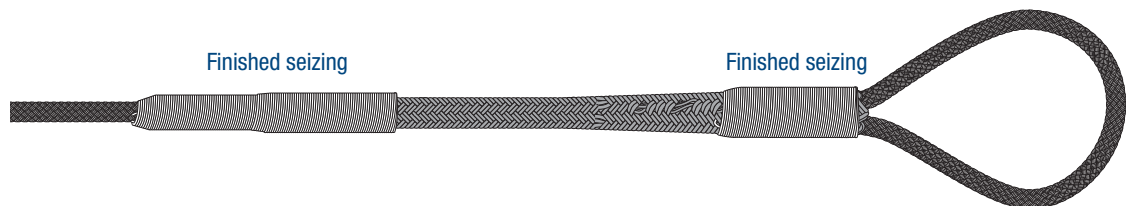
- 10H** Tape 6 inches tightly at the throat of splice and 12 inches at base of DC Gard cover.



- 10I** Seize twine over taped area. See page 189 for more information on seizing.



- 10J** Apply two-part urethane over seized area.

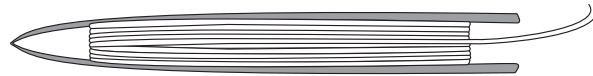


# SAMSON SPLICING INSTRUCTIONS

## Double Braid Class II TS-II Turbo EYE SPLICE

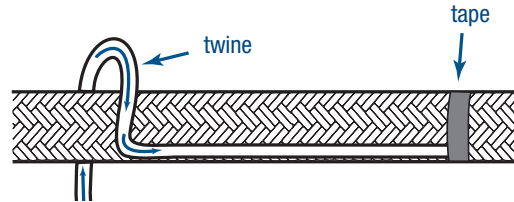
### STEP 1

Attach twine to netting needle.



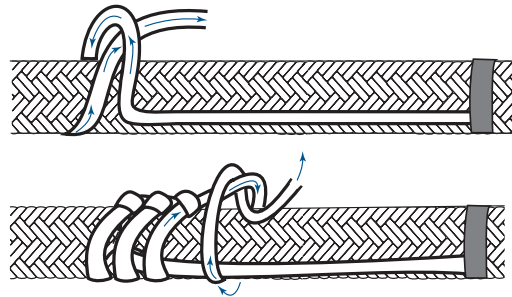
### STEP 2

Tape the free end of the twine to the opposite side of the area to be whipped.



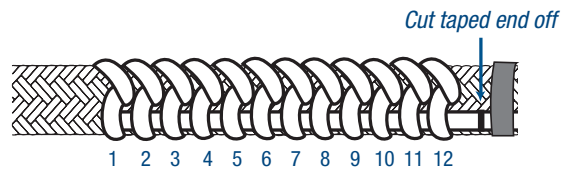
### STEP 3

Start seizing. Wrap the needle around the circumference of the rope 1 complete turn. Pass the netting needle under the complete wrap left to right. Pull the loop tight. Pull the needle up maintaining tension on the completed half hitch and then quickly pull back down to lock the half hitch in place.



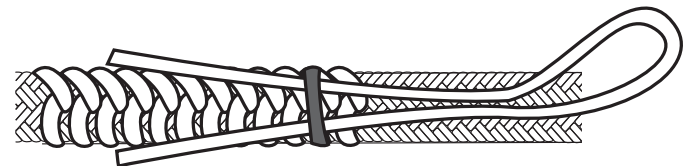
### STEP 4

Continue with this procedure until the whipped area is approximately 1/2 of the desired length, then cut off the taped end near the last wrap.



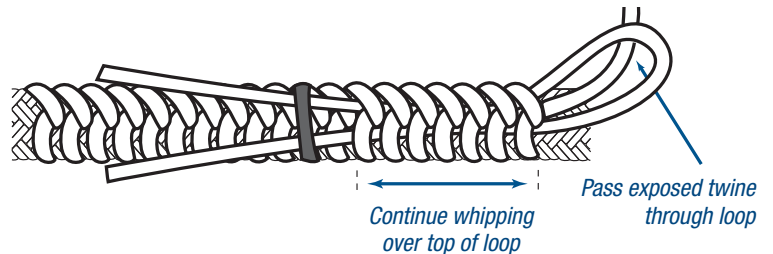
### STEP 5

Using some spare twine, tape a loop that covers the length of the intended whipping distance, letting the 2 free ends of the looped twine lay over the completed whipping. Tape the free ends of the loop past the already whipped area.



### STEP 6

Continue whipping for the desired total length over the top of the looped twine. After whipping is complete, pass the exposed whipping twine through the loop. Remove the tape on the looped twine and pull the ends to draw the loop under the whipping. Cut off any excess twine.



### STEP 7

Pull the loop through the whipped area. This should place the remaining whipping twine under the whipped area.



# Double Braid Class II Turbo-75 EYE SPLICE

The eye splice is used to place a permanent loop in the end of a rope, generally for attachment purposes to a fixed point. An eye is also used to form the rope around a thimble, which is used to protect the rope, especially when it is to be attached to a shackle, chain or wire rope.

*Additional rope needed for splice:  
64 x rope diameter plus length of eye:  
with thimble: 64 x rope diameter  
plus 1/2 circumference in feet.*

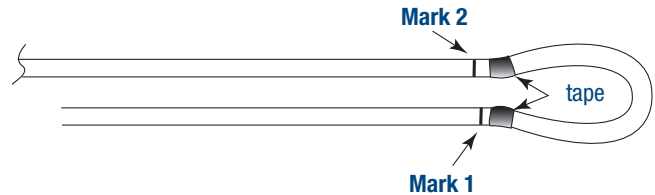
## STEP 1 MEASURING AND MARKING

From the end of the rope, measure a length that is equal to 64 times the rope diameter and make a mark on the jacket. This is Mark 1.



## STEP 2

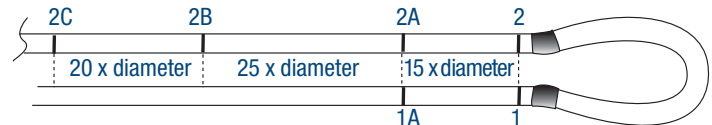
Using Mark 1 for reference, form the desired eye size and make Mark 2. Securely tape the jacket just beyond Mark 1 and just ahead of Mark 2.



## STEP 3

Keeping Marks 1 and 2 aligned, measure in the direction shown, a distance of 15 times the rope diameter, and mark the jacket on both legs.

These are Marks 1A and 2A. From 2A measure down standing part 25 times rope diameter and make Mark 2B. From 2B measure down standing part an additional 20 times rope diameter and make Mark 2C.



## 3B

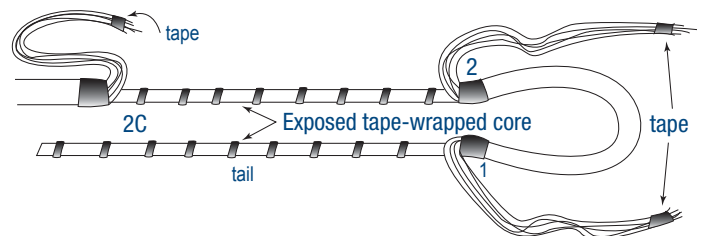
If the splice area is to be covered with a braided cover material, add this cover in here. Slide length of cover down the rope, beyond Mark 2C. Cover material should be long enough to cover splice area plus an additional 4 times the rope diameter.

Braided cover material is not required if the splice area will be whipped and coated when finished.

## STEP 4 CUT AWAY THE COVER

At Marks 1A and 2A, working around the rope circumferentially, carefully cut away all cover strands, so that the cover can be unbraided to expose the core. The cover material from Mark 1A to the end of the rope may be discarded, while the unbraided cover material from Mark 1A to Mark 1 must be retained, as this will be used to incorporate the cover into the splice. Likewise, the cover material between marks 2A and 2B may be discarded, while the material unbraided from mark 2A to Mark 2, and from Mark 2B to Mark 2C must be retained.

Tape the unbraided cover material at each of the three locations. This will help keep it out of the way as you proceed.



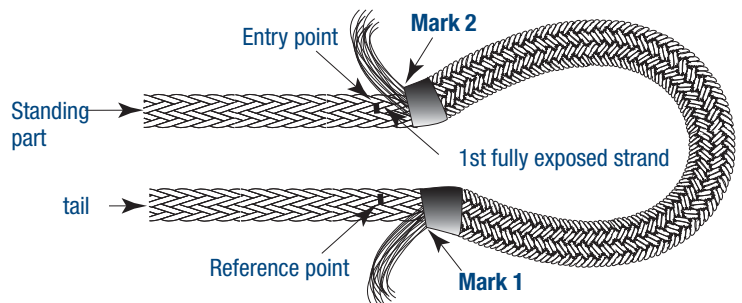
## STEP 5

Carefully remove all of the tape – wrap from the exposed sections of core. You are now ready to begin splicing the core.

## STEP 6

From Mark 2, find the first fully exposed strand on the standing part of the core, facing the core tail. Make a mark where this strand intersects with a strand going the opposite direction, also facing the core tail. This is the entry point or "throat" of the splice.

Now, keeping Marks 1 and 2 aligned, make a mark on the core tail, directly opposite the entry point. This is the reference point.





# Double Braid Class II Turbo-75 EYE SPLICE

STEP 7

From the reference point on the core tail, count 5 strands towards the end, and mark the 5th strand. Securely tape the core tail at this mark.

STEP 8

At the end of the core tail, tape the end of each of the 12 strands, then unbraid the core back to the tape wrapped around it in Step 7.

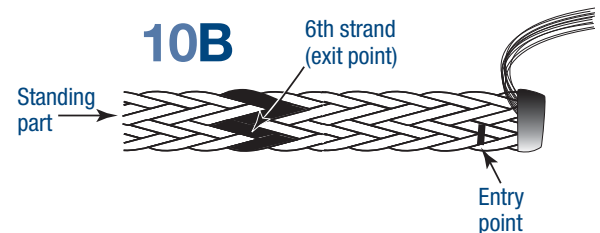
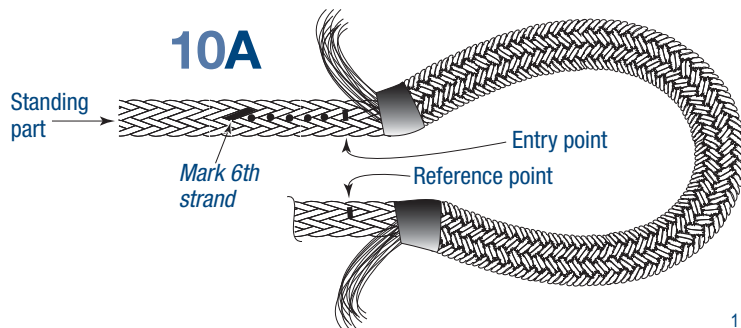
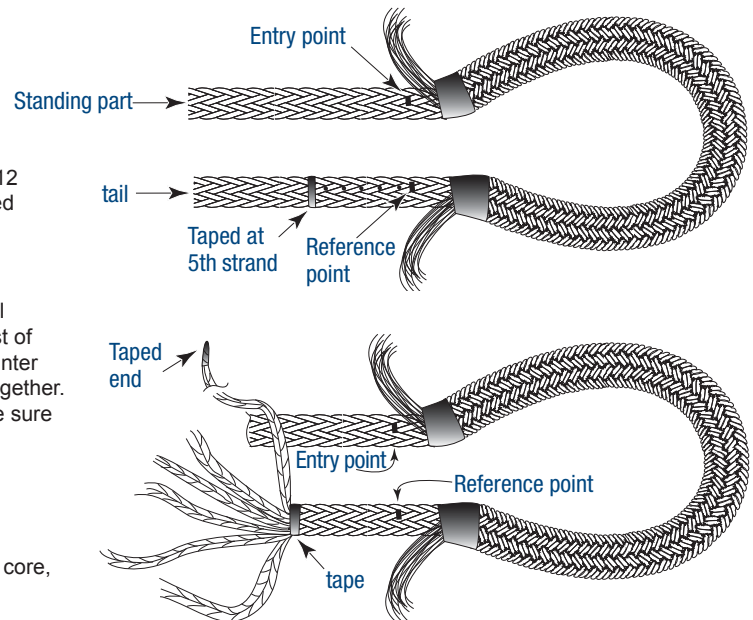
STEP 9

After unbraiding the core tail, combine the 12 individual strands into 6 pairs of strands. Each pair should consist of 1 "S" (clockwise twist) strand, and an adjacent "Z" (counter clockwise twist) strand. Now tape the paired strands together. As you tape the ends of the paired strands together, be sure that the individual strands have maintained their twist. Add twist if necessary, but be careful not to over twist.

STEP 10

From the "entry point" mark on the standing part of the core, count 6 strands and mark the 6th strand. This will be the exit point.

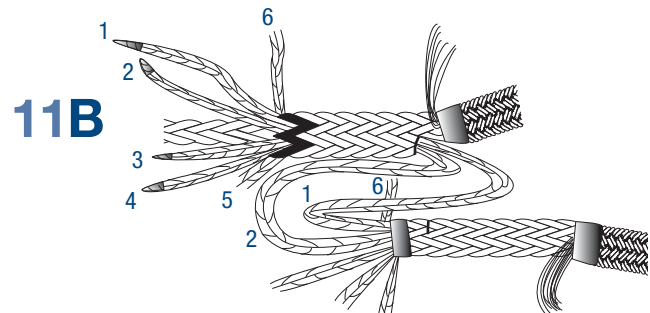
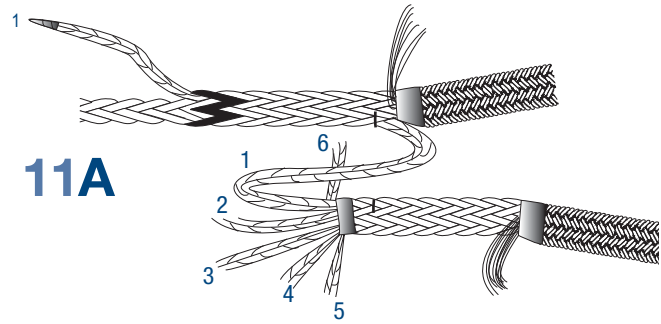
Now, working your way around circumference of the core, mark an additional 5 strands in the pattern shown.



STEP 11

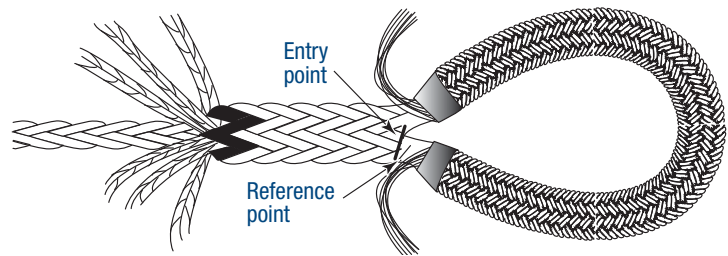
Carefully open up the braid at the entry point. Each of the six strand pairs will be inserted into the center of the braid at this point, and brought out behind its corresponding marked strand. Starting with the strand pair most nearly facing the standing part, use a tubular fid or similar device to insert the strand pair between strands at the entry point and bring it out behind the marked strand on the opposite side of the standing part. Next, insert the adjacent strand pair and bring it out behind the adjacent marked strand.

Continuing in this fashion, work your way around the rope, inserting each strand pair, and bringing it out behind its corresponding marked strand. When inserting the strand pairs, be careful not to entangle them with previously inserted pairs. When all six pairs have been inserted, they should have a common entry point, and run parallel through the center of the rope.



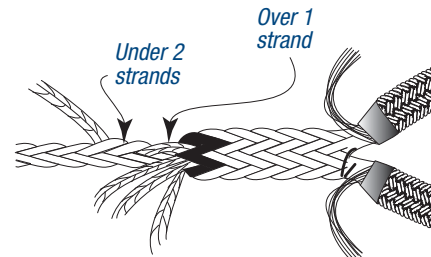
# Double Braid Class II Turbo-75 EYE SPLICE

**STEP 12** Alternately pull on each of the six strand pairs until the tape wrapped around the core tail approaches the entry point. Continue to gently pull on the strand pairs until the tape passes inside of the standing part, and the reference point is aligned with the entry point.

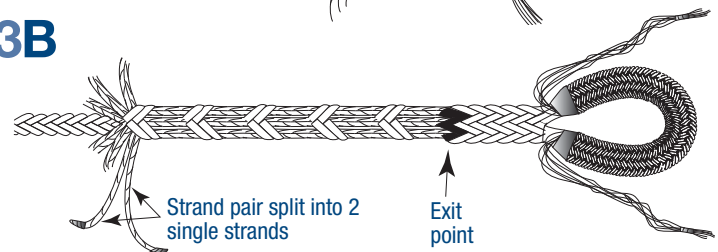


**STEP 13** Begin the tuck procedure by selecting any strand pair and passing it over the strand following the marked exit point, and under the next two strands. Following this procedure, make one tuck with each of the remaining strand pairs. A tuck is defined as passing over 1 strand and under 2 strands, and successive tucks should always progress in a straight line down the body of the rope. After one tuck has been completed with each strand pair, continue the procedure until a total of 5 tucks has been made with each pair.

**13A**



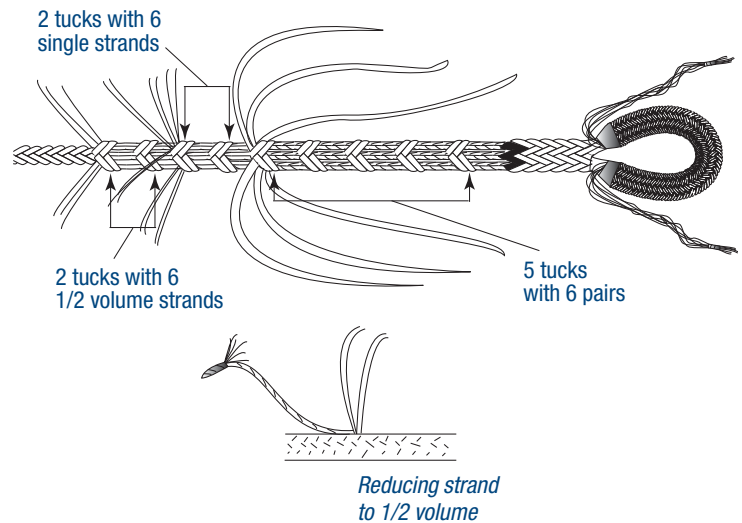
**13B**



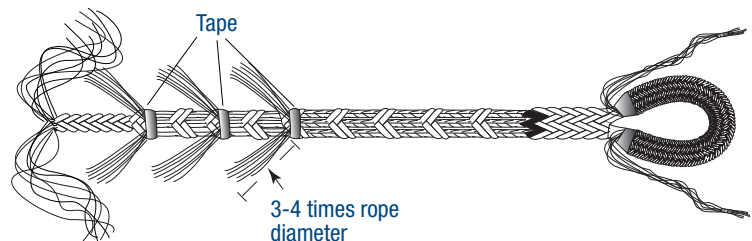
**STEP 14** Once 5 tucks have been made with all 6 strand pairs, split each strand pair into 2 single strands. Make two more tucks with one single strand from each pair. Leave the un-tucked single strands where they are. These will eventually be trimmed back.

**STEP 15** Note that the individual strands are made up of individual twisted yarns. The tuck portion of the splice is completed by cutting away half of the twisted yarns from each of the six individual strands near the taped end of the strand and performing 2 tucks each with six half-volume strands. If the strand make-up consists of an odd number of yarns, divide the number by 2 and round down to determine the number of yarns to cut away. For example, if a strand is made up of 7 yarns,  $7 \div 2 = 3.5$  and 3.5 rounded down is three, therefore, you will cut away 3 yarns and tuck the remaining 4 yarns.

NOTE: Due to slight variations in core construction, it may be necessary to unbraid several inches of additional cover to complete the final tucks.

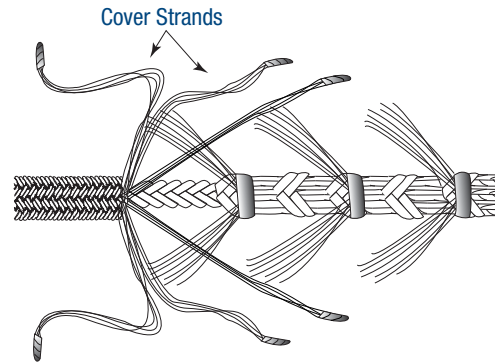


**STEP 16** After completing the tuck procedure, place a tight wrap of tape at the end of each group of tucks, then trim off the excess material leaving 3-4 times the rope diameter protruding.

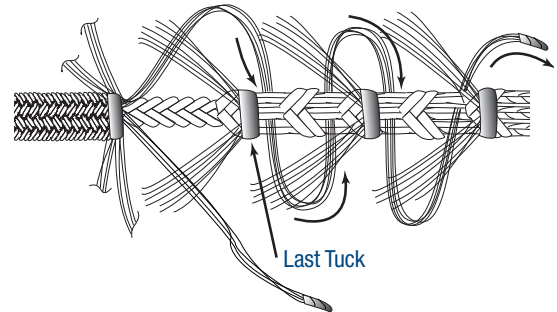


# Double Braid Class II Turbo-75 EYE SPLICE

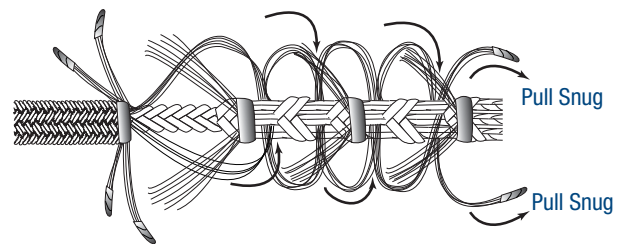
**STEP 17** Divide the unbraided cover material at the base of the splice into six equal groups and tape the end of each group.



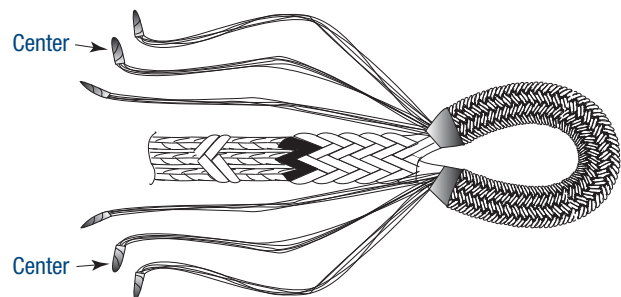
**STEP 18** Select one of the six groups and pass it back and forth underneath two adjacent tucked core strands as shown. A minimum of four passes should be made.



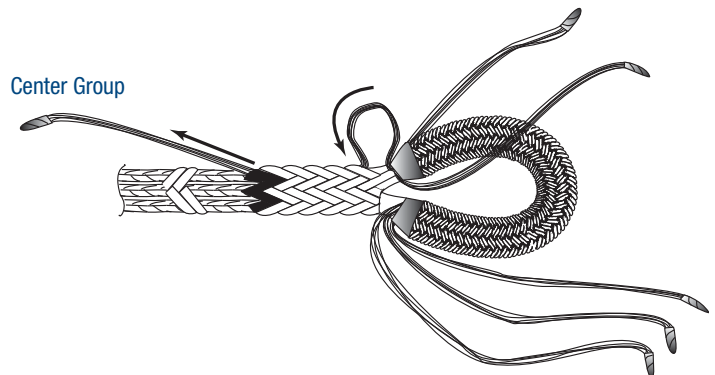
**STEP 19** Now select the adjacent group and pass it back and forth in the opposite direction under the same two tucked core strands so that the two groups cross underneath the tucked core strands. Pull the two groups snug.



**STEP 20** Roll the rope over slightly and repeat steps 18 and 19 using the next two adjacent groups of cover material, passing them back and forth under the next two adjacent tucked core strands. Then repeat again using the final two adjacent cover groups and the final two adjacent tucked core strands.



**STEP 21** Divide the unbraided cover material on each leg of the eye into three equal groups and tape the ends. Each leg of the eye should have one center group, with one group to either side.



**STEP 22** Starting with the top/center group as indicated, carefully insert it into the core at a point directly opposite the entry point. Bring it out behind its corresponding marked strand and pull snug.

# Jacketed Dyneema® Line COVER REPAIR

## MATERIALS NEEDED FOR INSTALLATION:

- > Size 84–96 twine
- > Masking tape
- > Netting needle
- > 2-part urethane
- > Latex gloves

## LENGTH OF TWINE NEEDED FOR INSTALLATION:

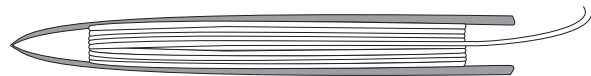
- >  $4 \times \text{diameter} \times (\text{length of damaged area in inches} + 6)$



Damaged cover

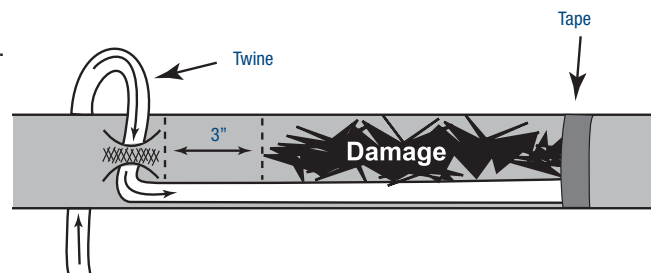
STEP 1

Attach twine to netting needle.



STEP 2

Measure 3 inches to the left of the damaged area. Pass free end of twine through the cover under the intersection of the cover strands at this point (make sure the twine does not pass under or through the core strands).



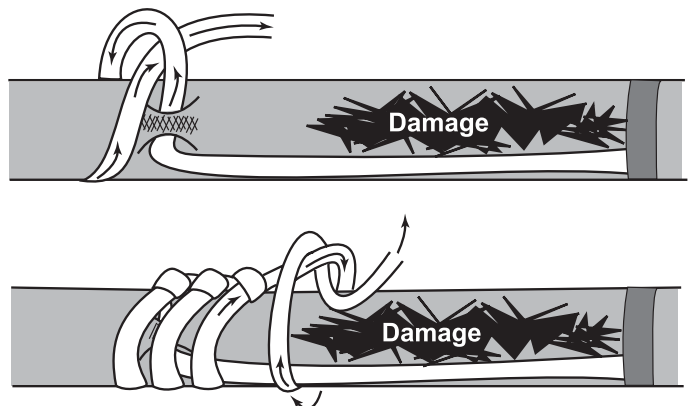
STEP 3

Tape the free end of the twine to the opposite side of the damaged area.

STEP 4

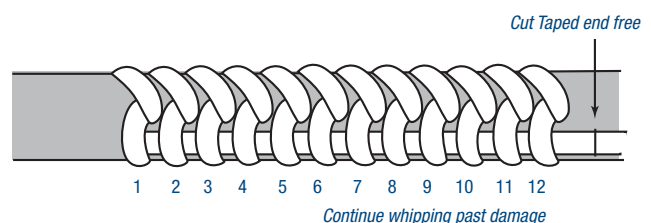
Start whipping. Wrap the needle around the circumference of the rope 1 complete turn. Pass the netting needle under the complete wrap left to right.

Pull the loop tight. Pull the needle up maintaining tension on the completed half hitch and then quickly pull back down to lock the half hitch in place.



STEP 5

Continue with this procedure until 12 wraps are completed, then cut the taped free end near the last wrap.

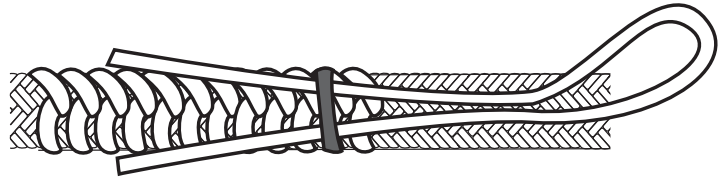




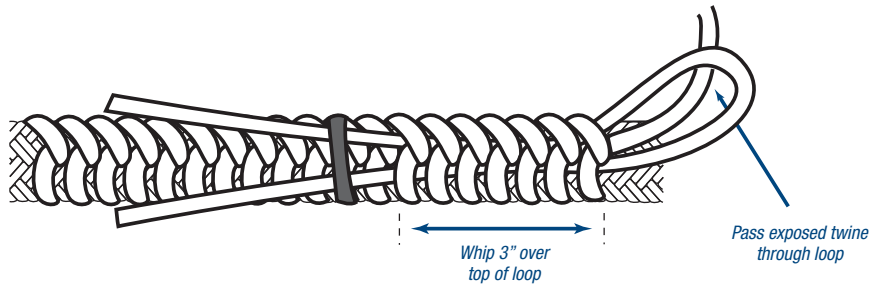
SAMSON REPAIR INSTRUCTIONS

# Jacketed Dyneema® Line COVER REPAIR

**STEP 6** Continue to whip the entire length of the damaged cover. Using some spare twine, tape a loop 2 inches past the last complete whipping, letting the two free ends of the looped twine pass over the completed whipping. Tape the free ends past the already whipped area.



**STEP 7** Continue whipping for 3 inches over the top of the looped twine. After whipping is complete, cut less than 1 inch of the exposed whipping twine. Remove the tape on the looped twine and pass the exposed whipping twine through the loop.



**STEP 8** Remove the tape from the two free ends of the looped twine and use them to pull loop through the whipped area. This should place the remaining whipping twine under the whipped area.



**STEP 9** Mix the urethane per the manufacturer's instructions.

**STEP 10** Apply urethane liberally to the whipped area by hand using a latex glove. Also apply the urethane 3" beyond the whipped area on either side. Cure times vary; consult manufacturer's instructions.



# TECHNICAL BULLETINS

## Rope Measurement Recommendations

These recommendations should be used when a cut length of rope is needed:

- > If a reliable rope length counter is available, it should be used as indicated by the manufacturer's instructions, while adding back-tension of approximately 10 lbs.
- > In the absence of a length counter, the recommended methods are identified in ISO standards 2307:2005 and C1 1500:2006. These recommendations state that the rope sample should be laid out straight on a flat surface with slight hand force or lightly tensioned by hand to measure the length. The rope should not be curved or twisted at any point along its length.



*Do not allow the length of rope being measured to be curved or twisted.*

### Length Tolerance at Samson

In order to meet Samson quality standards and practices, all high-performance products made in whole or in part from high-modulus fibers such as Dyneema®, Technora®, Vectran®, etc., are measured with a length tolerance of +5%/-0%. Other ropes made with olefin, nylon, or polyester fibers are measured with a length tolerance of +/-5%. These are determined during the reeling process, as described below:



*A rope is run over an elevated roller, or through two horizontal breaker bars that add back-tension to control the rope as it is pulled through the reeling system. The rope is then looped around a number of capstans that are controlled to a tension of 10 lb. The rope finally passes through a length counter as it is wound on to the final reel and cut at the required length. The back-tension on the rope as it moves through the counter assists in providing a consistent length measurement and a solidly wound reel.*

### Length Measurement Accuracy

The length counters are checked for accuracy weekly using a reference standard. The standard used is a predetermined rope sample with a firm shape and very low stretch that is run through the counters to verify the length readout. A 100' length of 20 mm Duravet is used as the reference standard.

Samson recently modeled and analyzed the application of our high-performance mooring lines under hot climate conditions [1]. In this technical bulletin, we look at how our mooring lines perform in an extremely cold environment.

Samson mooring lines are routinely exposed to different climatic conditions. Some concerns were raised regarding the performance of ropes that are directly exposed to the extreme cold. The pictures in Fig. 1 depict AmSteel®-Blue on a winch buried under heavy ice on board a ship sailing in a cold environment. In order to understand how our mooring lines perform in an extremely cold environment, we studied the flexibility and strength of ropes being directly exposed to a broad range of temperatures.

### FLEXIBILITY

Fig. 2 shows that rope made from Dyneema® fiber, such as AmSteel®-Blue, remains quite flexible even at an extremely cold temperature of  $-125^{\circ}\text{C}$  ( $-193^{\circ}\text{F}$ ).

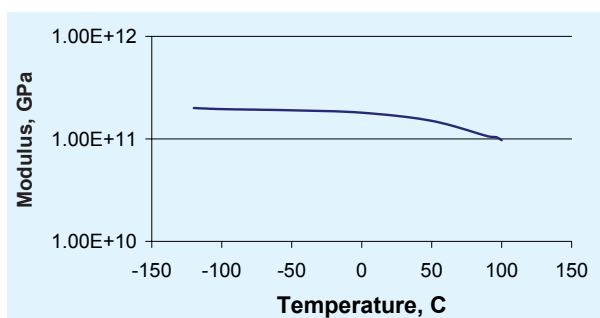


FIGURE 2 Stiffness of Dyneema® fiber vs. Temperature

### STRENGTH

Fig. 3 shows that Dyneema® fiber rope actually becomes stronger at lower temperatures. The rope may gain 5–10% of breaking strength if the environment becomes as cold as  $-50^{\circ}\text{C}$  ( $-58^{\circ}\text{F}$ ). Projections show that the rope gains even more strength at  $-150^{\circ}\text{C}$  ( $-193^{\circ}\text{F}$ ). [2]

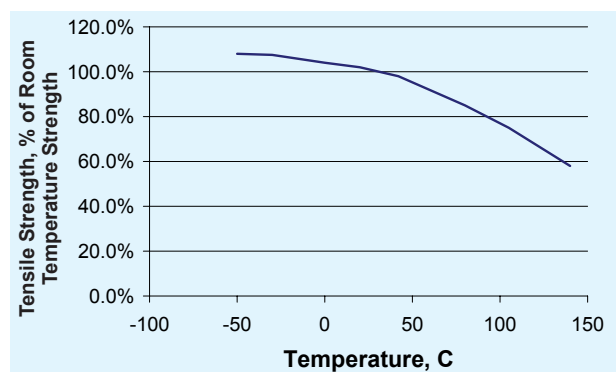


FIGURE 3 Strength of Dyneema® fiber vs. Temperature



FIGURE 1 AmSteel®-Blue mooring line on Shuttle Tanker KOMETIC buried in ice and snow

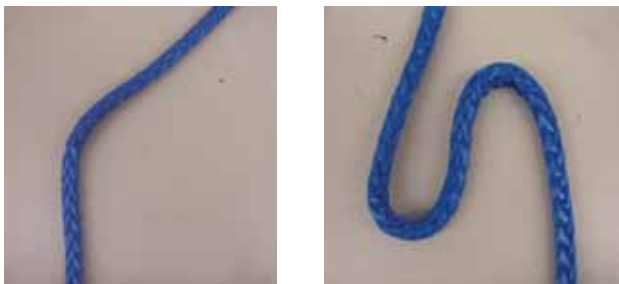


**samson**  
THE STRONGEST NAME IN ROPE



### ICE

In cold environments, there is a concern that ice may damage the rope through abrasion or cutting due to the ice's rigidity and sharp edges. To test this theory, we froze wet AmSteel®Blue rope to -5°C (23°F) in two different configurations, as shown in Fig. 4.



**FIGURE 4** Frozen rope bent at 45° on the left and 180° on the right

We then measured the strength of the frozen rope samples. The results in Table 1 show that there was no loss of strength regardless of the frozen configuration.

**TABLE 1.** Strengths of frozen 7/16" AmSteel®Blue

Configuration	45° Bend	180° Bend
% of Minimum Break Strength	100%	102%

### CONCLUSION

The safe operation temperature for ropes constructed from Dyneema® fiber, such as AmSteel®Blue, Force-8, Neutron-8, DPX™75, Turbo-75, etc., is at least as low as -125°C (-193°F).

For additional information, please contact our Engineering Department at 360-384-4669.

### REFERENCES:

- [1]. Technical Bulletin, *AmSteel®Blue Mooring Under Hot Climates*, Samson, 2004.
- [2]. DSM Dyneema® fiber technical data sheet, 2002.



**Samson**  
THE STRONGEST NAME IN ROPE

## HMPE Rope: Design vs. Performance

### OVERVIEW

Selecting a rope for any application involves evaluating several performance characteristics. These characteristics include, but are not limited to, minimum breaking strength, weight specifications, and elongation. These factors also play a critical role in the field performance of such ropes.

Not all high modulus polyethylene (HMPE) ropes are created equal. This study demonstrates the importance of detailed design factors to performance and service life of a rope. In this Technical Bulletin, we compare the performance characteristics among different HMPE rope designs to analyze and report the advantages, considerations and the long-term behavior of HMPE mooring lines.

After testing, the following conclusions have been made:

- > Rope design is critical to service life
- > Longer braid cycle lengths decrease abrasion resistance
- > Longer braid cycle lengths decrease tension fatigue life
- > Longer braid cycle lengths can increase strength efficiency

### ROPE CONSTRUCTION VS. PERFORMANCE

Fig. 1 compares three HMPE ropes with different braid cycle lengths, as marked by the arrows. Sample A is Samson's AmSteel®Blue, a 12-strand single braid made with Dyneema®. Sample B shows a longer cycle length. Sample C shows an even longer cycle length. The difference in braid cycle length is shown in Fig. 1, relative to Sample A.

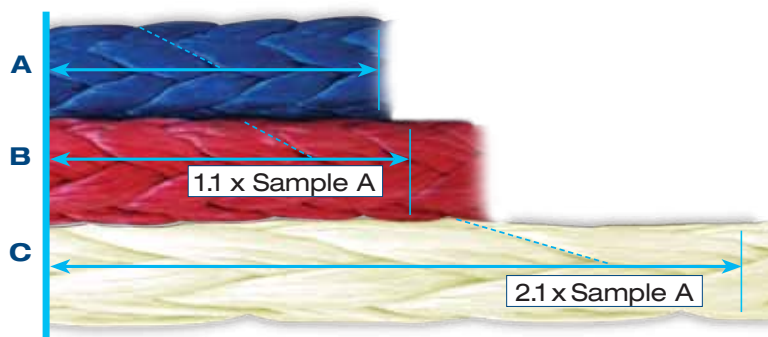


FIGURE 1 Construction Comparison

Aside from performance differences, these ropes have qualitative differences that affect how they will handle in operation. Shorter cycle lengths and more tightly twisted yarns will create a firmer rope which would typically be less likely to snag on sharp objects. It is important to balance all of these elements in order to create the best rope for each application with not only high strength, but long service life as well.

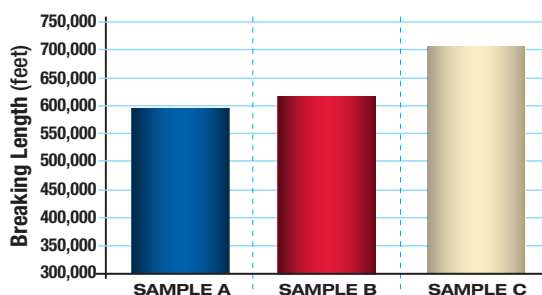
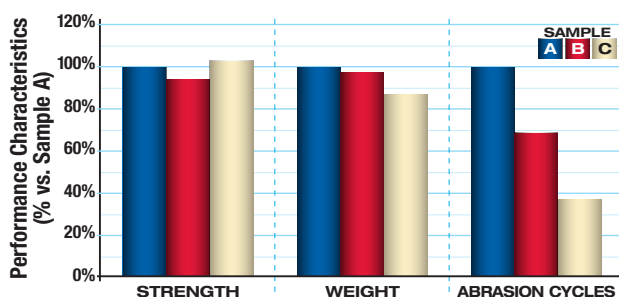


FIGURE 2 Breaking Length Comparison

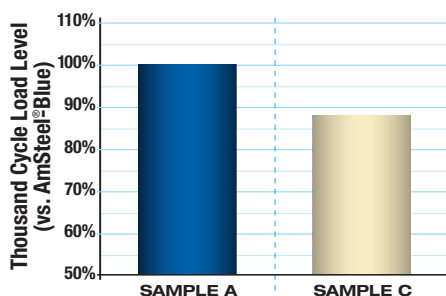
Fig. 2 compares breaking lengths, a commonly used parameter to describe the efficiency of rope. The breaking length is the calculated length of a rope whose weight is equal to its breaking strength. The comparison of the three samples shows a higher efficiency in a more loosely braided rope.

## HMPE Rope: Design vs. Performance



**FIGURE 3** Comparison of HMPE Rope Constructions

Although a loose braid leads to higher efficiency, the abrasion resistance of the rope will suffer significantly, as shown in Fig. 3. Field observation of rope also confirms this conclusion as the longer cycle length will result in more snagging and wear of the surface of the rope, which is the leading factor of strength decay of HMPE rope in service [1].



**FIGURE 4** Tension Fatigue Performance

Thousand cycle load level (TCLL) testing is used to determine the theoretical load at which a rope would fail at the 1,000th cycle [2]. Testing found that in addition to the lower abrasion resistance, a loosely braided rope also has much lower tension fatigue resistance, as shown in Fig. 4.

### CONCLUSION

Rope design is critical to the service life and performance of any rope. Extended service life can be achieved by improving rope design, as demonstrated in this study, to properly address the strength deterioration mechanisms. Improper product selection is a risk that could result in unsatisfactory performance in the field.

For additional information on this subject and other available Technical Bulletins, please contact your Samson representative or visit our website: **[SamsonRope.com](http://SamsonRope.com)**

### REFERENCES

- [1] McCorkle, E., Chou, R., Stenvers, D., Smeets, P., Vlasblom, M., & Grootendorst, E. (2003). *Fatigue and residual strength of fiber tug lines*. San Diego, CA: Oceans 2003 Proceedings, 1058–1063 Vol. 2.
- [2] Oil Companies International Marine Forum (OCIMF). (2000). *Guidelines for purchasing and testing SPM hawsers* (1st ed.). Livingston, UK: Witherby Seamanship International.

# ROPE SELF SELECTION

## US AGE & RETIREMENT



# Rope Selection, Usage, and Retirement

## ROPE SELECTION The Right Rope for the Job

The use of rope for any purpose subjects it to friction, bending, and tension. All rope hardware, sheaves, rollers, capstans, cleats, and knots are, in varying degrees, damaging to the rope. It is important to understand that rope is a moving, working strength member, and, even under ideal conditions, it will lose strength during use in any application. Maximizing the safety and rope performance begins with selecting the right rope, managing its strength loss through optimal handling practices, and retiring it from service before it creates a dangerous situation. Ropes are serious working tools, and when used properly they will give consistent and reliable service. The cost of replacing a rope is extremely small when compared to the physical damage or injury to personnel a worn-out rope can cause.

Selecting a rope involves evaluating a combination of factors. Some of these factors are straightforward such as comparing rope specifications. Others are not easily quantified, such as a preference for a specific color or how a rope feels in your hand. Reducing application factors that pertain to sizes or strengths on an initial purchase creates unnecessary frequent replacements and potentially dangerous conditions, in addition to increasing long-term costs. For ropes with equal fiber and construction, a larger rope will outlast a smaller rope because of the greater surface-wear distribution. Similarly, a stronger rope will outlast a weaker one because it will be used at a lower percentage of its break strength with a reduced chance of it being overstressed.

### 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.

Our published strengths and test results reflect as accurately as possible the conditions under which they are to be used. Because all ropes are terminated with a splice, all published strengths herein are spliced strengths unless otherwise noted. This is so the customer can select the appropriate size and strength of the rope for his application, and to ensure the utmost in safety and length of service life. This ensures that you are selecting the best sizes and strengths for your actual application and use of the rope. When comparing our data to that of other rope manufacturers, please be sure that spliced strengths are used.

### ELONGATION

It is widely accepted that ropes with lower elongation under load will give you better load control, which is a big help at complicated job sites. However, a rope with lower elongation that is shock loaded can fail without warning even though it appears to be in good shape. Low elongating ropes should be selected with the highest possible strength. Twisted rope has lower strength and more stretch. Braided rope has higher strength and lower stretch.

#### THIS BULLETIN COVERS THE FOLLOWING TOPICS:

- Rope Selection
- Rope Handling
- Installing on a Winch
- Bending Radius
- Sheave Diameters and Sizes
- Rope Inspection and Retirement
- Inspection and Retirement Checklists: *Single Braids and Double Braids*
- Elastic Elongation
- Fiber Characteristics
- Fiber Elongation at Break

### 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."

Any sudden load that exceeds the working load by more than 10% is considered a shock load. The farther an object falls, the greater the impact. 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 using rope as a towline, 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 dynamic loading applications involving severe exposure conditions, or for recommendations on special applications, consult the manufacturer.

### FIRMNESS

Select ropes that are firm and round and hold their shape during use. Soft or mushy ropes will snag easily and abrade quickly causing accelerated strength loss. A loose or mushy rope will almost always have higher break strengths than a similar rope that is firm and holds its shape because the fibers are in a straighter line. This alignment improves strength but compromises durability.

### CONSTRUCTION AND ABRASION

Choosing the right rope construction plays an important role in the longevity of the rope because of how it impacts 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, on an 8-strand rope.

# Rope Selection

## WORKING LOADS

Working loads are the loads that a rope is subjected to in everyday activity. For rope in good condition with appropriate splices, in noncritical applications and under normal service conditions, working loads are based on a percentage of the approximate breaking strength of new and unused rope of current manufacture. For the products depicted in this catalog, and when used under normal conditions, the working load percentage is 20% of published strengths.

Normal working loads do not cover dynamic conditions such as shock loads or sustained loads, nor do they cover where life, limb, or valuable property are involved. In these cases, a lower working load must be used. A higher working load may be selected only with expert knowledge of conditions and professional estimated of risk:

- 1) if the rope has been inspected and found to be in good condition;
- and 2) if the rope has not been subject to dynamic loading (such as sudden drops, snubs, or pickups), excessive use, elevated temperatures, or extended periods under load.

### RECOMMENDED WORK LOAD LIMIT For cataloged rope

Rope Construction	Percentage of Break Strength
3-Strand	20%
8-Strand	20%
12-Strand	20%
Double Braid	20%

## ROPE CLASS

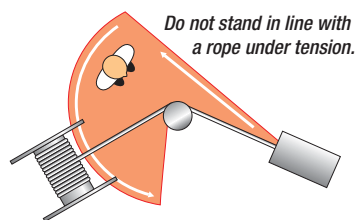
**All Samson ropes are categorized for splicing and testing purposes as a Class I or Class II construction.**

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/denier (gpd) or less and a total stretch at break of 6% or greater. Class I ropes are produced with traditional fibers such as: polypropylene or polyethylene, nylon, and 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 grams/denier (gpd) and a total stretch at break of less than 6%. Typical Class II ropes are produced with: HMPE (Dyneema®), aramid (Technora®), LCP (Vectran®), and 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.**

## ROPE HANDLING & USAGE How to Use the Rope Properly



### DANGER TO PERSONNEL

Persons should be warned of the serious danger of standing in line with a rope under tension. Should the rope part, it may recoil with considerable force and speed. In all cases where any such risks are present, or where there is any question about the load involved or the condition of use, the working load should be substantially reduced and the rope properly inspected before every use.

### TUG ASSIST LINES



A minimum of the first 3 or 4 layers of rope around the winch storage drum should be installed so the rope has a close and tight fit on the drum. The installation tension on the rope should be approximately 5% of the rope's minimum breaking strength. For new rope installations, the greater the number of wrap layers installed under the suggested tension

will minimize or prevent subsequent wraps from diving or burying down into lower wraps. As the rope is used, the wrap tensions may loosen, it is suggested the total rope be retensioned at original installation loads and thereby prevent potential downward wrap slippage. A single drum or split drum winch, should always keep a minimum of 8 to 10 wraps of rope on the drum at all times. This is to ensure that the connecting point of the rope to the winch does not under go load.

### WINDING ONTO A WINCH

**LEVEL WINDING:** Using the appropriate amount of tension, wind the rope evenly, without spaces across the drum of the winch. The next level should wind over the previous layer of rope and follow the valley between turns on the previous level. This pattern is followed for all layers of rope, with each layer of turns slightly offset from the layer below.



LEVEL WINDING

**CROSS WINDING:** When the rope is placed under load it can dive, or push into, the previously wrapped level below it. To avoid diving, cross winding is recommended.

When cross winding, start with two layers of level wound rope using the appropriate back tension. At the end of the second layer, pull the rope quickly across the drum, allow it to wind one full turn at the side of the drum, then quickly pull it back to the opposite side of the drum. This will force the rope to cross in the middle, and form a barrier that will prevent the rope from diving into the lower layers of the drum when placed under load. Follow the cross-wound layer with two layers of level wound turns, then form another cross. Repeat this pattern until the length of rope is fully spooled onto the winch.



CROSS WINDING First Cross



CROSS WINDING Second Cross



CROSS WINDING Level Layer

## ROPE CAPACITY OF A WINCH DRUM

**Effect of rope diameter on drum capacity.**

The formula for determining the length of rope that will fit on a winch drum is:

$$\text{LENGTH TO BE STORED} = \frac{A(B^2 - C^2)}{15.3 (\text{rope diameter})^2}$$

(A, B, C, and the rope diameter are expressed in inches; length is expressed in feet.)

## AVOID ALL ABRASIVE CONDITIONS

All rope will be severely damaged if subjected to rough surfaces or sharp edges. Chocks, bitts, winches, drums, and other surfaces must be kept in good condition and free of burrs and rust. Pulleys must be free to rotate and should be of proper size to avoid excessive wear.

## MINIMIZE TWIST IN THE LINE

As little twist as four turns per three feet (or meter) introduced into the line can cause as much as 10–30% 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 CHEMICAL EXPOSURE

Rope is subject to damage by chemicals. Consult the manufacturer for specific chemical exposure, such as solvents, acids, and alkalis. Consult the manufacturer for recommendations when a rope will be used where chemical exposure (either fumes or actual contact) can occur.

## AVOID OVERHEATING

Heat can seriously affect the strength of synthetic ropes. When using rope where the temperature exceeds 250°F (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.

## STORAGE

All rope should be stored in a clean, dry area, out of direct sunlight, and away from extreme heat. It should be kept off the floor and on racks to provide ventilation underneath. Never store rope on a concrete or dirt floor, and under no circumstance should cordage and acid or alkalis be kept in the same vicinity. Some synthetic rope (in particular polypropylene and polyethylene) may be severely weakened by prolonged exposure to ultraviolet (UV) rays unless specifically stabilized and/or pigmented to increase UV resistance. UV degradation is indicated by discoloration and the presence of splinters and slivers on the surface of the rope.

## KNOTS

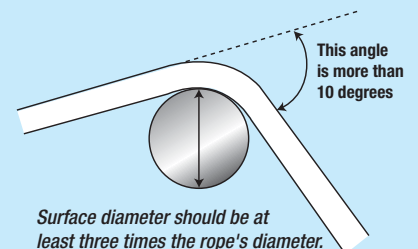
While it is true that a knot reduces rope strength, it is also true that a knot is a convenient way to accomplish rope attachment. The strength loss is a result of the tight bends that occur in the knot. With some knots, ropes can lose up to 50% of their strength, however, this number can change based 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.



## BENDING RADIUS Sizing the Radius of Bitts, Fairleads, and Chocks

**Any sharp bend in a rope under load decreases its strength substantially and may cause premature damage or failure. In sizing the radius of bitts, fairleads, and chocks for best performance the following guidelines are offered.**

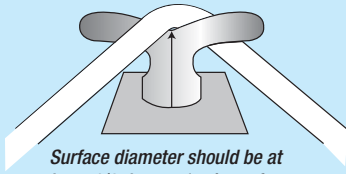
Where a rope bends more than 10 degrees around or across any surface, the diameter of that surface should not be less than three times the diameter of the rope. Stated another way, the diameter of the surface should be at least three times the rope's diameter. A 4:1 ratio (or larger) would be better yet because the durability of the rope increases substantially as the diameter of the surface over which it is worked increases.



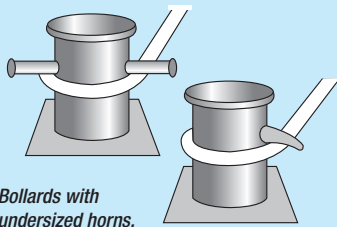


# Bending Radius | Rope Inspection & Retirement

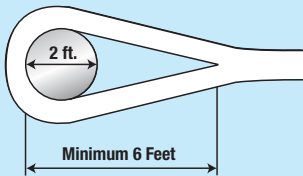
## BENDING RADIUS Sizing the Radius of Bitts, Fairleads, and Chocks Continued



Surface diameter should be at least 1/2 the rope's circumference.



Bollards with undersized horns.



Minimum 6 Feet

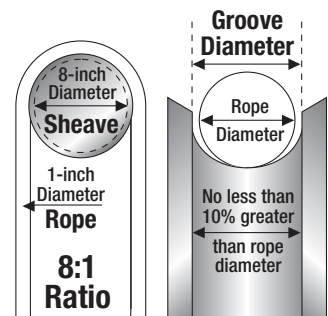
On a cleat when the rope does not bend radially, the barrel of the cleat can be one-half the rope's circumference (minimum).

Many tugboats using 8- and 9-inch circumference headlines in ship-handling work have bitts 18 inches in diameter or greater, which are adequate bending radii. However, many of these bow and shoulder bitts are equipped with "horns" of a relatively small diameter (5 or 6 inches), and it is these horns under or over which the lines pass and bend first in many cases, resulting in a shortened rope life. It is recommended that the hardware be replaced with the appropriate sized horns to avoid excessive rope replacement costs.

The ratio of the length of an eye splice to the diameter of the object over which the eye is to be placed (bollard, bitt, cleat, etc.) should be a minimum 3:1 relationship, and preferably 5:1. In other words, if you have a bollard two feet in diameter the eye splice should be six or ten feet in length. By using this ratio the angle of the two legs of the eye splice at its throat will not be so severe as to cause a parting or tearing action at this point (thimbles are normally designed with a 3:1 ratio).

### SHEAVE DIAMETERS SHOULD BE 8 TIMES THE ROPE DIAMETER

To assure maximum efficiency and safety, sheaves for braided ropes should be no less than eight times the rope diameter. The sheave groove diameter should be no less than 10% greater than the rope diameter. The sheave groove should be round in shape. (Sheaves with "V" shaped grooves should be avoided, as they tend to pinch and damage the rope through excessive friction and crushing of the rope fibers.) Sheave surfaces should be kept smooth, and free of burrs and gouges. Bearings should be maintained to ensure smooth rotation of sheaves.



## ROPE INSPECTION & RETIREMENT Retire the Rope When it's Time



One question frequently asked 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 such as 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 AmSteel® II 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 member. 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.



## ROPE INSPECTION & RETIREMENT *Continued*

### 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 determine 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

## 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 in to rope

### REDUCED VOLUME *Repair or retire*



- WHAT**
- > 25% reduction
- CAUSE**
- > Abrasion
  - > Sharp edges and surfaces
  - > Cyclic tension wear

### 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

### DISCOLORATION/DEGRADATION *Repair or retire*



- WHAT**
- > Fused fibers
  - > Brittle fibers
  - > Stiffness
- CAUSE**
- > Chemical contamination

### INCONSISTENT DIAMETER *Repair or retire*



- WHAT**
- > Flat areas
  - > Lumps and bumps
- CAUSE**
- > Shock loading
  - > Broken internal strands

## 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)

# Rope Inspection & Retirement Checklist **DOUBLE BRAID**

## 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.

## 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 the 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.

## 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

## 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

## DISCOLORATION/DEGRADATION Repair or retire



- WHAT** > Fused fibers  
> Brittle fibers  
> Stiffness
- CAUSE** > Chemical contamination

## INCONSISTENT DIAMETER Repair or retire



- WHAT** > Flat areas  
> Lumps and bumps
- CAUSE** > Shock loading  
> Broken internal strands

# Elastic Elongation | Components of Stretch

## Elongation (Stretch)

**ELASTIC ELONGATION (EE):** Refers to the portion of stretch or extension of a rope that is immediately recoverable after the load on the rope is released. This recoverable tendency is a primary result of the fiber (or fibers) used as opposed to the rope construction. Each type of synthetic fiber inherently displays a unique degree of elasticity. Relatively, HMPE fiber has an extremely low elasticity compared to nylon fiber.

**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 recovery that occurs immediately when a load is removed; thereafter, a remaining small percentage of elastic recovery will occur slowly and gradually over a period of hours or days. This retardation in recovery is measured on a length/time scale and is known as hysteresis or recovery over time.

### PERMANENT EXTENSION (PE) WHILE WORKING:

The amount of extension that exists when stress is removed but no time is given for hysteresis recovery. It includes the nonrecoverable and hysteretic extension as one value and represents any increase in the length of a rope in a continual working situation, such as during repeated surges in towing or other similar cyclical operations.

The percentage of PE over the working load range is four to six percent for braided ropes and two to three times as much for plaited. However, it will vary slightly with different fibers and rope constructions.

Allowances must be made for this factor in applications such as subsurface mooring or when using devices that demand precise depth location and measurement.

### PERMANENT EXTENSION (PE) AFTER RELAXED:

That portion of extension which, due to construction deformation (compacting of braid and helical changes) and some plastic deformation of the yarn fibers, prevents the rope from returning to its original length.

**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.

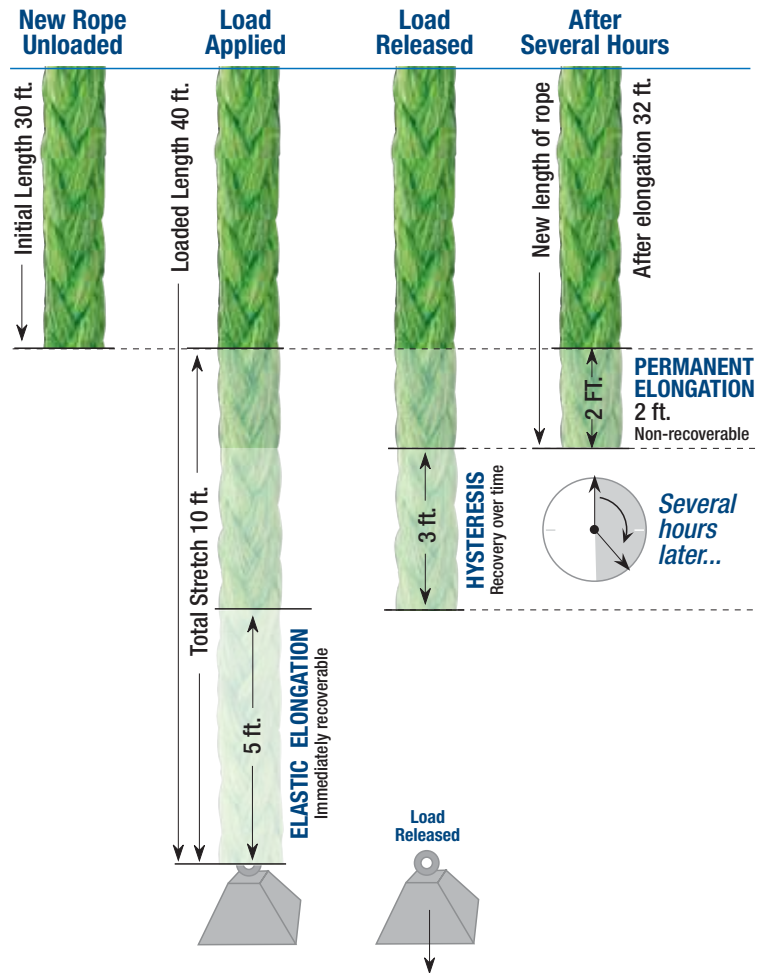
**CONSTRUCTIONAL ELONGATION:** The elongation of a loaded rope that results from compaction as the fibers and strands align and adjust.

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

## Components of Stretch on a Loaded Rope

### Published Elastic Elongation Data:

All reported percentages are averages based on tests of new rope, where tested ropes were stabilized by being cycled 50 times at each stated percentage of its average break strength.





## Comparison of Fiber Characteristics

GENERIC FIBER TYPE	NYLON	POLYESTER	POLYPROPYLENE	HMPE	LCP	ARAMID	PBO
Tenacity (g/den) <sup>1</sup>	7.5 – 10.5	7 – 10	6.5	32 (SK-60) 40 (SK-75)	23 – 26	28	42
Elongation <sup>2</sup>	15 – 28%	12 – 18%	18 – 22%	3.6%	3.3%	4.6%	2.5%
Coefficient of Friction <sup>3</sup>	.12 – .15	.12 – .15	.15 – .22	.05 – .07	.12 – .15	.12 – .15	.18
Melting Point	425° – 490° F	480° – 500° F	330° F	300° F	625° F	930° F*	1200° F*
Critical Temperature <sup>4</sup>	325° F	350° F	250° F	150° F	300° F	520° F	750° F
Specific Gravity	1.14	1.38	.91	.98	1.40	1.39	1.56
Creep <sup>5</sup>	Negligible	Negligible	Application Dependent	Application Dependent	Negligible	Negligible	Negligible

\* Char temperature — does not melt

<sup>1</sup> **TENACITY** is the measurement of the resistance of fiber to breaking.

<sup>2</sup> **ELONGATION** refers to percent of fiber elongation at break.

<sup>3</sup> **COEFFICIENT OF FRICTION** is based on the rope's resistance to slipping.

<sup>4</sup> **CRITICAL TEMPERATURE** is defined as the point at which degradation is caused by temperature alone.

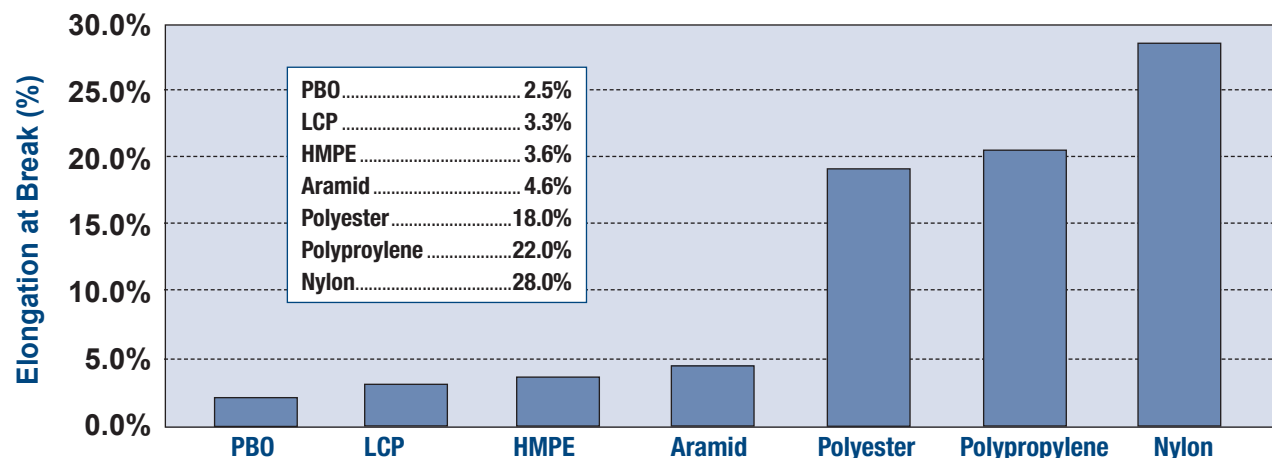
<sup>5</sup> **CREEP** is defined as a material's slow deformation that occurs while under load over a long period of time. Creep is mostly nonreversible. For some synthetic ropes, permanent elongation and creep are mistaken for the same property and used interchangeably when in fact creep is only one of the mechanisms that can cause permanent elongation.

### FIBER STRENGTH RETENTION AFTER CHEMICAL IMMERSION

(HMPE strength retention after 6-months immersion)

AGENT	HMPE
Sea Water	100%
Hydraulic Fluid	100%
Kerosene	100%
Gasoline	100%
Glacial Acetic Acid	100%
1 M Hydrochloric Acid	100%
5 M Sodium Hydroxide	100%
Ammonium Hydroxide (29%)	100%
Hypophosphite Solution (5%)	100%
Perchloroethylene	100%
10% Detergent Solution	100%
Bleach	91%

## Fiber Elongation at Break



# GLOSSARY | Common Cordage Terms

**ABRASION RESISTANCE:** The ability of a fiber or rope to withstand surface wear and rubbing due to motion against other fibers or rope components (internal abrasion) or a contact surface such as wraps on a winch drum (external abrasion), which can be a portion of the rope itself.

**BLOCK CREEL:** A method of rope making where a given length of rope is produced from a ropemaking machine where all the subcomponents of the rope structure are continuous without splices. The term arises from filling all creels or bobbins to maximum (block creels) and ending rope making when the first one empties.

**BRAID:** *n.* A rope or textile structure formed by a braiding process. *v.* The intertwining of strands in a braiding process to produce a tubular rope structure.

**BRAID, DOUBLE:** A rope constructed from an inner hollow braided rope (core) which has another hollow braided rope constructed around its exterior (cover). Core and cover may be either plain or twill braid and both share any load on the rope, but not necessarily in equal amounts. Also called "braid-on-braid."

**BRAID, HOLLOW (Also: Braid, Single; Braid, Diamond):** A single braid rope construction of either plain or twill braid. The center is hollow. On the surface all strands are parallel to the axis.

**BRAID, SOLID:** A cylindrical braid in which each strand alternately passes under and over one or more of the other strands of the rope while all strands are rotating around the axis with the same direction of rotation. On the surface, all strands appear to be parallel to the axis.

**BRAIDER SPLICE:** In a braided rope, the continuation of a single interrupted strand (or multiple strands) with another identical strand, which is braided from the same carrier. The interrupted and replacement strands are arranged in parallel over some distance, and are buried, or tucked, into the braid so as to secure them into the braid. To maintain maximum strength, the strands should overlap one another for a sufficient distance.

**BREAKING LENGTH:** A convenient term for comparing the strength-to-weight ratio of textile structures from one product to another. The calculated length of a specimen whose weight is equal to the breaking load.

**BREAKING STRENGTH:** For cordage, the nominal force (or load) that would be expected to break or rupture a single specimen in a tensile test conducted under a specified procedure. On a group of like specimens it may be expressed as an average or as a minimum based on statistical analysis.

*Note: Breaking force refers to an external force applied to an individual specimen to produce rupture, whereas breaking strength preferably should be restricted to the*

*characteristic average force required to rupture several specimens of a sample. While the breaking strength is numerically equal to the breaking force for an individual specimen, the average breaking force observed for two or more specimens of a specific sample is referred to or used as the breaking strength of the sample.*

**BREAKING STRENGTH, MINIMUM:** Cordage Institute standard. A value based on a statistically significant number of breaking load tests and the standard deviation used to establish the minimum value.

**CLASS I ROPE:** Rope constructions produced with **non high modulus fibers** that impart the strength and stretch characteristics to the rope which have **tenacities of 15 grams/denier (gpd) or less and a total stretch at break of 6% or greater.** Typical Class I ropes are produced with traditional fibers such as: olefin (polypropylene or polyethylene), nylon, and polyester. These fibers can be used in combination or singularly in the various rope constructions such as: 3-strand, 8-strand, 12-strand braids, double braids, or core-dependent braids.

**CLASS II ROPE:** Rope constructions produced with **high modulus fibers** that impart the strength and stretch characteristics to the rope which have **tenacities greater than 15 grams/denier (gpd) and a total stretch at break of less than 6%.** Typical Class II ropes are produced with: HMPE (Dyneema® fiber), Aramid (Technora® or Kevlar®), LCP (Vectran®), and PBO (ZYLON®). These fibers can be used in combination or singularly in the various ropes constructions such as: 3-strand, 8-strand, 12-strand, double braids, or core-dependent braids.

**CORE-DEPENDENT BRAIDS:** Cover braided rope constructions that utilize an internal core member or members to create the strength and stretch characteristics of the rope. The primary function of the external cover braid is to contain the core or cores and create the degree of rope firmness desired. Based on the fiber or combination of fibers used in the cover braid, the following characteristics of the rope can be altered: coefficient of friction, wear resistance, specific gravity, and heat resistance due to friction. Core-dependent braided ropes typically have internal strength members produced with parallel bundled fiber cores, a single braid core, multiple braid cores, or multiple 3 strand cores. This type of rope construction can be produced with traditional fibers, high modulus fibers, or combinations of both fiber groups, and offers the potential of creating a wide range of design parameters.

**CYCLE LENGTH:** The length along the axis required for a strand to make one revolution around the rope.

**DEGRADATION:** The loss of desirable physical properties by a textile material due to some process of physical/chemical phenomenon.

**DENIER:** The system used internationally for the numbering of silk and man-made filament yarns, except glass yarns. It is the primary unit for determining the size of a yarn and is based on its linear density. Officially, it is defined as the number unit weights of 0.05 grams per 450-meter length. Denier is equivalent numerically to the number of grams per 9,000 meters. In the English numbering system, 1 denier equals 4,464,528 yards to the pound. Denier is also used to indicate the thickness of a man-made fiber staple. For example, a staple is said to be 3 denier if 1,488,176 linear yards of the staple (were it continuous) would weigh one pound. The metric equivalent is Tex, the grams mass of 10,000 meters of yarn.

**DYNAMIC LOAD (for cordage):** Any rapidly applied load that increases the load significantly above the normal static load when lifting or suspending a weight. Dynamic effects are greater on a low elongation rope such as manila than on a higher elongation rope such as nylon, and greater on a shorter rope than on a longer one. Also, any rapidly applied load to cordage that may change its properties significantly when compared to slowly applied loads.

**EXTRUSION:** For polymer filaments. The process of producing filaments by forcing a polymer through a die.

**FATIGUE:** The tendency of a material to weaken or fail during alternate tension-tension or tension-compression cycles. In cordage, particularly at loads well below the breaking strength, this degradation is often caused by internal abrasion of the fibers and yarns but may also be caused by fiber damage due to compression. Some fibers develop cracks or splits that cause failure, especially at relatively high loads.

**FIBER:** A long, fine, very flexible structure that may be woven, braided, or twisted into a variety of fabrics, twine, cordage or rope.

**FINISH:** An oil, emulsion, lubricant or the like, applied to fibers to prevent damage during textile processing or to improve performance during use of the product.

**HYDROLYSIS:** The attack of the water ions on polymeric molecules, which results in polymer chain scission and loss of the fiber's physical properties.

**LAI D ROPES:** Ropes made by twisting of three or more strands together with the twist direction opposite that of the strands.

**LAY LENGTH:** The actual distance required to make one complete revolution around the axis in any element in a strand, cord or rope.

# Common Cordage Terms | GLOSSARY

## LIQUID CRYSTAL POLYMER (LCP):

A thermoplastic multifilament yarn spun from a proprietary liquid crystal polymer. LCP fiber is five times stronger than steel and 10 times stronger than aluminum for its weight. It has no creep and excellent chemical resistance.

**MONOFILAMENT:** A yarn consisting of one or more heavy, coarse, continuous filaments produced by the extrusion of a polymeric material suitable for fiber production.

**MULTIFILAMENT:** A yarn consisting of many fine continuous filaments produced by the spinning of a polymeric material suitable for fiber production.

**NAPPING:** A process that raises the surface fibers of a fabric, cord or rope by means of rapid passage over metal surfaces.

**NOMINAL SIZE:** A designation that has been determined by the measurement of another property. For rope, diameter is considered a nominal property and is based upon the measurement of the linear density of the rope in accordance with some standard.

**NYLON (PA) FIBER:** A manufactured fiber in which the fiber-forming substance (polyamide) is characterized by recurring amide groups as an integral part of the polymer chain. The two principal types of nylon fiber used in rope production are type 6.6 and type 6. The number in the type designation is indicative of the number of carbon atoms separating the acid and amine groups in the polymer chain.

**pH:** Value indicating the acidity or alkalinity of a material. A pH of 7.0 is neutral; less than 7.0 is acidic, and more than 7.0 is basic.

**POLYESTER (PET) FIBER:** A manufactured fiber in which the fiber-forming substance (polyester) is characterized by a long chain polymer having 85% by weight of an ester of a substituted aromatic carboxylic acid.

**POLYETHYLENE (PE):** A polyolefin resin, produced from the polymerization of ethylene gas, and used in the production of manufactured fiber. Polyethylene is similar to polypropylene in its properties but has a higher specific gravity and a lower melting point.

**POLYETHYLENE, EXTENDED CHAIN:** A polyolefin fiber that is characterized by the gel spinning of a very high and narrow molecular weight distribution fiber to produce extremely high tenacity material. The strength of the fiber is approximately 10 times that of steel on a weight-for-weight basis.

**POLYMER:** A long chain molecule from which man-made fibers are derived; produced by linking together molecular units called monomers.

**POLYPROPYLENE (PP):** A polyolefin resin, produced from the polymerization of propylene gas, and used in the production of manufactured fiber. Polypropylene may be extruded into a number of fiber forms for use by the ropemaker.

**ROPE, EIGHT-STRAND PLAITED:** A rope of which the strands are generally plaited in pairs, and mainly used for marine purposes.

**ROPE, FIBER:** A compact but flexible, torsionally balanced structure produced from strands that are laid, plaited or braided together to produce a product that serves to transmit a tensile force between two points. Generally greater than 3/16" diameter.

**SPECIFIC GRAVITY:** Ratio of the mass of a material to the mass of an equal volume of water.

**SPLICE:** The joining of two ends of yarn, strand or cordage by intertwining or inserting these ends into the body of the product. An eye splice may be formed by using a similar process to join one end into the body of the product.

**STRAND:** The largest individual element used in the final rope-making process and obtained by joining and twisting (or braiding) together several yarns or groups of yarns.

**STAPLE:** Natural fibers of cut lengths from filaments of man-made fibers. The staple length of natural fibers varies from less than 1" for some cotton fibers to several feet for some hard fibers. Man-made fibers are cut to a definite length, usually about 1-1/2" but occasionally down to 1" so they can be processed on the cotton, woolen and worsted systems. The term staple (fiber) is used in the textile industry to distinguish natural or cut length man-made fibers from filament.

**TENSILE STRENGTH, MINIMUM:** A value based on a large number of breaking force tests representing a value that is two standard deviations below the mean. See: Breaking Strength, Minimum.

**TORQUE:** A force or a combination of forces that produces or tends to produce a twisting or rotating motion. When used in describing the performance or characteristic of yarn, the term torque refers to that character which tends to make it turn on itself as a result of twisting.

**TWIST:** The number of turns about the axis applied to a fiber, yarn, strand or rope over a given length to combine the individual elements into a larger and stronger structure. The direction of rotation about the axis denoted as "S" (left hand) or "Z" (right hand) twist.

**TWIST, BALANCED:** In a plied yarn or cord, an arrangement of twist which will not cause the yarn or cord to twist on itself when held in the form of an open loop.

**TWISTING:** The process of combining two or more parallel textile elements by controlling the lineal and rotational speeds of the material to produce a specific twist level.

**WORKING LOAD LIMIT:** The working load that must not be exceeded for a particular application as established by an engineer, supervisor, regulatory or standards setting agency.

**YARN:** A generic term for a continuous strand of textile fibers, filaments or material in a form suitable for intertwining to form a textile structure via any one of a number of textile processes.

**YARN, SINGLE:** The simplest textile structure available for processing into rope, twine or cordage.

**YARN, PLIED:** A yarn formed by twisting together two or more single yarns in one operation in a direction opposite to the twist direction of the single yarns to produce a balanced structure.

## CONVERSION CHART

### SIZE

**INCHES** x 25.40 = Millimeters

**MILLIMETERS** x 0.03937 = Inches

### LENGTH

**FEET** x 0.3048 = Meters

**METERS** x 3.2808 = Feet

### WEIGHT

**POUNDS** x 0.4536 = Kilograms

**KILOGRAMS** x 2.2046 = Pounds

### YARDAGE

**POUNDS** per 100 Feet x 1.4882 =

Kilograms per 100 Meters

**KILOGRAMS** per 100 Meters x 0.6720 =

Pounds per 100 Feet

### STRENGTH

**POUNDS** Force x 4.448 = Newtons

**KILOGRAMS** Force x 9.806 = Newtons

**POUNDS** Force x 0.00448 = Kilonewtons

**METRIC TONS** Force x 2204.6 = Pounds Force

**POUNDS** Force x 0.00045359 = Metric Tons Force

### TEMPERATURE

**CELSIUS** = .55556 x ( Fahrenheit - 32 )

**FAHRENHEIT** = 1.8 x Celsius + 32



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