Comparison of Fiber Characteristics

GENERIC FIBER TYPE	NYLON	POLYESTER	POLYPROPYLENE	HMPE	LCP	ARAMID	PBO
Tenacity (g/den)[1]	7.5 – 10.5	7 – 10	6.5	32 (SK-60) 40 (SK-75)	23 – 26	28	42
Elongation[2]	15 – 28%	12 – 18%	18 – 22%	3.6%	3.3%	4.6%	2.5%
Coefficient of Friction[3]	.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[4]	325° F	350° F	250° F	150° F	300° F	520° F	750° F
Specific Gravity[5]	1.14	1.38	.91	.98	1.40	1.39	1.56
Creep[6]	Negligible	Negligible	Application Dependent	Application Dependent	Negligible	Negligible	Negligible

** Char temperature — does not melt*

HMPE STRENGTH RETENTION AFTER A 6-MONTH CHEMICAL 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%**

[1] **TENACITY** is the measurement of the resistance of fiber to breaking.

[2] **ELONGATION** refers to percent of fiber elongation at break.

[3] **COEFFICIENT OF FRICTION** is based on the rope's resistance to slipping.

[4] **CRITICAL TEMPERATURE** is defined as the point at which degradation is caused by temperature alone.

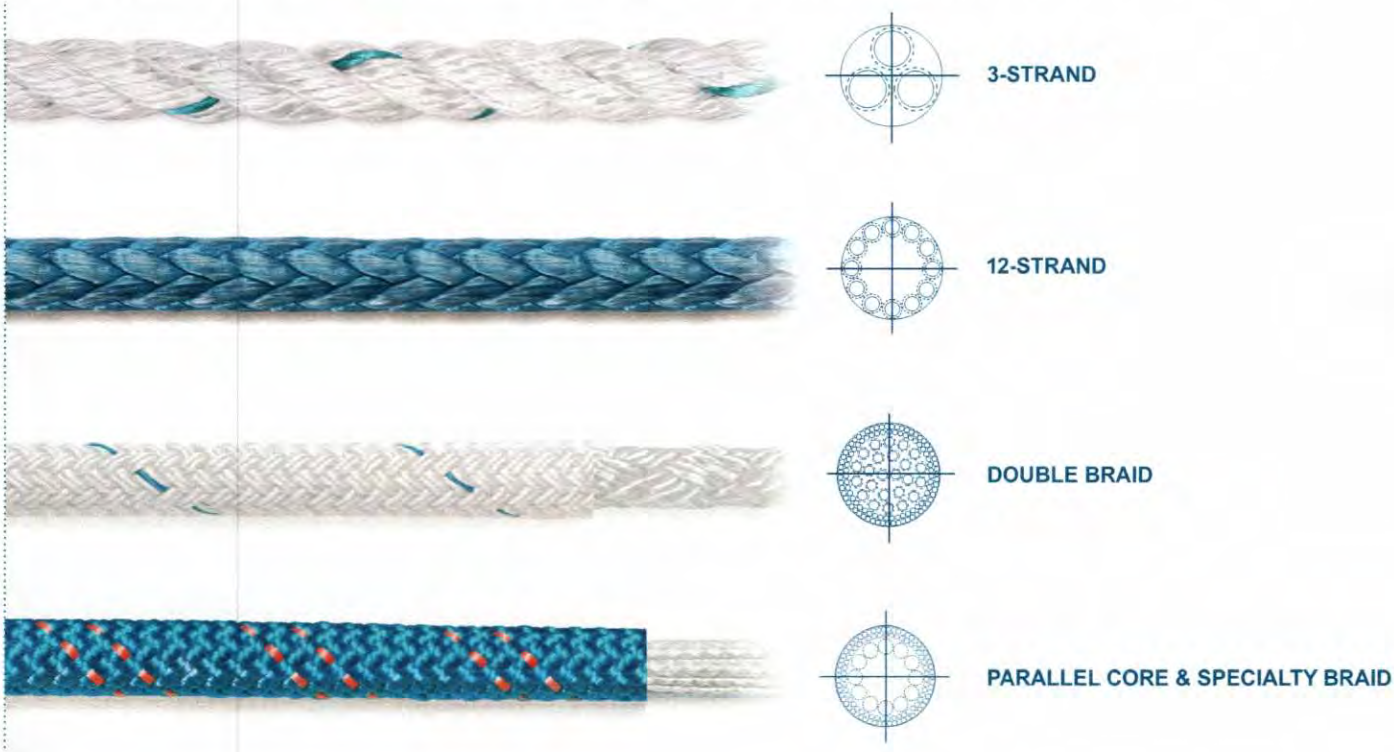
[5] **SPECIFIC GRAVITY** is the ratio between the mass of a material and the mass of an equal volume of water. Specific gravities below 1 indicate the material will float in water; greater than 1 and the material will sink.

[6] **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.

Rope Construction

All sizes stated are nominal diameters and do not reflect exact dimensions. Weights depicted are average net rope weights relaxed and standard tolerances are ± 5% unless agreed to in writing.

All Samson ropes are categorized for testing purposes as Class I or Class II ropes. Class I ropes are manufactured from polyolefin, nylon and/or polyester fiber. Class II ropes are manufactured from high-modulus fiber (i.e., Dyneema®, Zylon®, Technora®, Vectran®).



3-STRAND

12-STRAND

DOUBLE BRAID

PARALLEL CORE & SPECIALTY BRAID

Elongation (Stretch)

Defining Elastic Elongation

In order to establish definitions involving stretch in ropes, it is necessary to review the terms used to define its basic components.

ELASTIC ELONGATION (EE)

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

ELASTIC HYSTERESIS

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

PERMANENT EXTENSION (PE) AFTER RELAXATION

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

PE WHILE WORKING

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

CREEP

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

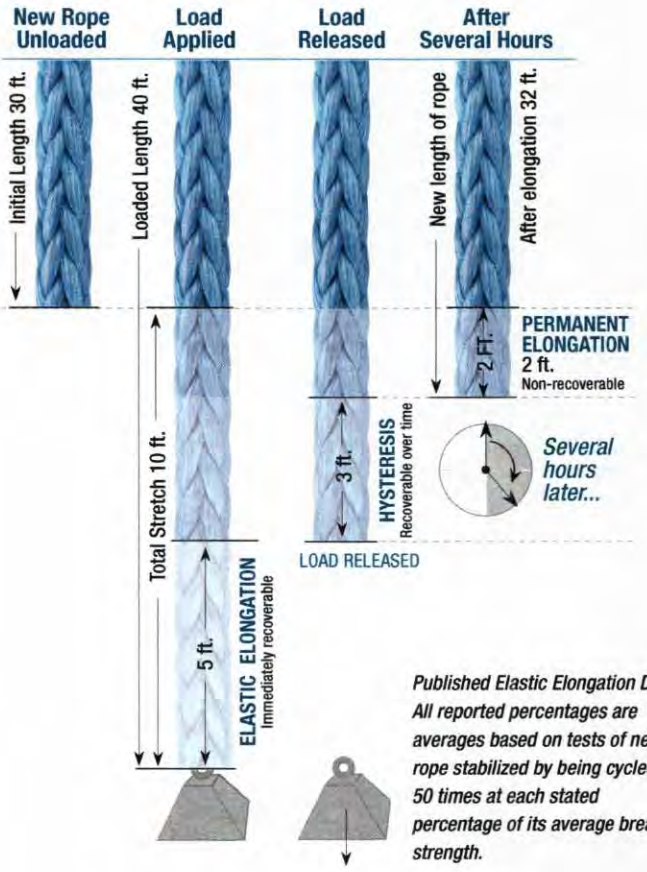
CONSTRUCTIONAL ELONGATION

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

SPLICE SETTING

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

COMPONENTS OF STRETCH ON A LOADED ROPE



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

TABLE 2. ELASTIC ELONGATION FOR ALL PRODUCTS.
Percent of elastic elongation at percent of break strength.

	10%	20%	30%
AmSteel®-Blue	0.46%	0.70%	0.96%
ArborMaster®	3.00%	5.00%	6.00%
Arbor-Plex	3.00%	3.30%	4.20%
Bail Out	1.00%	1.20%	1.60%
Ice Tail	1.08%	1.61%	1.64%
Nystron	2.40%	4.50%	5.90%
Pro-Master	2.00%	3.20%	3.90%
Prusik Cord	1.10%	2.20%	3.50%
Stable Braid	1.10%	1.70%	2.70%
Tenex	1.40%	2.30%	3.00%
Tenex-TEC	1.40%	2.30%	3.00%
Tree-Master	2.90%	5.60%	8.20%
True-Blue	2.60%	3.00%	4.00%
True-White	2.60%	3.00%	4.00%
Ultra-Tech	0.63%	0.97%	1.24%
Velocity	3.00%	5.00%	6.00%
Vortex	3.00%	5.00%	6.00%