GENERAL INFORMATION

ROPE CONSTRUCTION
RAW MATERIALS
CARE & USE

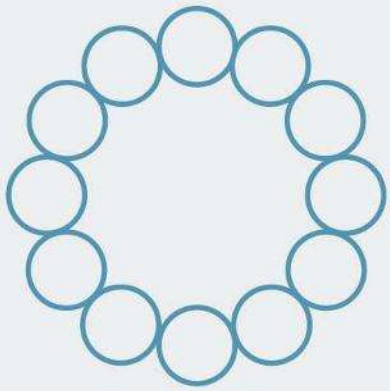
CONSTRUCTION

Rope construction plays an important role in resistance to wear and abrasion. Braided ropes have a, basically, round, smooth construction that tends to flatten out some-what on a bearing surface. This distributes the wear over a much greater area, as opposed to the crowns of a three-strand.

All ropes should be protected against sharp and abrasive surfaces. Wire ropes tend to score and gouge chocks and bitts creating cutting edges that can damage synthetic ropes. Weld beads on repaired capstands, fairleads, etc. are equally damaging unless dressed down smoothly.

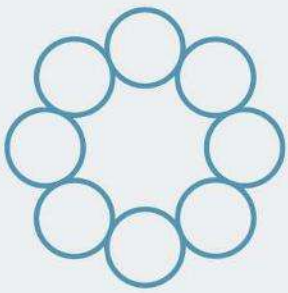
12 STRAND BRAIDED

12 strands ropes are constructed of left and right-hand laid strands to give a torque-free balanced construction and its round shape provides excellent abrasion resistance due to a greater surface of contact and may offer higher breaking strengths over conventional constructions. They are easily spliceable and provide a good rope structure for mooring lines.



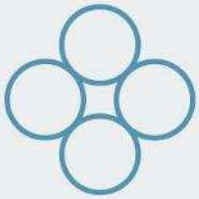
8 STRAND BRAIDED

8 strands ropes also called square braided or plaited are constructed of left and right-hand laid strands to give a torque-free rope. They are easily spliceable and provide an excellent rope structure for mooring lines.



3 OR 4 STRAND TWISTED

3 or 4 strands is the oldest and simplest rope construction, consisting of 3 or 4 twisted strands laid together. Twisted constructions may retain some torque, and therefore tend to kink up, and to rotate under load. Twisted ropes are hard wearing and easily spliced.



RAW MATERIALS

Different fibres, different characteristics, different results

FIBRE	POLYAMIDE (PA) 6 unid 6,6	PES (POLYESTER)	PP (POLYPROPYLENE)	PP (POLYPROPYLENE) MULTIFLAMENT	PE (POLYETHYLENE)	HMWPE	MIXED (POLYOLEFIN)	SISAL
BRANDNAME	Perlon Nylon Nylsuisse Enkalon	Diolen Trevira Dacron Ersuisse	Leolene Arova	Hostalen Softlene Leolene	Lupolen Vestalen Wetalen	Dyneema Spectra		
TENACITY (GF/DENIER)	7,5 to 10,5	7,5 to 10,5	6,0 to 6,5	6,0 to 6,5 7,3 to 9,5	5,5 to 9,0	32,8 to 39,8	6,5 to 8,5	2,0 to 2,5
SPECIFIC GRAVITY KG/DM^3	1,14	1,38	0,91	0,91	0,96	0,96		
ELONGATION AT BREAK%	14 to 28	14 to 18	12 to 18	20 to 24 16 to 20	16 to 24	3 to 3,5	12 to 18	3 to 12
CREEP RESISTANCE	Moderate	Low	High	High	High	Moderate	High	Very low
SHOCK LOAD ABSORPTION	Excellent	Very good	Very good	Very good	Fair	Excellent	Good	Poor
MELTING POINT APP. °C	215 (PA) 255 (NYLON)	260	170	170	150	150	165	
WATER ABSORPTION %	Yes	Yes	No	No	No	No	No	Yes
WET STRENGTH COMPARED TO DRY STRENGTH	85-90%	100%	100%	100%	105%	100%	100%	Up to 120%
UV RESISTANCE	Good	Excellent	Fair	Fair	Fair	Excellent	Good	Good
RESISTANCE TO ABRASION	Very good	Very good	Fair	Fair	Fair	Good	Good	Fair

Table Based on the information provided by Cordage Institute Technical Service

EXTENSION AND ELASTICITY

Rope extension and elasticity are important features because they will establish rope behaviour in terms of peak loads. Load-extension characteristics of Synthetic fibre ropes are non-linear and time dependent.

Several different components complete overall extension of a rope:

VISCOELASTIC EXTENSION

Viscoelastic extension is only recoverable some time after releasing the load. The performance of ropes subjected to occasional high loads will be significantly influenced by this viscoelastic component.

ELASTIC EXTENSION

Elastic extension is the immediately recoverable extension upon the release of the load and in a continuously working environment dominates rope behaviour.

PERMANENT EXTENSION

Permanent extension is non-recoverable. It occurs when a new rope is first used or when subject to an unusually high load and is the result of the lay down of individual fibre components to their preferred positions. Continuous loading of some ropes can also lead to permanent extension.

STORAGE

Ropes should be stored on a dry and clean place, out of direct sunlight and any heat sources. When possible it should be stored off the ground, away from metal walls or steam pipes, to allow adequate ventilation and away from chemicals of all types.

Never store rope on concrete or dirty floors, or drag over rough ground - dirt or sand picked up by the rope may cause cuttings on inside fibres during work. In case of long term storage, ropes should be cleaned with fresh water to reduce salt crystals that may affect its life and efficiency.

HANDLING

When a rope is supplied in a coil it should always be uncoiled from the inside so that the first turn comes off from the bottom in a counter-clockwise direction. When supplied on reels, it must be allowed to freely rotate so that the rope can be drawn off the top layer. Never take rope from a reel lying on its side.

A wrong coil or uncoil on a twisted rope will provoke kinking and hockling. Three and four strand ropes should be coiled in a clockwise direction (in lay's direction) and uncoiled in a counter-clockwise direction to avoid hockling and kinking.

Braided ropes can not be kinked or hockled, however, twist can be produced into ropes during service. Excessive twist may cause an imbalance between the right and left hand strands and should be removed as soon as possible by counter-rotating the rope when it is relaxed. The best method for storing both braided and twisted ropes is in a eight figure fashion.

ROPE SAFETY

Never stand in line with a rope under tension. If a rope fails it can draw back with sufficient force to cause serious injuries. Always ensure correct safety factors are being used.

ROPE INSPECTION

Avoid using ropes that show signs of aging and wear. Rope should be inspected regularly for evidence of chemical attack, kinking, and surface abrasion including major yarn or strand cuts and heat fusion indicated by glazed or heavy fuzzed areas.

Braided ropes should be examined along their entire length for areas of stiffening or inconsistent diameter, which can be a sign of internal damage or core failure due to overloading or severe shock loads. Both outer and inner rope fibers contribute to the strength of the rope and when either is worn, rope is naturally weakened.

No type of visual inspection is a guarantee to an accurate determination of residual strength. When the fibers show wear in any given area, if limited to one small section the damaged area may be cut out and re-spliced, otherwise the rope should be downgraded or replaced.

SPLICING AND KNOTS

The use of knots can reduce rope strength over fifty percent so whenever possible splices should be used instead. Variations up to twenty five percent can occur with poor splicing or very short length. According to each situation, always take into consideration the corresponding reduction to the rope strength adjusting working loads accordingly. When splices are used, always use recommended splicing procedures of the manufacturer.

The length of an eye in a rope should be a minimum of three times, and preferably five times, the diameter of the item around which it is to be used. This will ensure that the angle between the two legs of the eye will not cause a tearing action to the throat of the eye. For instance if the eye of a mooring line is passing around a 600mm diameter bollard then the eye should be a minimum of 1.8 metres.

BENDING RADIUS

Sharp bends around any piece of equipment should be avoided as, under load, it decreases rope strength substantially and may cause premature damage and failure. The diameter on fixed pin terminations should be at least 3 times the rope diameter and on rotating sheave blocks, it should be 10 times the rope diameter for twisted ropes and 8 times the rope diameter for braided ropes.

WORKING LOADS

Working loads are the loads that a rope is subjected to when in activity. They are normally expressed as a percentage of new rope strength and should not exceed 20% of published strengths (many industries are subject to special working loads regulations that supersede manufacturer's recommendation).

When sever overloaded or shock loads takes place, rope can suffer damages and consequently strength losses without any visible indication, which may weaken the rope causing it to break on next use, even if used under normal working loads. Sharp bends should be avoided as, under load, it decreases rope strength substantially and can cause premature failure.

COTESI®

Cotesi is a ISO 9001 certified company
and all the ropes are manufactured according to international standards.