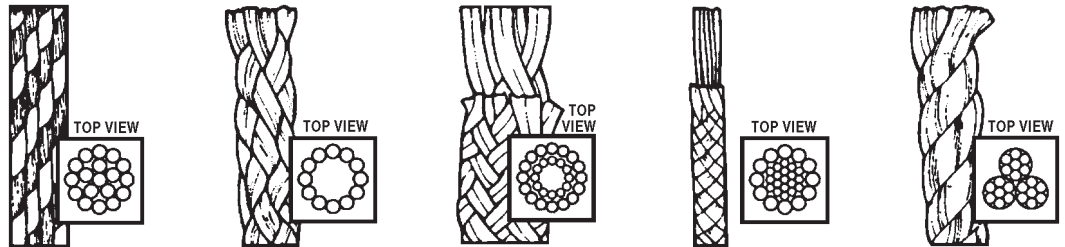


## ROPE CONSTRUCTION SELECTION GUIDE

WARNING: This guide is designed for general reference only. The construction comparisons assume using the same rope fiber and size. Expert advice should be sought when choosing a rope where protection of life or property is involved.

CHARACTERISTICS	SOLID BRAID	HOLLOW BRAID	DOUBLE BRAID	MAYPOLE BRAID/ DIAMOND	TWISTED
Number of Strands or Carriers	9, 12 or 16	8, 12 or 16	16, 24 or 32	8 or 16	3
Spliceable	No	Yes	Yes	No	Yes
Strength to Weight	5	2	1	4	3
Flexibility	3	1	2	4	5
Flattens Under Load	No	Yes	No	Yes	No
Rotates Under Load	No	No	No	No	Yes
Mechanical Elongation	1	4	5	3	2
Cost Per Size	2	4	1	3	5
Working Load (a % of Tensile)	15-20%	15-20%	15-20%	15-20%	8-15%
Abrasion Resistant	1	5	2	3	4

Best - 1  
Worst - 5



## CORDAGE FIBER PROPERTIES—TYPICAL VALUES

	MANIL	SISAL	COTTON	NYLON	POLYESTER	POLYPRO- PYLENE	POLY- ETHYLENE	KEVLAR <sup>1</sup>	SPECTRA <sup>2</sup>
<b>STRENGTH</b>									
Breaking Tenacity - Dry (Grams/Denier)	5.0 - 6.0	4.0 - 5.0	2 - 3.0	7.8 - 10.4	7.0 - 9.5	6.5	6.0	18 - 26.5	30.0
Wet Strength vs. Dry Strength	Up to 120%	Up to 120%	Up to 120%	85 - 90%	100%	100%	100%	95%	100%
Shock-Load Absorption Ability	Poor	Poor	Very Poor	Excellent	Very Good	Very Good	Fair	Poor	Fair
<b>WEIGHT</b>									
Specific Gravity	1.38	1.38	1.54	1.14	1.38	0.91	0.95	1.44	0.97
Floats	No	No	No	No	No	Yes	Yes	No	Yes
<b>ELONGATION</b>									
Percent at Break	10 - 12%	10 - 12%	5 - 12%	20 - 34%	12 - 15%	15 - 25%	15 - 25%	1.5 - 3.6%	3.5%
Creep (Extension Under Sustained Load)	Very Low	Very Low	—	Moderate	Low	High	High	Very Low	Moderate
<b>EFFECTS OF MOISTURE</b>									
Water Absorp. of Individual Fibers	Up to 100%	Up to 100%	Up to 100%	2 - 8%	Less than 1%	None	None	3.5 - 7.0%	None
Dielectric Properties	Very Poor	Very Poor	Very Poor	Poor	Good	Excellent	Excellent	Poor	Excellent
<b>DEGRADATION</b>									
Resistance to UV in Sunlight	Good	Good	Good	Good	Excellent	Poor Black Best	Fair Black Best	Fair	Fair
Resistance to Rot and Mildew	Poor	Poor	Poor	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Storage Requirements	Dry Only	Dry Only	Dry Only	Wet or Dry	Wet or Dry	Wet or Dry	Wet or Dry	Wet or Dry	Wet or Dry
<b>ROPE ABRASION RESISTANCE</b>									
Surface	Good	Fair	Poor	Very Good	Excellent	Good	Good	Fair	Very Good
Internal	Fair	Fair	Fair	Excellent	Excellent	Good	Good	Fair	Excellent
<b>THERMAL PROPERTIES<sup>3</sup></b>									
Melts at	Does Not Melt Chars at 350°	Does Not Melt Chars at 350°	Does Not Melt Chars at 300°	420 - 480°	490 - 500°	330°	275°	800° Begins to Decompose	297°
<b>RESISTANCE</b>									
Resistance to Acids	Poor	Poor	Poor	Fair	Good	Excellent	Excellent	Fair	Excellent
Resistance to Alkalis	Poor	Poor	Fair	Very Good	Fair	Excellent	Excellent	Fair	Excellent
Resistance to Oils and Gas	Poor	Fair	Poor	Very Good	Very Good	Very Good	Very Good	Very Good	Very Good

<sup>1</sup> Based on Dupont Kevlar® Data

<sup>2</sup> Based on Allied/Signal Spectra® Data, Type 900

<sup>3</sup> Resistance is relative to the length of exposure, percent of concentration and temperature.

# ROPE SPECIFICATIONS

## (\*RWL) RECOMMENDED WORKING LOADS

Recommended working loads should be exceeded only with expert knowledge of conditions and professional estimates of risks. If the rope has not been subjected to dynamic loading or other excessive use and has been inspected and found to be in good working condition, it can be used in the following recommended manner. The recommended working loads for twisted rope are derived by taking 8-11% of new rope tensile strength for nylon and 1-14% for other twisted ropes in this catalog. The recommended working loads for braided rope are 15-20% of new rope tensile strength. The percentages vary according to rope size and type.

## USE OF RECOMMENDED WORKING LOADS

Because of the wide range of rope use rope conditions, exposure to several factors affecting rope behavior, and the degree of risk to life and property involved, it is impossible to make blanket recommendations as to working loads. However, to provide guidelines, recommended working loads are tabulated for rope in good condition with appropriate splices, in non-critical applications and under normal service conditions.

## NEW ROPE TENSILE STRENGTHS

New rope tensile strengths are based on tests of new and unused rope of standard construction in accordance with Cordage institute Standard Test Methods. All figures are "Average"—The minimum is 10% below stated amount.

## —CAUTION—

"Never allow anyone to stand in line with or within 45° on either side of a rope under tension. Should the rope fail or other parts of the assembly fail, the recoil force could cause serious injury or damage, especially if the rope is nylon."

FAILURE OF A TENSIONED ROPE AND/OR CONNECTIONS IS A SERIOUS HAZARD. SUDDEN LOSS RELEASE FROM A TENSIONED ROPE CAUSES SNAPBACK, WHICH CAN RESULT IN PERSONAL INJURY OR DEATH.

Recoiling rope may oscillate violently in an unpredictable path, away from the failure point hitting anything in its way with great impact.

Personnel in the path of the recoiling rope may be seriously hurt or even killed. Rope and its connecting hardware must be selected with sufficient safety factors for the specific dynamic use conditions, and the rope and/or connector must be inspected before each use and replace if worn, frayed or cut.

# PROPER USE AND CARE OF CORDAGE



**BRAIDED AND  
TWISTED ROPE  
SPLICING  
AVAILABLE  
IN OUR SHOP**

## AVOID OVERLOADING

Working loads should be exceeded only with expert knowledge of conditions and professional estimates of risk. Working loads should be reduced where life, limb or valuable property are involved; or for exceptional service conditions such as shock loads, sustained loads, etc.

## AVOID ABRASION

Outer and inner rope fibers contribute equally to the strength of your rope. When worn, your rope is naturally weakened. Where it is necessary for a rope to rub over an object, protect it with chafing gear, such as canvas wrapped and tied around the rope.

## AVOID SUDDEN STRAIN

Rope that is strong enough under a steady strain can be broken with a sudden jerk. Care when working with rope is extremely important.

## AVOID KINKS

When rope is repeatedly turned or twisted in one direction, it is certain that kinks will develop, unless twists are repeatedly thrown in, or out of rope. Pulling a kink through a restricted space such as a tackle block will seriously damage the rope fibers.

## AVOID SHARP ANGLES

Sharp bends greatly affect the strength of a rope. Any sharp angle is a weak spot. Pad it for safety, and even then, Be Careful.

## REVERSE ENDS

Prolonged use, or wear, of one part of a rope will naturally decrease its effectiveness at that point. Occasionally reverse your rope, end-for-end, to distribute the wear more evenly. A good example is an anchor line aboard a boat.

## AVOID CHEMICALS

Virtually all synthetic fiber ropes are resistant to damage from oil, gasoline, paint and most chemicals. To be on the safe side, however, keep your rope free of any type chemical. Natural fiber ropes are, of course, severely damaged by exposure to chemicals

## KEEP ROPE CLEAN

Dirt on the surface and imbedded in rope acts as an abrasive on fibers. When rope becomes dirty, wash it thoroughly with clean water. Be sure to dry natural fiber ropes before storing.

## AVOID IMPROPER STORAGE

Synthetic fiber ropes require no special storing conditions other than keeping them out of direct sunlight, away from the elements and out of extremely hot rooms. The ultra-violet rays of sunlight have a weakening effect on rope that is exposed for prolonged periods of time. Natural fiber ropes must, of course, be kept dry or they will rot in a very short time.

# PROPER USE AND CARE OF CORDAGE

## CRITICAL CONDITIONS OF USE

Design factors at the high end of the range or larger shall be used when:

1. Small ropes are used (because they can be more severely damaged by cutting, abrasion and sunlight).
2. Loads are not accurately known.
3. Operators are poorly trained.
4. Operation/use procedures are not well defined and/or controlled.
5. Inspection is infrequent.
6. Abrasion, cutting or dirt are present.
7. Shock loads or extreme dynamic loadings are likely.
8. High temperatures are present.
9. Chemicals are present.
10. Ropes are kept in service indefinitely.
11. Tensions on the rope is maintained continuously for long periods.
12. Rope can be subject to sharp bends or is used over pulleys or surfaces with too small a radius.
13. If knots are used (because strength is reduced by up to 50%).
14. Death, injury or loss of valuable property may result from failure.

For critical applications, a design factor greater than 12 may be necessary. Users must determine the design factor as they are the only ones who can assess service conditions and establish operating procedures. The load applied to the rope shall not exceed the working load. If uncertain, contact the rope manufacturer or a qualified engineering consultant for assistance.

**In all cases where any such conditions are present, or there is any question about the loads involved or the risks of use, the working load should be substantially reduced and the rope inspected frequently.**

## PERCENT OF STRENGTH LOSS

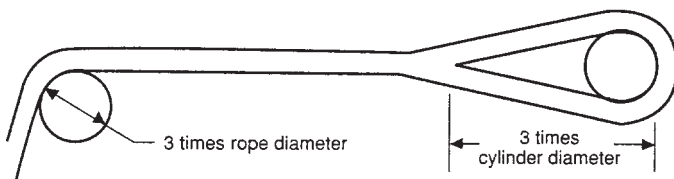
Lines should not be subjected to bending radius less than 3 x diameter of line. Preferably 8 x diameter will extend life of line.

Eye Splice .....	10%
In Line Splice .....	10%
Bowline .....	.35-40%
Square Knot .....	.45-50%
Two Half Hitches .....	.30%

## BENDS/SHEAVE SIZES

Sharp bends significantly reduce rope strength. A working rope should never be subjected to a bend of less than 3 times rope diameter. A bend ratio of 4 times, or more, will prolong rope life. Eye-splice length should be at least 3 times the diameter of the cylinder (bitt, etc.) over which the eye is used. A length of 5 times diameter is even better.

Sheave diameter should be 8 times braided rope diameter and 10 times twisted rope diameter. Sheave groove must be wider than rope diameter. Never use wire rope or V-belt sheaves because they pinch fiber ropes and cause excessive friction and damage.



Never allow anyone to stand in line with or within 45° on either side of a rope under tension. Should the rope fail or other parts of the assembly fail, the recoil force could cause serious injury or damage, especially if the rope is nylon.



## WATCH ROPE CONDITION

Inspect rope frequently, whether working or in storage. Occasionally reverse your rope, end-for-end, to distribute the wear more evenly.

Use worn rope only where strength failure will not cause injury or damage.

## HOW MUCH LINE CAN BE STORED IN BOX OR BIN?

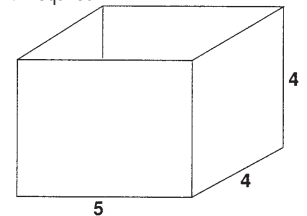
(Assuming line is to be dropped into and not carefully laid in)

V = Cubic footage required  
C = Rope circumference in inches  
L = Length of rope in feet

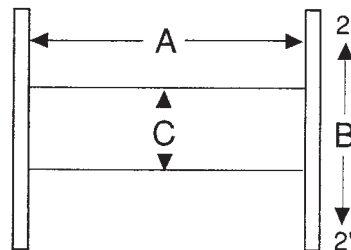
Example: 2" circ.<sup>2</sup> = 4 x 15,000 =  $\frac{60,000}{830}$  = 72 Cu. Ft. Required.

Box will hold entire length.

$$V = \frac{C^2 \times L}{830}$$



## HOW MUCH LINE ON A DRUM OR REEL?



$$\frac{A (B^2 - C^2)}{15.3 \times \text{rope dia.}^2} = L$$

**CAUTION: Do not put line on reel under tension. To do so can cause extreme contracting forces to crush drum.**

## DO NOT USE WIRE ROPE OR V BELT SHEAVES FOR SYNTHETIC ROPE AS ROPE IS PINCHED INSIDE.

