



Donaghys Winch Ropes

Handling & Installation Guide

September 2015



Choosing the right rope for the job

It is important to choose the right rope for the job. Donaghys specialise in custom designing ropes fit for purpose, however, some key factors to consider are:-

- Rope selection must consider all fibre characteristics, manufacturer's load certification and mode/factors as per AS1380.1:1998
- Ropes should not be subjected to Dynamic (Shock) Loading, sudden application of 10-15% of BF rating
- All mechanical hardware must be free from defect prior to use i.e. Pulleys, Shackles, Terminations, etc.
- Ropes should not be subjected to excessive heat, abrasion or chemical exposure
- Strength loss factors must be applied to splicing (10 - 20% dependant on type) & up to 50% for basic knotting used for joining or termination
- Always consult your manufacturer for technical information or assistance as required

Below is a simple checklist which can also be used:-

Determine best fit rope for use - Checklist		<small>Tick the most appropriate rating of importance on each of the important variants pertaining to the ropes characteristics in the application planned (1 Most Important - 5 Least Important)</small>				
Key Project Criteria	Quantity / Detail	1	2	3	4	5
1. Describe use/application						
2. Project engineers SWL BF requirement						
3. Total weight of cable being hauled						
4. Rope diameter to allow length on winch drum						
5. Severity of abrasion expected						
6. Are thimbles/hooks/splices required?						
7. Do you require rope on drum or loose in carton?						
8. Total continuous length of rope required						
9. When can order be confirmed?						
10. Completed product deadline on site						

Rope Handling and Usage

It is important to handle any fibre rope with adequate care and visually inspected before and after use to determine if any noticeable defects are showing along the rope. Please refer to **Donaghys Care & Usage Guidelines** for more detail. If a rope has degraded beyond a safe working situation it is critical it is retired from service without any further use.

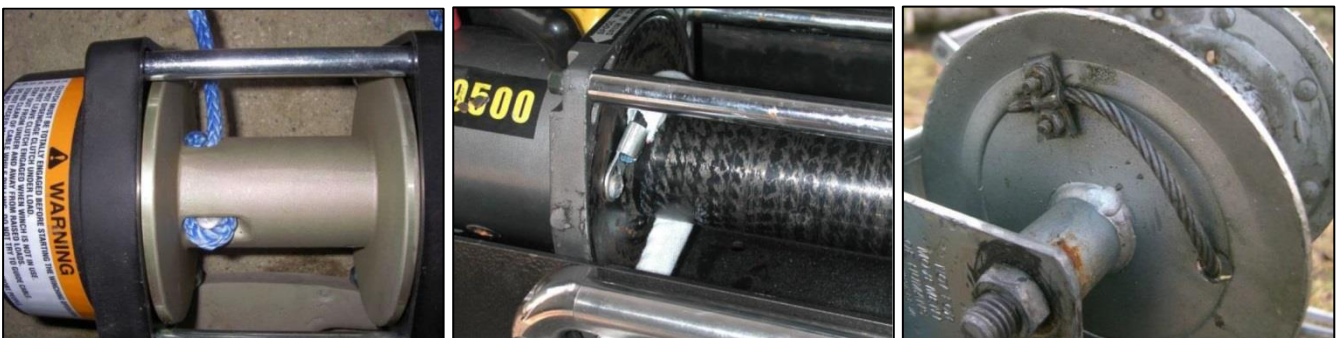
Ropes are often exposed to a wide range of load, bending, friction and mechanical damage; as well as environmental challenges such as dirt and grit, temperature and chemical exposure which can all lead to degradation of ropes. Ensuring you maintain longevity and maximising performance starts with understanding what challenges you will face and choosing the right rope and fibre types to suit.

Danger to Winch Operators and Personnel

In all applications, it is important a winch be operated by a well-trained and competent person. Safety should always be top of mind and a conservative approach is recommended. It is critical that a person does not stand directly in line with a rope in use whilst under load. If the application determines that this is the case, the design safety factor should increase substantially and the rope checked twice, by two different people, for defects before use.

Attaching a Line to a Winch Drum

There are several methods of attaching a rope to a winch drum. Most common are using a wedge or plug and set-screw in the main body of the drum, or using a “U” bolt through the side flange.



Another method involves splicing a soft eye into each end of the rope or fixing a lug to one end. At the rope connection to the winch end, using a round plug welded on the winch drum, the soft eye or lug is placed over the plug and held into place with a flat keeper. If the rope connection is outside the flange, plain ends with a back splice is required.

In these instances the rope manufacturer should be consulted to assist with identifying the correct splicing method. It is important to ensure that any attachment end is free from sharp edges that may cut the line under load. In most instances it is advised that an eye is spliced into both ends of the rope to avoid knots being tied. This is not always possible however, dependant on how the rope is installed to the winch and whether a thimble is to be spliced to one end. Please refer to winch manufacturer's installation guides for additional information and attachment best methods.

Installing and tensioning of synthetic rope

There are several specific considerations to be carefully thought through before installing a synthetic rope to a winch. If installed incorrectly it may lead to a wide range of operational issues or even premature failure of the rope.

Correct Tension:

New ropes need to be spooled onto the winch drum with high tension to reduce the likelihood of the rope burying in on itself during unwinding under load. A tension of 10% of the ropes MBL can be used as with steel wire rope however, synthetic ropes have more constructional stretch than steel wire ropes which needs to be factored in.

Ideally synthetic ropes should be spooled, unwound, and then re-spoiled onto the winch a minimum of 5 times at 20 – 25% of the ropes MBL before use to minimise the effect of constructional stretch in use. This might be problematic in actual practice and in the event of towing tugs it might be possible to connect the rope to a bollard, go out and then return back to the bollard via the rope spooling onto the winch under sufficient load.

It is preferred that 6-8 wraps should be left on the barrel of the winch to build down tension on the end of the winch and to reduce subsequent layers burying in. These are also called "Dead Wraps" so should not be used. When installing the rope to the winch, it is ideal that these wraps are installed at the higher WLL (Working Load Limit) which has been pre-determined by the end user if being installed in a controlled method. If the wrap tension is loosened off during use it is recommended the rope be fully unwound and reinstalled using the above methods.



Winding the rope onto the winch

There are several methods of winding the rope onto the winch. Most commonly used are straight or level winding and cross winding.

Straight Winding:

This method involves winding the rope under the correct tension in a straight line onto the winch. If possible this should be done using winch guide rollers and wound evenly without spacers across the drum. The next level should lie on top of the previous level but being slightly offset from the layer underneath.



Cross Winding:

Ropes subjected to high load can bury in on themselves. A method to help reduce this is to cross wind the rope onto the winch when installing.

1. Start by installing two straight wound layers onto the winch using the suggested tension.
2. Once two layers are complete start the third layer by pulling the rope diagonally across the second layer allowing for one full turn.
3. Repeat step 2 by pulling the rope across in the opposite direction to layer three allowing for one full turn.
4. Install two straight wound layers of appropriate tension on top of the previous layers.
5. Return to step two and continue with steps three and four until the desired length of rope has been installed onto the winch.



Step 2



Step 3



Minimising Twist

Braided ropes are generally torque neutral and would not normally insert a twist into the line when under load. It is important to ensure that a twist is not inserted into a rope by outside influences such as handling and installation.

It is important that a rope is not pulled off from a reel which is lying on its side/flange. The correct method is to stand the rope up using an A-Frame Stand and to ensure the rope is pulled off from the top while it is free to rotate. A rope with 3 – 4 twists per metre should not be used as the overall break force of the rope has been compromised. The break force loss varies dependant on the size of the rope. The bigger the diameter the greater % strength loss when compared to a smaller diameter with the same twist induced.

CORRECT



INCORRECT



CORRECT



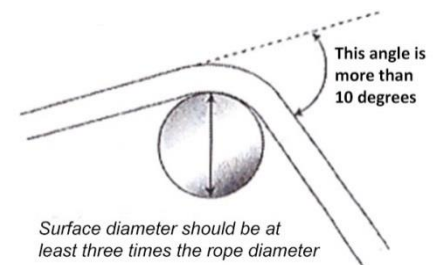
INCORRECT



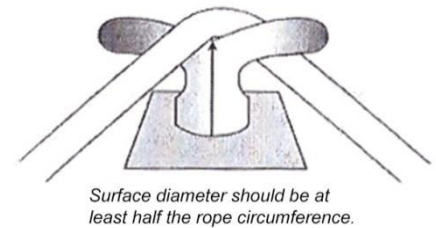
Bending Radius

In applications where rope is subjected to tight bends, it must be taken into account that this substantially decreases the ropes tensile strength and may cause premature failure. In sizing the radius across any surface, for optimal performance please note the following guidelines:

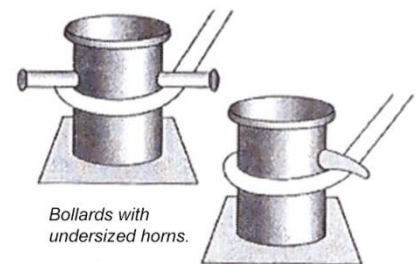
- 1) If the rope's bend is more than 10 degrees around a surface, the diameter of the surface should be not less than 3 times the rope diameter. Where possible a 4:1 ratio should be used but this may not always be practical. Note, the larger the surface area the better as a rope's durability increases as the ratio between rope to surface area increases.



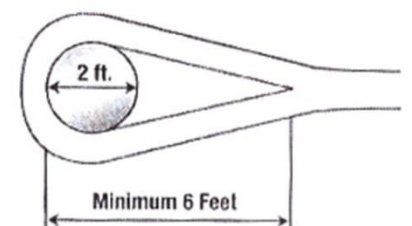
- 2) On a cleat where the rope doesn't bend radially around, the barrel the cleat can be one half the rope circumference at a minimum.



- 3) Many tugboats using 8-inch circ. (64mm dia) and 9-inch circ. (72mm dia) headlines in ship-handling work can have large size bits, app 18-inch diameter, is adequate bend radius. Many of these bits can be equipped with "horns" of relatively small diameter, 5 or 6 inches, and in many instances this is where the rope passes around first. This has a detrimental effect on the ropes life and leads to early retirement and replacement lines.



- 4) The ratio between a spliced eye in a rope and that of a surface it passes around should be not less than 3:1 but ideally 5:1. For example, if you have a bollard that is 610mm in diameter, the eye splice should be a minimum of 1828mm or 3048mm in length. This ensures the angle of the 2 lengths from the throat of the eye is not too great which can cause damage to the splice by parting and splitting. Note thimbles are generally designed with a 3:1 ratio.





Terminations

It is Donaghys' recommendation that ropes are spliced rather than knots. Knots can reduce a rope's breaking load by as much as 60% whereas a spliced rope maintains at least 90% or as much as 100% of the rope's break load. It is also recommended that splices are stitched to lock them in. Donaghys can supply a comprehensive splicing guide, however some typical types of splices and knots as follows;

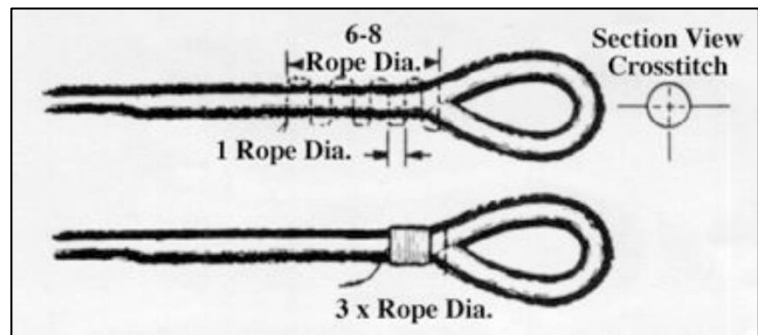
FULL BURY



BRUMMEL SPLICE



LOCK STITCHING & WHIPPING



COMMON KNOTS

Grog's Index of Basic Knots



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