

“Haggie Hints”



by George Delorme

Issue 2, March 2001

Addendum February 2017



Haggie North America - Meeting your hoisting needs!

GEORGE DELORME

**Ph: 514-453-1283; Fax: 514-453-0631; Email: georgedelorme@sympatico.ca ;
Toll Free: 1-888-HAGGIE-9 (424-4439)**

On page 2, there is a reference made regarding the fact that the serrations should be ground off rope clips when they are to be used on Left hand lay ropes. This is incorrect and wire rope clips must not be altered in any way but rather used as per the manufacturer's recommendations. Please refer to "Haggie Hints" #10C for further clarification.

CHOOSING THE CORRECT LAY DIRECTION

This document will discuss the selection of the proper rope lay direction for a conventional (grooved) drum hoist.

The lay direction of hoist rope will have an impact on the drum spooling. Furthermore, the correct lay direction can assist good spooling when a fleet angle is slightly out of spec. To accomplish this, we exploit the natural movement of a rope when loaded. It should be noted that the correct lay direction has greater significance for 6 stranded mine hoisting ropes and lesser for a spin resistant type.

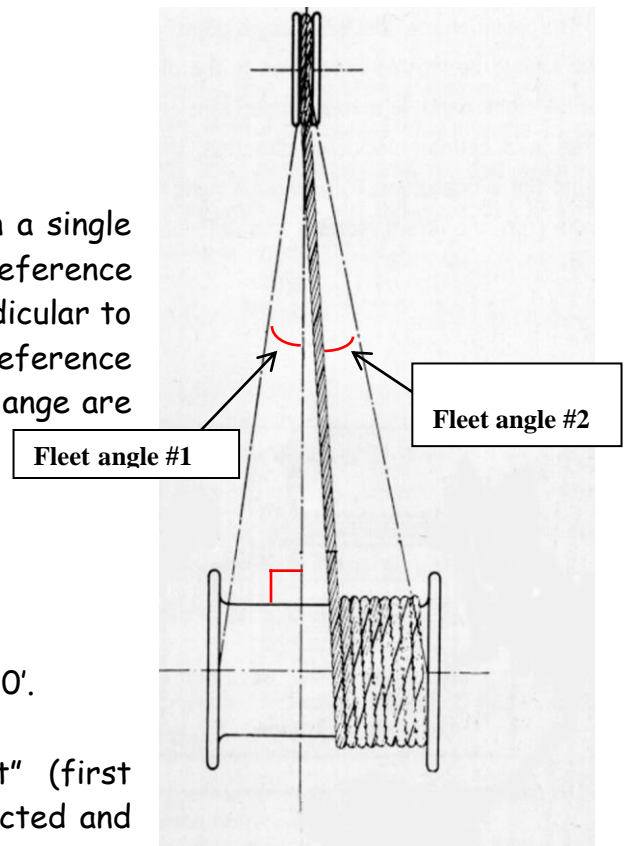
In general, the selection of a particular lay direction is used to overcome the effects on spooling when either too large or too small a fleet angle exists. It is the actual point at which the rope rises from one layer to another that is critical. In this position, the rope must change direction and it is only the fleet angle and the lay direction that will assist (for this discussion, the use of a "kicker" is ignored as it has no impact of the theory).

In order to select the correct rope lay direction, each installation must be studied on it's own and the following items must be considered:-

- Fleet angles
- Hoisting layout / configuration & position of drum spout (side on which rope is attached to the drum)
- Hand Rule - determining the natural direction a rope will take

FLEET ANGLES:

By definition, the two fleet angles that exist on a single drum are established as follows. An imaginary reference line is drawn through the headsheave and perpendicular to the drum. The two angles formed between this reference line and the position of the rope at each drum flange are the "fleet angles".



The ideal fleet angle to assist good spooling is $1^{\circ}20'$.

As we move away from this value, the "rise point" (first cross-over on each layer) will be negatively impacted and we do recommend limits; the maximum being $1^{\circ}45'$ and the minimum $0^{\circ}30'$.

It should also be mentioned that the fleet angles are formed by the geometry of the hoisting layout i.e. compartment centers, drum width and position, distance from the shaft to the drum etc., and cannot be changed by aligning the headsheave towards the middle of the drum. The alignment of the sheave will only insure that the rope enters the headsheave without hitting the flanges.

If the fleet angles are both close to $1^{\circ}20'$ or there is only one layer of rope on the drum, then it does not matter which rope lay direction is used. Under these rare circumstances, then a right hand lay is used for several reasons:-

1. Most rope-making machines are designed to fabricate right hand lay ropes and are considered the standard.
2. If wire rope clips are used, they have corrugations to suit. (~~The corrugations should be ground smooth if left lay ropes are used.~~)

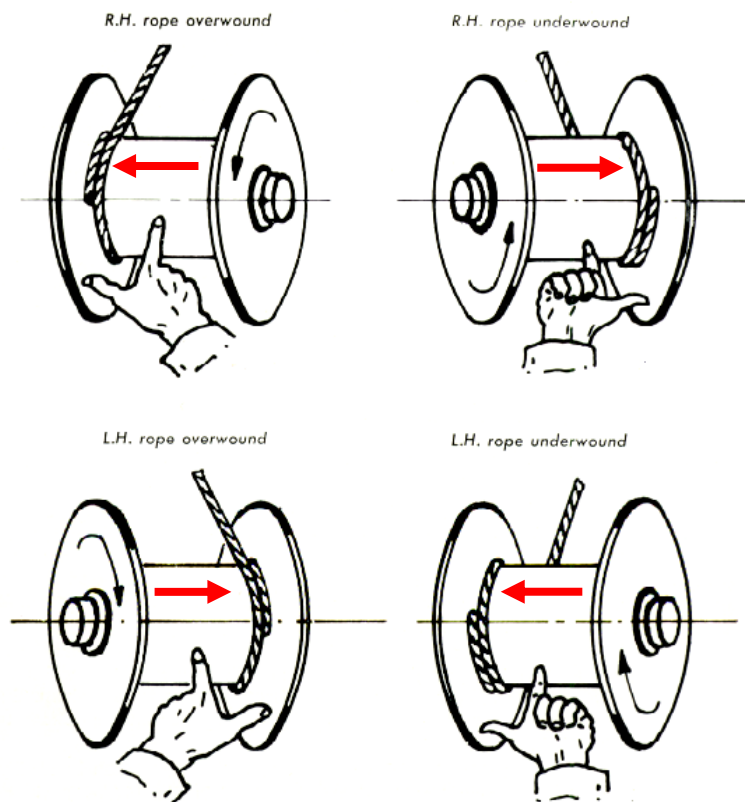
HOISTING LAYOUT:

In the process of selecting the correct lay direction, the hoisting layout must be sketched as viewed from the hoistman's position. The drum(s) is sketched positioned on the page showing the side where the rope(s) is attached to the drum. The headsheave(s) is sketched at the top of the page with all the fleet angles shown.

HAND RULE:

The "Hand Rule" is used to determine the natural direction the rope wants to move when working on a drum. The rule is applied as follows:-

- Sitting in the hoistman's chair, we use the hand corresponding to the rope lay being considered i.e. we use our right hand for a right hand lay rope or our left hand for a left hand lay rope.
- We select the drum we wish to verify and as an example, if we choose the "under-wound" drum, then we position our hand so that our index finger is following the rope under the drum going up to the headsheave.
- In this position, our thumb will point in the direction in which the rope will naturally want to move.



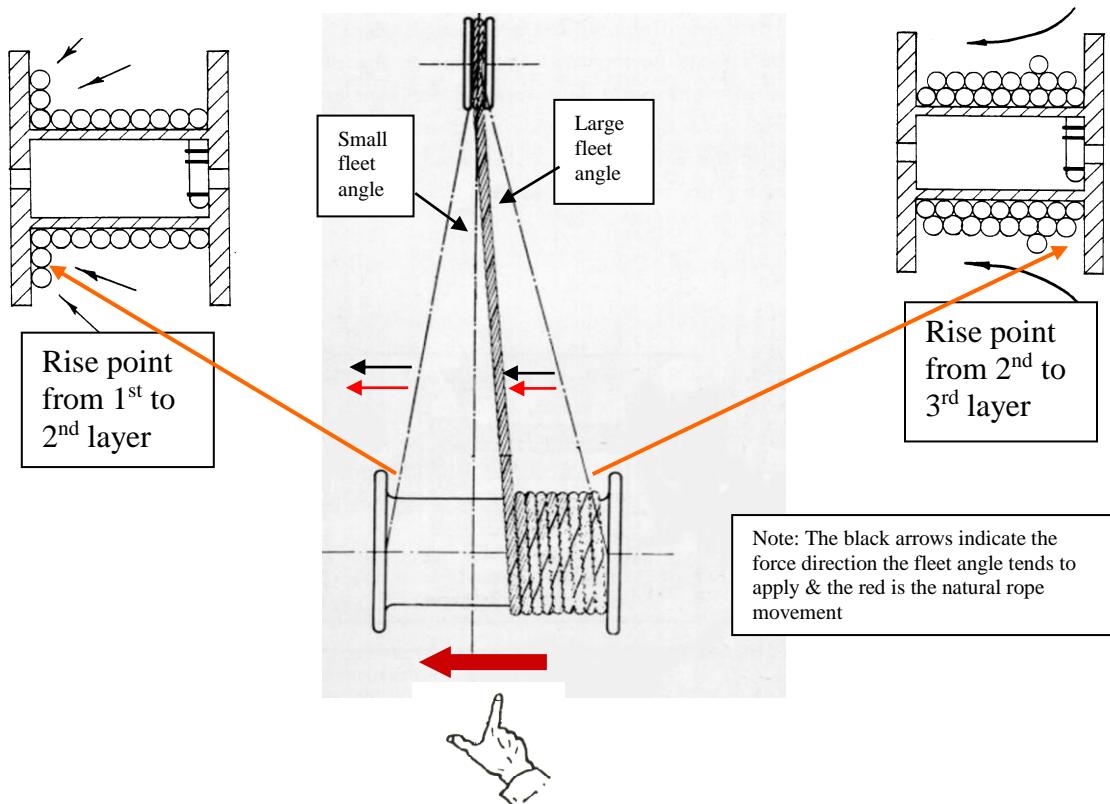
Another issue is that since most drums always have the ropes attached symmetrically, i.e. either both inside or outside, from a rope spooling point of view, both drums are identical in terms of rope action.

EXAMPLE:

In this scenario, we will look at one drum that has a very small fleet angle on the left hand side and a very large fleet angle on the right hand side. The rope is coiled "over-wound" and is connected on the right hand flange. There are three layers of rope on the drum.

We will consider the effects of using a right hand lay rope. From the hand rule, we know the rope will want to move naturally towards the **left**.

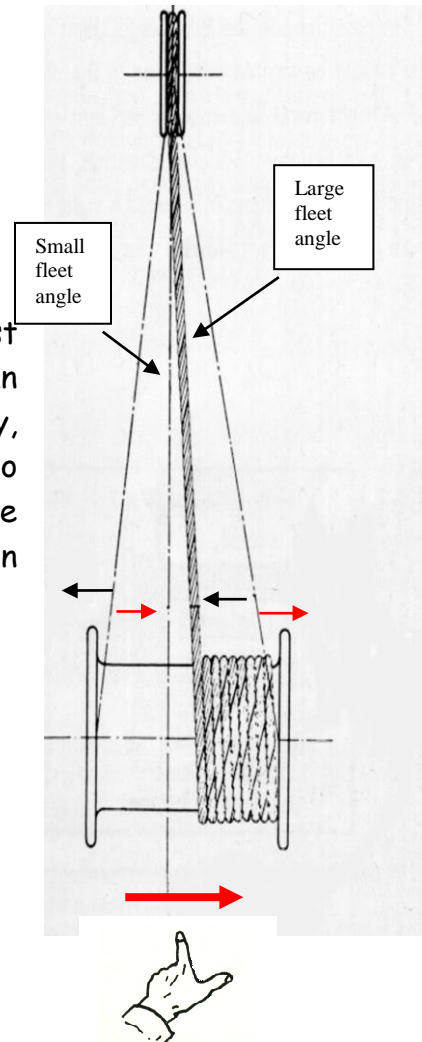
On the bottom layer, the rope moves away from the right hand flange, to which it is attached, and the spooling is controlled by the drum grooves. When it arrives at the left hand flange, it is forced up to the second layer and as it is balancing on the wrap below, the force of the natural tendency of the right hand lay rope coupled with the effects of the small fleet angle will cause the rope to be reluctant to leave the flange. The wraps will tend to "build-up" as shown on the left side of the sketch. The result will be a very hard and steep crossover leading to premature broken wires.



Again, the rope coils across the face of the drum controlled by the wraps of rope below and when it reaches the right hand flange, the rope is forced to rise. At this point, there are again two forces pulling the rope to the left; the natural rope movement and the large fleet angle. The result is that the rope will most likely want to skip a wrap or two as shown on the right of the sketch. This skipping of a wrap on the large fleet angle side is especially devastating if another layer is to be coiled on top.

REMEDY:

While there is no substitute for good fleet angles to assist spooling, the selection of the correct lay direction can assist. If we consider the scenario using a **left** hand lay, we will see that the natural rope movement will assist to overcome the small fleet angle on the first rise to the second layer and help prevent the "skipping" of a wrap on the second rise to the third layer.



CONCLUSION:

If your crossovers appear "rough" and it is known that the fleet angles approach the upper or lower limits, then the above procedure should be carried out to verify the hoist rope being used has the correct lay direction.