

BLOCK ROTATION

Also called cabling, block rotation occurs when multi-part reeving twists together at a certain height, entangling the parts of rope between the traveling block and boomtip. It can happen with little warning, making it virtually impossible to lift or lower a suspended load. Twisted hoist lines can bring a project to a sudden halt, resulting in downtime.

But the good news is this. You can minimize block rotation through proper installation and handling, as well as take corrective measures.

THE KEY IS UNDERSTANDING TORQUE.

Every wire rope – regardless of type, classification, grade or manufacturer – will develop torque when loaded.

Torque is normal and natural, caused by the way wire ropes are made. Wires are first laid together in a spiral to form strands, then several strands are laid together in a spiral to form the rope. When loaded, wires and strands try to straighten out, thus creating torque.

Another source of torque is any change in the rope lay length. This is normally caused by “milking” or rotation at the end of the rope.

Torque in a rope affects the tendency of the traveling block to rotate. Thus, it’s important to minimize any torque.

HOW TO HELP REDUCE BLOCK ROTATION.

There are at least seven different operating practices you can use to minimize block rotation on your crane.

CHANGE THE RIGGING GEOMETRY.

This includes the following operating practices:

- Use larger diameter traveling block sheaves to increase the rope spacing. As the diameter of the traveling block sheave increases, the chances for block rotation are reduced.
- Use the outer (farthest apart) sheaves – traveling block and boom.
- Dead-end the rope at the boomtip to increase the spread between the wire rope parts.

USE THE SHORTEST FALL LENGTH POSSIBLE.

The length of fall, or the distance from the pick point to the point sheaves, is critical. Longer fall lengths are less stable and more likely to lead to block rotation.

AVOID ODD-PART REEVING.

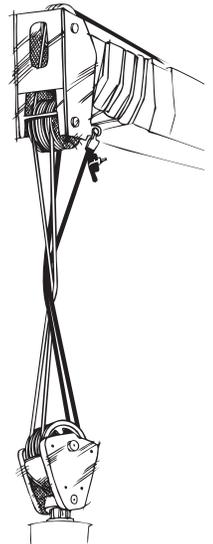
An even number of parts is more stable.

USE TAGLINES ON LIFTS.

Attach a tagline to restrain the load block and keep the load from rotating.

USE A DIFFERENT ROPE CONSTRUCTION. Standard 6-strand ropes do not provide any rotation resistance. There are different levels of rotation resistance that can be obtained from specialty ropes. For maximum block stability use Category 1 ropes or XLT⁴. Both XLT⁴ and Category 1 ropes are also used in single part hoisting.

There are other specialty ropes that provide some rotation resistance. Our Flex-X 19 and 19 x 7 ropes are Category 2 rotation-resistant ropes. Flex-X 19 is very resistant to crushing in multiple layer spooling and is frequently used in multi-part hoisting applications.



USE A SWIVEL ONLY WITH CATEGORY 1 ROPES. XLT⁴ and Category 1 ropes, due to their special design, may be used with a swivel. The use of a swivel is not recommended with other wire rope types.

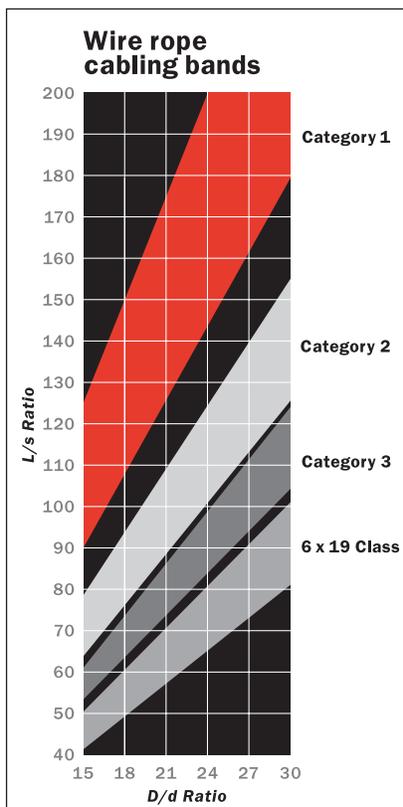
With standard ropes, Category 2 (Flex-X 19 and 19 x 7) rotation-resistant rope and Category 3 (8 x 25) rotation-resistant rope, a swivel in an end termination will allow rotation in a direction that unlays the outer strands when the rope is loaded. This can cause a reduction in rope strength, unbalance in the rope and spooling problems.

While the rope rotation only occurs between the swivel and the first sheave, the unlaid rope travels over the sheave as the load is lifted and introduces unlaying to the section of the rope beyond the sheave. This unlaying becomes trapped and will not come out of the rope when the load is removed. The trapped unlaying causes twist in the rope, which leads to block rotation, erratic spooling, unbalancing and decreased rope service. Remove the swivel from the rope termination and follow steps to remove twist from the rope to optimize rope service.

CHECK SHEAVE ALIGNMENT AND GROOVE SIZE. Improper sheave alignment or groove size can “milk” the lay in a rope and cause torque.

HOW TO EVALUATE BLOCK STABILITY DUE TO RIGGING GEOMETRY

The band for XLT⁴ and Category 1 rotation-resistant ropes is based on torque values. The bands for 6-strand, Category 2 and Category 3 rotation-resistant ropes were developed in field research jointly conducted by Wire Rope Technical Board and the Power Crane and Shovel Association.



Four independent variables are used in pairs to locate a reference point on the graph that indicates the stability of the lift being made. The ratios used include:

L/S = Length of fall (ft.) ÷ Spacing of the rope (ft.).

L = Length of fall measured from the centerline of the point sheave to the centerline of the traveling block sheave as shown in the diagram.

S = Average diagonal spacing of the rope at the boom point and the traveling block sheaves as shown in the diagram.

D/d = (D) Average pitch diameter of point and block sheaves (in.) ÷ (d) nominal rope diameter (in.).

For 2-part reeving, S = average pitch diameter of point and block sheave

For 3-part reeving, S = 2/3 of 2-part

For 4-part reeving, S = diagonal distance of rope parts

For 5-part reeving, S = 4/5 of 4-part

For 6-part reeving, S = diagonal distance of rope parts

For 7-part reeving, S = 6/7 of six-part system

Some graphs were developed in field research jointly conducted by Wire Rope Technical Board and the Power Crane and Shovel Association.

When the reference point on the graph lies above the appropriate band, block rotation will probably occur. If the reference point lies below the band, then the lift will probably be stable without block rotation. If the point lies within the band, block rotation is uncertain.

