Rope and Rigging Compatability

A quick glance at the list of educational sessions at NATE UNITE 2019, as well as safety communication in recent industry-specific publications shows a renewed focus on the need for safer and more sustainable rigging practices. At the time of writing, there are multiple rope and rigging subcommittees that are currently working to improve training and communications, refine standards and best practices, and consult equipment manufacturers for product innovations. These committees are made up entirely of volunteers that are investing their time and talent to ensure the workforce has access to the knowledge that, when applied, will ensure that the industry becomes a safer place.

This article is intended to continue this momentum, and compliments the recent document about the basics of rope selection, characteristics, and usage. Improved familiarity with existing regulations, standards, and best practices for rigging with synthetic rope should serve as a good starting point in the development of training, sound operating procedures, and equipment selection. This document will address the most common pieces of equipment used as part of a rigging system in telecommunications work: capstan hoists, synthetic rope, blocks, shackles, and synthetic slings.

Please note, this article is not intended to be an all-inclusive list and does not attempt to cover all equipment, jobsite-safety, or rigging fundamentals. For means and methods, the ANSI/ASSP A10.48 Standard should be consulted along with other standards and regulations that may apply to the specific work environment.

Many standards address safe rigging principles. The ANSI/ASSP A10.48 Standard provides an industry-specific point of reference in order to simplify the search for the most relevant standards. Some of the other key standards are listed on the next page. Much of the

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content in this article is derived from this list.

Applicable Standards

- ANSI A10.48
- ASME B30.26
- ASME B30.30
- Cordage Institute CI1401
- ASTM F1740
- ISO 16625

A chain is only as strong as its weakest link. The same is true for a rigging system. The ANSI/ASSP A10.48 and ASME B30 Standards do an excellent job of requiring and clarifying the Working Load Limit (WLL) of the system components. Information about the WLL requirements of each component and the source of those requirements is below. Industry best practices are to ensure the WLL of each of the components below exceeds the maximum rated capacity of the hoist/winch which will be used in a lift.

Synthetic Rope

It should be noted that establishing the WLL for synthetic rope used in our industry for hoisting applications is specifically addressed in the ANSI/ASSP A10.48 due to the simple fact synthetic ropes are not currently addressed within other recognized consensus standards for this particular application. It is therefore essential for those working with synthetic ropes to be trained and knowledgeable on the requirements for properly determining the applicable WLL using a minimum gross 10:1 safety factor applied to the rope manufacturer's published minimum breaking strength (MBS) which builds in efficiency losses up to 50% for typical knot terminations and wrap efficiencies thus netting an effective safety factor no less than 5:1.

Synthetic Slings

Synthetic slings require a minimum 5:1 safety factor in accordance with the ASME B30.9 with the rated WLL based upon the type of sling hitch.

Shackles

Standard shackles used in our industry require a minimum 5:1 safety factor in accordance with the ASME B30.26.

Blocks

Rigging blocks require a minimum 4:1 safety factor in accordance with the ASME B30.26.

The establishment of minimum safety factors for each of the rigging components is only beneficial if those in the field fully understand the loading demands and are able to clearly discern the rated capacity for each component within the system. As a result, the standards which dictate the safety factors have also generated labeling requirements which are intended to eliminate accidental overloads. Below are the labeling requirements for each of the components. One additional note - the labels must be legible throughout the service life of the product. If a label becomes illegible or is removed from the product, it must be removed from service.

Synthetic Rope

The ANSI/ASSP A10.48 doesn't specify labeling requirements for rope, but does require that "Synthetic rope shall not be used unless there is documentation available verifying its minimum breaking strength (MBS)." The commonly accepted best practice at this point is that the rope is tagged with the MBS, production date, original length, and diameter.

Synthetic Slings

ASME B30.9 requires that synthetic slings be marked with the manufacturer's name or trademark, material composition of the sling, manufacturer's code or stock number, and the rated WLL in at least one hitch type; although, standard practice is to clearly label the WLL for vertical, choked, and basket hitch configurations.

Shackles

ASME B30.26 mandates that the shackle body be durably marked with the name or trademark of the manufacturer, the rated WLL, and the size. Additionally, the shackle pin must be labeled with the name or trademark of the manufacturer, and the grade, material type,

and/or WLL rating. The ANSI/ASSP A10.48 Standard further dictates that the WLL be provided in pounds or tons.

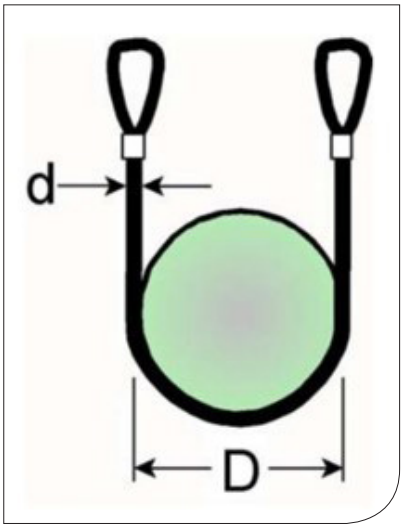
Blocks

ASME B30.26 requires blocks be labeled with the manufacturer's name or trademark, the rated WLL, and the compatible rope size(s). Like shackles, the ANSI/ASSP A10.48 Standard further dictates that the WLL be provided in pounds or tons.

With the inherent versatility of common slings and shackles, there are few special compatibility concerns other than ensuring only OEM approved parts be used for items such as replacement shackles pins. That said, there are a few additional important considerations in the relationship between synthetic rope and rigging blocks that merit review.

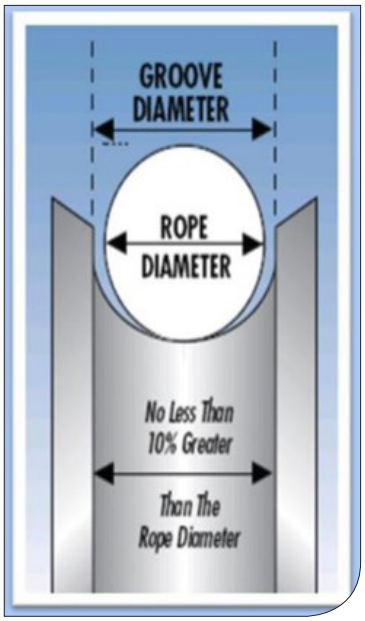
D:d Ratio

The D:d ratio is a comparison of the pitch diameter around which a rope is being run (big "D") vs. the nominal rope diameter (little "d"). The concern and ultimate derating from this D:d relationship involves increased and disproportionate force demands being placed on the localized extreme fibers within the rope segment located at the bend as the D:d ratio decreases.



The ANSI/ASSP A10.48 dictates a minimum 6:1 ratio for double-braid and kernmantle ropes, and a minimum 10:1 ratio for three-strand ropes. ASME B30.26 provides guidance on the effective calculation of the D:d ratio. The graphic on the top right illustrates the sheave pitch approach to calculating the ratio. Essentially, the center to center measurement from the rope on both sides of the block is the sheave pitch. This number is used in conjunction with the rope manufacturer's stated diameter. For double-braid and kernmantle ropes, the sheave pitch diameter measurement must be greater than or equal to six times the diameter of the rope.

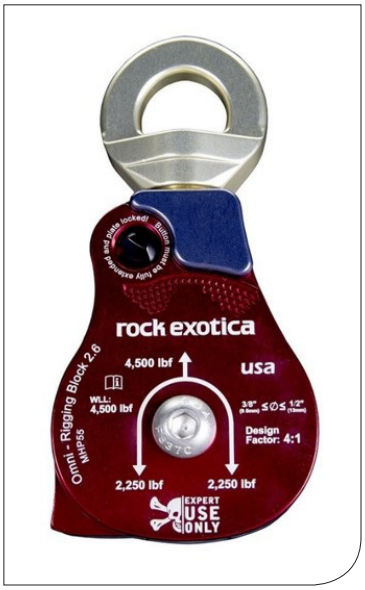
The use of the sheave pitch diameter for the D:d ratio calculation is why common ASME B30.26 compliant rigging blocks used in our industry with labeled compatible rope sizes of ½" and an inner sheave diameter slightly below 3" still meet the minimum 6:1 ratio when used with double-braid and kernmantle ropes.



Sheaves for Synthetic Rope vs. Wire Rope

With regards to the sheave groove profile, the ANSI/ASSP A10.48 states, "The size of the synthetic rope shall be compatible with the sheave groove in the rooster head and rigging blocks. Groove widths shall be greater than or equal to 1.10 times the rope diameter." This requirement is one of the primary reasons why blocks may be categorized as either wire rope or synthetic rope blocks.

The narrower groove on the sheave of wire rope blocks introduces significant risk of rope milking or binding as it passes over the block. The wider groove enables the rope to spread over the sheave as it passes over the block enabling a smooth transition.



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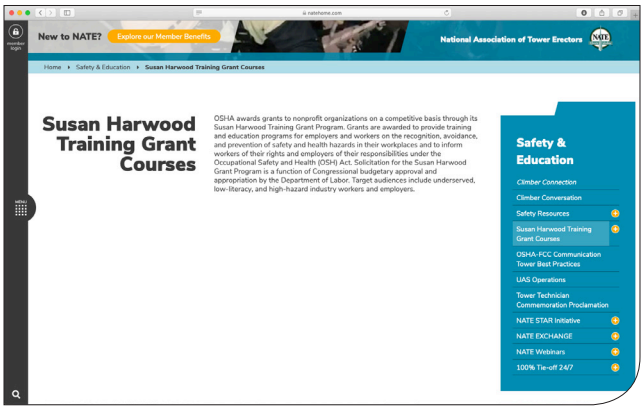
Industry Best Practice for Simplicity

The content on the previous page is only a surface level evaluation of the most common rigging components and relevant compatibility concerns. The generally accepted industry best-practice in order to make compliance straightforward is outlined below.

- Operate your hoist following the manufacturer's guidelines and make your hoist's rated capacity your "weakest link" in the overall system, which for common receiver mounted capstan hoists would be 1,000 pounds of line pull capacity.
- Ensure your rope has all of the required documentation and labels, and has a published MBS no less than 10 times the hoist capacity, or no less than 10,000 pounds assuming a 1,000 pound rated capstan.
- Ensure your rigging block(s) are designed for use with synthetic rope, compatible for your given rope size(s), have a rated WLL no less than two times the rated capacity of your rope to account for a maximum block angle factor of 2.0, and used within the operating requirements established in ASME B30.26.
- Ensure your shackles also have a rated WLL no less than two times the capacity of your rope and are used within the operating requirements established in ASME B30.26.
- Ensure that your slings have a rated WLL no less than two times the capacity of your rope while in the sling's lowest rated choked hitch configuration and used within the operating requirements established in ASME B30.9.

In case you're interested in learning more about rigging principles, NATE has secured support from OSHA



once again via the Susan G. Harwood Training Grant. This year's content is "Advanced Rigging Principles Training". The course is designed to filter rigging policies and practices specifically through the lens of a tower technician, with particular emphasis on the requirements of that ANSI/ASSP A10.48 Standard. The following section outlines the content of the Advanced Rigging Principles Course.

Section 1: Introduction to NATE and OSHA

Section 2: State of the Industry

Section 3: Primary Regulations, Codes, Standards, and Policies

Section 4: Synthetic Rope

Section 5: Rigging Forces and Lift Systems

Section 6: Hoisting Operations, Execution and Communication

Visit **www.natehome.com** for a complete list of course dates and locations throughout 2019. ■