



HALO

Rigging Information - Angles & Hitches

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Angles:

There are four primary factors to take into consideration when lifting a load. They are: (1) the physical parameters of the load; (2) the number of legs and the angle they make with the horizontal; (3) the rated capacity of the sling; and (4) the condition of the sling.

Physical parameters of the load

The size of the object to be lifted, and particularly the location of lifting points, will affect sling selection. The weight of the lift, while a critical component, is only a part of the information. The location of the center of gravity is also necessary to determine sling loadings.

If the load has small diameter corners, protective blocking or "softeners" must be used so that sling capacity isn't reduced. Also, if lifting a painted object or an object with a finished surface, padding or softeners may be needed between the sling and the load to protect the load.

Number of legs and angle with the horizontal

As the angle formed by the sling leg and the horizontal decreases, the rated capacity of the sling also decreases. In other words, the smaller the angle between the sling leg and the horizontal, the greater the load on the sling leg. The minimum angle allowed is 30 degrees.

Rated capacity

The rated capacity of a sling must never be exceeded. The rated capacity is based both on sling fabrication components (minimum breaking force of rope used, splicing efficiency, number of parts of rope in sling and number of sling legs) and sling application components (angle of legs, type of hitch, D/d ratios, etc.) If you are using one wire rope sling in a vertical hitch, you can utilize the full rated lifting capacity of the sling, but you must not exceed that lifting capacity. If you are using two wire rope slings in a vertical hitch (called a 2-legged bridle hitch) in a straight lift, the load on each leg increases as the angle between the leg and the horizontal plane decreases. Whenever you lift a load with the legs of a sling at an angle, you can calculate the actual load per leg by using the following three-step formula.

Three-step formula for calculating load per sling leg

These calculations assume that the center of gravity is equal distance from all of the lifting points, and the sling angles are the same. If not, more complicated engineering calculations are needed.

1. Divide the weight of your total load by the number of legs you are using. This gives you the load per leg if the lift were being made with all legs lifting vertically.
2. Measure the angle between the legs of the sling and the horizontal plane.
3. Multiply the load per leg that you calculated in step 1 by the load factor for the leg angle you are using. Use the Load factor guidelines table to determine the load factor. The result

is the actual load on each leg of the sling for this lift and angle. The actual load must never exceed the sling's vertical rated capacity.

Load factor guidelines

Leg angle	Load factor
90°	1.000
85°	1.003
80°	1.015
75°	1.035
70°	1.064
65°	1.103
60°	1.154
55°	1.220
50°	1.305
45°	1.414
40°	1.555
35°	1.743
30°	2.000

Examples

1. Total load is 1,000 lbs. divided by two legs - 500 lbs. load per leg if vertical lift.
2. Horizontal sling angle is 60 degrees.
3. Multiply 500 lbs. by 1.154 load factor (from table) = 577 lbs. actual load per leg.



1. Total load is 1,000 lbs. divided by two legs - 500 lbs. load per leg if vertical lift.
2. Horizontal sling angle is 45 degrees.
3. Multiply 500 lbs. by 1.414 load factor (from table) = 707 lbs. actual load per leg



1. Total load is 1,000 lbs. divided by two legs - 500 lbs. load per leg if vertical lift.
2. Horizontal sling angle is 30 degrees.
3. Multiply 500 lbs. by 2 load factor (from table) = 1000 lbs. actual load per leg.



WARNING: Slings shall not be used with horizontal angles less than 30°.

Condition of sling

Each sling must be inspected daily. If the sling does not pass inspection, do not use.

Hitches:

How wire rope slings are configured to lift a load is called a hitch. Most lifts use one of three basic hitch configurations.

- A **Vertical**, or straight hitch, is formed when one eye of the sling is attached to the lifting hook and the other is attached to the load. The full rated capacity of the sling may be utilized, but not exceeded, while used in this configuration. A tagline should be used to prevent load rotation that may damage the sling. When two or more slings are attached to the same lifting hook the total hitch becomes, in effect, a lifting bridle, and the load is distributed equally among the individual slings.



Vertical

- A **Choker Hitch** is formed when one eye of the sling is attached to the lifting hook, while the sling itself is drawn through the other eye. The load is placed inside the "choke" that is created while the sling is drawn tight over the load through the eye. For increased load control the **Double Wrap Choker Hitch** configuration is recommended. This hitch is defined as having one eye of the sling attached to the lifting hook. The wire rope is securely wrapped around the load prior to drawing the sling through the other eye. The sling is drawn tight over the entire surface of the load during lifting.



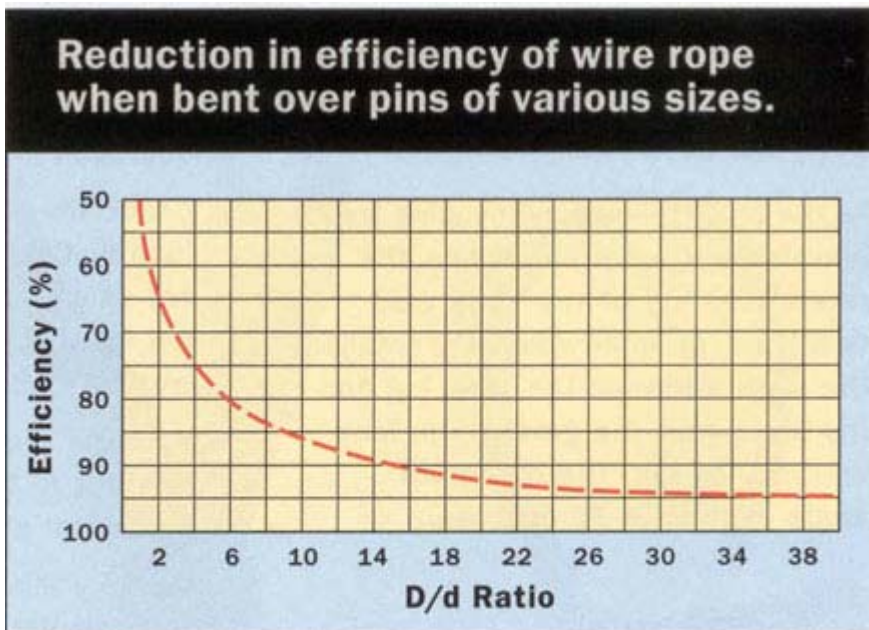
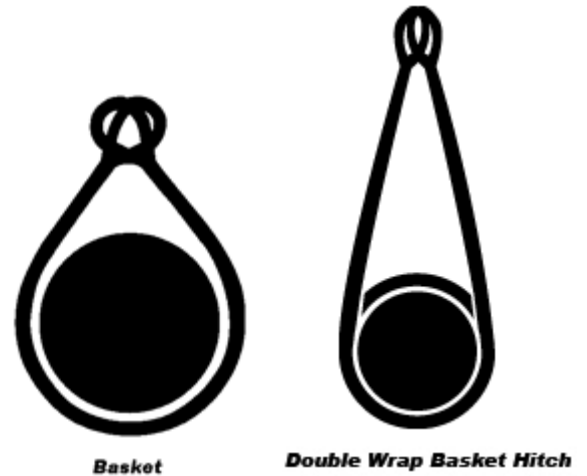
Choker

Double Wrap Choker Hitch

Choker hitches of all configuration types reduce the lifting capacity of the sling since the wire rope component's ability to adjust during the lift is affected. A choker hitch should only be used when the load will not be seriously damaged by the sling body - or the sling damaged by the load, and when the lift requires the sling to hug the load. The diameter of the bend where the sling contacts the load should keep the point of choke against the sling body - never against a splice or the base of the eye. When a choker hitch is used at an angle of less than 120 degrees the sling choker rated capacity must be adjusted accordingly.

- A **Basket Hitch** is formed when both eyes of the sling are based on the lifting hook, thereby forming a circular basket of the sling. This type of hitch distributes the load equally between the two legs of the basket, within limitations.

For increased load control the **Double Wrap Basket Hitch** configuration is recommended. This style basket hitch has the wire rope securely wrapped around the load. The sling is drawn tight over the entire surface of the load during lifting.



Note: This graph refers to bending wire rope over pins. Any time a wire rope sling is bent around sharp corners additional reductions in efficiency will occur. Sharp corners should always be padded to prevent damage to the sling.