General Use of Different Types of Slings

In this article we'll explore the different types of slings and which ones to use in various applications. If you're good at math there's a section on calculating sling capacity. If you're *not* good at math you can scroll down to the awesome videos – then consider enrolling in a remedial math course ;c)

Slings are used on many job sites as a safe and effective way to lift, or move large objects. There are four main types of slings that are used in tandem with a variety of hooks, rings, links and shackles. These are then secured to a crane or other mechanical lifting device. Let's take look at some popular sling configurations and the suggested applications for use.

Chain Slings

Alloy chain slings combine superior strength, ease of handling, and durability. The combination of heavy loads, elevated working temperatures, and severe lift conditions usually dictate that an alloy chain sling be used. Typical chain sling applications are found in steel mills, foundries, and heavy machining operations requiring repetitive lifts.

Wire Rope Slings

The most common and lowest cost per ton of lift of all slings. Used in the construction industry and other industries where heavy loads and rugged conditions exist.

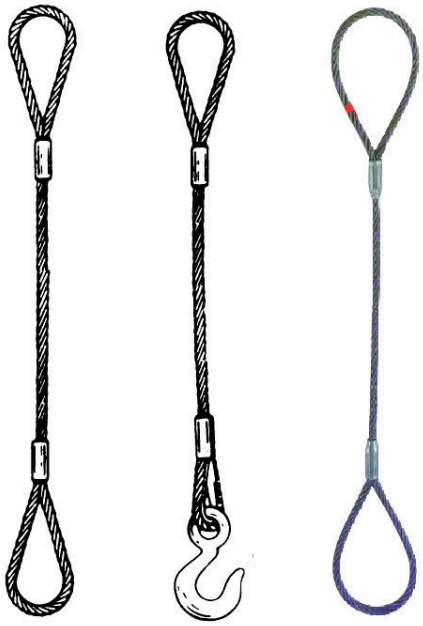
Mesh Slings: Wire and Chain

These slings excel in lifting objects that are hot or have sharp edges, such as bar stock or plate steel. Mesh slings greatly enhance load balancing due to their wide load bearing surface. Machine shops and steel warehouses typically have good application for mesh slings.

Synthetic Slings

Both Web Slings and Roundslings are used where loads must be protected from damage. The lift weight and flexibility of synthetic slings reduce fatigue and strain on riggers. Tuflex Roundslings, with their color coded capacities, and ease of use and inspection, are rapidly gaining in popularity.

Chain Slings



Wire Rope Slings

Mesh Slings

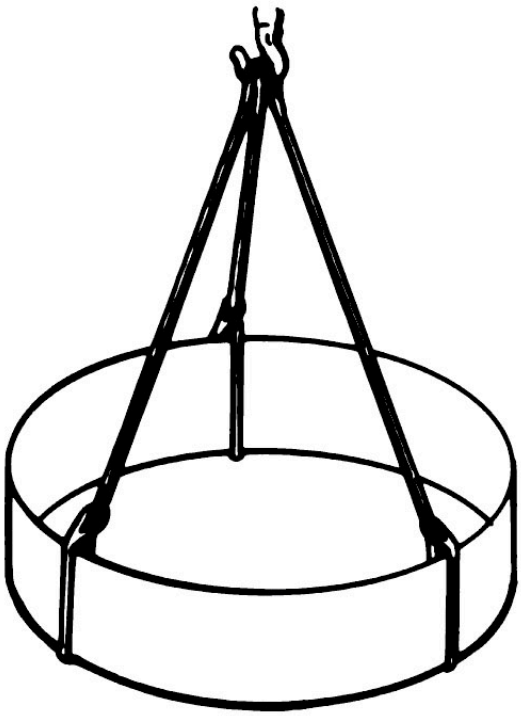
Synthetic Slings

General OSHA and Manufacturer Requirements for All Slings

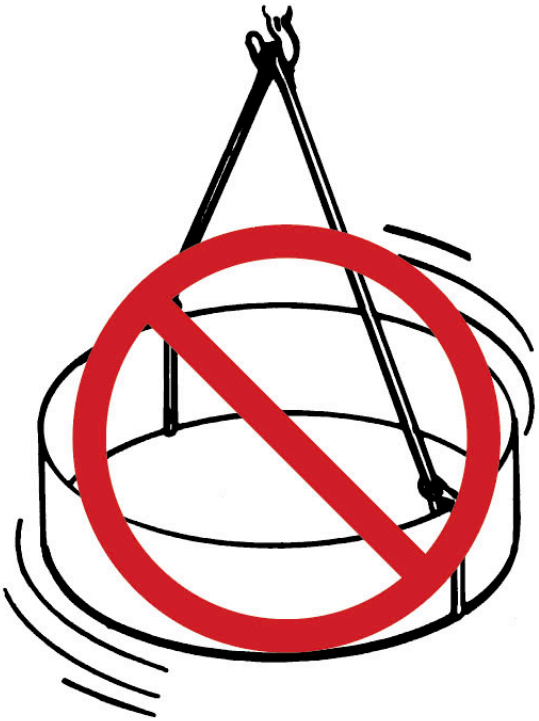
Safe Operating Practices

- Inspect slings prior to each use and do not use if damaged.
- Slings shall not be loaded in excess of their rated capacities. Rated capacities (Working Load Limits) must be shown by markings or tags attached to all slings.

- Angle of lift must be considered in all lifts.
- Slings shall be padded or protected from the sharp edges of their loads.
- Loads must be rigged to prevent slippage.



Right Way



Wrong Way

- Slings shall be securely attached to their loads.
- Lift must be stable with respect to the center of gravity, and balanced.
- Do not point load hooks – center load in base of hook.
- Suspended loads shall be kept clear of all obstructions.
- All persons shall be kept clear of loads to be lifted, and suspended loads.
- Hands and fingers shall not be placed between the sling and load while the sling is being tightened around the load. After lifting, the load should not be pushed or guided by employees hands directly on the load. Ropes or “tag lines” should be attached for this purpose.
- Do not shock load. Jerking the load could overload the sling and cause it to fail.
- A sling shall not be pulled from under a load when the load is resting on the sling. Before a load is lifted, a place should be prepared where it is to be put down. Lumber can be used to allow space to remove the sling and prevent shifting of the load.
- Temperature and chemical environment must be considered.
- Slings shall not be shortened with knots, bolts, or makeshift devices.
- Sling legs shall not be kinked or twisted.
- Slings shall not be dragged on floor.
- Slings shall be stored in cool, dark, dry areas, preferably on racks.

What capacity sling do I need?

1. Determine the weight that the sling will be lifting [LW].
2. Calculate the Tension Factor [TF].
   a. Using the *Angle From Horizontal*, read across the angle chart to the corresponding *Tension Factor* value -OR-

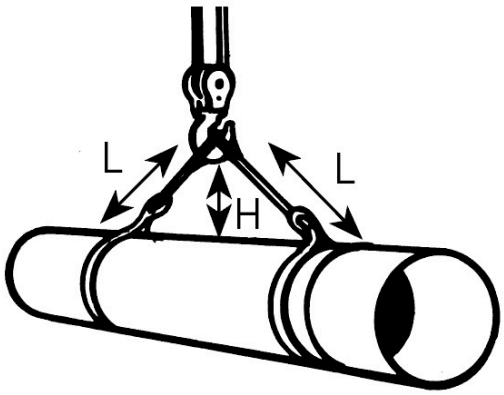
b. Divide sling length* [L] by sling height* [H] (* Measured from a common horizontal plane to the hoisting hook)

3. Lifting Weight [LW] x the Tension Factor [TF] = Minimum Sling Rating for the type of hitch that will be used.

EFFECT OF ANGLE CHART		
Reduction Factor (RF)	Angle From Horizontal	Tension Factor
1.000	90º	1.000
0.996	85º	1.004
0.985	80º	1.015
0.996	75º	1.035
0.940	70º	1.064
0.906	65º	1.104
0.866	60º	1.155
0.819	55º	1.221
0.766	50º	1.305
0.707	45º	1.414
0.643	40º	1.555
0.574	35º	1.742
0.500	30º	2.000

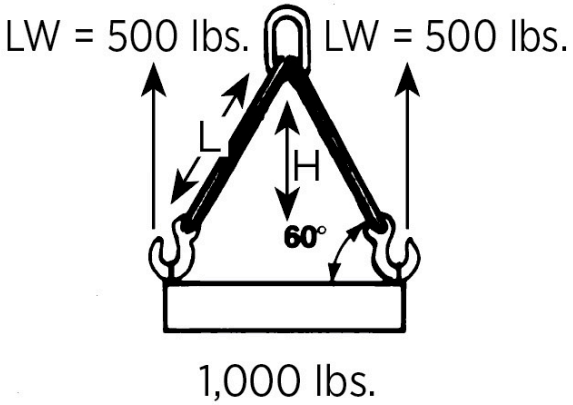
Sling capacity decreases as the angle from horizontal decreases.
Sling angles of less than 30º are not recommended.

Reduced Capacity



Example:
Vertical Choker rating of each sling = 6,000 lbs.
Measured Length (L) = 6 ft.
Measured Height (H) = 4 ft.
Reduction Factor (RF) = 4 (H) / 6 (L) = .667
Reduced sling rating in this configuration = .667 (RF) x 6,000 lbs. =
4,000 lbs. of lifting capacity per sling

Increasing Tension



Example:
Load weight = 1,000 lbs.
Rigging – 2 slings in vertical hitch
Lifting Weight (LW) per sling = 500 lbs.
Measured Length (L) = 10 ft.
Measured Height (H) = 5 ft.
Tension Factor (TF) = 10 (L) / 5 (H) =
2.0 Minimum Vertical Rated Capacity required for this lift = 500 (LW) x 2.0 (TF) =
1,000 lbs. per sling

Lift Evaluation and Operating Practices

IMPORTANT CONSIDERATIONS – Before buying or using a sling, know as much as possible about the lift you will make to minimize the potential dangers to personnel, product and property. All of the following items should be evaluated.

Environment

- Crane and load foundation
- Obstruction in path of travel and for head height
- Power lines or other hazards
- Chemical conditions
- Temperature of load and surroundings
- Location of people – away from danger
- Inspect all equipment

Load

- Weight of load
- Center of gravity (drain liquids)
- Pick-up point integrity, including location and number

- Edges that may damage sling
- Abrasive areas that may damage sling
- Secure or remove loose parts
- Structural integrity (bending and crushing)

Rigging

- Type of sling required, including number of legs
- Type of hitch required
- Balance of load and stability, including flexing
- Prevention of load shift and movement against sling
- Angle of lift
- Tag line and spotter requirements
- Plan and procedures

Choker Hitch Angles

When lifting and turning a load using a choker hitch it is not uncommon to bend the body of the sling around the choker loop and have a severe bend occur around the body at this point.

For choker angles of 120º or less, the choker rating must be reduced by multiplying the corresponding factor times the slings standard choker rating.

Effect of Anchor Shackle Pin or Crane Hook on Sling Eye

Damage to slings can occur if the wrong size pin is used. The width of the pin or hook should never exceed the natural inside width of the eye.

The eye dimension for each type and size of sling are shown in the capacity tables. If your pin or hook is large, request an oversized eye for the sling.

Inspection

Daily Inspection

Each day before using the sling, all fastenings and attachments should be inspected for damage or defects by a competent person designated by the employer. Additional inspections should be performed prior to each use where severe conditions warrant. Damaged or defective slings should be immediately removed from service.

Periodic Inspection

OSHA specifies that alloy steel chain slings should have a thorough periodic inspection by a competent person at least once every 12 months. Lift-All recommends that all slings have a thorough inspection by a competent person at least once every 12 months. These inspections must be recorded and maintained for each individual sling.

In some instances, it is possible to repair slings, proof test and return them to service. Damaged components and sections of chain or wire mesh can be replaced. Hooks, links and other components that are in good condition can be salvaged from a damaged web or round sling, rewebbed, proof

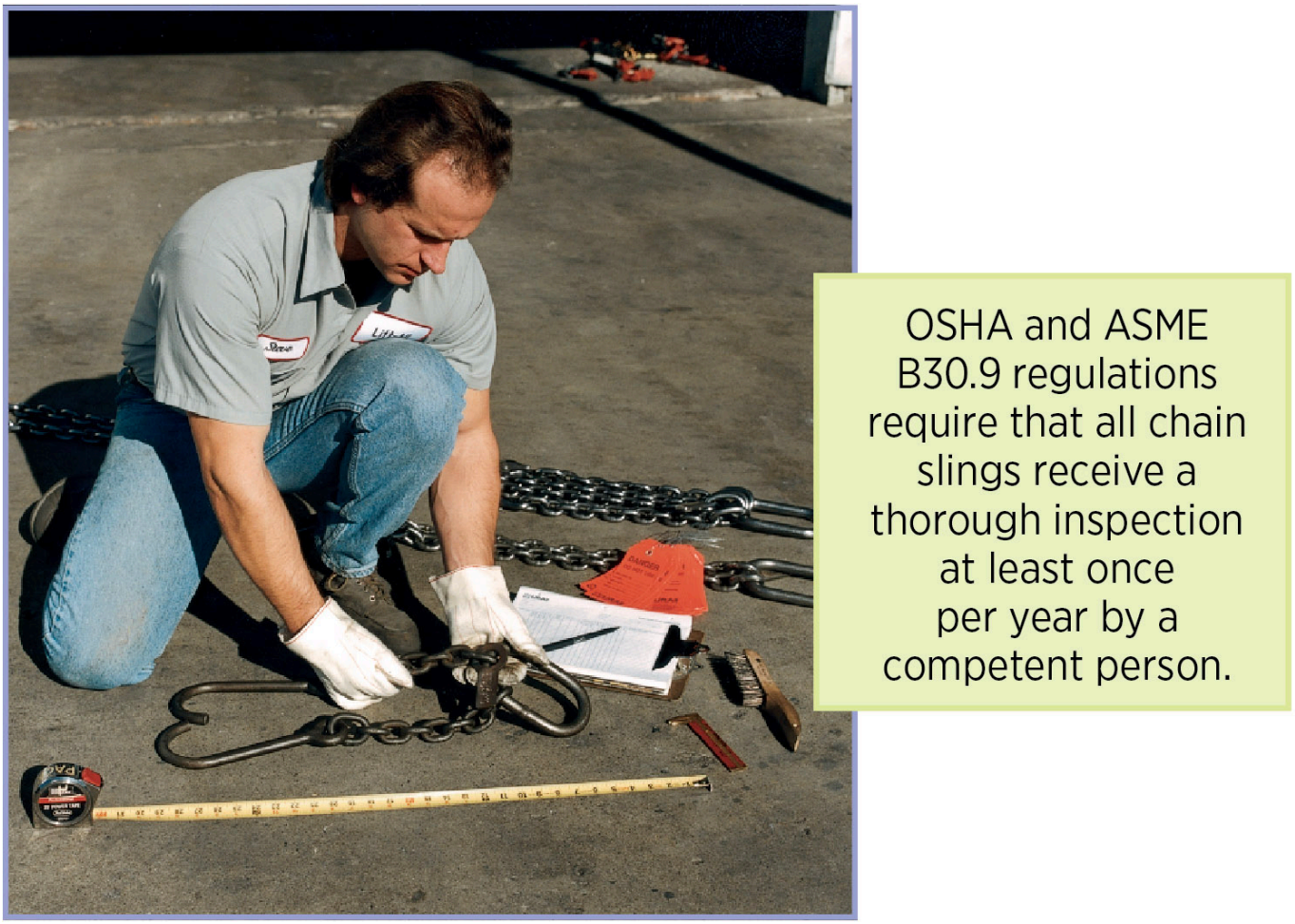
tested by Lift-All and returned to service.

Repair

Lift-All strongly advises that damaged slings be repaired only by the manufacturer.

Physical Factors

Your care in the use and handling will prolong sling life significantly. The following physical factors should be considered when using any of the slings:



1. **Cutting of synthetic sling, Nicking or Gouging of steel slings**
   Probably the number one cause of sling failure. Usually caused by a sharp or small diameter load edge against the sling. It can be prevented with proper padding.
2. **Improper Loading**
   Shock loading, unbalanced loading, overloading and inadequate consideration for the effect of angle factors can adversely affect safety. Make sure the load weight is within the rated capacity of the sling(s) being used for both type of hitch and angle of lift.
3. **Temperature**
   Avoid loads and environments where temperatures exceed the limits of the slings being used. All slings can be damaged by excessive heat.
4. **Punctures & Abrasions seriously degrade sling strength**
   Rough load surfaces and dragging slings on the ground will damage all slings, steel or synthetic. Use proper padding between slings and rough loads. Never drag slings on ground or

concrete floors.

5. **Foreign Matter**
   Material such as metal chips and heavy grit can damage web slings, both internally and externally. Both synthetic and steel slings can be damaged by weld spatter and heat from a welding torch. Avoid contact with foreign matter whenever possible.
6. **Ultraviolet Light**
   Nylon and polyester web slings are adversely affected by prolonged exposure to UV light, i.e., sunlight or arc welding. Inspect and remove if slings appear bleached and stiff. Store slings properly when not in use.
7. **Improper Storage**
   Even in storage, synthetic and steel slings can degrade if not kept in clean, dry conditions. Lift-All recommends hanging slings on a rack. Web slings should be stored in a dark area to avoid unnecessary sunlight/UV degradation.
8. **Chemical Environment**
   Slings exposed to certain chemicals or the vapors of these chemicals can lose some or all of their strength. When using slings in a chemical environment, contact Lift-All to assure sling compatibility.

Effect of Angle of Lift on A Sling's Rated Capacity

Using slings at an angle can become deadly if that angle is not taken into consideration when selecting the sling to be used.

The tension on each leg of the sling is increased as the angle of lift, from horizontal, decrease. It is most desirable for a sling to have a larger angle of lift, approaching 90º. Lifts with angles of less than 30º from horizontal are not recommended. If you can measure the angle of lift or the length and height of the sling as rigged, you can determine the properly rated sling for your lift.

What would be the rating of each sling rigged at this angle?

1. Calculate the Reduction Factor (RF).

a. Using the angle from horizontal, read across the Angle Chart to the corresponding number of the Reduction Factor column.

-OR-

b. Divide sling height* [H] by sling length* [L (*Measured from a common horizontal plane to the hoisting hook)

2. Reduction Factor (RF) x the sling's rated capacity for the type hitch that will be used = Sling's Reduced Rating.

digging deeper

LiftAll has a comprehensive training video on using slings in construction:

BACK TO SAFETY TOOLBOX TALKS

WHITE CAP