Additional Resources:

- **Complete OSHA Standard**

Rigging equipment for material handling shall be inspected prior to use on each shift and as necessary during its use to ensure that it is safe. Defective rigging equipment shall be removed from service. 1926.251(a)(1)

Alloy Steel Chain Slings

Welded alloy steel chain slings shall have permanently affixed durable identification stating size, grade, rated capacity, and sling manufacturer. 1926.25 1(b)(1)

When inspecting alloy steel chain slings, pay special attention to any stretching, wear in excess of the allowances made by the manufacturer, and nicks and gouges. These signs indicate that the sling may be unsafe and they must be removed from service.

Wire Rope Slings

Wire rope is composed of individual wires that have been twisted to form strands. Strands are then twisted to form a wire rope. When wire rope has a fiber core, it is usually more flexible but less resistant to environmental damage. Conversely, a core that is made of a wire rope strand tends to have greater strength and is more resistant to heat damage.
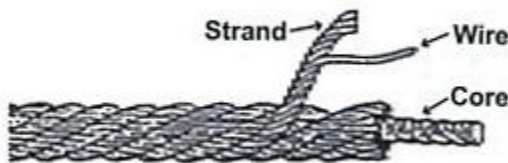
Wire rope shall not be used if, in any length of eight diameters, the total number of visible broken wires exceeds 10 percent of the total number of wires, or if the rope shows other signs of excessive wear, corrosion, or defect. 1926.251(c)(4)(iv)

An observed guideline is 10 randomly broken wires in 1 rope lay or 5 broken wires in 1 strand in 1 rope lay. ASME 830.9-2003

Wire Rope Clips - Installed with the U-bolt of all clips on the dead end of the rope. Never stagger clips and never put the U-bolt of the clip on the live end of the rope. 1926.251(c)(5)(i)

Reminder: Never Saddle a Dead Horse! D=six times the diameter of the wire rope
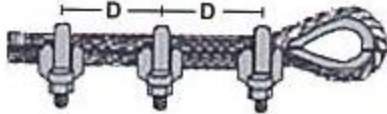
D= Six times the diameter of the wire rope

Defective gear shall be removed from service. 1926.251(a)(1)

Job or shop hooks and links or makeshift fasteners formed from bolts, rods, or other such attachments shall not be used. 1926.251(b)(3)

When U-bolt wire rope clips are used to form eyes, the following table shall be used to determine the number and spacing of clips. 1926.251(c)(5)

Number and Spacing of U-Bolt Wire Rope Clips

Improved plow steel, rope diameter (inches)	Number of clips		Minimum spacing (inches)
	Drop forged	Other material	
1/2 (1.27 cm)	3	4	3 (7.62 cm)
5/8 (.625 cm)	3	4	3-3/4 (8.37 cm)
3/4 (.75 cm)	4	5	4-1/2 (11.43 cm)
7/8 (.875 cm)	4	5	5-1/4 (12.95 cm)
1 (2.54 cm)	5	6	6 (15.24 cm)
1-1/8 (2.665 cm)	6	6	6-3/4 (15.99 cm)
1-1/4 (2.79 cm)	6	7	7-1/2 (19.05 cm)
1-3/8 (2.915 cm)	7	7	8-1/4 (20.57 cm)

Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire rope clips or knots. 1926.251(c)(4)

Natural Rope, and Synthetic Fiber Slings

When using natural or synthetic fiber rope slings, follow the manufacturer's strength recommendation.

All splices in rope slings provided by the employer shall be made in accordance with fiber rope manufacturer's recommendations. 1926.251(d) (1) through (2)

Natural and synthetic fiber rope slings shall be immediately removed from service if any of the following conditions are present:

- Abnormal wear.
- Powdered fiber between strands.
- Broken or cut fibers.
- Variations in the size or roundness of strands.
- Discoloration or rotting.
- Distortion of hardware in the sling. 1926.251(d)(6)

Hitch Configurations

Basket Hitch   Choker Hitch   Vertical Hitch

Synthetic Webbing

The employer shall have each synthetic web sling marked or coded to show:

- Name or trademark of manufacturer.
- Rated capacities for the type of hitch.
- Type of material. 1926.251(e)(1)

"Removal from service." Synthetic web slings shall be immediately removed from service if any of the following conditions are present:

- Acid or caustic burns;
- Melting or charring of any part of the sling surface;
- Snags, punctures, tears or cuts;
- Broken or worn stitches; or Distortion of fittings. 1926.251(e)(8)

Sling Angles

As the horizontal angle of a sling decreases, the load on each leg increases. The effect is the same whether a single sling is used as a basket, or two (2) slings are used with each in a straight pull as with a two-legged bridle.

500 Lbs.

1,000 Lbs.

577 Lbs. 30°

1,000 Lbs.

707 Lbs. 45°

1,000 Lbs.

1,000 Lbs. 60°

1,000 Lbs.
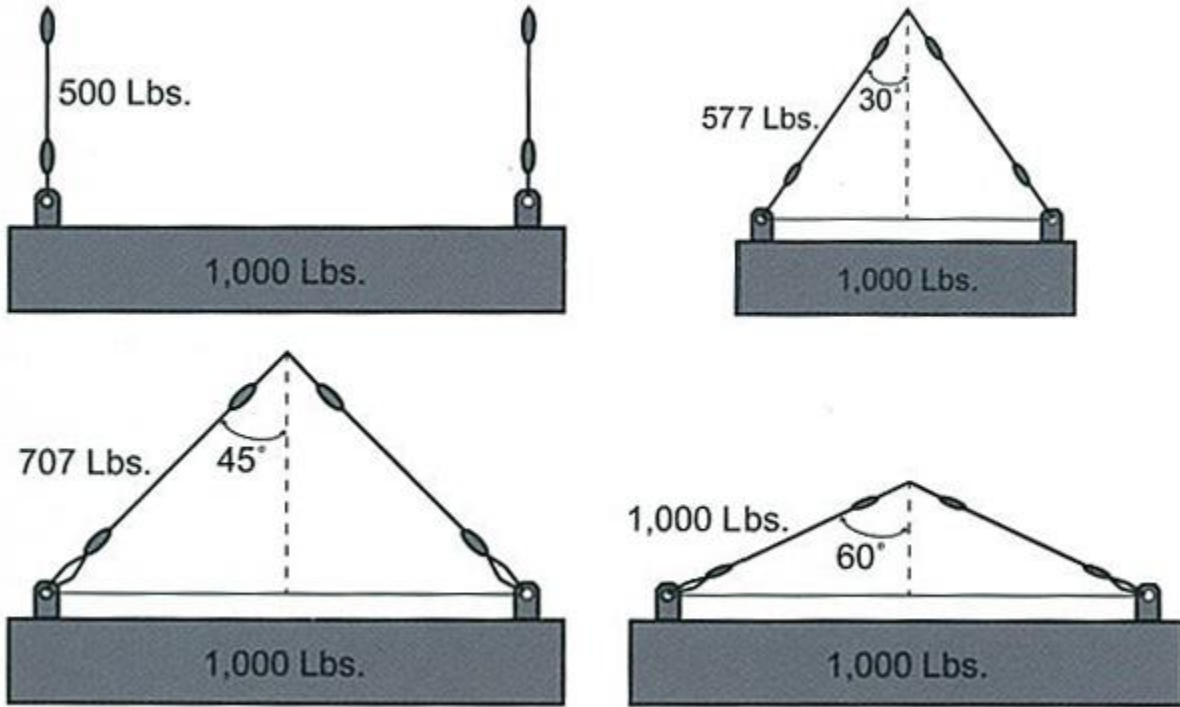
Calculating Sling Angle Tension

The formula for calculating the vertical component of load at each lift point: [Y/(X+Y)] * Load Weight = Vertical Component

The formula for actual sling tension: Length of Sling/Height (*) Vertical Component = Tension in Sling

Length of Sling A

Length of Sling B

Height

X   Y

Load
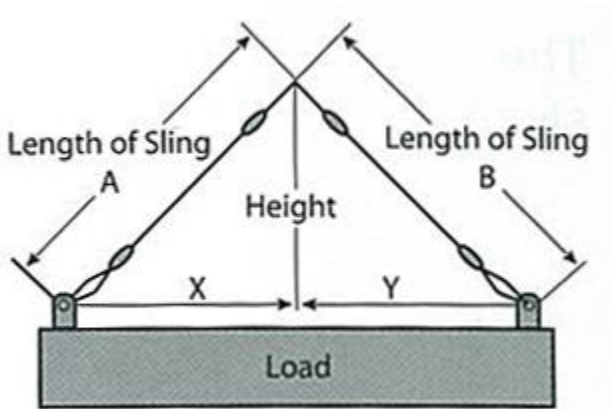
Equation
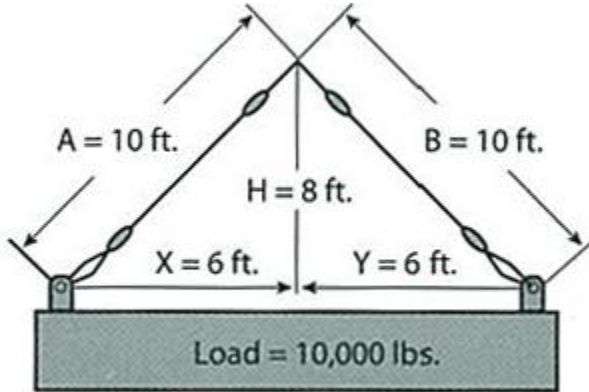
Example

Block and Tackle

A block and tackle is a pulley system consisting of fixed and moveable pulleys combined to form a mechanical advantage for the user. The mechanical advantage of a tackle is determined by counting the number of parts that are supporting the weight. The trade-off is an increase in the amount of line that must be pulled. For example, using a two part block and tackle and lifting 100lbs. a distance of 20' the user will only have to exert 100/2 = 50 lbs. of force but the user will have to pull 100' of rope.