RIGGING
J.A. Rosa Construction, LLC

15.A GENERAL

15A1 Inspection and use.

a. Rigging equipment shall be inspected as specified by the manufacturer, by a competent person, before use on each shift and as necessary during its use to ensure that it is safe.

b. Defective rigging shall be removed from service.

c. The use and maintenance of rigging equipment shall be in accordance with recommendations of the rigging manufacturer and the equipment manufacturer. Rigging equipment shall not be loaded more than its recommended safe working load.

d. Rigging equipment, when not in use, should be safely stored and maintained in a safe condition.

15A2 Hoist rope shall not be wrapped around the load.

15A3 Running lines located within 6 ft - 6 in (1.9 m) of the ground or working level shall be guarded or the area restricted by physical barriers to preclude injury or injury from broken lines.

15A4 All eye splices shall be made in an approved manner. Rope thimbles of proper size shall be fitted in the eye, except that in slings the use of thimbles shall be optional.

15A5 When hoisting loads, a positive latching device shall be used to secure the load and rigging.

15.A.02 Hooks, shackles, rings, pad eyes, and other fittings that show excessive wear or that have been bent, twisted, or otherwise damaged shall be removed from service.

15.A.03 Custom designed grabs, hooks, clamps, or other lifting accessories shall be marked to indicate the safe working loads and shall be proof tested, before use, to 125% of their rated load.

15.A.04 The practice of multiple lift rigging (Christmas tree lifting) is prohibited.

15.B WIRE ROPE

15.B.01 When two or more wires are broken or rust or corrosion is found adjacent to a socket or end fitting, the wire rope shall be removed from service or re-socketed

15.B.02 Wire rope removed from service due to defects shall be cut up or plainly marked as unfit for further use as rigging.

15.B.03 Wire rope clips attached with U-bolts shall have the U-bolts on the unloaded (dead) or short end of the rope. The clip nuts shall be retightened immediately after initial load carrying use and at frequent intervals thereafter.

15.B.04 When a wedge socket fastening is used, the unloaded (dead) or short end of the wire rope shall be looped back and secured to itself by a clip or have a separate piece of equal size wire rope attached with a clip or be properly secured to an extended wedge. The clip shall not be attached to the load (live) end.

FIGURE 1

WIRE ROPE CLIP SPACING
(NOT TO BE USED FOR SLINGS)

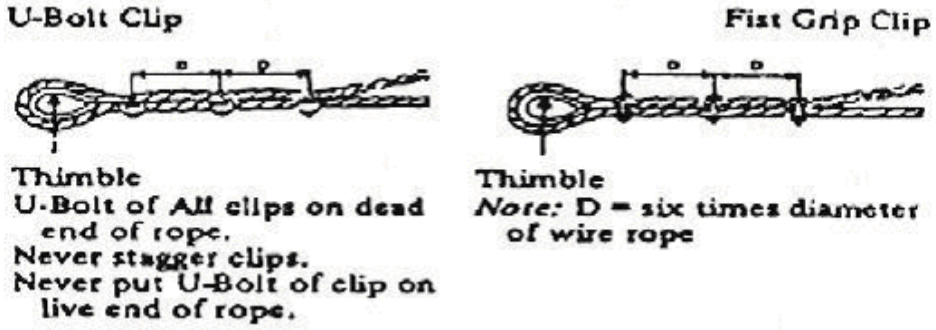
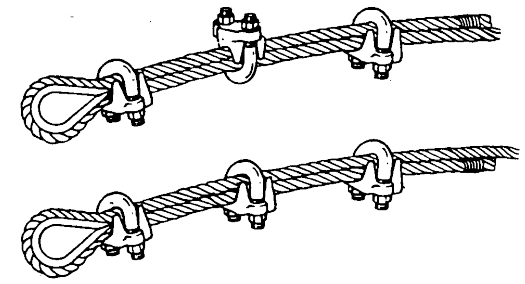
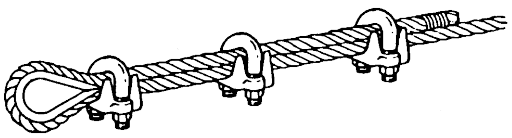


FIGURE 15-2

WIRE ROPE CLIP ORIENTATION
(NOT TO BE USED FOR SLINGS)



The wrong way to clip wire rope



The right way to clip wire rope

FIGURE 11

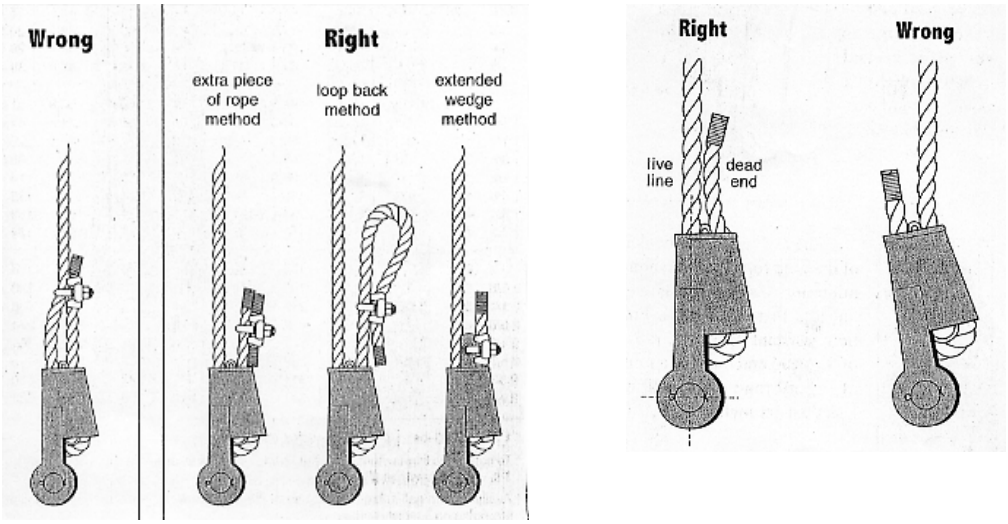
NUMBER OF CLIPS AND THE PROPER TORQUE NECESSARY TO ASSEMBLE WIRE ROPE-EYE-LOOP CONNECTIONS WITH A PROBABLE EFFICIENCY NOT MORE THAN 80%

Rope diameter (in/cm)	Nominal size of clips (in/cm)	Number of clips	Torque to be applied to nuts of clips (ft-lb/N-m)
5/16 (0.7)	3/8 (0.9)	3	25 (33.9)
3/8 (0.9)	3/8 (0.9)	3	25 (33.9)
7/16 (1.0)	1/2 (1.2)	4	40 (54.3)
1/2 (1.2)	1/2 (1.2)	4	40 (54.3)
5/8 (1.5)	5/8 (1.5)	4	65 (88.2)
3/4 (1.9)	3/4 (1.9)	5	100 (135.7)
7/8 (2.2)	1 (2.5)	5	165 (223.9)
1 (2.5)	1 (2.5)	6	165 (223.9)
1 1/4 (3.1)	1 1/4 (3.1)	7	250 (339.3)
1 3/8 (3.4)	1 1/2 (3.8)	7	375 (508.9)
1 1/2 (3.8)	1 1/2 (3.8)	8	375 (508.9)
1 3/4 (4.3)	1 3/4 (4.3)	8	560 (760.0)

The spacing of clips should be 6 times the diameter of the wire rope. Thimbles shall be used if wire rope is to be spliced.

FIGURE 2

WEDGE SOCKET FASTENING



15.B.05 Protruding ends of strands in splices on slings and bridles shall be covered or blunted.

15.B.06 Except for eye splices in the ends of wires and for endless wire rope slings, wire rope used in hoisting, lowering, or pulling loads shall consist of one continuous piece without knot or splice.

a. An eye splice made in any wire rope shall have not less than five full tucks (this requirement shall not preclude the use of another form of splice or connection that can be shown to be as efficient and that is not otherwise prohibited).

b. Wire rope shall not be secured by knots except on haul back lines on scrapers.

15.B.07 Eyes in wire rope bridles, slings, or bull wires shall not be formed by wire rope clips or knots.

15.B.08 Wire rope clips shall not be used to splice rope.

15.C CHAIN

15.C.01 Only alloyed chains shall be used in rigging.

15.C.02 Chain shall be inspected before initial use and weekly thereafter.

15.C.03 When used with alloy steel chains, hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links, or other attachments shall have a rated capacity at least equal to that of the chain.

15.C.04 Job or shop hooks and links, makeshift fasteners formed from bolts and rods, and other similar attachments shall not be used.

ID tag showing chain lifting capacity

15.D FIBER ROPE (NATURAL AND SYNTHETIC)

15.D.01 Fiber rope shall not be used if it is frozen or if it has been subjected to acids or excessive heat.

15.D.02 Fiber rope shall be protected from abrasion by padding where it is fastened or drawn over square corners or sharp or rough surfaces.

15.D.03 All splices in rope slings provided by the employer shall be made in accordance with fiber rope manufacturer's recommendations.

15.D.04 Eye splices.

a. In manila rope, eye splices shall contain at least three full tucks, and short splices shall contain at least six full tucks (three on each side of the centerline of the splice).

b. In layed synthetic fiber rope, eye splices shall contain at least four full tucks, and short splices shall contain at least eight full tucks (four on each side of the centerline of the splice).

15.D.05 Strand end tails shall not be trimmed short (flush with the surface of the rope) immediately adjacent to the full tucks: this applies to both eye and short splices and all types of fiber rope.

a. For fiber ropes less than 1 in (2.5 cm) diameter, the tails shall project at least six rope diameters beyond the last full tuck.

b. For fiber ropes 1 in (2.5 cm) diameter and larger, the tails shall project at least 6 in (15.2 cm) beyond the last full tuck.

In applications where the projecting tails may be objectionable, the tails shall be tapered and spliced into the body of the rope using at least two additional tucks (which will require a tail length of approximately six rope diameters beyond the last full tuck).

15.D.06 For all eye splices, the eye shall be sufficiently large to provide an included angle of not greater than 60° at the splice when the eye is placed over the load or support.

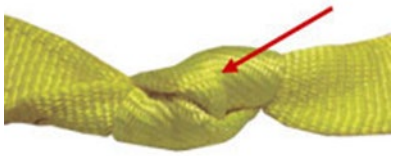
15.D.07 Knots shall not be used in lieu of splices.

15.E SLINGS

15.E.01 Slings and their fittings and fastenings shall be inspected before use on each shift and as necessary during use.

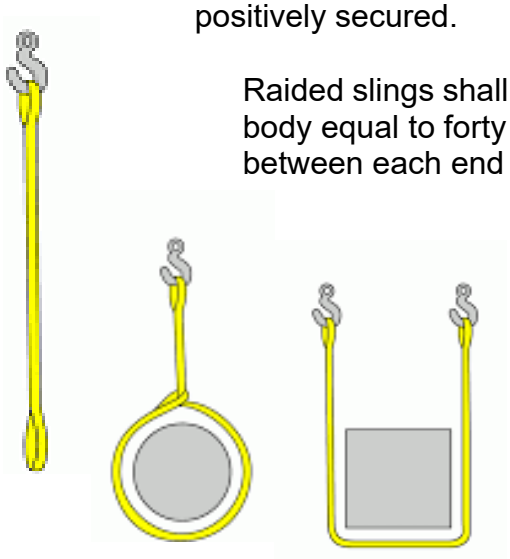
15.E.02 Protection shall be provided between the sling and sharp unyielding surfaces of the load to be lifted.

15.E.03 Never tie a knot in a sling. This compromises the strength of the sling by as much as 50%.



15.E.04 The use of slings will be such that the entire load is positively secured.

Raided slings shall have a minimum clear length of braided body equal to forty times the diameter of component ropes between each end fitting or eye splice.



8,000 lbs – Vertical
7,040 lbs – Choker
17,600 lbs - Basket

FIGURE 21-4

SLING CONFIGURATIONS

15.E.05 Welded alloy steel chain slings shall have affixed durable permanent identification stating size, grade, rated capacity, and sling manufacturer.

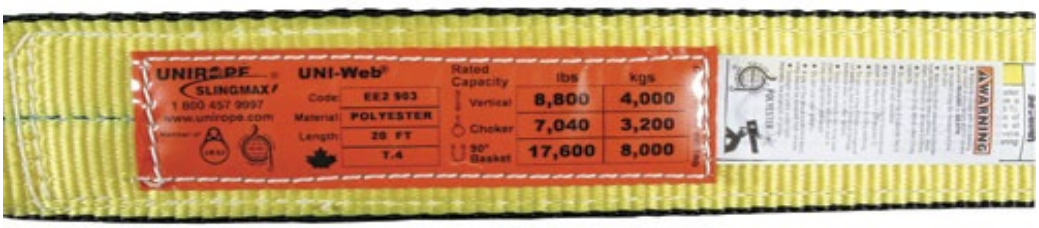
15.E.06 Wire rope slings shall have affixed a durable permanent identification tag stating the diameter, rated load, lifting capacity in vertical, choker, basket configuration, and date placed in service.

15.E.07 The employer shall have each synthetic web sling marked or coded to show:

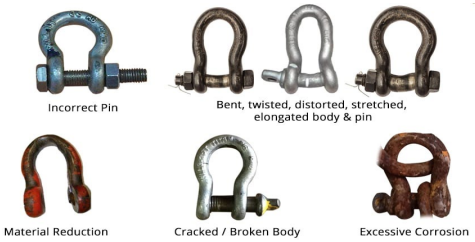
a. Name or trademark of the manufacturer,

b. Rated capacities for the type of hitch, and

c. Type of material.



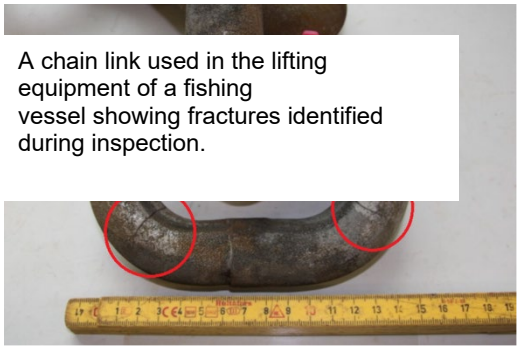
RIGGING **HARDWARE**



15.E.08 Drums, sheaves, and pulleys shall be smooth and free of surface defects that may damage rigging.

15.E.09 The ratio between the diameter of the rigging and the drum, block, sheave, or pulley tread diameter shall be such that the rigging will adjust itself to the bend without excessive wear, deformation, or damage.

15.E.10 In no case will the safe diameters of drums, blocks, sheaves, or pulleys be reduced in replacement of such items unless compensating changes are made in terms of the rigging used and the safe loading limits.



A chain link used in the lifting equipment of a fishing vessel showing fractures identified during inspection.

15.E.11 Drums, sheaves, or pulleys having eccentric bores, cracked hubs, spokes, or flanges shall be removed from service.

15.E.12 Connections, fittings, fastenings, and attachments used with rigging shall be of decent quality, of proper size and strength, and shall be installed in accordance with recommendations of the manufacturer.

Shackles.

a. Table 15-2 shall be used to determine the safe working loads of many sizes of shackles, except that higher safe working loads are permissible when allowed by the manufacturer if a safety factor of at least five is maintained. Only marked shackles shall be used.

b. Shackles shall not be eccentrically loaded.

TABLE 21-2

SAFE WORKING LOADS FOR SHACKLES

Material size (in/cm)	Pin diameter (in/cm)	Safe working load (lb/kg)
1/2 (1.2 cm)	5/8 (1.5 cm)	2,800 (1,270 kg)
5/8 (1.5 cm)	3/4 (1.9 cm)	4,409 (2,000 kg)
3/4 (1.9 cm)	7/8 (2.2 cm)	6,393 (2,900 kg)
7/8 (2.2 cm)	1 (2.5 cm)	8,598 (3,900 kg)
1 (2.5 cm)	1 1/8 (2.8 cm)	11,199 (5,080 kg)
1 1/8 (2.8 cm)	1 1/4 (3.1 cm)	13,404 (6,080 kg)
1 1/4 (3.1 cm)	1 3/8 (3.4 cm)	16,424 (7,450 kg)
1 3/8 (3.4 cm)	1 1/2 (3.8 cm)	20,018 (9,080 kg)
1 1/2 (3.8 cm)	1 5/8 (4.1 cm)	23,810 (10,800 kg)
1 3/4 (4.3 cm)	2 (5 cm)	32,407 (14,700 kg)
2 (5 cm)	2 1/4 (5.5 cm)	42.549 (19,300 kg)

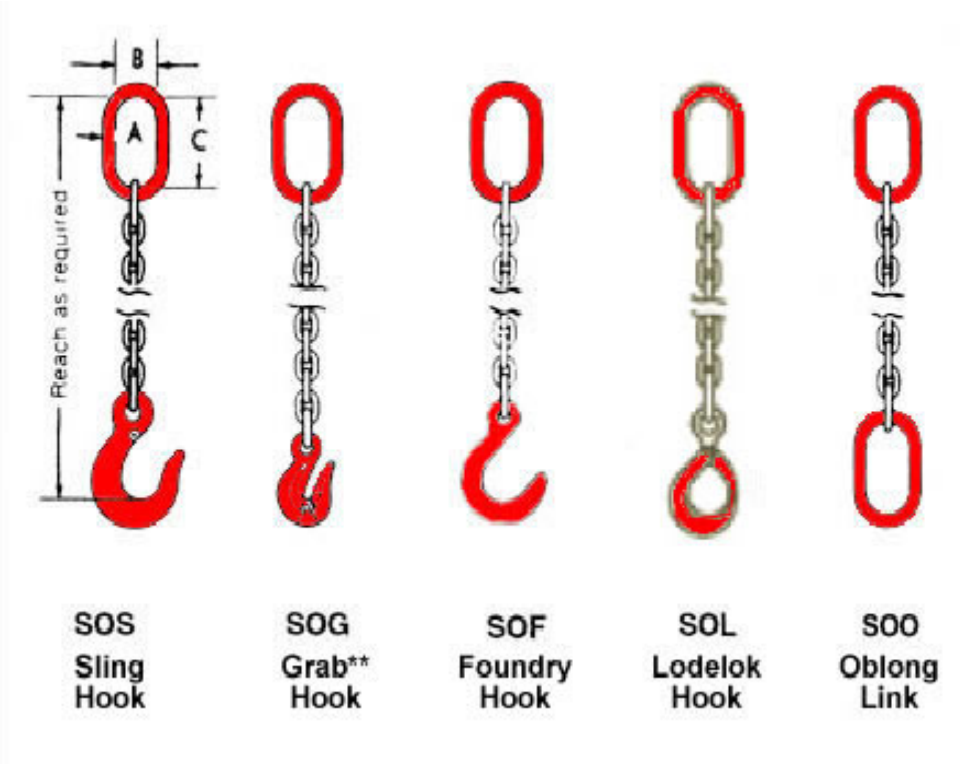
15.E.13 Hooks.

a. The manufacturer's recommendations shall be followed by determining the safe working loads of the many sizes and types of specific and identifiable hooks. Any hook for which the manufacturer's recommendations are not available shall be tested to twice the intended safe working load before it is put into use. The employer shall maintain a record of the dates and

results of such tests.

b. Open hooks are prohibited in rigging used to hoist loads.

c. Hoisting hooks rated at 10 tons (9,072 kg) or larger shall be provided with a means for safe handling.



15.E.14 Drums.

a. Drums should have sufficient rope capacity with recommended rope size and reeving to perform all hoisting and lowering functions.

b. At least three full wraps (not layers) of rope shall always remain on the drum.

c. The drum end of the rope shall be anchored by a clamp securely attached to the drum with an arrangement approved by the manufacturer.

d. Grooved drums shall have the correct groove pitch for the diameter of the rope. The depth of the groove shall be correct for the diameter of the rope.

(1) The flanges on grooved drums shall project beyond the last layer of rope either 2 in (5 cm) or twice the diameter of the rope, whichever is greater.

(2) The flanges on ungrooved drums shall project beyond the last layer of rope either 2 1/2 in (6.3 cm) or twice the diameter of the rope, whichever is greater.

15.E.15 Sheaves.

a. Sheaves shall be compatible with the size of rope used, as specified by the manufacturer.

b. Sheaves shall be inspected to ensure they are of correct size, properly aligned, lubricated, and in good condition.

c. When rope is subject to riding or jumping off a sheave, the sheave shall be equipped with cable-keepers.

21.E.16 Eye bolts.

a. Shoulderless eye bolts shall not be loaded at an angle.

b. Eye bolts shall only be loaded in the plain of the eye and shall not be loaded at angles of less than 45° to the horizontal.