Subchapter 7. General Industry Safety Orders
Group 13. Cranes and Other Hoisting Equipment
Article 101. Slings

CONTENTS

§5040. Scope:

This Article applies to slings used in conjunction with material handling equipment for the movement of material by hoisting. The types of slings covered are those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three strand construction), and synthetic web (nylon, polyester, and polypropylene).

EXCEPTION: Slings made from materials other than those detailed in this section shall be used only in accordance with the manufacturer's recommendations.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New Article 101 (Sections 5040-5049) filed 2-6-76; effective thirtieth day thereafter (Register 76, No. 6).

2. Amendment filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

§5041. Definitions:

Angle of Loading. Inclination of a leg or branch of a sling may be measured from the horizontal or vertical plane as shown in Figure S-5. When angle of loading is less than 5 degrees from the vertical, the load may be considered a vertical load.

Basket Hitch. A sling configuration whereby the sling is passed under the load and has both ends, end attachments, eyes or handles on the hook or a single master link.

Braided Wire Rope. A rope formed by plaiting component wire ropes.

Braided Wire Rope Sling. A sling made from braided rope.

Bridle Wire Rope Sling. A sling composed of multiple legs with the top ends gathered in a fitting that goes over the lifting hook.

Cable Body Endless Sling, Mechanical Joint. A wire rope sling made endless from one continuous length of cable laid rope with the ends joined by one or more metallic fittings.

Cable Laid Grommet, Hand Tucked. An endless wire rope sling made from one continuous length of rope formed to make a body composed of 6 ropes around a rope core. The rope ends are hand tucked into the body thus forming the core. No sleeves are used.

Cable Laid Rope. A wire rope composed of 6 ropes laid as strands with a rope core.

Cable Laid Rope Sling, Mechanical Joint. A wire rope sling made from a cable laid wire rope with eyes fabricated by pressing or swaging one or more metal sleeves over the rope junction.

Choker Hitch. A sling configuration with one end of the sling passing under the load and through an end attachment, handle or eye on the other end of the sling.

Coatings. Elastomers or other suitable material applied to a sling to impart desirable properties.

Cross Rod. A wire used to join spirals of metal mesh to form the complete fabric. (See Figure S-3).

Equivalent Entity. A person or organization (including an employer) which, by possession of equipment, technical knowledge and skills, can perform with equal competence the same repairs and tests as the person or organization with which it is equated.

Fabric (Metal Mesh). The flexible portion of the sling consisting of a series of transverse coils and cross rods and exclusive of terminal fittings. (See Figure S-3).

Fabric Length (Metal Mesh). Length of the fabric measured between the extreme ends of the spiral loops. (See Figure S-2).

Fabric Thickness (Metal Mesh). The fabric thickness shall be the nominal overall thickness of the spirals. (See Figure S-3).

Handle. A terminal fitting to which metal mesh fabric is attached. This terminal fitting may be either a male handle (triangle) or female handle (choker). (See Figure S-2).

Handle Eye. An opening in the handle shaped to accept a hook, shackle or other lifting device.

Handle, Female (Choker). A terminal fitting containing a handle eye and a slot. The slot shall be of such a dimension as to permit passage of the male handle and thereby allow use of the sling in a choker hitch.

Handle, Male (Triangle). The standard terminal fitting without a choker slot.

Hitch, Basket. Loading with sling passed under the load with both ends, end attachments, eyes, or handles on the hook or a single master link.

Hitch, Choker. Loading with sling passed through one end attachment, eye or handle and suspended by the other.

Hitch, Vertical. Loading with the sling vertical. Load suspended on a single part or leg.

Link, Master Coupling. Alloy steel welded coupling link used as an intermediate link to join alloy steel chain to master links. (See Figure S-1).

Link, Master (Gathering Ring). Forged or welded steel link used to support all members (legs) of an alloy steel chain or wire rope sling. (See Figure S-1).

Link, Mechanical Coupling (Alloy Steel Chain). A non-welded, mechanically closed link used primarily to attach master links, hooks, etc. to running length alloy steel chain.

Proof Load. The specific load applied in performance of the proof test.

Proof Test. A nondestructive tension test made by the sling manufacturer or equivalent entity to verify construction and workmanship of the individual sling.

Rated Capacity (Working Load Limit). The maximum allowable working load established by the sling manufacturer and permitted by the provisions of this Article.

Reach (Alloy Steel Chain). Effective length of an alloy steel chain sling measured from the top bearing surface of the master link to the bearing surface in the base (Bowl) of the hook.

Selvage Edge. Finished edge of synthetic webbing to prevent unraveling.

Sling Manufacturer. A person or company assembling sling components into their final form for actual use. The sling manufacturer and the manufacturer of the sling material (Alloy steel chains, wire rope, metal mesh webbing, fiber rope or synthetic webbing) may or may not be identical.

Spiral. A single transverse coil that is the basic element from which metal mesh is fabricated.

Strand Laid Endless Sling, Mechanical Joint. A wire rope sling made endless from one continuous length of rope with the ends joined by one or more metallic fittings.

Strand Laid Grommet, Hand Tucked. An endless wire rope sling made from one continuous length of strand formed to make a 6 strand rope with a strand core. The strand ends are hand tucked into the body. No sleeves are used.

Strand Laid Rope. A wire rope made with strands (usually 6 or 8) formed around a fiber core, wire strand core, or independent wire rope core (IWRC).

Strength, Minimum Breaking. Minimum load at which the sling will break when loaded to destruction in direct tension.

Strength, Nominal Breaking. Load at which the sling could be expected to break when loaded to destruction in direct tension.

Tagline. A restraining line to control position of the load.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

§5042. Safe Operating Practices:

(a) Whenever any sling is used, the following practices shall be enforced:

(1) Slings that are damaged or defective shall not be used.

(2) Chain or wire rope slings shall not be shortened with knots or bolts or other makeshift devices.

(3) Slings shall not be kinked, or knotted.

(4) Slings shall not be loaded in excess of their rated capacities as prescribed by the sling manufacturer on the identification markings permanently affixed to the sling.

(5) Slings used in a basket hitch shall have the loads balanced to prevent slippage.

(6) Slings shall be set to avoid slippage.

(7) Slings shall be padded or protected from the sharp edges of their loads.

(8) Suspended loads shall be kept clear of all obstructions.

(9) All employees shall be kept clear of loads about to be lifted and of suspended loads. (See Section 5002).

(10) Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.

(11) Shock loading is prohibited.

(12) A sling shall not be pulled from under a load when the load is resting on the sling and damage to the sling may result.

(13) Tables S-1 and S-2 shall be used to determine the maximum safe working loads of various sizes of wrought iron and alloy steel chains and chain slings, except that higher safe working loads are permissible when recommended by the manufacturer for specific, identifiable products. Proof coil steel chain, also known as common or hardware chain, or other chain not recommended for slinging or hoisting by the manufacturer, shall not be used for hoisting purposes.

(14) Wrought iron chains in constant use shall be annealed or normalized at intervals not exceeding 6 months when recommended by the manufacturer. The chain manufacturer shall be consulted for recommended procedures for annealing or normalizing. Alloy chains shall not be annealed.

(15) Employers shall not use slings without affixed and legible identification markings.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of subsection (a)(3) filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Editorial correction of subsection (a)(3) (Register 2010, No. 34).

3. Amendment of subsection (a)(4) and new subsection (a)(15) filed 1-18-2012; operative 1-18-2012 pursuant to Labor Code section 142.3(a)(4)(C). Submitted to OAL for printing only pursuant to Labor Code section 142.3(a)(3) (Register 2012, No. 3).

§5043. Inspections:

Each day before being used, the sling and all fastenings and attachments shall be inspected for damage or defects by a qualified person. Additional inspections shall be performed during sling use, where service conditions warrant. Damaged or defective slings shall be immediately removed from service.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

§5044. Alloy Steel Chain Slings:

(a) Sling Identification.

Alloy steel chain slings shall have permanently affixed and legible markings as prescribed by the manufacturer that indicate the recommended safe working load for the type(s) of hitch(es) used, the angle upon which it is based, and the number of legs if more than one.

(b) Attachments.

(1) 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 alloy steel chain with which they are used or the sling shall not be used in excess of the rated capacity of the weakest component.

(2) Makeshift links or fasteners formed from bolts or rods, or other such attachments, shall not be used.

(c) Inspections.

(1) In addition to the inspection required by Section 5043 of this Article, a thorough periodic inspection of alloy steel chain slings in use shall be made on a regular basis, to be determined on the basis of:

(A) Frequency of sling use;

(B) Severity of service conditions;

(C) Nature of lifts being made; and

(D) Experience gained on the service life of slings used in similar circumstances.

Such inspections shall in no event be at intervals greater than once every 12 months.

(2) Each employer shall make and maintain, for the service life of the sling, a record of the most recent month in which each alloy steel chain sling was thoroughly inspected, and shall make such record available for examination by the Division upon request.

(3) The thorough inspection of alloy steel chain slings shall be performed by a qualified person designated by the employer, and shall include a thorough inspection for wear, defective welds, deformation and increase in link length. Where such defects or deterioration reduce the rated capacity the sling shall be immediately removed from service.

(d) Proof Testing. The employer shall ensure that before use, each new, repaired, or reconditioned alloy steel chain sling, including all welded components in the sling assembly, shall be proof tested in accordance with the sling manufacturer's recommendations. The employer shall retain a certificate of the proof test, for the service life of the sling, and shall make it available for examination by the Division upon request.

Minimum proof loads for alloy steel chain shall be equal to twice the working load limit values shown for single slings.

(e) Sling Use.

Alloy steel chain slings shall not be used with loads in excess of the rated capacities prescribed in Table S-1. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

(f) Safe Operating Temperatures. Alloy steel chain slings shall be permanently removed from service if they are heated above 1000o F. When exposed to service temperatures in excess of 600o F, maximum working load limits permitted in Table S-

1 shall be reduced in accordance with the chain or sling manufacturer's recommendations.

(g) Repairing and Reconditioning Alloy Steel Chain Slings.

(1) Worn or damaged alloy steel chain slings or attachments shall not be used until repaired. When alloy steel chain slings are repaired or reconditioned and welding or heat treating is involved, such slings shall be proof tested by the manufacturer or equivalent entity.

(2) Mechanical coupling links or low carbon steel repair links shall not be used to repair broken lengths of chain.

(h) Effects of Wear. If the chain size at any point of any links is less than that stated in Table S-1a, the sling shall be removed from service.

(i) Deformed Attachments.

(1) Alloy steel chain slings with cracked or deformed master links, coupling links or other components shall be removed from service.

(2) Slings shall be removed from service if hooks are cracked, have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of subsection (c)(2), (d) and (e) filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect amending subsections (d) and (e) filed 4-13-2004 pursuant to section 100, title 1, California Code of Regulations (Register 2004, No. 16).

3. Amendment of subsections (a) and (f) filed 1-18-2012; operative 1-18-2012 pursuant to Labor Code section 142.3(a)(4)(C). Submitted to OAL for printing only pursuant to Labor Code section 142.3(a)(3) (Register 2012, No. 3).

§5045. Wire Rope Slings:

(a) Sling Use. Wire rope slings shall not be used with loads in excess of the rated capacities shown in Tables S-3 through S-14.

Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

(b) Minimum Sling Lengths.

(1) Cable laid and 6 x 19 and 6 x 37 slings shall have a minimum clear length of wire rope 10 times the component rope diameter between splices, sleeves or end fittings.

(2) Braided slings shall have a minimum clear length of wire rope 40 times the component rope diameter between the loops or end fittings.

(3) Cable laid grommets, strand laid grommets and endless slings shall have a minimum circumferential length of 96 times their body diameter.

(c) Safe Operating Temperatures. Fiber core wire rope slings of all grades shall be permanently removed from service if they are exposed to temperatures in excess of 200o F. When nonfiber core wire rope slings of any grade are used at temperatures above 400o F, or below minus 60o F, the sling manufacturer's recommendations shall be followed.

(d) End Attachments.

(1) Welding of end attachments, except covers to thimbles, shall be performed prior to the assembly of the sling.

(2) A prototype of each welded end attachment shall be proof tested by the manufacturer or equivalent entity to check the design and welding method at twice the

rated capacity before production is started. Subsequent tests of random samples shall be made. The manufacturer or equivalent entity shall provide a certificate of such tests which the employer shall retain and make available for examination by the Division upon request.

(3) Where rope clip attachments are used, they shall be made with U-bolts on the dead or short end of the rope and the saddle on the live end. The minimum number of clips for end attachments shall be not less than indicated in manufacturer's tables, but in no case shall be less than three for any permanent installation. Clips shall be drop-forged steel. The clips shall be spaced at a distance equal to at least six times the diameter of the rope. All clip or clamp bolts shall be kept tight after tightening while rope is under tension.

(e) Removal from Service.

Wire rope slings shall be immediately removed from service if any of the following conditions are present:

(1) Six randomly distributed broken wires in one rope lay, or 3 broken wires in one strand in one rope lay.

(2) Wear or scraping of one-third the original diameter of outside individual wires.

(3) Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure.

(4) Evidence of heat damage.

(5) End attachments that are cracked, deformed or worn to the point where the rated capacity is reduced.

(6) Hooks that have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.

(7) Corrosion that is of such severity or extent as to reduce the rated load capacity of the rope or end attachment.

(8) One or more broken wires within one rope lay of the end attachments.

(f) Knots. Eyes in wire rope slings shall not be formed by using knots.

(g) Employers must ensure that wire rope and wire-rope slings:

(1) Have permanently affixed and legible identification markings as prescribed by the manufacturer, and that indicate the recommended safe working load for the type(s) of hitch(es) used, the angle upon which it is based, and the number of legs if more than one; and

(2) Not be used without affixed and legible identification markings as required by subsection (g)(1) of this section.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of subsections (a), (c), (d)(2) and new subsection (e)(8) filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. New subsections (g)-(g)(2) filed 1-18-2012; operative 1-18-2012 pursuant to Labor Code section 142.3(a)(4)(C). Submitted to OAL for printing only pursuant to Labor Code section 142.3(a)(3) (Register 2012, No. 3)

§5046. Metal Mesh Slings:

(a) Sling Marking. Each metal mesh sling shall have permanently affixed durable identification stating the following:

(1) Manufacturer's name or trademark.

(2) Rated capacity in vertical basket hitch and choker hitch.

(b) Handles. Handles shall have a rated capacity at least equal to the metal fabric and exhibit no deformation after proof testing.

(c) Attachments of Handles to Fabric. The fabric and handles shall be joined so that:

(1) The rated capacity of the sling is not reduced.

(2) The load is evenly distributed across the width of the fabric.

(3) Sharp edges will not damage the fabric.

(d) Sling Coatings. Coatings which diminish the rated capacity of a sling shall not be applied.

(e) Sling Testing. All new and repaired metal mesh slings, including handles, shall not be used unless proof tested by the manufacturer or equivalent entity at a minimum of 1 1/2 times their rated capacity. Elastomer impregnated slings shall be proof tested before coating.

(f) Proper Use of Metal Mesh Slings. Metal mesh slings shall not be used to lift loads in excess of their rated capacities as prescribed in Table S-17. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

(g) Safe Operating Temperatures. Metal mesh slings which are not impregnated with elastomers may be used in a temperature range from minus 20o F. to plus 550o F.without decreasing the working load limit. Metal mesh slings impregnated with polyvinyl chloride or neoprene may be used only in a temperature range from zero degrees to plus 200o F. For operations outside these temperature ranges or for metal mesh slings impregnated with other materials, the sling manufacturer's recommendations shall be followed.

(h) Repairs.

(1) Metal mesh slings which are repaired shall not be used unless repaired by a metal mesh sling manufacturer or an equivalent entity.

(2) Once repaired, each sling shall be permanently marked or tagged, or a written record maintained, to indicate the date and nature of the repairs and the person or organization that performed the repairs. Records of repairs shall be made available for examination by the Division upon request.

(i) Removal From Service. Metal mesh slings shall be immediately removed from service if any of the following conditions are present:

(1) A broken weld or broken brazed joint along the sling edge.

(2) Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.

(3) Lack of flexibility due to distortion of the fabric.

(4) Distortion of the female handle so that the depth of the slot is increased more than 10 percent.

(5) Distortion of either handle so that the width of the eye is decreased more than 10 percent.

(6) A 15 percent reduction of the original cross sectional area of metal at any point around the handle eye.

(7) Distortion of either handle out of its plane.

NOTE

Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of subsection (f) and (h)(2) filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect amending subsection (f) filed 4-13-2004 pursuant to section 100, title 1, California Code of Regulations (Register 2004, No. 16).

§5047. Natural and Synthetic Fiber Rope Slings:

(a) Sling Use.

(1) Fiber rope slings made from conventional three strand construction fiber rope shall not be used with loads in excess of the rated capacities prescribed in Tables S-18 through S-21.

(2) Fiber rope slings shall have a diameter of curvature meeting at least the minimums specified in Figures S-4 and S-5.

(3) Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

(4) Natural and synthetic fiber rope slings shall not be used for suspending personnel platforms.

(b) Safe Operating Temperatures. Natural and synthetic fiber rope slings, except for wet frozen slings, may be used in a temperature range from minus 20o F to plus 180o F without decreasing the working load limit. For operations outside this temperature range and for wet frozen slings, the sling manufacturer's recommendations shall be followed.

(c) Splicing. Spliced fiber rope slings shall not be used unless they have been spliced in accordance with the following minimum requirements and in accordance with any additional recommendations of the manufacturer:

(1) In manila rope, eye splices shall consist of at least three full tucks, and short splices shall consist of at least six full tucks, three on each side of the splice center line.

(2) In synthetic fiber rope, eye splices shall consist of at least four full tucks, and short splices shall consist of at least eight full tucks, four on each side of the center line.

(3) Strand end tails shall not be trimmed flush with the surface of the rope immediately adjacent to the full tucks. This applies to all types of fiber rope and both eye and short splices. For fiber rope under one inch in diameter, the tail shall project at least six rope diameters beyond the last full tuck. For fiber rope one inch in diameter and larger, the tail shall project at least six inches beyond the last full tuck. Where a projecting tail interferes with the use of the sling, the tail 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).

(4) Fiber rope slings shall have a minimum clear length of rope between eye splices equal to 10 times the rope diameter.

(5) Knots shall not be used in lieu of splices.

(6) Clamps not designed specifically for fiber ropes shall not be used for splicing.

(7) For all eye splices, the eye shall be of such size to provide an included angle of not greater than 60 degrees at the splice when the eye is placed over the load or support.

(d) End Attachments. Fiber rope slings shall not be used if end attachments in contact with the rope have sharp edges or projections.

(e) Removal from Service. Natural and synthetic fiber rope slings shall be immediately removed from service if any of the following conditions are present:

(1) Abnormal wear;

(2) Powdered fiber between strands;

(3) Broken or cut fibers;

(4) Variations in the size or roundness of strands;

(5) Discoloration or rotting;

(6) Distortion of hardware in the sling.

(f) Repairs. Repairs shall only be made by the manufacturer or equivalent entity. Only fiber rope slings made from new rope shall be used. Use of repaired or reconditioned fiber rope slings is prohibited.

(g) Employers must ensure that natural and synthetic fiber-rope slings:

(1) Have permanently affixed and legible identification markings as prescribed by the manufacturer, and that indicate the recommended safe working load for the type(s) of hitch(es) used, the angle upon which it is based, type of fiber material, and the number of legs if more than one; and

(2) Not be used without affixed and legible identification markings as required by subsection (g)(1) of this section.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of subsections (a)(3) and (f) filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. New subsection (a)(4) filed 4-24-2007; operative 5-24-2007 (Register 2007, No. 17).

3. New subsections (g)-(g)(2) filed 1-18-2012; operative 1-18-2012 pursuant to Labor Code section 142.3(a)(4)(C). Submitted to OAL for printing only pursuant to Labor Code section 142.3(a)(3) (Register 2012, No. 3).

§5048. Synthetic Web Slings:

(a) Sling Identification. Each sling shall be marked or coded to show the rated capacities for each type of hitch and type of synthetic web material.

(b) Webbing. Synthetic webbing shall be of uniform thickness and width and selvage edges shall not be split from the webbing's width.

(c) Fittings. Fittings shall be:

(1) Of a minimum breaking strength equal to that of the sling; and

(2) Free of all sharp edges that could in any way damage the webbing.

(d) Attachment of End Fittings to Webbing and Formation of Eyes.

Stitching shall be the only method used to attach end fittings to webbing and to form eyes. The thread shall be in an even pattern and contain a sufficient number of stitches to develop the full breaking strength of the sling.

(e) Sling Use. Synthetic web slings illustrated in Figure S-6 shall not be used with loads in excess of the rated capacities specified in Tables S-22 through S-24. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.

(f) Environmental Conditions. When synthetic web slings are used, the following precautions shall be taken:

(1) Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present.

(2) Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

(3) Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

(g) Safe Operating Temperatures. Synthetic web slings of polyester and nylon shall not be used at temperatures in excess of 180o F. Polypropylene web slings shall not be used at temperatures in excess of 150o F.

(h) Repairs.

(1) Synthetic web slings which are repaired shall not be used unless repaired by a sling manufacturer or an equivalent entity.

(2) The employer shall retain a certificate of proof test, for the service life of the sling, and make it available for examination by the Division upon request.

(3) Slings, including webbing and fittings, which have been repaired in a temporary manner shall not be used.

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

(1) Acid or caustic burns;

(2) Melting or charring of any part of the sling surface;

(3) Broken or worn stitches;

(4) Distortion of fittings;

(5) Snags, punctures, tears or cuts; or

(6) Those slings with other apparent defects shall be referred to the manufacturer or equivalent entity for determination of rated capacity and safety for continued use.

(j) Synthetic Web Sling Storage. Synthetic web slings shall be stored in an area or facility where they are not subject to heat above 150o F or exposed to direct sunlight.

(k) Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendation.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of subsections (e), (h)(2), (i)(6), (j) and new subsection (k) filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

§5049. Defective Hoist or Sling Hooks and Rings:

(a) Deformed or defective hooks or rings shall not be used.

(b) Deformed hooks or rings shall be replaced or repaired and reshaped under proper metallurgical control and proof tested.

(c) Annealing or normalizing shall be done only in accordance with the chain manufacturer's specifications.

(d) Hooks and shackles shall be used in accordance with manufacturer's recommendations.

(e) All hooks for which no applicable manufacturer's recommendations are available shall be tested to twice the intended safe working load before they are initially put into use. The employer shall maintain and keep readily available a certification record which includes the date of the test, the signature of the person who performed the test, and an identifier of the hook which was tested.

(f) Special custom design grabs, hooks, clamps, or other lifting accessories for such units as modular panels, prefabricated structures and similar materials, shall be marked to indicate the safe working loads and shall be proof-tested to 125 percent of the rated load prior to use.

(g) Shackles. Employers must ensure that shackles:

(1) Have permanently affixed and legible identification markings as prescribed by the manufacturer that indicate the recommended safe working load;

(2) Not be loaded in excess of its recommended safe working load as prescribed on the identification markings by the manufacturer; and

(3) Not be used without affixed and legible identification markings as required by subsection (g)(1) of this section.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1.New subsections (d) and (e) filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

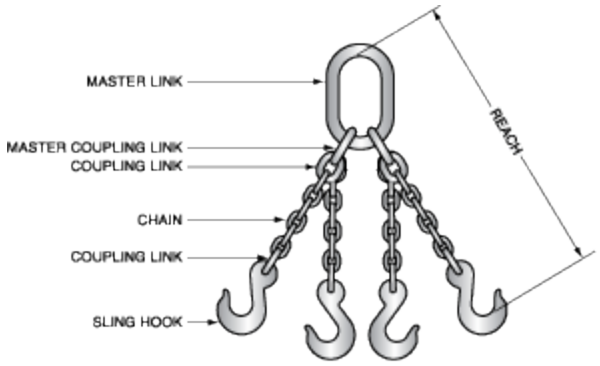
2. Relettering of former subsection (e) to subsection (f), and new subsection (e) filed 3-5-90; operative 4-4-90 (Register 90, No. 12).

3. Change without regulatory effect providing proper placement for History 2 filed 4-13-2004 pursuant to section 100, title 1, California Code of Regulations (Register 2004, No. 16).

4. New subsections (g)-(g)(3) filed 1-18-2012; operative 1-18-2012 pursuant to Labor Code section 142.3(a)(4)(C). Submitted to OAL for printing only pursuant to Labor Code section 142.3(a)(3) (Register 2012, No. 3).

Figure S-1

Major Components of a Quadruple Sling

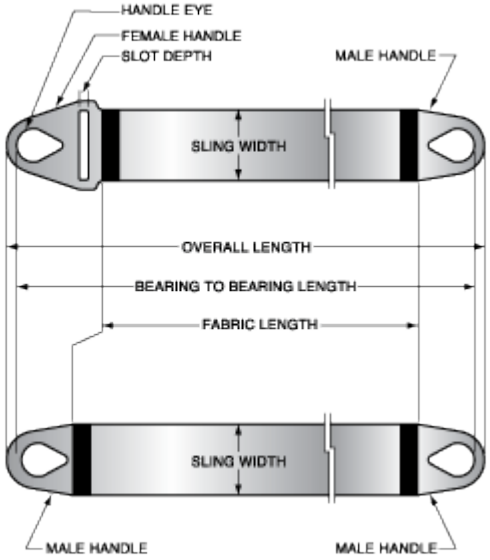


HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect providing more legible illustration for Figure S-1 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).

Figure S-2



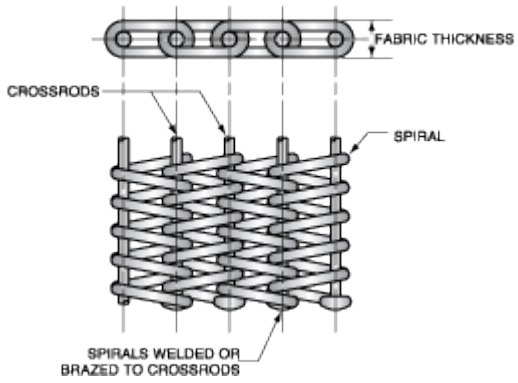
Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New Note filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect providing more legible illustration for Figure S-2 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).

Figure S-3



Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

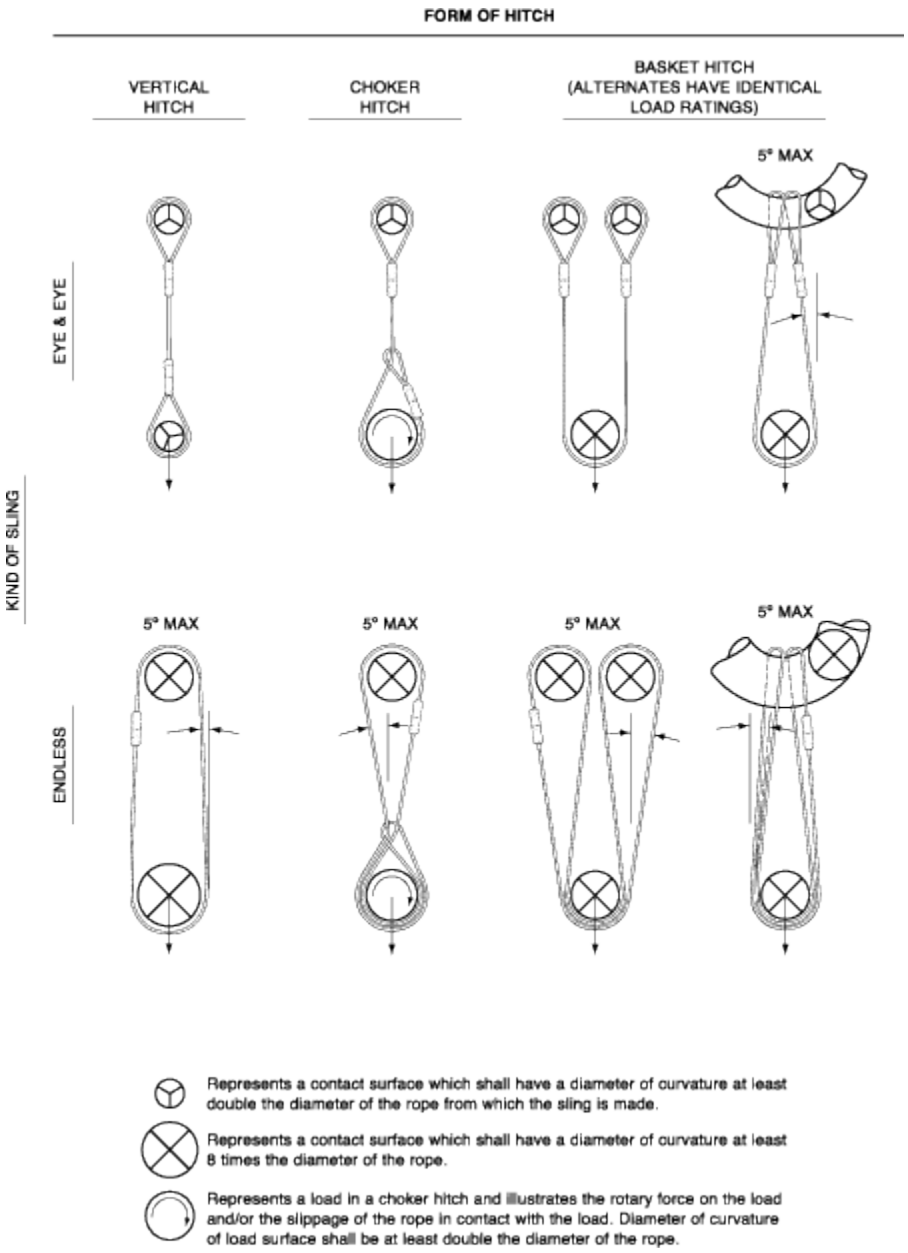
1. New Note filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect providing more legible illustration for Figure S-2 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).

Figure S-4

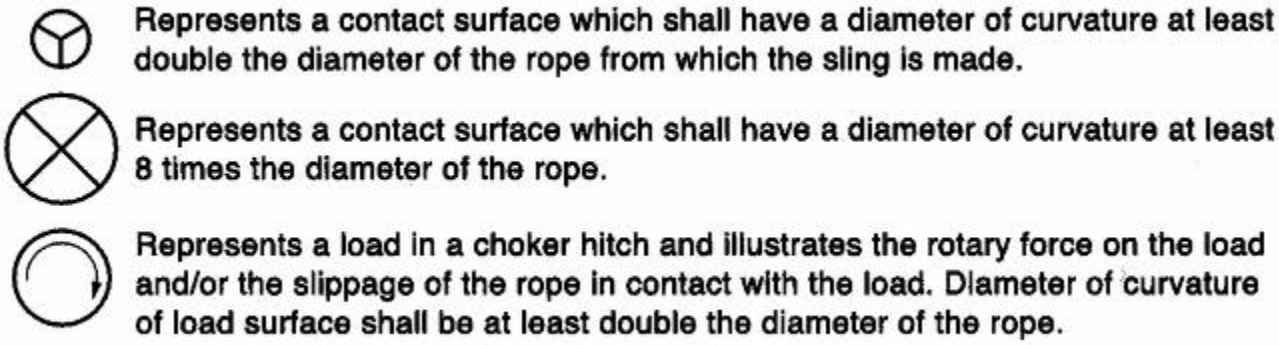
Basic Sling Configurations With Vertical Legs

NOTE: Note: Legs 5° or less from vertical may be considered vertical. For slings with legs more than 5° off vertical, the actual angle as shown, in Figure S-5, must be considered.



These symbols represent load or support surfaces in contact with the sling. For fiber rope slings, these surfaces have limitations as stated in Section 5047.

Explanation Of Symbols: Minimum Diameter Of Curvature



Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

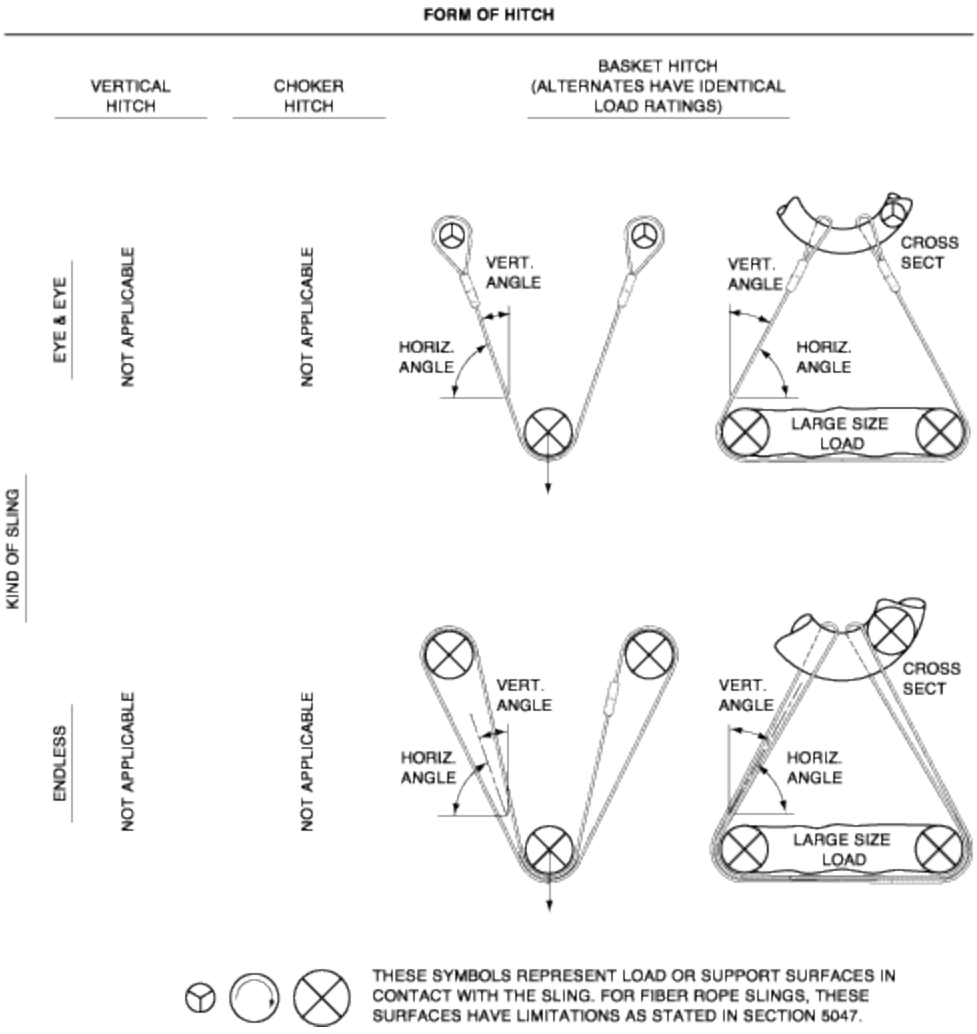
1. New Note filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect providing more legible illustration for Figure S-4 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).

Figure S-5

Sling Configurations With Angled Legs

Note: For vertical angles of 5° or less, refer to Figure S-4, "Basic Sling Configurations with Vertical Legs." The use of slings with vertical angles of more than 60° (horizontal angles less than 30°) is not recommended.

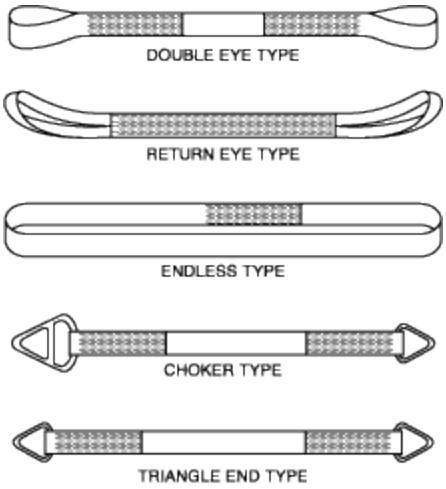


HISTORY

1. Change without regulatory effect providing more legible illustration for Figure S-5 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).

Figure S-6

Basic Synthetic Web Sling Construction



Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New Note filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect providing more legible illustration for Figure S-6 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).

Table S-1
Rated Capacity (Working Load Limit), for Alloy Steel Chain Slings*
Rated Capacity (Working Load Limit), Pounds
[Horizontal angles shown in parentheses]

Chain size, inches	Single branch sling-- 90 deg. loading	Double sling vertical angle (1) 30 deg. (60 deg.)	45 deg. (45 deg.)	60 deg. (30 deg.)
1/4	3,250	5,650	4,550	3,250
3/8	6,600	11,400	9,300	6,600
1/2	11,250	19,500	15,900	11,250
5/8	16,500	28,500	23,300	16,500
3/4	23,000	39,800	32,500	23,000

7/8.....	28,750	49,800	40,600	28,750
1.....	38,750	67,100	54,800	38,750
1 1/8...	44,500	77,000	63,000	44,500
1 1/4...	57,500	99,500	61,000	57,500
1 3/8...	67,000	116,000	94,000	67,000
1 1/2...	80,000	138,000	112,900	80,000
1 3/4...	100,000	172,000	140,000	100,000

TABLE S-1. -- RATED CAPACITY (WORKING LOAD LIMIT), FOR ALLOY STEEL CHAIN SLINGS (CONTINUED)

Rated Capacity (Working Load Limit), Pounds
[Horizontal angles shown in parentheses]

Chain size, inches	Triple and quadruple sling (3) vertical angle (1)		
	30 deg. (60 deg.)	45 deg. (45 deg.)	60 deg. (30 deg.)
1/4.....	8,400	6,800	4,900
3/8.....	17,000	14,000	9,900
1/2.....	29,000	24,000	17,000
5/8.....	43,000	35,000	24,500
3/4.....	59,500	48,500	34,500
7/8.....	74,500	61,000	43,000
1.....	101,000	82,000	58,000
1 1/8...	115,500	94,500	66,500
1 1/4...	149,000	121,500	86,000
1 3/8...	174,000	141,000	100,500
1 1/2...	207,000	169,000	119,500
1 3/4...	258,000	210,000	150,000

(1) Rating of multileg slings adjusted for angle of loading measured as the included angle between the inclined leg and the vertical as shown in Figure S-5.

(2) Rating of multileg slings adjusted for angle of loading between the inclined leg and the horizontal plane of the load, as shown in Figure S-5.

(3) Quadruple sling rating is same as triple sling because normal lifting practice may not distribute load uniformly to all 4 legs.

* Other grades of proof tested steel chain include Proof Coil, BBB Coil and Hi-Test Chain. These grades are not recommended for overhead lifting and therefore are not covered by this order.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

HISTORY

1. Editorial corrrection typesetting Table S-1a (Register 92, No. 33).

Table S-1a

Minimum Allowable Chain Size At Any Point of Link

Chain size, inches	Minimum allowable chain size, inches
1/4	13/64
3/8	19/64
1/2	25/64
5/8	31/64
3/4	19/32
7/8	45/64
1	13/16

1 1/8	29/32
1 1/4	1
1 3/8	1 3/32
1 1/2	1 3/16
1 3/4	1 13/32

Table S-2
Safe Working Loads for Wrought Iron Chain
(In Pounds or Tons of 2000 Pounds)

Nominal size chain (Stock inch)	***Single leg***	***Angles from the horizontal***		
		60-degree angle	***45-degree angle***	***30-degree angle***
1/4*	1060 Pounds	1835 Pounds	1500 Pounds	1060 Pounds
1/16*	1655	2865	2340	1655
3/8	2385	2.1 Tons	3370	2385
7/16*	3250	2.8	2.3 Tons	3250
1/2	2.1 Tons	3.7	3.0	2.1 Tons
3/16*	2.7	4.6	3.8	2.7
3/8	3.3	5.7	4.7	3.3
3/4	4.8	8.3	5.7	4.8
7/8	6.5	11.2	9.2	6.5
1	8.5	14.7	12.0	8.5
1 1/2	10.0	17.3	14.2	10.0
1 1/4	12.4	21.4	17.5	12.4
1 3/8	15.0	25.9	21.1	15.0
1 1/2	17.8	30.8	25.2	17.8
1 5/8	30.9	36.2	29.5	20.9
1 3/4	24.2	42.0	34.3	24.2
1 7/8	27.6	47.9	39.1	27.6

2	31.6	54.8	44.8	31.0

* These sizes of wrought iron chain are no longer manufactured in the United States. The source is ASTM A56-68, Specifications for Wrought Iron Crane Chain.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-3. - RATED CAPACITIES FOR SINGLE LEG SLINGS

6x19 and 6x37 Classification Improved Plow Steel Grade Rope With Fiber Core (FC)

Rope		Rated capacities, tons (2,000 lb)					
		Vertical			Choker		
Dia (inches)	Constr	HT	MS	S	HT	MS	S
1/4	6x19	0.49	0.51	0.55	0.37	0.38	0.41
5/16	6x19	0.76	0.79	0.85	0.57	0.59	0.64
3/8	6x19	1.1	1.1	1.2	0.80	0.85	0.91
7/16	6x19	1.4	1.5	1.6	1.1	1.1	1.2
1/2	6x19	1.8	2.0	2.1	1.4	1.5	1.6
9/16	6x19	2.3	2.5	2.7	1.7	1.9	2.0
5/8	6x19	2.8	3.1	3.3	2.1	2.3	2.5
3/4	6x19	3.9	4.4	4.8	2.9	3.3	3.6
7/8	6x19	5.1	5.9	6.4	3.9	4.5	4.8
1	6x19	6.7	7.7	8.4	5.0	5.8	6.3
1 1/8	6x19	8.4	9.5	10.0	6.3	7.1	7.9
1 1/4	6x37	9.8	11.0	12.0	7.4	8.3	9.2
1 3/8	6x37	12.0	13.0	15.0	8.9	10.0	11.0
1 1/2	6x37	14.0	16.0	17.0	10.0	12.0	13.0
1 5/8	6x37	16.0	18.0	21.0	12.0	14.0	15.0
1 3/4	6x37	19.0	21.0	24.0	14.0	16.0	18.0
2	6x37	25.0	28.0	31.0	18.0	21.0	23.0

TABLE S-3. - RATED CAPACITIES FOR SINGLE LEG SLINGS

(CONTINUED)

6x19 and 6x37 Classification Improved Plow Steel Grade Rope

With Fiber Core (FC)

Rope		Rated capacities, tons (2,000 lb)		
		Vertical Basket(1)		
Dia (inches)	Constr	HT	MS	S
1/4	6x19	0.99	1.0	1.1
5/16	6x19	1.5	1.6	1.7
3/8	6x19	2.1	2.2	2.4
7/16	6x19	2.9	3.0	3.3
1/2	6x19	3.7	3.9	4.3
9/16	6x19	4.6	5.0	5.4
5/8	6x19	5.6	6.2	6.7
3/4	6x19	7.8	8.8	9.5
7/8	6x19	10.0	12.0	13.0
1	6x19	13.0	15.0	17.0
1 1/8	6x19	17.0	19.0	21.0
1 1/4	6x37	20.0	22.0	25.0
1 3/8	6x37	24.0	27.0	30.0
1 1/2	6x37	28.0	32.0	35.0
1 5/8	6x37	33.0	37.0	41.0
1 3/4	6x37	38.0	43.0	48.0
2	6x37	49.0	55.0	62.0

HT = Hand Tucked Splice and Hidden Tuck Splice.

For hidden tuck splice (IWRC) use values in HT columns.

MS = Mechanical Splice

S = Swaged or Zinc Poured Socket

* These values only apply when the D/d ratio for HT slings is 10 or greater, and for MS and S slings is 20 or greater where:

D = Diameter of curvature around which the body of the sling is bent.

d = Diameter of rope.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-4. - RATED CAPACITIES FOR SINGLE LEG SLINGS

6x19 and 6x37 Classification Improved Plow Steel Grade Rope
With Independent Wire Rope Core (IWRC)

Rope		Rated capacities, tons (2,000 lb)					
		Vertical			Choker		
Dia (inches)	Constr	HT	MS	S	HT	MS	S
1/4	6x19	0.53	0.56	0.59	0.40	0.42	0.44
5/16	6x19	0.81	0.87	0.92	0.61	0.65	0.69
3/8	6x19	1.1	1.2	1.3	0.86	0.93	0.98
7/16	6x19	1.5	1.7	1.8	1.2	1.3	1.3
1/2	6x19	2.0	2.2	2.3	1.5	1.6	1.7
9/16	6x19	2.5	2.7	2.9	1.8	2.1	2.2
5/8	6x19	3.0	3.4	3.6	2.2	2.5	2.7
3/4	6x19	4.2	4.9	5.1	3.1	3.6	3.8
7/8	6x19	5.5	6.6	6.9	4.1	4.9	5.2
1	6x19	7.2	8.5	9.0	5.4	6.4	6.7
1 1/8	6x19	9.0	10.0	11.0	6.8	7.8	8.5
1 1/4	6x37	10.0	12.0	13.0	7.9	9.2	9.9
1 3/8	6x37	13.0	15.0	16.0	9.6	11.0	12.0
1 1/2	6x37	15.0	17.0	19.0	11.0	13.0	14.0
1 5/8	6x37	18.0	20.0	22.0	13.0	15.0	17.0
1 3/4	6x37	20.0	24.0	26.0	15.0	18.0	19.0
2	6x37	26.0	30.0	33.0	20.0	23.0	25.0

TABLE S-4. - RATED CAPACITIES FOR SINGLE LEG SLINGS

(CONTINUED)

6x19 and 6x37 Classification Improved Plow Steel Grade Rope
With Independent Wire Rope Core (IWRC)

Rope		Rated capacities, tons (2,000 lb)
Dia (inches)	Constr	Vertical Basket(1)

		HT	MS	S
1/4	6x19	1.0	1.1	1.2
5/16	6x19	1.6	1.7	1.8
3/8	6x19	2.3	2.5	2.6
7/16	6x19	3.1	3.4	3.5
1/2	6x19	3.9	4.4	4.6
9/16	6x19	4.9	5.5	5.8
5/8	6x19	6.0	6.8	7.2
3/4	6x19	8.4	9.7	10.0
7/8	6x19	11.0	13.0	14.0
1	6x19	14.0	17.0	18.0
1 1/8	6x19	18.0	21.0	23.0
1 1/4	6x37	21.0	24.0	26.0
1 3/8	6x37	25.0	29.0	32.0
1 1/2	6x37	30.0	35.0	38.0
1 5/8	6x37	35.0	41.0	44.0
1 3/4	6x37	41.0	47.0	51.0
2	6x37	53.0	61.0	66.0

HT = Hand Tucked Splice. For hidden tuck splice (IWRC) use Table I values in HT column.

MS = Mechanical Splice.

S = Swaged or Zinc Poured Socket.

* These values only apply when the D/d ratio for HT slings is 10 or greater, and for MS and S Slings is 20 or greater where:

D = Diameter of curvature around which the body of the sling is bent.

d = Diameter of rope.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-5. -- RATED CAPACITIES FOR SINGLE LEG SLINGS

Cable Laid Rope -- Mechanical Splice Only

7x7x7 & 7X7X19 Constructions Galvanized Aircraft Grade Rope

7x6x19 IWRC Construction Improved Plow Steel Grade Rope

Rope		Rated capacities, tons (2,000 lb)		
Dia (inches)	Constr	Vertical	Choker	Vertical basket(1)
1/4	7x7x7	0.50	0.38	1.0
3/8	7x7x7	1.1	0.81	2.0
1/2	7x7x7	1.8	1.4	3.7
5/8	7x7x7	2.8	2.1	5.5
3/4	7x7x7	3.8	2.9	7.6
5/8	7x7x19	2.9	2.2	5.8
3/4	7x7x19	4.1	3.0	8.1
7/8	7x7x19	5.4	4.0	11.0
1	7x7x19	6.9	5.1	14.0
1 1/8	7x7x19	8.2	6.2	16.0
1 1/4	7x7x19	9.9	7.4	20.0
3/4	7x6x19 IWRC	3.8	2.8	7.6
7/8	7x6x19 IWRC	5.0	3.8	10.0
1	7x6x19 IWRC	6.4	4.8	13.0
1 1/8	7x6x19 IWRC	7.7	5.8	15.0
1 1/4	7x6x19 IWRC	9.2	6.9	18.0
1 5/16	7x6x19 IWRC	10.0	7.5	20.0
1 3/8	7x6x19 IWRC	11.0	8.2	22.0
1 1/2	7x6x19 IWRC	13.0	9.6	26.0

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-6. -- RATED CAPACITIES FOR SINGLE LEG SLINGS

8-Part and 6-Part Braided Rope

6x7 and 6x19 Construction Improved Plow Steel Grade Rope

7x7 Construction Galvanized Aircraft Grade Rope

Component ropes		Rated capacities, tons (2,000 lb)		
Diameter (inches)	Constr	Vertical	Choker	Basket vertical to 30 deg.(1)

		8-Part	6-Part	8-Part	6-Part	8-Part	6-Part
3/32.....	6x7	0.42	0.32	0.32	0.24	0.74	0.55
1/8.....	6x7	0.76	0.57	0.57	0.42	1.3	0.98
3/16.....	6x7	1.7	1.3	1.3	0.94	2.9	2.2
3/32.....	7x7	0.51	0.39	0.38	0.29	0.89	0.67
1/8.....	7x7	0.95	0.71	0.71	0.53	1.6	1.2
3/16.....	7x7	2.1	1.5	1.5	1.2	3.6	2.7
3/16.....	6x19	1.7	1.3	1.3	0.98	3.0	2.2
1/4.....	6x19	3.1	2.3	2.3	1.7	5.3	4.0
5/16.....	6x19	4.8	3.6	3.6	2.7	8.3	6.2
3/8.....	6x19	6.8	5.1	5.1	3.8	12.0	8.9
7/16.....	6x19	9.3	6.9	6.9	5.2	16.0	12.0
1/2.....	6x19	12.0	9.0	9.0	6.7	21.0	15.0
9/16.....	6x19	15.0	11.0	11.0	8.5	26.0	20.0
5/8.....	6x19	19.0	14.0	14.0	10.0	32.0	24.0
3/4.....	6x19	27.0	20.0	20.0	15.0	46.0	35.0
7/8.....	6x19	36.0	27.0	27.0	20.0	62.0	47.0
1.....	6x19	47.0	35.0	35.0	26.0	81.0	61.0

* These values only apply when the D/d ratio is 20 or greater where:

D = Diameter of curvature around which the body of the sling is bent.

d = Diameter of component rope.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-7.-- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

6x19 and 6x37 Classification Improved Plow Steel Grade Rope With Fiber Core (FC)
[Horizontal angles shown in parentheses]

Rope	Rated capacities, tons (2,000 lb)
	2-Leg bridle slings

Dia [in.]	Constr	Vert 30 deg. Horz(60 deg.)		45 deg. angle		Vert 60 deg. Horz(30 deg.)	
		HT	MS	HT	MS	HT	MS
1/4	6x19	0.85	0.83	0.70	0.72	0.49	0.51
5/16	6x19	1.3	1.4	1.1	1.1	0.76	0.79
3/8	6x19	1.8	1.9	1.5	1.6	1.1	1.1
7/16	6x19	2.5	2.6	2.0	2.2	1.4	1.5
1/2	6x19	3.2	3.4	2.6	2.8	1.8	2.0
9/16	6x19	4.0	4.3	3.2	3.5	2.3	2.5
5/8	6x19	4.8	5.3	4.0	4.4	2.8	3.1
3/4	6x19	6.8	7.6	5.5	6.2	3.9	4.4
7/8	6x19	8.9	10.0	7.3	8.4	5.1	5.9
1	6x19	11.0	13.0	9.4	11.0	6.7	7.7
1 1/8	6x19	14.0	16.0	12.0	13.0	8.4	9.3
1 1/4	6x37	17.0	19.0	14.0	16.0	9.8	11.0
1 3/8	6x37	20.0	23.0	17.0	19.0	12.0	13.0
1 1/2	6x37	24.0	27.0	20.0	22.0	14.0	16.0
1 5/8	6x37	28.0	32.0	23.0	26.0	16.0	18.0
1 3/4	6x37	33.0	37.0	27.0	30.0	19.0	21.0
2	6x37	43.0	48.0	35.0	39.0	25.0	28.0

TABLE S-7.-- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

[Continued]

6x19 and 6x37 Classification Improved Plow Steel Grade Rope With Fiber Core (FC)
[Horizontal angles shown in parentheses]

Rope		Rated capacities, tons (2,000 lb)					
		3-Leg bridle slings					
Dia [in.]	Constr	Vert 30 deg. Horz(60 deg.)		45 deg. angle		Vert 60 deg. Horz(30 deg.)	
		HT	MS	HT	MS	HT	MS
1/4	6x19	1.3	1.3	1.0	1.1	0.74	0.76
5/16	6x19	2.0	2.0	1.6	1.7	1.1	1.2
3/8	6x19	2.8	2.9	2.3	2.4	1.6	1.7
7/16	6x19	3.7	4.0	3.0	3.2	2.1	2.3

1/2	6x19	4.8	5.1	3.9	4.2	2.8	3.0
9/16	6x19	6.0	6.5	4.9	5.3	3.4	3.7
5/8	6x19	7.3	8.0	5.9	6.5	4.2	4.6
3/4	6x19	10.0	11.0	8.3	9.3	5.8	6.6
7/8	6x19	13.0	15.0	11.0	13.0	7.7	8.9
1	6x19	17.0	20.0	14.0	16.0	10.0	11.0
1 1/8	6x19	22.0	24.0	18.0	20.0	13.0	14.0
1 1/4	6x37	25.0	29.0	21.0	23.0	15.0	17.0
1 3/8	6x37	31.0	35.0	25.0	28.0	18.0	20.0
1 1/2	6x37	36.0	41.0	30.0	33.0	21.0	24.0
1 5/8	6x37	43.0	48.0	35.0	39.0	25.0	28.0
1 3/4	6x37	49.0	56.0	40.0	45.0	28.0	32.0
2	6x37	64.0	72.0	52.0	59.0	37.0	41.0

HT = Hand Tucked Splice.

MS = Mechanical Splice.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-8.-- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

6x19 and 6x37 Classification Improved Plow Steel Grade Rope With Independent Wire Rope Core (IWRC)
[Horizontal angles shown in parentheses]

Rope		Rated capacities, tons (2,000 lb)					
		2-Leg bridle slings					
Dia [in.]	Constr	30 deg. (60 deg.)		45 deg. angle		60 deg. (30 deg.)	
		HT	MS	HT	MS	HT	MS
1/4	6x19	0.92	0.97	0.75	0.79	0.53	0.56

5/16	6x19	1.4	1.5	1.1	1.2	0.81	0.87
3/8	6x19	2.0	2.1	1.6	1.8	1.1	1.2
7/16	6x19	2.7	2.9	2.2	2.4	1.5	1.7
1/2	6x19	3.4	3.8	2.8	3.1	2.0	2.2
9/16	6x19	4.3	4.8	3.5	3.9	2.5	2.7
5/8	6x19	5.2	5.9	4.2	4.8	3.0	3.4
3/4	6x19	7.3	8.4	5.9	6.9	4.2	4.9
7/8	6x19	9.6	11.0	7.8	9.3	5.5	6.6
1	6x19	12.0	15.0	10.0	12.0	7.2	8.5
1 1/8	6x19	16.0	18.0	13.0	15.0	9.0	10.0
1 1/4	6x37	18.0	21.0	15.0	17.0	10.0	12.0
1 3/8	6x37	22.0	25.0	18.0	21.0	13.0	15.0
1 1/2	6x37	26.0	30.0	21.0	25.0	15.0	17.0
1 5/8	6x37	31.0	35.0	25.0	29.0	18.0	20.0
1 3/4	6x37	35.0	41.0	29.0	33.0	20.0	24.0
2	6x37	46.0	53.0	37.0	43.0	26.0	30.0

TABLE S-8.-- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

[Continued]

6x19 and 6x37 Classification Improved Plow Steel Grade Rope With Independent Wire Rope Core (IWRC)
[Horizontal angles shown in parentheses]

Rope		Rated capacities, tons (2,000 lb)					
		3-Leg bridle slings					
Dia [in.]	Constr	Vert 30 deg. Horz(60 deg.)		45 deg. angle		Vert 60 deg. Horz(30 deg.)	
		HT	MS	HT	MS	HT	MS
1/4	6x19	1.4	1.4	1.1	1.2	0.79	0.84
5/16	6x19	2.1	2.3	1.7	1.8	1.2	1.3
3/8	6x19	3.0	3.2	2.4	2.6	1.7	1.9
7/16	6x19	4.0	4.4	3.3	3.6	2.3	2.5
1/2	6x19	5.1	5.7	4.2	4.6	3.0	3.3
9/16	6x19	6.4	7.1	5.2	5.8	3.7	4.1
5/8	6x19	7.8	8.8	6.4	7.2	4.5	5.1
3/4	6x19	11.0	13.0	8.9	10.0	6.3	7.3
7/8	6x19	14.0	17.0	12.0	14.0	8.3	9.9
1	6x19	19.0	22.0	15.0	18.0	11.0	13.0
1 1/8	6x19	23.0	27.0	19.0	22.0	13.0	16.0
1 1/4	6x37	27.0	32.0	22.0	26.0	16.0	18.0
1 3/8	6x37	33.0	38.0	27.0	31.0	19.0	22.0

1 1/2	6x37	39.0	45.0	32.0	37.0	23.0	26.0
1 5/8	6x37	46.0	53.0	38.0	43.0	27.0	31.0
1 3/4	6x37	53.0	61.0	43.0	50.0	31.0	35.0
2	6x37	68.0	79.0	56.0	65.0	40.0	46.0

HT = Hand Tucked Splice.

MS = Mechanical Splice.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-9. -- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

Cable Laid Rope - Mechanical Splice Only

7x7x7 and 7x7x19 Construction Galvanized Aircraft Grade Rope
7x6x19 IWRC Construction Improved Plow Steel Grade Rope
[Horizontal angles shown in parenthesis]

Rope		Rated capacities, tons (2,000 lb)		
		2-Leg bridle slings		
Dia [in.]	Constr	V 30 deg. H(60 deg.)	45 deg. angle	V 60 deg. H(30 deg.)
1/4	7x7x7	0.87	0.71	0.50
3/8	7x7x7	1.9	1.5	1.1
1/2	7x7x7	3.2	2.6	1.8
5/8	7x7x7	4.8	3.9	2.8
3/4	7x7x7	6.6	5.4	3.8
5/8	7x7x19	5.0	4.1	2.9
3/4	7x7x19	7.0	5.7	4.1
7/8	7x7x19	9.3	7.6	5.4
1	7x7x19	12.0	9.7	6.9
1 1/8	7x7x19	14.0	12.0	8.2
1 1/4	7x7x19	17.0	14.0	9.9
3/4	7x6x19 IWRC.	6.6	5.4	3.8

7/8.....	7x6x19 IWRC.	8.7	7.1	5.0
1.....	7x6x19 IWRC.	11.0	9.0	6.4
1 1/8....	7x6x19 IWRC.	13.0	11.0	7.7
1 1/4....	7x6x19 IWRC.	16.0	13.0	9.2
1 5/16...	7x6x19 IWRC.	17.0	14.0	10.0
1 3/8....	7x6x19 IWRC.	19.0	15.0	11.0
1 1/2....	7x6x19 IWRC.	22.0	18.0	13.0

TABLE S-9. -- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

[Continued]

Cable Laid Rope - Mechanical Splice Only

7x7x7 and 7x7x19 Construction Galvanized Aircraft Grade Rope
7x6x19 IWRC Construction Improved Plow Steel Grade Rope
[Horizontal angles shown in parenthesis]

Rope		Rated capacities, tons (2,000 lb)		
		3-Leg bridle slings		
Dia [in.]	Constr	V 30 deg. H(60 deg.)	45 deg. angle	V 60 deg. H(30 deg.)
1/4.....	7x7x7	1.3	1.1	0.75
3/8.....	7x7x7.....	2.8	2.3	1.6
1/2.....	7x7x7.....	4.8	3.9	2.8
5/8.....	7x7x7.....	7.2	5.9	4.2
3/4.....	7x7x7.....	9.9	8.1	3.7
5/8.....	7x7x19.....	7.5	6.1	4.3
3/4.....	7x7x19.....	10.0	8.6	6.1
7/8.....	7x7x19.....	14.0	11.0	8.1
1.....	7x7x19.....	18.0	14.0	10.0
1 1/8....	7x7x19.....	21.0	17.0	12.0
1 1/4....	7x7x19.....	26.0	21.0	15.0
3/4.....	7x6x19 IWRC.	9.9	8.0	5.7
7/8.....	7x6x19 IWRC.	13.0	11.0	7.5
1.....	7x6x19 IWRC.	17.0	13.0	9.6
1 1/8....	7x6x19 IWRC.	20.0	16.0	11.0
1 1/4....	7x6x19 IWRC.	24.0	20.0	14.0
1 5/16...	7x6x19 IWRC.	26.0	21.0	15.0
1 3/8....	7x6x19 IWRC.	28.0	23.0	16.0
1 1/2....	7x6x19 IWRC.	33.0	27.0	19.0

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-10. -- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

8-Part and 6-Part Braided Rope
6x7 and 6x19 Construction Improved Plow Steel Grade Rope
7x7 Construction Galvanized Aircraft Grade Rope
[Horizontal angles shown in parentheses]

Rope		Rated capacities, tons (2,000 lb)					
		2-Leg bridle sling					
Dia (in.)	Constr	Vert 30 deg Horz (60 deg)		45 deg angle		Vert 60 deg Horz (30 deg)	
		8-Part	6-Part	8-Part	6-Part	8-Part	6-Part
3/32	6x7	0.74	0.55	0.60	0.45	0.42	0.32
1/8	6x7	1.3	0.98	1.1	0.80	0.76	0.57
3/16	6x7	2.9	2.2	2.4	1.8	1.7	1.3
3/32	7x7	0.89	0.67	0.72	0.55	0.51	0.39
1/8	7x7	1.6	1.2	1.3	1.0	0.95	0.71
3/16	7x7	3.6	2.7	2.9	2.2	2.1	1.5
3/16	6x19	3.0	2.2	2.4	1.8	1.7	1.3
1/4	6x19	5.3	4.0	4.3	3.2	3.1	2.3
5/16	6x19	8.3	6.2	6.7	5.0	4.8	3.6
3/8	6x19	12.0	8.9	9.7	7.2	6.8	5.1
7/16	6x19	16.0	12.0	13.0	9.8	9.3	6.9
1/2	6x19	21.0	15.0	17.0	13.0	12.0	9.0
9/16	6x19	26.0	20.0	21.0	16.0	15.0	11.0
5/8	6x19	32.0	24.0	26.0	20.0	19.0	14.0
3/4	6x19	46.0	35.0	38.0	28.0	27.0	20.0
7/8	6x19	62.0	47.0	51.0	38.0	36.0	27.0
1	6x19	81.0	61.0	66.0	50.0	47.0	35.0

TABLE S-10. -- RATED CAPACITIES FOR 2-LEG AND 3-LEG BRIDLE SLINGS

[Continued]

8-Part and 6-Part Braided Rope
6x7 and 6x19 Construction Improved Plow Steel Grade Rope
7x7 Construction Galvanized Aircraft Grade Rope
[Horizontal angles shown in parentheses]

Rope		Rated capacities, tons (2,000 lb)					
		3-Leg bridle sling					
Dia (in.)	Constr	Vert 30 deg Horz 60 deg		45 deg angle		Vert 60 deg Horz 30 deg	
		8-Part	6-Part	8-Part	6-Part	8-Part	6-Part
3/32	6x7	1.1	0.83	0.90	0.68	0.64	0.48
1/8	6x7	2.0	1.5	1.6	1.2	1.1	0.85
3/16	6x7	4.4	3.3	3.6	2.7	2.5	1.9
3/32	7x7	1.3	1.0	1.1	0.82	0.77	0.58
1/8	7x7	2.5	1.8	2.0	1.5	1.4	1.1
3/16	7x7	5.4	4.0	4.4	3.3	3.1	2.3
3/16	6x19	4.5	3.4	3.7	2.8	2.6	1.9
1/4	6x19	8.0	6.0	6.5	4.9	4.6	3.4
5/16	6x19	12.0	9.3	10.0	7.6	7.1	5.4
3/8	6x19	18.0	13.0	14.0	11.0	10.0	7.7
7/16	6x19	24.0	18.0	20.0	15.0	14.0	10.0
1/2	6x19	31.0	23.0	25.0	19.0	18.0	13.0
9/16	6x19	39.0	29.0	32.0	24.0	23.0	17.0
5/8	6x19	48.0	36.0	40.0	30.0	28.0	21.0
3/4	6x19	69.0	52.0	56.0	42.0	40.0	30.0
7/8	6x19	94.0	70.0	76.0	57.0	54.0	40.0
1	6x19	122.0	91.0	99.0	74.0	70.0	53.0

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Rated Capacities for Strand Laid Grommet Hand Tucked Improved Plow Steel Grade Rope

TABLE S-11. -- RATED CAPACITIES FOR STRAND LAID GROMMET

-- HAND TUCKED

Improved Plow Steel Grade Rope

Rope body		Rated capacities, tons (2,000 lb)		
				
Dia (inches)	Constr	Vertical	Choker	Vertical basket(1)
1/4	7x19	0.85	0.64	1.7
5/16	7x19	1.3	1.0	2.6
3/8	7x19	1.9	1.4	3.8
7/16	7x19	2.6	1.9	5.2
1/2	7x19	3.3	2.5	6.7
9/16	7x19	4.2	3.1	8.4
5/8	7x19	5.2	3.9	10.0
3/4	7x19	7.4	5.6	15.0
7/8	7x19	10.0	7.5	20.0

1	7x19	13.0	9.7	26.0
1 1/8	7x19	16.0	12.0	32.0
1 1/4	7x37	18.0	14.0	37.0
1 3/8	7x37	22.0	16.0	44.0
1 1/2	7x37	26.0	19.0	52.0

* These values only apply when the D/d ratio is 5 or greater where:D = Diameter of curvature around which rope is bent.d = Diameter of rope body.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-12. -- RATED CAPACITIES FOR CABLE LAID GROMMET -- HAND TUCKED

7x6x7 and 7x6x19 Constructions Improved Plow Steel Grade Rope
7x7x7 Construction Galvanized Aircraft Grade Rope

Cable body		Rated capacities, tons (2,000 lb)		
				
Dia (inches)	Constr	Vertical	Choker	Vertical basket(1)
3/8	7x6x7	1.3	0.95	2.5
9/16	7x6x7	2.8	2.1	5.6
5/8	7x6x7	3.8	2.8	7.6
3/8	7x7x7	1.6	1.2	3.2
9/16	7x7x7	3.5	2.6	6.9
5/8	7x7x7	4.5	3.4	9.0
5/8	7x6x19	3.9	3.0	7.9
3/4	7x6x19	5.1	3.8	10.0

15/16	7x6x19	7.9	5.9	16.0
1 1/8	7x6x19	11.0	8.4	22.0
1 5/16	7x6x19	15.0	11.0	30.0
1 1/2	7x6x19	19.0	14.0	39.0
1 11/16	7x6x19	24.0	18.0	49.0
1 7/8	7x6x19	30.0	22.0	60.0
2 1/4	7x6x19	42.0	31.0	84.0
2 5/8	7x6x19	56.0	42.0	112.0

* These values only apply when the D/d ratio is 5 or greater where: D = Diameter of curvature around which cable body is bent.d = Diameter of cable body.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-13. -- RATED CAPACITIES FOR STRAND LAID ENDLESS SLINGS -- MECHANICAL JOINT

Improved Plow Steel Grade Rope

Rope body		Rated capacities, tons (2,000 lb)		
				
Dia (inches)	Constr	Vertical	Choker	Vertical basket(1)
1/4	(2)6x19	0.92	0.69	1.8
3/8	(2)6x19	2.0	1.5	4.1
1/2	(2)6x19	3.6	2.7	7.2
5/8	(2)6x19	5.6	4.2	11.0
3/4	(2)6x19	8.0	6.0	16.0
7/8	(2)6x19	11.0	8.1	21.0
1	(2)6x19	14.0	10.0	28.0
1 1/8	(2)6x19	18.0	13.0	35.0
1 1/4	(2)6x37	21.0	15.0	41.0
1 3/8	(2)6x37	25.0	19.0	50.0
1 1/2	(2)6x37	29.0	22.0	59.0

* These values only apply when the D/d ratio is 5 or greater where: D = Diameter of curvature around which rope is bent. d = Diameter of rope body.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

TABLE S-14. -- RATED CAPACITIES FOR CABLE LAID ENDLESS SLINGS -- MECHANICAL JOINT

7x7x7 and 7x7x19 Constructions Galvanized Aircraft Grade Rope
7x6x19 Construction Improved Plow Steel Grade Rope

Cable body		Rated capacities, tons (2,000 lb)		
				
Dia (inches)	Constr	Vertical	Choker	Vertical basket(1)
1/4	7x7x7	0.83	0.62	1.6
3/8	7x7x7	1.8	1.3	3.5
1/2	7x7x7	3.0	2.3	6.1
5/8	7x7x7	4.5	3.4	9.1
3/4	7x7x7	6.3	4.7	12.0
5/8	7x7x19	4.7	3.5	9.5
3/4	7x7x19	6.7	5.0	13.0
7/8	7x7x19	8.9	6.6	18.0
1	7x7x19	11.0	8.5	22.0
1 1/8	7x7x19	14.0	10.0	28.0
1 1/4	7x7x19	17.0	12.0	33.0
3/4	(2)7x6x19	6.2	4.7	12.0
7/8	(2)7x6x19	8.3	6.2	16.0
1	(2)7x6x19	10.0	7.9	21.0
1 1/8	(2)7x6x19	13.0	9.7	26.0
1 1/4	(2)7x6x19	16.0	12.0	31.0
1 3/8	(2)7x6x19	18.0	14.0	37.0
1 1/2	(2)7x6x19	22.0	16.0	43.0

* These values only apply when the D/d value is 5 or greater where:D = Diameter of curvature around which cable body is bent.d = Diameter of cable body.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-15

Type	***Classification***	***Designation***
Heavy Duty	Carbon Steel Stainless Steel	35-CS 35-SS
Medium Duty	Carbon Steel Stainless Steel	43-CS 43-SS
Light Duty	Carbon Steel Stainless Steel	59-CS 59-SS

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-16
Fabric Construction

	Heavy Duty	***Medium Duty***	***Light Duty***
Nominal Spiral Turns per foot of Sling Width	35	43	59
Spiral Wire Size USSWG	10 Ga. (0.135 in.)	12 Ga. (0.103 in.)	14 Ga. (0.080 in.)
Nominal Cross Rods per foot of Fabric Lenght	21	30	38
Size of Cross Rods USSWG	10 Ga. (0.135 in.)	12 Ga. (0.103 in.)	14 Ga. (0.080 in.)
Nominal Fabric Thinkness	1/2 in.	3/8 in.	3/16 in.

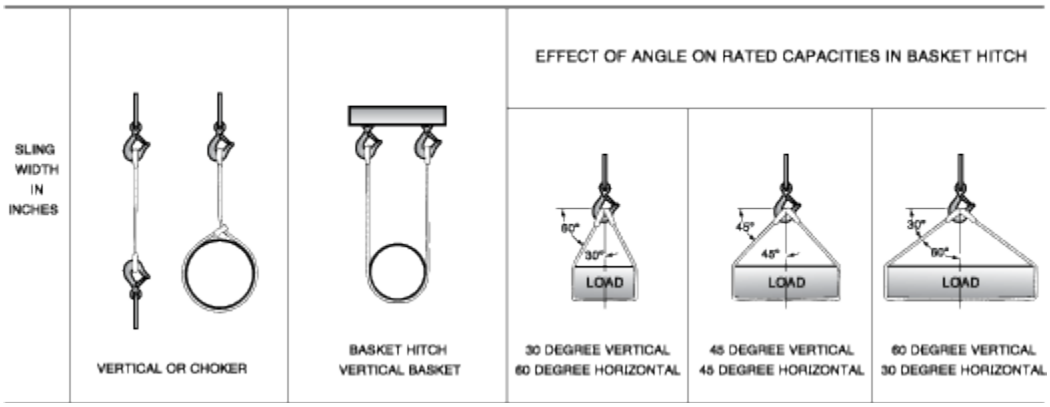
NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-17

Rated Capacities (Lb) Carbon Steel and Stainless Steel Metal Mesh Slings



35--CS and 35--SS

2	1,500	3,000	2,600	2,100	1,500
3	2,700	5,400	4,700	3,800	2,700
4	4,000	8,000	6,900	5,600	4,000
6	6,000	12,000	10,400	8,400	6,000
8	8,000	16,000	13,800	11,300	8,000
10	10,000	20,000	17,000	14,100	10,000
12	12,000	24,000	20,700	16,900	12,000
14	14,000	28,000	24,200	19,700	14,000
16	16,000	32,000	27,700	22,600	16,000
18	18,000	36,000	31,100	25,400	18,000
20	20,000	40,000	34,600	28,200	20,000

43--CS and 43--SS

2	1,350	2,700	2,300	1,900	1,400
3	2,000	4,000	3,500	2,800	2,000
4	2,700	5,400	4,700	3,800	2,700

6	4,500	9,000	7,800	6,400	4,500
8	6,000	12,000	10,400	8,500	6,000
10	7,500	15,000	13,000	10,600	7,500
12	9,000	18,000	15,600	12,700	9,000
14	10,500	21,000	18,200	14,800	10,500
16	12,000	24,000	20,800	17,000	12,000
18	13,500	27,000	23,400	19,100	13,500
20	15,000	30,000	26,000	21,200	15,000

59--CS and 59--SS

2	900	1,800	1,600	1,300	900
3	1,400	2,800	2,400	2,000	1,400
4	2,000	4,000	3,500	2,800	2,000
6	3,000	6,000	5,200	4,200	3,000
8	4,000	8,000	6,900	5,700	4,000
10	5,000	10,000	8,600	7,100	5,000
12	6,000	12,000	10,400	8,500	6,000
14	7,000	14,000	12,100	9,900	7,000
16	8,000	16,000	13,900	11,300	8,000
18	9,000	18,000	15,600	12,700	9,000
20	10,000	20,000	17,300	14,100	10,000

See tables S-15 and S-16 for designation and fabric construction.

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New Note filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect providing more legible illustration for Table S-17 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).

Table S-18 Manila Rope Slings

			Eye and eye sling			
Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Vertical hitch	Choker hitch	Basket hitch; Angel of rope to horizontal		
				90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)

1/2	7.5	480	240	960	830	680	480
9/16	10.4	620	310	1,240	1,070	875	620
5/8	13.3	790	395	1,580	1,370	1,120	790
3/4	16.7	970	485	1,940	1,680	1,370	970
13/16	19.5	1,170	585	2,340	2,030	1,650	1,170
7/8	22.5	1,390	695	2,780	2,410	1,970	1,390
1	27.0	1,620	810	3,240	2,810	2,290	1,620
1 1/16	31.3	1,890	945	3,780	3,270	2,670	1,890
1 1/8	36.0	2,160	1,080	4,320	3,740	3,050	2,160
1 1/4	41.7	2,430	1,220	4,860	4,210	3,440	2,430
1 5/16	47.9	2,700	1,350	5,400	4,680	3,820	2,700
1 1/2	59.9	3,330	1,670	6,660	5,770	4,710	3,330
1 5/8	74.6	4,050	2,030	8,100	7,010	5,730	4,050
1 3/4	89.3	4,770	2,390	9,540	8,260	6,740	4,770
2	107.5	5,580	2,790	11,200	9,660	7,890	5,580
2 1/8	125.0	6,480	3,240	13,000	11,200	9,160	6,480
2 1/4	146.0	7,380	3,690	14,800	12,800	10,400	7,380
2 1/2	166.7	8,370	4,190	16,700	14,500	11,800	8,370
2 5/8	190.8	9,360	4,680	18,700	16,200	13,200	9,360

TABLE S-18. -- MANILA ROPE SLINGS
[Continued]

Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Endless sling					
		Vertical hitch	Choker hitch	Basket hitch; Angel of rope to horizontal			
				90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)
1/2	7.5	865	430	1,730	1,500	1,220	865
9/16	10.4	1,120	560	2,230	1,930	1,580	1,120
5/8	13.3	1,420	710	2,840	2,460	2,010	1,420
3/4	16.7	1,750	875	3,490	3,020	2,470	1,750
13/16	19.5	2,110	1,050	4,210	3,650	2,980	2,110
7/8	22.5	2,500	1,250	5,000	4,330	3,540	2,500

1	27.0	2,920	1,460	5,830	5,050	4,120	2,920
1 1/16	31.3	3,400	1,700	6,800	5,890	4,810	3,400
1 1/8	36.0	3,890	1,940	7,780	6,730	5,500	3,890
1 1/4	41.7	4,370	2,190	8,750	7,580	6,190	4,370
1 5/16	47.9	4,860	2,430	9,720	8,420	6,870	4,860
1 1/2	59.9	5,990	3,000	12,000	10,400	8,480	5,990
1 5/8	74.6	7,290	3,650	14,600	12,600	10,300	7,290
1 3/4	89.3	8,590	4,290	17,200	14,900	12,100	8,590
2	107.5	10,000	5,020	20,100	17,400	14,200	10,000
2 1/8	125.0	11,700	5,830	23,300	20,200	16,500	11,700
2 1/4	146.0	13,300	6,640	26,600	23,000	18,800	13,300
2 1/2	166.7	15,100	7,530	30,100	26,100	21,300	15,100
2 5/8	190.8	16,800	8,420	33,700	29,200	23,800	16,800

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-19 Nylon Rope Slings

Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Eye and eye sling					
		Vertical hitch	Choker hitch	Basket hitch; Angel of rope to horizontal			
				90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)
1/2	6.5	635	320	1,270	1,100	900	635
9/16	8.3	790	395	1,580	1,370	1,120	790
5/8	10.5	1,030	515	2,060	1,780	1,460	1,030
3/4	14.5	1,410	705	2,820	2,440	1,990	1,410

13/16	17.0	1,680	840	3,360	2,910	2,380	1,680
7/8	20.0	1,980	990	3,960	3,430	2,800	1,980
1	26.0	2,480	1,240	4,960	4,300	3,510	2,480
1 1/16	29.0	2,850	1,430	5,700	4,940	4,030	2,850
1 1/8	34.0	3,270	1,640	6,540	5,660	4,620	3,270
1 1/4	40.0	3,710	1,860	7,420	6,430	5,250	3,710
1 5/16	45.0	4,260	2,130	8,520	7,380	6,020	4,260
1 1/2	55.0	5,250	2,630	10,500	9,090	7,420	5,250
1 5/8	68.0	6,440	3,220	12,900	11,200	9,110	6,440
1 3/4	83.0	7,720	3,860	15,400	13,400	10,900	7,720
2	95.0	9,110	4,560	18,200	15,800	12,900	9,110
2 1/8	109.0	10,500	5,250	21,000	18,200	14,800	10,500
2 1/4	129.0	12,400	6,200	24,800	21,500	17,500	12,400
2 1/2	149.0	13,900	6,950	27,800	24,100	19,700	13,900
2 5/8	168.0	16,000	8,000	32,000	27,700	22,600	16,000

TABLE S-19. -- NYLON ROPE SLINGS
[Continued]

[Angle of rope to vertical shown in parentheses]

Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Endless sling					
		Vertical hitch	Choker hitch	Basket hitch; Angel of rope to horizontal			
				90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)
1/2	6.5	1,140	570	2,290	1,980	1,620	1,140
9/16	8.3	1,420	710	2,840	2,460	2,010	1.420
5/8	10.5	1,850	925	3,710	3,210	2,620	1,850
3/4	14.5	2,540	1,270	5,080	4,400	3,590	2,540
13/16	17.0	3,020	1,510	6,050	5,240	4,280	3,020
7/8	20.0	3,560	1,780	7,130	6,170	5,040	3,560
1	26.0	4,460	2,230	8,930	7,730	6,310	4,460
1 1/16	29.0	5,130	2,570	10,300	8,890	7,260	5,130
1 1/8	34.0	5,890	2,940	11,800	10,200	8,330	5,890

1 1/4	40.0	6,680	3,340	13,400	11,600	9,450	6,680
1 5/16	45.0	7,670	3,830	15,300	13,300	10,800	7,670
1 1/2	55.0	9,450	4,730	18,900	16,400	13,400	9,450
1 5/8	68.0	11,600	5,800	23,200	20,100	16,400	11,600
1 3/4	83.0	13,900	6,950	27,800	24,100	19,700	13,900
2	95.0	16,400	8,200	32,800	28,400	23,200	16,400
2 1/8	109.0	18,900	9,450	37,800	32,700	26,700	18,900
2 1/4	129.0	22,300	11,200	44,600	38,700	31,600	22,300
2 1/2	149.0	25,000	12,500	50,000	43,300	35,400	25,000
2 5/8	168.0	28,800	14,400	57,600	49,900	40,700	28,800

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-20 Polyester Rope Slings

Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Eye and eye sling					
		Vertical hitch	Choker hitch	Basket hitch; Angel of rope to horizontal			
				90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)
1/2	8.0	635	320	1,270	1,100	900	635
9/16	10.2	790	395	1,580	1,370	1,120	790
5/8	13.0	990	495	1,980	1,710	1,400	990
3/4	17.5	1,240	620	2,480	2,150	1,750	1,240
13/16	21.0	1,540	770	3,080	2,670	2,180	1,540
7/8	25.0	1,780	890	3,560	3,080	2,520	1,780
1	30.5	2,180	1,090	4,360	3,780	3,080	2,180
1 1/16	34.5	2,530	1,270	5,060	4,380	3,580	2,530
1 1/8	40.0	2,920	1,460	5,840	5,060	4,130	2,920

1 1/4	46.3	3,290	1,650	6,580	5,700	4,650	3,290
1 5/16	52.5	3,710	1,860	7,420	6,430	5,250	3,710
1 1/2	66.8	4,630	2,320	9,260	8,020	6,550	4,630
1 5/8	82.0	5,640	2,820	11,300	9,770	7,980	5,640
1 3/4	98.0	6,710	3,360	13,400	11,600	9,490	6,710
2	118.0	7,920	3,960	15,800	13,700	11,200	7,920
2 1/8	135.0	9,110	4,460	18,200	15,800	12,900	9,110
2 1/4	157.0	10,600	5,300	21,200	18,400	15,000	10,600
2 1/2	181.0	12,100	6,050	24,200	21,000	17,100	12,100
2 5/8	205.0	13,600	6,800	27,200	23,600	19,200	13,600

TABLE S-20. -- POLYESTER ROPE SLINGS
[Continued]

[Angle of rope to vertical shown in parentheses]

Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Endless sling					
		Vertical hitch	Choker hitch	Basket hitch; Angel of rope to horizontal			
				90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)
1/2	8.0	1,140	570	2,290	1,980	1,620	1,140
9/16	10.2	1,420	710	2,840	2,460	2,010	1,420
5/8	13.0	1,780	890	3,570	3,090	2,520	1,780
3/4	17.5	2,230	1,120	4,470	3,870	3,160	2,230
13/16	21.0	2,770	1,390	5,540	4,800	3,920	2,770
7/8	25.0	3,200	1,600	6,410	5,550	4,530	3,200
1	30.5	3,920	2,960	7,850	6,800	5,550	3,920
1 1/16	34.5	4,550	2,280	9,110	7,990	6,440	4,550
1 1/8	40.0	5,260	2,630	10,500	9,100	7,440	5,260
1 1/4	46.3	5,920	2,960	11,800	10,300	8,380	5,920
1 5/16	52.5	6,680	3,340	13,400	11,600	9,450	6,680
1 1/2	66.8	8,330	4,170	16,700	14,400	11,800	8,330

1 5/8	82.0	10,200	5,080	20,300	17,600	14,400	10,200
1 3/4	98.0	12,100	6,040	24,200	20,900	17,100	12,100
2	118.0	14,300	7,130	28,500	24,700	20,200	14,300
2 1/8	135.0	16,400	8,200	32,800	28,400	23,200	16,400
2 1/4	157.0	19,100	9,540	38,200	33,100	27,000	19,100
2 1/2	181.0	21,800	10,900	43,600	37,700	30,800	21,800
2 5/8	205.0	24,500	12,200	49,000	42,400	34,600	24,500

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-21 Polypropylene Rope Slings

Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Eye and eye sling: Vertical hitch	Eye and eye sling: Choker hitch	Eye and eye sling: Basket hitch; Angel of rope to horizontal: 90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)
1/2	4.7	645	325	1,290	1,120	910	645
9/16	6.1	780	390	1,560	1,350	1,100	780
5/8	7.5	950	475	1,900	1,650	1,340	950
3/4	10.7	1,300	650	2,600	2,250	1,840	1,300
13/16	12.7	1,520	760	3,040	2,630	2,150	1,520
7/8	15.0	1,760	880	3,520	3,050	2,490	1,760
1	18.0	2,140	1,070	4,280	3,700	3,030	2,140
1 1/16	20.4	2,450	1,230	4,900	4,240	3,460	2,450
1 1/8	23.7	2,800	1,400	5,600	4,850	3,960	2,800
1 1/4	27.0	3,210	1,610	6,420	5,560	4,540	3,210

1 5/16	30.5	3,600	1,800	7,200	6,240	5,090	3,600
1 1/2	38.5	4,540	2,270	9,080	7,860	6,420	4,540
1 5/8	47.5	5,510	2,760	11,000	9,540	7,790	5,510
1 3/4	57.0	6,580	3,290	13,200	11,400	9,300	6,580
2	69.0	7,960	3,980	15,900	13,800	11,300	7,960
2 1/8	80.0	9,330	4,670	18,700	16,200	13,200	9,330
2 1/4	92.0	10,600	5,300	21,200	18,400	15,000	10,600
2 1/2	107.0	12,200	6,100	24,400	21,100	17,300	12,200
2 5/8	120.0	13,800	6,900	27,600	23,900	19,600	13,800

TABLE S-21. -- POLYPROPYLENE ROPE SLINGS
[Continued]

[Angle of rope to vertical shown in parentheses]

Rope dia. nominal in inches	Nominal wt. per 100 ft in pounds	Endless sling					
		Vertical hitch	Choker hitch	Basket hitch; Angel of rope to horizontal			
				90 deg (0 deg)	60 deg (30 deg)	45 deg (45 deg)	30 deg (60 deg)
1/2	4.7	1,160	580	2,320	2,010	1,640	1,160
9/16	6.1	1,400	700	2,810	2,430	1,990	1,400
5/8	7.5	1,710	855	3,420	2,960	2,420	1,710
3/4	10.7	2,340	1,170	4,680	4,050	3,310	2,340
13/16	12.7	2,740	1,370	5,470	4,740	3,870	2,740
7/8	15.0	3,170	1,580	6,340	5,490	4,480	3,170
1	18.0	3,850	1,930	7,700	6,670	5,450	3,860
1 1/16	20.4	4,410	2,210	8,820	7,640	6,240	4,410
1 1/8	23.7	5,040	2,520	10,100	8,730	7,130	5,040
1 1/4	27.0	5,780	2,890	11,600	10,000	8,170	5,780
1 5/16	30.5	6,480	3,240	13,000	11,200	9,170	6,480
1 1/2	38.5	8,170	4,090	16,300	14,200	11,600	8,170
1 5/8	47.5	9,920	4,960	19,800	17,200	14,000	9,920

1 3/4	57.0	11,800	5,920	23,700	20,500	16,800	11,800
2	69.0	14,300	7,160	28,700	24,800	20,300	14,300
2 1/8	80.0	16,800	8,400	33,600	29,100	23,800	16,800
2 1/4	92.0	19,100	9,540	38,200	33,100	27,000	19,100
2 1/2	107.0	22,000	11,000	43,900	38,000	31,100	22,000
2 5/8	120.0	24,800	12,400	49,700	43,000	35,100	24,800

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-22

Rated Capacity in Pounds Synthetic Web Slings 1,000 Lbs. Per Inch of Width Single Ply

Sling body width, inches	Triangle -- Choker slings, type I: Triangle -- Triangle slings, type II: Eye and eye with flat eye slings, type III: Eye and eye with twisted eye slings, type IV					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	1,000	750	2,000	1,700	1,400	1,000
2	2,000	1,500	4,000	3,500	2,800	2,000
3	3,000	2,200	6,000	5,200	4,200	3,000
4	4,000	3,000	8,000	6,900	5,700	4,000
5	5,000	3,700	10,000	8,700	7,100	5,000
6	6,000	4,500	12,000	10,400	8,500	6,000

TABLE S-22. -- SYNTHETIC WEB SLINGS
-- 1,000 Pounds per Inch of Width
-- Single-Ply

[Rated capacity in pounds]

(Continued)

Sling body width, inches	Endless slings, type V					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	1,600	1,300	3,200	2,800	2,300	1,600
2	3,200	2,600	6,400	5,500	4,500	3,200
3	4,800	3,800	9,600	8,300	6,800	4,800
4	6,400	5,100	12,800	11,100	9,000	6,400
5	8,000	6,400	16,000	13,900	11,300	8,000
6	9,600	7,700	19,200	16,600	13,600	9,600

TABLE S-22. -- SYNTHETIC WEB SLINGS
-- 1,000 Pounds per Inch of Width
-- Single-Ply

[Rated capacity in pounds]

(Continued)

Sling body width, inches	Return eye slings, type VI					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	800	650	1,600	1,400	1,150	800
2	1,600	1,300	3,200	2,800	2,300	1,600
3	2,400	1,950	4,800	4,150	3,400	2,400
4	3,200	2,600	6,400	5,500	4,500	3,200
5	4,000	3,250	8,000	6,900	5,650	4,000
6	4,800	3,800	9,600	8,300	6,800	4,800

(1) All angles shown are measured from the vertical.

(2) Capacities for intermediate widths not shown may be obtained by interpolation.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-23

Rated Capacity in Pounds Synthetic Web Slings 1,200 Lbs. Per Inch of Width Single Ply

Sling body width, inches	Triangle -- Choker slings, type I: Triangle -- Triangle slings, type II: Eye and eye with flat eye slings, type III: Eye and eye with twisted eye slings, type IV					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	1,200	900	2,400	2,100	1,700	1,200
2	2,400	1,800	4,800	4,200	3,400	2,400
3	3,600	2,700	7,200	6,200	5,100	3,600
4	4,800	3,600	9,600	8,300	6,800	4,800
5	6,000	4,500	12,000	10,400	8,500	6,000
6	7,200	5,400	14,400	12,500	10,200	7,200

TABLE S-23. -- SYNTHETIC WEB SLINGS

-- 1,200 Pounds per Inch of Width

-- Single-Ply

[Rated capacity in pounds]

(Continued)

Sling body width, inches	Endless slings, type V					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	1,900	1,500	3,800	3,300	2,700	1,900
2	3,800	3,000	7,600	6,600	5,400	3,800
3	5,800	4,600	11,600	10,000	8,200	5,800
4	7,700	6,200	15,400	13,300	10,900	7,700
5	9,600	7,700	19,200	16,600	13,600	9,600
6	11,500	9,200	23,000	19,900	16,300	11,500

TABLE S-23. -- SYNTHETIC WEB SLINGS

-- 1,200 Pounds per Inch of Width

-- Single-Ply

[Rated capacity in pounds]

(Continued)

Sling body width, inches	Return eye slings, type VI					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	950	750	1,900	1,650	1,350	950
2	1,900	1,500	3,800	3,300	2,700	1,900
3	2,850	2,250	5,700	4,950	4,050	2,850
4	3,800	3,000	7,600	6,600	5,400	3,800
5	4,750	3,750	9,500	8,250	6,750	4,750
6	5,800	4,600	11,600	10,000	8,200	5,800

(1) All angles shown are measured from the vertical.

(2) Capacities for intermediate widths not shown may be obtained by interpolation.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-24

Rated Capacity in Pounds Synthetic Web Slings 1,600 Lbs. Per Inch of Width Single Ply

Sling body width, inches	Triangle -- Choker slings, type I: Triangle -- Triangle slings, type II: Eye and eye with flat eye slings, type III: Eye and eye with twisted eye slings, type IV					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	1,600	1,200	3,200	2,800	2,300	1,600
2	3,200	2,400	6,400	5,500	4,500	3,200
3	4,800	3,600	9,600	8,300	6,800	4,800
4	6,400	4,800	12,800	11,100	9,000	6,400
5	8,000	6,000	16,000	13,800	11,300	8,000
6	9,600	7,200	19,200	16,600	13,600	9,600

TABLE S-24. -- SYNTHETIC WEB SLINGS

-- 1,600 Pounds per Inch of Width

-- Single-Ply

[Rated capacity in pounds]

(Continued)

Sling body width, inches	Endless slings, type V					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	2,600	2,100	5,200	4,500	3,700	2,600
2	5,100	4,100	10,200	8,800	7,200	5,100
3	7,700	6,200	15,400	13,300	10,900	7,700
4	10,100	8,200	20,400	17,700	14,400	10,200
5	12,800	10,200	25,600	22,200	18,100	12,800
6	15,400	12,300	30,800	26,700	21,800	15,400

TABLE S-24. -- SYNTHETIC WEB SLINGS

-- 1,600 Pounds per Inch of Width

-- Single-Ply

[Rated capacity in pounds]

(Continued)

Sling body width, inches	Return eye slings, type VI					
	Vert.	Choker	Vert. basket	30 deg. basket	45 deg. basket	60 deg. basket
1	1,050	1,050	2,600	2,250	1,850	1,300
2	2,600	2,100	5,200	4,500	3,700	2,600
3	3,900	3,150	7,800	6,750	5,500	3,900
4	5,100	4,100	10,200	8,800	7,200	5,100
5	6,400	5,150	12,800	11,050	9,050	6,400
6	7,700	6,200	15,400	13,300	10,900	7,700

(1) All angles shown are measured from the vertical.

(2) Capacities for intermediate widths not shown may be obtained by interpolation.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

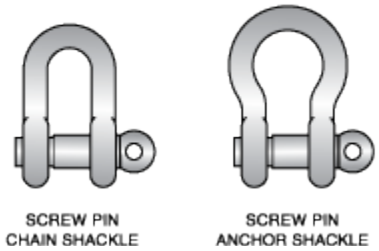
HISTORY

1. New NOTE filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

Table S-25

SAFE WORKING LOAD FOR SHACKLES

(IN TONS OF 2000 POUNDS)



Material size (Inches)	***Pin diameter (Inches)***	***Safe working load (Tons)***
1/2	1/2	1.4
1/3	3/4	2.2
3/4	1/3	3.2
1/2	1	4.3
1	1 1/8	5.6
1 1/8	1 1/4	6.7

1 1/4	1 3/8	8.2
1 3/8	1 1/2	10.2
1 1/2	1 3/4	11.9
1 3/4	2	18.2
2	2 1/4	21.2

Note: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New Note filed 5-1-87; operative 5-31-87 (Register 87, No. 19).

2. Change without regulatory effect providing more legible illustration for Table S-25 filed 3-2-2009 pursuant to section 100, title 1, California Codeof Regulations (Register 2009, No. 10).