

Cranes & Lifts – Appendix B: Sling Specifications by Type

Along with the general use information provided in the Plan, departments must use slings in accordance with the following:

A. Alloy Steel Chain Slings

Attachments:

- Shall have a rated capacity at least equal to that of the alloy steel chain with which they are used.
- A sling shall not be used to lift loads in excess of the rated capacity of the weakest component.
- Makeshift links or fasteners formed from bolts or rods, or other such attachments, shall not be used.

Inspections:

- Alloy steel chain slings in use shall receive a routine thorough periodic inspection on a regular basis according to frequency of sling use, severity of service conditions, nature of lifts being made, and experience gained on the service life of slings used in similar circumstances. Such inspections shall be at intervals no greater than once every 12 months.
- The thorough inspection of alloy steel chain slings shall be performed by a competent person designated by the employer, and shall include a thorough inspection for wear, defective welds, deformation and increase in length. If defects or deterioration are found, the sling shall be immediately removed from service.
- The employer shall maintain a record of the most recent inspection and shall make such record available for examination.

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 by the sling manufacturer or equivalent entity.
- The employer shall retain a certificate of the proof test and shall make it available for examination.

Safe Operating Temperatures:

- Any alloy steel-chain sling heated above 1,000 °F must be permanently removed from service.
- When exposed to service temperatures in excess of 600 °F, employers must reduce the maximum working-load limits permitted by the chain manufacturer in accordance with the chain or sling manufacturer's recommendations.

Repairing and Reconditioning Alloy Steel Chain Slings:

- Worn or damaged alloy steel chain slings or attachments shall not be used until repaired. When welding or heat testing is performed, slings shall not be used unless repaired, reconditioned and proof tested by the sling manufacturer or an equivalent entity.
- Mechanical coupling links or low carbon steel repair links shall not be used to repair broken lengths of chain.
- If the chain link at any point shows signs of wear, the employer must confirm that the link size is still within allowable tolerances or be removed from service

Deformed Attachments:

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

B. Wire Rope Slings

Minimum Sling Lengths:

- 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.
- Braided slings shall have a minimum clear length of wire rope 40 times the component rope diameter between the loops or end fittings.
- Cable laid grommets, strand laid grommets, and endless slings shall have a minimum circumferential length of 96 times their body diameter.

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 200 °F.
- When non-fiber core wire rope slings of any grade are used at temperatures above 400 °F or below minus 60 °F, recommendations of the sling manufacturer regarding use at that temperature shall be followed.

End Attachments:

- Welding of end attachments, except covers to thimbles, shall be performed prior to the assembly of the sling.
- All welded end attachments shall not be used unless proof tested by the manufacturer or equivalent entity at twice their rated capacity prior to initial use. The employer shall retain a certificate of the proof test, and make it available for examination.

Removal from Service:

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

- Ten randomly distributed broken wires in one rope lay, or five broken wires in one strand in one rope lay.
- Wear or scraping of one-third the original diameter of outside individual wires.
- Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure.
- Evidence of heat damage.
- End attachments that are cracked, deformed or worn.
- 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.
- Corrosion of the rope or end attachments.

C. Metal Mesh Slings

Handles:

- Handles shall have a rated capacity at least equal to the metal fabric and exhibit no deformation after proof testing.
- The fabric and handles shall be joined so that the rated capacity of the sling is not reduced, the load is evenly distributed across the width of the fabric, and sharp edges will not damage the fabric.

Sling Testing:

- All new and repaired metal mesh slings 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.

Safe Operating Temperatures:

- Metal mesh slings which are not impregnated with elastomers may be used in a temperature range from minus 20 °F to plus 550 °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 0 °F to plus 200 °F.

- For operations outside these temperature ranges or for metal mesh slings impregnated with other materials, the sling manufacturer's recommendations shall be followed.

Repairs:

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

Removal from Service:

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

- A broken weld or broken brazed joint along the sling edge
- Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion
- Lack of flexibility due to distortion of the fabric
- Distortion of the female handle so that the depth of the slot is increased more than 10 percent
- Distortion of either handle so that the width of the eye is decreased more than 10 percent
- A 15 percent reduction of the original cross-sectional area of metal at any point around the handle eye
- Distortion of either handle out of its plane

D. Natural and Synthetic Fiber Rope Slings

Safe Operating Temperatures:

- Natural and synthetic fiber rope slings, except for wet frozen slings, may be used in a temperature range from minus 20°F to plus 180 °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.

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:

- In manila rope, eye splices shall consist of at least three full tucks, and short splices shall consist of at least three tucks on each side of the splice centerline.
- In synthetic fiber rope, eye splices shall consist of at least four full tucks, and short splices shall consist of at least four tucks on each side of the centerline.
- 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 1-inch in diameter, the tail shall project at least six rope diameters beyond the last full tuck. For fiber rope 1-inch in diameter and larger, the tail shall project at least 6 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 and a tail length of approximately six rope diameters beyond the last full tuck.
- Fiber rope slings shall have a minimum clear length of rope between eye splices equal to 10 times the rope diameter.
- Knots shall not be used in lieu of splices.
- Clamps not designed specifically for fiber ropes shall not be used for splicing.
- 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.

Removal from Service:

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

- Abnormal wear
- Powdered fiber between strands
- Broken or cut fibers
- Variations in the size or roundness of strands
- Discoloration or rotting
- Distortion of hardware in the sling
- End attachments have or develop sharp edges

E. Synthetic Web Slings

Webbing and Fittings:

- Synthetic webbing shall be of uniform thickness and width and selvage ends shall not be split from the webbing's width.
- Fittings shall be of a minimum breaking strength equal to that of the sling, and free of sharp edges that could in any way damage the webbing.

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

Environmental Conditions:

When synthetic web slings are used, the following precautions shall be taken:

- Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present.
- Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.
- Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.

Safe operating temperatures:

- Synthetic web slings shall not be used at temperatures in excess of 180 °F.
- Polypropylene web slings shall not be used at temperatures in excess of 200 °F.

Repairs:

- Synthetic web slings which are repaired shall not be used unless repaired by a sling manufacturer or an equivalent entity.
- Each repaired sling shall be proof tested by the manufacturer or equivalent entity to twice the rated capacity prior to its return to service. The employer shall retain a certificate of the proof test and make it available for examination.
- Slings, including webbing and fittings, which have been repaired in a temporary manner shall not be used.

Removal from Service:

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

- Acid or caustic burns
- Melting or charring of any part of the sling surface
- Snags, punctures, tears or cuts
- Broken or worn stitches
- Distortion of fittings