



SECTION 25

RIGGING AND HOISTING EQUIPMENT



1. **RIGGING AND HOISTING:** These rules apply to all Maul Electric, Inc. employees and subcontractors. **Note: Maul Electric, Inc. employees will utilize mechanical means of lifting if at all possible. Manual Lifting is the last option.** Additional specific information can be obtained from the above referenced OSHA Standard.

A. **OSHA Reference:** 29 CFR 1926.251

B. **Rigging and Hoisting:**

1. The manufacturer's name and specifications applicable to the operation of the specific equipment will be attached to the equipment. Equipments shall be used per manufacture's intended use and shall never exceed the manufacture's load capacity.
2. Rated load capacities load test and recommended rules for safe operation will be conspicuously posted on all equipment at the operator's station.
3. A competent person experienced in rigging and hoisting shall be designated on all projects where rigging and hoisting is needed.
4. A competent person shall inspect all rigging and hoisting equipment prior to each use and during use to ensure that it is in safe condition. Any equipment found to be defective shall be removed from service immediately. An initial inspection following the guidelines specified in this program shall take place prior to use of any rigging and hoisting equipment. Monthly inspections are required to be completed and documented there after. The inspections are to be turned in to the site Supervisor or Safety Officer no later the 12 hrs after the inspection period.
5. Rigging equipment not in use shall be removed from the immediate work area so as not to present a hazard to employees and shall be properly stored.

C. **Below The Hook Structural And Mechanical Lifting Devices**

Suggested requirements include but are not limited to the following:

1. Shall conform to requirements of ASME/ANSI B30.20. **NOTE: Special lifting devices for shipping containers weighing 10,000 lbs or more that are used for radioactive materials maybe governed by ANSI N14.6 (Standard for Shipping Containers Weighing 10,000 Pounds or More for Nuclear Materials).**
2. Shall have the rated load capacity marked on the main structure where it is visible. If the lifter is made up of several lifters, each detachable from the group, these lifters shall also be marked with their individual rated loads.



3. A load test, not to exceed 125 percent of the rated load unless otherwise recommended by a manufacturer shall be provided.
4. A load test certificate indicating the date of load test, amount of load applied, and confirmation of lifter load rating shall be supplied.
5. Rated load should not be more than 80 percent of the maximum load sustained during the test.
6. Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook throat opening. Alternatively, an alloy anchor type shackle with a bolt, nut and retaining pin may be used
7. Shall have a complete or other permanent marking affixed to the lifting device displaying the following:
 - a) Manufacturer's Name
 - b) Serial Number/Identification Number
 - c) Lifter Weight if over 100 lbs. (45KG)
 - d) Rated load Capacity

D. General Construction

1. Shall be designed to withstand the forces imposed by the rated load.
2. Shall have a minimum design factor of 3 based on yield strength for all load bearing structural components.
3. Welding shall be in accordance with ANSI/AWS D1.
4. Guards for exposed moving parts such as, but not limited to gearing, projecting shafts, and chain drives that constitute a hazard under normal operating conditions should be guarded.
5. Electrical equipment and wiring shall comply with Article 610 of ANSI/NFPA 70.

E. Wire Rope

Suggested requirements include but are not limited to the following:

1. Wire rope shall meet or exceed the requirements of Federal Specification, RR-W-410 for wire rope, Mil Specification MIL-DTL-83420 for air craft cable and MIL-W-83140 for non-rotating stainless steel wire rope
2. Wire rope shall be made in the United States by a member of the Wire Rope Technical Board (except stainless steel, and unless recommended otherwise by a crane or hoist manufacturer). Stainless steel wire rope shall be made in the United States and shall be 302 or 304 grade stainless steel unless otherwise recommended by a crane or hoist manufacturer.



4. Wire rope shall have documentation from the manufacturer traceable to the material furnished and signed by the manufacturer's authorized representative. Documentation should reference as a minimum the diameter, number of strands, core, lay, grade, manufacturer's lot/run number, material number, and the nominal breaking strength of a sample.
5. Shall be shipped lubricated and with a protective covering, i.e. plastic or cardboard.

F. Chain Slings

Suggested requirements include but are not limited to the following:

1. Shall meet or exceed requirements of ASME/ANSI B30.9 and 29 CFR 1910.184.
2. Alloy steel chain slings shall have permanently affixed durable identification; stating size, manufacturer's grade, rated load, and angle upon which the rating is based, reach, number of legs, and sling manufacturer.
3. Hooks, rings, oblong links, pear-shaped links, welded, or mechanical coupling links or other attachments shall have a rated load of at least equal to that of alloy steel chain with which they are used.
4. All welded components in the sling assembly shall be proof load tested as components or as part of the sling assembly.
5. Hooks attached to chain slings shall meet the requirements of ASME/ANSI B30.10.
6. The welded components of all new slings shall be proof tested by the component or sling manufacturer to 200 percent of the rated load.
7. The proof load for multiple leg slings shall be applied to the individual legs and shall be 200 percent of the rated load of a single leg sling.
8. A certificate of proof test shall be provided by the manufacturer or supplier referencing the specific sling identification number, date of test, and amount of load applied. (Employer shall retain a certificate of the proof test and shall make it available for examination.)

G. Synthetic Slings

Suggested requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of 29 CFR 1910.184 and ASME/ANSI B30.9.
2. Should be manufactured from webbing specifically constructed for overhead lifting, featuring red core yarns.



3. Webbing shall have the following characteristics:
- a) Sufficient certified tensile strength to meet the sling manufacturer's requirements;
 - b) Uniform thickness and width;
 - c) Full woven width, including selvage edges;
 - d) Webbing ends shall be sealed by heat, or other suitable means, to prevent raveling.
 - e) Thread used in the manufacture of synthetic web slings shall be the same generic type yarn as the sling webbing.
 - f) Stitches shall be lock-stitched and preferably continuous. When not continuous, it shall be back stitched at the ends to prevent raveling.
 - g) The load carrying splice shall be sewn with a pattern of sufficient strength to justify the manufacturer's rated capacities.
 - h) Shall have a minimum design factor of 5.
 - i) End fittings shall have sufficient strength to sustain twice the rated load of the sling without permanent deformation.
 - j) EACH SLING SHALL BE PERMANENTLY MARKED WITH THE FOLLOWING:
 - (1) Manufacturer's name or trademark.
 - (2) Manufacturer's code or stock number.
 - (3) Type of synthetic web material.
 - (4) Rated loads for the type of hitches used.
- NOTE: Hand written, or ink embossed markings are not acceptable. Sling tags shall be indelibly marked and the lettering shall not wear off with use. The markings shall remain legible for the life of the sling.
- k) The manufacturer shall have on file a written system of sling traceability as well as a quality control procedure. Traceability should be specific mill lots.
 - l) Fabric wear pads should be sewn into the bearing points of the sling eyes. Leatherwear pads are not recommended.
 - m) Product warnings relative to the proper use, care, and maintenance shall accompany the shipment.
 - n) Single leg and endless synthetic-web slings shall be proof tested to 200 percent of the rated load.
 - o) Multiple leg bridle slings shall have the proof load applied to the individual legs. The proof load shall be two times the vertical rated load of a single leg sling.
 - p) A load test certificate (LTC) shall be provided for each lot of slings supplied. The LTC shall reference as a minimum the date of proof test, amount of load applied, sling capacity,



and lot/run number. The manufacturers authorized representative shall sign the LTC.

- q) NOTE: Sling lengths shall be within a specified tolerance. Synthetic sling manufacturer's normal length is ± 1 percent of the sling length.

H. Synthetic Polyester Round Slings

Suggested requirements include but are not limited to the following:

1. Slings should meet or exceed requirements of the Web Sling and Tie Down Association, recommended specification for round slings made of polyester fibers used for general lifting purposes.
2. Polyester round slings including those incorporating welded fittings shall be proof tested to 200 percent of the vertical rated capacity.
3. A load test certificate (LTC) shall be provided for each lot of slings supplied. The LTC shall reference at a minimum the date of proof test, amount of load applied, sling capacity and lot/run number. The manufacturers authorized representative shall sign the LTC.
4. The core(s) shall be formed from one or more ends of yarn, wound together on a plurality of turns. The core(s) should be uniformly wound to ensure even distribution of the load.
5. The cover(s) should be of the same fiber type as the load bearing core(s). When the cover is a different fiber type than the load-bearing core, follow the manufacturer's recommendations for use.
6. The cover should be made from one length of material.
7. When the core and cover are of the same fiber, the thread shall also be of that fiber type. When the core and cover are of different fiber types, the thread should be of the same fiber type as the cover.
8. All stitching shall be lock-stitched type and should be continuous. When not continuous, they shall be backstitched or overstitched to prevent raveling.
9. The design factor for new polyester round slings and polyester round slings incorporating fittings shall be a minimum of five (5).
10. Each polyester round sling shall be permanently marked or labeled showing:
 - a) Name or trademark of manufacturer.
 - b) Manufacturer's code or stock number.
 - c) Rated capacities for the three basic hitches. (vertical, choker, vertical basket)
 - d) Core fiber type - if cover(s) is of a different fiber type, both fiber types shall be identified.
 - e) Length (reach) - bearing point to bearing point.



11. Each manufacturer shall internally identify their product with name or trademark for traceability.

I. Wire Rope Slings

Suggested requirements include but are not limited to the following:

1. Shall meet or exceed the requirements of 29 CFR 1910.184 and ASME/ANSI B30.9.
2. Wire rope purchased to fabricate slings shall be made in the United States by a member of Wire Rope Technical Board (Except stainless steel). Stainless steel wire rope shall be made in the United States and shall be 302 or 304 Grade stainless steel.
3. Wire rope shall meet the requirements of Federal Specification RR-W-410D or Military Specification MIL-W-83420.
4. Wire rope shall have documentation from the manufacturer traceable to the material furnished and signed by the manufacturer's authorized representative. Documentation shall reference as a minimum the diameter, number of strands, core, lay, grade, manufacturing lot/run number, master reel number and nominal breaking strength of sample.
5. Shall be shipped lubricated and with a protective covering, i.e. plastic or cardboard.
6. Slings should be either 6 x 19 or 6 x 37 classification.
7. Slings should be made of wire rope produced from EXIPS (Extra Improved Plow Steel) with an IWRC (Independent Wire Rope Center). Consideration may be given to other grades or types of wire rope, dependent upon the type of expected service due to the type of load, hitch, or environment.
8. Shall have a minimum of 5 to 1 safety factor.
9. Mechanical spliced single leg and endless wire rope slings, and swaged socket or poured socket assemblies shall be load tested to 200 percent of the rated vertical load.
10. Shall be individually tagged with a durable tag including the following information:
 - a) WLL (Working Load Limit)
 - b) Purchase order number or serial number
 - c) Manufacturer's name or ID
11. Shall have a load test certificate (LTC) for each lot of slings supplied. The LTC shall reference as a minimum the date of proof test, amount of load applied, sling capacity, & lot/run number, the manufacturers authorized representative shall sign the LTC.
12. Single leg hand tucked slings shall have a proof load equal to the rated load but shall not exceed 125 percent of the rated load.



13. The proof load for multiple leg bridle slings shall be applied to the individual legs and shall be either 125 percent for hand tucked splice or 200 percent for mechanical splice, times the vertical rated load of a single leg sling of the same size, grade, and construction of rope. Any master link to which multiple leg slings are connected shall be proof loaded to 200 percent of the force applied by the combined legs
14. Multiple leg bridle slings shall be tagged with a durable tag on the master link indicating the working load limit for the total combined legs for each individual sling in a vertical configuration. The purchase order number or serial number and the manufacturer's ID should be supplied.

J. Shackles

Suggested requirements include but are not limited to the following:

1. Shackles shall meet or exceed the requirements of Federal Specification RR-C-271D.
2. Type of shackles covered by this specification include:
 - a) Class 1, Round Pin Anchor
 - b) Class 2, Screw Pin Anchor
 - c) Class 3, Safety Anchor
 - d) Class 1, Round Pin Chain
 - e) Class 2, Screw Pin Chain
 - f) Class 3, Safety Chain shackles.
3. Each shackle body shall be permanently and legibly marked in raised or stamped letters on the side of the shackle bow with the identifying manufacturer's name or trademark, shackle size, and the recommended safe working load.
 - a) Grade A regular strength shackle pins and bolts shall be unmarked;
 - b) Grade B high strength shackle pins and bolts shall be marked by the raised or stamped letters "HS" on the head.
 - c) Shackle markings shall be raised or stamped letters of the maximum height permitted by the size of the shackle component being marked.
 - d) Grade A shackles (Regular Strength), together with their pins and bolts shall be forged from carbon steel.
 - e) Grade B shackles (High Strength) together with their pins and bolts shall be forged from alloy steel.
4. Shackles shall have minimum 5 to 1 safety factor.



5. Shackle samples shall be subjected to proof loads of 200 percent of the rated capacity.
6. Shackle pins shall fit freely without binding and seat properly.
7. Shackles shall be sufficiently ductile so that, when fractured, the fractured member shall show a permanent distortion before breaking.

K. Turnbuckles - Type Iii Rigging

Suggested requirements include but are not limited to the following:

1. Turnbuckles used for rigging applications shall meet or exceed the requirements of Federal Specification FF-T-791B, Section 3.9.3.
2. Shall be fabricated from forged alloy steel.
3. Shall be provided with a jam nut of a type, which does not depend upon deformation of the threads for security.
4. Certificate of proof test shall be provided by the manufacturer for selected samples from each lot. Certificate shall indicate as a minimum the size, WLL, test weight, and date of test.
5. Proof test loads shall be one-half the specified breaking strength for the end pull.
6. Turnbuckles shall have a minimum safety factor of 5 based on ultimate breaking strength.
7. Manufacturer's name or trademark and turnbuckle size shall be permanently marked on the body of the turnbuckle.

L. Wire Rope Clips (Clamps)

Suggested requirements include but are not limited to the following:

1. Shall meet or exceed requirements of Federal Specification FF-C-450D.
2. Shall be permanently and legibly marked with the size and manufacturer's identifying mark.
3. Wire rope clips should be shipped with application instructions and product warnings for each type or size clip.

M. Eye Bolts

Suggested requirements include but are not limited to the following:

1. Shall be fabricated from forged carbon or alloy steel and shall meet or exceed the requirements of ASTM specification A489 for "Carbon Steel Eye Bolts" or ASTM F541 "Standard Specification for Alloy Steel Eyebolts." and ANSI/ASME B18.15 "Forged Eye Bolts".



2. Eye bolts used for lifting service shall have the manufacturer's name or identification mark forged in raised characters on the surface of the eyebolt. Alloy steel eyebolts shall have the symbol "A" (denoting alloy) and the manufacturer's name or identification forged in raised letters on the surface of the eyebolt.
3. The safe working load shall have a safety factor of 5.

N. Hooks

Suggested requirements include but are not limited to the following:

1. Hooks used for lifting service shall meet or exceed the requirements of ANSI/ASME B30.10.
2. Manufacturer's identification shall be forged cast, or die stamped on a low stress non-wearing area of the hook.
3. When proof tests are used to verify manufacturing process, material, or configuration, hooks shall be able to withstand proof load application, without permanent deformation when a load is applied for a minimum of 15 seconds. Proof loads for hooks up to 50-ton capacity shall be 200 percent of the rated capacity.
4. Performance testing of hooks shall not be required except where necessary to conform to requirements for the equipment of which they are a part of.

O. Swivel Hoist Rings

Suggested requirements include but are not limited to the following:

1. All hoist rings shall be individually proof load tested to a minimum of 200 percent of the rated capacity, but no more than 250 percent of the rated capacity.
2. Shall have a proof load certificate supplied from the manufacturer with each swivel Hoist ring.
3. Shall have the manufacturer's name or trademark permanently marked on the swivel Hoist ring.
4. Shall have a minimum safety factor of 4, based on ultimate breaking strength.
5. Shall be permanently marked by the manufacturer with the WLL and recommended Torque value.
6. Shall be packaged with proper application instructions and warning information.

P. Hoist Rings, Pear Shaped Links

Suggested requirements include but are not limited to the following:



1. Shall meet or exceed the requirements of RR-C-271-D.
2. Welded rings or links shall be subjected to a nondestructive weld test (NDT) and have documentation provided. Note: NDT is not required for forged rings or links.
3. Shall have a minimum safety factor of 5, based on ultimate breaking strength.
4. Rings shall be forged or welded from low alloy steel.
5. Should be marked by the manufacturer with the manufacturer's name or trademark and ring or link size.

Taglines shall be used for all lifts unless it creates an unsafe condition to assist in maintaining control of the load.

All employees shall be kept clear of loads about to be lifted and of suspended loads.