

Potential Hazard Review

Physical Hazards

- Flying object/struck by
- Slips/fall
- Striking against
- Caught in/on/between; pinch points

Related Safe Work Practices

- Aerial Lifts
- Electrical Safety
- Traffic Safety
- Vehicle Operation

Authority

- CCR Title 8 Sections 4290-4944 and 4945-4956, 4990-5008, 5020-5028, 5031-5035, 5040- 5045, 5048, 5049

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This Safe Work Practice (SWP) addresses the hazards related to using boom-type mobile cranes and hydraulic excavators. It is organized into the following areas:

- A. Definitions
- B. Operation
- C. Slings
- D. Testing and Repair

References to the following regulatory requirements in the specific Title 8 sections as noted in the “authority” section were not included in SWP because they were not relevant to RPD:

1. Lattice cranes, electric cranes, derricks, floats
2. Any references to using two or more cranes at one time
3. Booms passing over the cab
4. Cranes which are assembled or disassembled on the ground
5. Barriers not erected on the ground or equipment

6. Design requirements; see CCR Title 8 Sections 4945-4956 for Boom-Type Mobile Cranes, and Sections 4920-4944 for Hydraulic Excavators. See EHS for assistance with purchasing any new equipment

This SWP is dedicated to helping you avoid an injury or illness from known hazards – Laceration, cut, puncture, foreign object in eye, abrasion, bruise, contusion, sprain, strain, fracture from fall and impact, laceration, puncture, crush, amputation, shock, burn, cardiac arrest, death.

You are advised to follow these recommendations, read and follow this SWP and any related SWPs, complete any required or recommended training, and to obtain advice from a Qualified Person if you have any questions.

A Qualified Person is a person **designated** by the employer; and by reason of **training**, experience, or instruction who has demonstrated the ability to perform safely all assigned duties; and, when required is properly licensed in accordance with federal, state, or local laws and regulations.

All tasks require that you:

- Use the equipment in accordance with the guidelines set forth by the manufacturer. This includes following all signs and labels, and reviewing any manufacturer's operating manuals.
 - o If the instructions provided in the operating manual conflict with this SWP, then follow the instructions in the manual. The manufacturer's instructions prevail over this SWP.
- Review the safety data sheets (SDSs) for each chemical.
- Be trained on this SWP and those listed above as related. Training on SWPs must be completed before initial assignment. It is also recommended that you complete refresher training every two years.

A. DEFINITIONS

Authorized Person. A person assigned to perform duties at a location where the person will be exposed to a crane related hazard.

Certifying Agency. Certifying agencies are qualified agencies, and/or persons, licensed by Cal OSHA to examine, test and certify cranes in accordance with Cal OSHA regulations.

Certified Agent. The manufacturer, or a person who is currently registered as a professional civil, mechanical, or structural engineer by the State of California and is knowledgeable in the structure and use of the equipment.

Qualified Person. A person designated by the employer who by reason of training, experience or instruction has demonstrated the ability to safely perform all assigned duties and, when required, is properly licensed in accordance with federal, state, or

local laws and regulations. A rigger may be considered to be a Qualified Person if they have adequate training or experience.

Qualified Operator. A crane operator who has valid certificate of competency in accordance with Cal OSHA requirements.

B. OPERATION

1. Only operators who have been certified for the type of crane to be used shall be permitted to operate such equipment.
 - a. Trainees may be authorized to operate cranes or apparatus provided they are under the supervision of a qualified operator.
 - b. Operators must have a valid NCCCO certificate of competency for the type of crane to be used from an Cal OSHA compliant accredited certifying entity (see Cal OSHA Title 8 CCR, Section 5006 for the specific requirements).
 - i. Certification must be renewed every 5 years.
2. Inspections shall be conducted as follows:
 - a. A Qualified Person shall visually inspect the crane's controls, rigging and operating mechanism prior to the first operation on any work shift.
 - i. Any unsafe conditions disclosed by the inspection requirements shall be corrected promptly.
 - ii. Defective components of equipment which create an imminent safety hazard shall be replaced, repaired or adjusted prior to use.
 - b. Daily visual inspections by the operator or other Qualified Person shall be made of/for:
 - a. All functional mechanisms for maladjustment interfering with proper operation.
 - b. The operation of all limit switches without a load on the hook.
 - c. Lines, tanks, valves, pumps, and other parts of air or hydraulic systems for deterioration or leakage.
 - d. Hooks for deformation and cracks.
 - e. Hoist or load attachment chains including end connections for excessive wear, twist, distorted or stretched links interfering with proper function.
 - f. Excessive wear, broken wires, stretch, kinking, or twisting of ropes and rope slings, including end connections.
 - c. All rope which has been idle for a period of a month or more due to shutdown or storage of a crane on which it is installed shall be given a thorough inspection before it is placed in service.
 - i. This inspection shall be for all types of deterioration and shall be performed by a Qualified Person whose approval shall be required for further use of the rope. A certification record shall be made available for inspection which

includes the date of inspection, the signature of the person who performed the inspection, and an identifier of the rope which was inspected.

3. The operator shall be required to test all controls at the start of a new shift. If any controls do not operate properly, they shall be adjusted or repaired before operations are begun.
4. The travel of cranes or boom-type excavators shall be controlled so as to avoid collision with persons, material, and equipment.
5. In transit, the following additional precautions for mobile cranes shall be exercised:
 - a. The boom shall be carried in line with the direction of motion and the superstructure shall be secured against rotation, except when negotiating turns when there is an operator in the cab, or when the boom is supported on a dolly.
 - b. The empty hook, headache ball, or block shall be lashed or otherwise restrained so that it cannot swing freely.
6. When rotating the crane, sudden stops shall be avoided.
 - a. Rotational speed shall be such that the load does not swing out beyond the radius at which it can be safely controlled.
 - b. Tag or restraint lines shall be used where rotation of the load is hazardous.
 - c. Cranes or boom-type excavators shall not be mounted by personnel, unless the unit is stopped or an exchange of signals with the operator indicates that it is safe to mount
7. Where the equipment's rotating superstructure poses a hazard of striking and injuring an employee; or pinching/crushing an employee against another part of the equipment or another object, the employees shall be prevented from entering these hazard areas:
 - a. Train each authorized person assigned to work on or near the equipment in how to recognize struck-by and pinch/crush hazard areas posed by the rotating superstructure.
 - b. Erect and maintain control lines, warning lines, railings or similar barriers to mark the boundaries of the hazard areas.
 - i. If it is not feasible to erect such barriers on the ground or on the equipment, the hazard areas shall be clearly marked by a combination of warning signs (such as "Danger - Swing/Crush Zone") and high visibility markings on the equipment that identify the hazard areas. The markings shall be visible to employees from outside the hazard area. In addition, each employee shall understand what these markings signify.
 - c. Before an employee goes to a location in the hazard area that is out of view of the operator, the employee shall inform the operator that he/she is going to that location.

- d. When the operator has been informed of employee entry, the operator shall not rotate the superstructure until the operator is informed by the employee or visually confirms that the employee has exited the location and is in a safe position.
- 8. Cranes shall not be operated with wheels or tracks off the ground or working surface at any time unless properly bearing on outriggers or stabilizers. Power actuated jacks (outriggers or stabilizers), where used, shall be provided with means to prevent loss of support under load.
- 9. Outriggers or stabilizers shall be used when the load to be handled at that particular radius exceeds the rated load without outriggers or stabilizers as given by the certified agent for that crane.
 - a. Outrigger or stabilizer supports shall:
 - i. Be strong enough to prevent crushing;
 - ii. Be free from defects.
 - iii. Be set in accordance with the crane manufacturer's specified configuration requirements for the capacity chart being used. If the crane manufacturer is no longer in business or if the crane manufacturer's specifications regarding the deployment of outriggers or stabilizers is no longer available, the outriggers or stabilizers shall be deployed as specified by a Qualified Person.
 - b. If needed to support the load of an outrigger or stabilizer so as not to exceed the allowable bearing capacity of the underlying material or to establish a level condition for the crane, timbers, cribbing or other structural members shall be used. When used, timbers, cribbing or other structural members shall be strong enough to prevent crushing and be of such thickness, width, and length as to completely support the outrigger.
- 10. The brakes shall be tested each time a load approaching the rated load is handled by raising the load a few inches and applying the brakes.
- 11. The load or the boom shall not be lowered below the point where less than two full wraps of rope remain on grooved drums and three full wraps on ungrooved drums.
- 12. No employee shall be permitted to ride on loads, hooks, or slings of any hoist or crane.
- 13. A fire extinguisher of not less than 10-B:C rating shall be kept in serviceable condition and readily accessible to the operator's station, and affected personnel shall be familiarized with its use.
- 14. When refueling:

- a. Open lights, flames or spark-producing devices shall be kept at a safe distance while refueling an internal combustion engine, and no person shall smoke or carry lighted smoking material in the immediate vicinity of the refueling area.
- b. The engine shall be stopped during refueling, unless the fueling system provides adequate safe refueling features.
- c. Fuel tank filler pipe shall be located in such a position, or protected in such manner, as to prevent fuel spillage or overflow to run onto the engine, exhaust, or electrical equipment of any machine being fueled.

15. When handling loads:

- a. The Qualified Person (rigger) shall be trained and capable of safely performing the rigging operation. All loads shall be rigged by a Qualified Person (rigger) or by a trainee under the direct visual supervision of a Qualified Person (rigger).
- b. A crane shall not be loaded beyond the rated capacity or safe working load whichever is smaller, except for test purposes. In all operations where the weight of the load being handled is unknown and may approach the rated capacity, there shall be a Qualified Person (rigger) assigned to determine the magnitude of the load, unless the crane is equipped with a load weighing device. The operator shall not make any lift under these conditions until informed of such weight by the Qualified Person (rigger) assigned to that operation.
- c. The load shall be attached to the hook by means of slings or other suitable and effective means which shall be rigged to insure the safe handling of the load.
 - i. Slings shall be freed of kinks or twists before use.
 - ii. Baskets, tubs, skips, or similar containers used for hoisting bulk materials shall be loaded so as not to exceed their safe carrying capacity.
 - iii. The hoist rope shall not be wrapped around the load.
- d. The individual directing the lift shall see that:
 - i. The crane is properly leveled for the work being performed and blocked, where necessary;
 - ii. The load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches;
 - iii. Ropes shall not be handled on a winch head without the knowledge of the operator.
 - iv. While a winch head is being used, the operator shall be within convenient reach of the power unit control lever.
- e. Before starting to hoist:
 - i. The hoist rope shall not be kinked.
 - ii. Multiple part lines shall not be twisted around each other.
 - iii. The hook shall be positioned over the load in such a manner as to prevent swinging of the load when lifted.
 - iv. If there is a slack rope condition, the rope shall be properly seated on the drum and in the sheaves.
- f. During hoisting:

- i. There shall be no sudden acceleration or deceleration of the moving load.
 - ii. The load, boom, or other parts of the equipment shall not contact any obstruction in a way which could cause falling material or damage to the boom.
 - g. Side loading of booms shall be limited to freely suspended loads, and booms shall not be used for dragging loads sideways unless the boom is specifically designed and constructed to withstand such side loading.
 - h. Loads shall not be released or detached from a crane or other hoisting apparatus until the Qualified Person (rigger) detaching the load has verified that the load has been secured or supported to prevent inadvertent movement.
 - i. When a load of any kind is to be suspended for any considerable time, the drum holding mechanism shall be used in addition to the brake which shall also be applied.
 - i. Cranes shall not be left unattended while the load is suspended unless the load is suspended over water, a barricaded area, or is blocked up or otherwise supported from below during repairs or emergency.
 - j. On truck mounted cranes, no loads shall be lifted over the front area except as approved by the certified agency.
16. A signal person shall be provided when the point of operation is not in full and direct view of the operator unless a signaling or control device is provided for safe direction of the operator.
- a. Only Qualified Persons shall be permitted to give signals, though a stop signal may be given by any person.
 - b. A uniform signal system shall be used on all operations and if hand signals are used, they shall be clearly understood by the operator.
 - c. Signal systems other than manual shall be protected against unauthorized use, breakage, weather or obstruction which will interfere with safe operation. In the event of any known malfunction, an alternate signal system shall be used or all motion shall be stopped.
 - d. There shall be conspicuously posted in the vicinity of the hoisting operations, a legible chart depicting and explaining the system of signals used.
17. Operations shall be conducted and the job controlled in a manner that will avoid exposure of employees to the hazard of overhead loads.
- a. Wherever loads must be passed directly over workers, occupied work spaces or occupied passageways, safety type hooks or equivalent means of preventing the loads from becoming disengaged shall be used.
 - b. Employees should not work in the area directly beneath a suspended load.
18. If working in the vicinity of high voltage lines, please refer to the Electrical Safety SWP.

19. Loose material, tools, lunch box, clothing, etc., shall be stored in a manner which will not interfere with the operation of the crane controls.
20. The operator shall respond to signals only from the appointed signal person, but shall obey a stop signal from any person.
21. Whenever the operator doubts the safety of a movement, the operator shall be authorized to stop the hoisting operation until safety has been assured.
22. A warning signal shall be sounded as required, particularly when approaching workers.
23. Before leaving the crane unattended, the operator shall be required to:
 - a. Land or properly secure any attached load, bucket, lifting magnet, or other device.
 - b. Disengage clutch.
 - c. Set travel, swing, boom brakes, and other locking devices unless otherwise specified by the certified agents.
 - d. Put controls in the "off" position.
 - e. Stop the engine or motor.
 - f. Secure crane against accidental travel.
24. Before closing the switch or starting the engine, all controls shall be in the "off" position and all personnel in the clear.
25. If power fails during operation, the operator shall be required to:
 - a. Set all brakes and locking devices;
 - b. Move all clutch or other power controls to the "off" position;
 - c. If practical, the suspended load shall be landed under brake control.

C. SLINGS

26. Whenever any sling is used, the following practices shall be enforced:
 - a. Slings that are damaged or defective shall not be used.
 - b. Chain or wire rope slings shall not be shortened with knots or bolts or other makeshift devices.
 - c. Slings shall not be kinked, or knotted.
 - d. 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.
 - e. Slings used in a basket hitch shall have the loads balanced to prevent slippage.
 - f. Slings shall be set to avoid slippage.

- g. Slings shall be padded or protected from the sharp edges of their loads.
 - h. Suspended loads shall be kept clear of all obstructions.
 - i. All employees shall be kept clear of loads about to be lifted and of suspended loads.
 - j. Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.
 - k. Shock loading is prohibited.
 - l. 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.
 - m. To determine the maximum safe working loads of various sizes of alloy steel chains and chain slings, refer to Tables S-1 and S-2 (see CCR Title 8, [Section 5049](#)). 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.
 - n. Do not use slings without affixed and legible identification markings.
27. Each day before being used, the sling and all fastenings and attachments shall be inspected for damage or defects by a Qualified Person.
- a. Additional inspections shall be performed during sling use, where service conditions warrant.
 - b. Damaged or defective slings shall be immediately removed from service.
28. Alloy Steel Chain Slings
- a. 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. 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.
 - i. Makeshift links or fasteners formed from bolts or rods, or other such attachments, shall not be used.
 - c. 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:
 - i. Frequency of sling use;
 - ii. Severity of service conditions;
 - iii. Nature of lifts being made; and
 - iv. Experience gained on the service life of slings used in similar circumstances.
 - d. Such inspections shall in no event be at intervals greater than once every 12 months.

- i. 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.
- ii. 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.
- e. 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.
 - i. Minimum proof loads for alloy steel chain shall be equal to twice the working load limit values shown for single slings.
- f. Alloy steel chain slings shall not be used with loads in excess of the rated capacities prescribed in Table S-1 (see CCR Title 8, [Section 5049](#)). Slings not included in the table shall be used only in accordance with the manufacturer's recommendations.
- g. 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.
- h. 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.
 - i. Mechanical coupling links or low carbon steel repair links shall not be used to repair broken lengths of chain.
- i. 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.
- j. Alloy steel chain slings with cracked or deformed master links, coupling links or other components shall be removed from service.
- k. 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.

29. Wire Rope Slings

- a. Wire rope slings shall not be used with loads in excess of the rated capacities shown in Tables S-3 through S-14 (see CCR Title 8, [Section 5049](#)). Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.
- b. Minimum Sling Lengths.

- i. 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.
- ii. Braided slings shall have a minimum clear length of wire rope 40 times the component rope diameter between the loops or end fittings.
- iii. Cable laid grommets, strand laid grommets and endless slings shall have a minimum circumferential length of 96 times their body diameter.
- c. 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.
 - i. Welding of end attachments, except covers to thimbles, shall be performed prior to the assembly of the sling.
 - ii. 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.
 - iii. 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. Wire rope slings shall be immediately removed from service if any of the following conditions are present:
 - i. Six randomly distributed broken wires in one rope lay, or 3 broken wires in one strand in one rope lay.
 - ii. Wear or scraping of one-third the original diameter of outside individual wires.
 - iii. Kinking, crushing, bird caging or any other damage resulting in distortion of the wire rope structure.
 - iv. Evidence of heat damage.
 - v. End attachments that are cracked, deformed or worn to the point where the rated capacity is reduced.
 - vi. 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.

- vii. Corrosion that is of such severity or extent as to reduce the rated load capacity of the rope or end attachment.
- viii. One or more broken wires within one rope lay of the end attachments.
- f. Eyes in wire rope slings shall not be formed by using knots.
- g. Employers must ensure that wire rope and wire-rope slings:
 - i. 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
 - ii. Not be used without affixed and legible identification markings.

30. Natural and Synthetic Fiber Rope Slings

- a. 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 (see CCR Title 8, [Section 5049](#)).
 - i. Fiber rope slings shall have a diameter of curvature meeting at least the minimums specified in Figures S-4 and S-5.
 - ii. Slings not included in these Orders shall be used only in accordance with the manufacturer's recommendations.
 - iii. Natural and synthetic fiber rope slings shall not be used for suspending personnel platforms.
- b. 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. 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:
 - i. 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.
 - ii. 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.
 - iii. 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).

- iv. Fiber rope slings shall have a minimum clear length of rope between eye splices equal to 10 times the rope diameter.
- v. Knots shall not be used in lieu of splices.
- vi. Clamps not designed specifically for fiber ropes shall not be used for splicing.
- vii. 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. Fiber rope slings shall not be used if end attachments in contact with the rope have sharp edges or projections.
- e. Natural and synthetic fiber rope slings shall be immediately removed from service if any of the following conditions are present:
 - i. Abnormal wear;
 - ii. Powdered fiber between strands;
 - iii. Broken or cut fibers;
 - iv. Variations in the size or roundness of strands;
 - v. Discoloration or rotting;
 - vi. Distortion of hardware in the sling.
- f. 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. Natural and synthetic fiber-rope slings must:
 - i. 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
 - ii. Not be used without affixed and legible identification markings.

31. Synthetic Web Slings

- a. Each sling shall be marked or coded to show the rated capacities for each type of hitch and type of synthetic web material.
- b. Synthetic webbing shall be of uniform thickness and width and selvage edges shall not be split from the webbing's width.
- c. Fittings shall be:
 - i. Of a minimum breaking strength equal to that of the sling; and
 - ii. Free of all sharp edges that could in any way damage the webbing.
- d. 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. Synthetic web slings shall not be used with loads in excess of the rated capacities specified in Tables S-22 through S-24 (see CCR Title 8, [Section 5049](#)). Slings not included in the table shall be used only in accordance with the manufacturer's recommendations.
- f. When synthetic web slings are used, the following precautions shall be taken:

- i. Nylon web slings shall not be used where fumes, vapors, sprays, mists or liquids of acids or phenolics are present.
 - ii. Polyester and polypropylene web slings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.
 - iii. Web slings with aluminum fittings shall not be used where fumes, vapors, sprays, mists or liquids of caustics are present.
 - g. 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.
 - i. Synthetic web slings which are repaired shall not be used unless repaired by a sling manufacturer or an equivalent entity.
 - ii. 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.
 - iii. Slings, including webbing and fittings, which have been repaired in a temporary manner shall not be used.
 - i. Synthetic web slings shall be immediately removed from service if any of the following conditions are present:
 - i. Acid or caustic burns;
 - ii. Melting or charring of any part of the sling surface;
 - iii. Broken or worn stitches;
 - iv. Distortion of fittings;
 - v. Snags, punctures, tears or cuts; or
 - vi. 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 slings shall be stored in an area or facility where they are not subject to heat above 150o F or exposed to direct sunlight.
32. Deformed or defective hooks or rings shall not be used.
- a. Deformed hooks or rings shall be replaced or repaired and reshaped under proper metallurgical control and proof tested.
 - b. Annealing or normalizing shall be done only in accordance with the chain manufacturer's specifications.
 - c. Hooks and shackles shall be used in accordance with manufacturer's recommendations.
 - d. 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.
 - e. 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.
- f. Shackles must:
 - i. Have permanently affixed and legible identification markings as prescribed by the manufacturer that indicate the recommended safe working load;
 - ii. Not be loaded in excess of its recommended safe working load as prescribed on the identification markings by the manufacturer; and
 - iii. Not be used without affixed and legible identification markings.
33. All boom-type mobile cranes shall be used as follows:
- a. Foot-operated brake pedals shall be maintained so that the operator's foot will not easily slip off.
 - b. Outrigger wheels when used on mobile cranes shall be properly guarded to prevent a person being run over by a wheel.
 - c. An effective, audible warning and operating signal device shall be provided on the outside of the crane.
34. All hydraulic excavators shall be used as follows:
- a. When required by certified agent's instructions, outriggers shall be set so that wheels or crawler tracks within the boundary of the outriggers shall be relieved of all weight by the outrigger jacks or blocking.
 - b. Telescopic booms that have an indicator shall show the boom length from minimum to maximum and be visible to the operator from the operator's position at the controls.
 - c. A boom hoist disconnect shut-off or hydraulic relief shall be provided to automatically stop the boom hoist when the boom reaches a predetermined high angle.
 - d. At least one of the following stops shall be provided to resist the boom falling backwards:
 - i. A fixed or telescoping bumper.
 - ii. A shock absorbing bumper.
 - iii. Hydraulic boom elevation cylinder(s).
 - e. A load rating chart and/or label(s) shall be located on the crane to be available to the operator from the operator's position at the control stand. It shall include the maximum loads permitted during actual boom telescoping operation.

D. TESTING AND REPAIR

35. Testing of cranes shall be done as follows:
- a. Testing and certification of cranes shall be in accordance with Cal OSHA Title 8 CCR, Article 99.

- i. Tests and examinations shall be conducted annually by a currently licensed certifying agency or designee listed in the certifying agency license, and a certificate shall be issued by the certifying agency;
 - ii. Certificates (annual and quadrennial) attesting to current compliance with testing and examination standards of requirements shall be maintained for each crane.
 - b. Proof load tests and examinations of cranes shall be carried out as follows:
 - i. In the case of new cranes, before being taken into initial use and every 4 years thereafter.
 - ii. In the case of uncertificated cranes which have been in use, at the time of initial certification and every 4 years thereafter.
 - iii. In the case of major modifications or repairs to important structural components, before they are returned to service.
 - iv. Test weights shall be legibly marked to indicate the documented weight.
 - v. Lifting attachments on test weights shall be visually inspected prior to each use. Damaged or defective lifting attachments that are not suitable for safe use shall not be used.
 - vi. Embedded wire rope and reinforcing steel (rebar) shall not be used as lifting attachments.
 - c. If the equipment meets the requirements, a certificate shall be issued indicating that the required tests and/or examinations have been performed and that any defects found by such examination and tests have been corrected and that the equipment is in safe operating condition at the time of examination.
 - i. A copy of such certificate shall be available with each crane or at the project site.
36. Periodic inspections shall be conducted at least four times a year. The annual certification, can serve as one of the required periodic inspections.
- a. The periodic inspections shall be evenly spaced or as close to evenly spaced as scheduling permits through the year.
 - b. Cranes shall not be operated more than 750 hours, between periodic inspections.
 - c. The inspection shall include the following in addition to the items in the section above:
 - i. Excessive wear of all functional operating mechanisms.
 - ii. Ropes, brakes, friction clutches, chain drives, and other parts subject to wear which may be readily inspected.
 - iii. Cranes handling molten metal shall be inspected at least weekly when in use and necessary repairs made.
 - iv. An inspection record shall be maintained which includes the date of the inspection, the signature of the person who performed the inspection, and the serial number or other identifier of the crane inspected. The most recent inspection record shall be maintained on file.

37. In any year in which no quadrennial (every four years) proof load test is required on cranes, such equipment shall be examined by a Qualified Person. Such examination shall be made not later than the anniversary date of the quadrennial certification and shall conform with the following:
- a. Crane hooks with cracks or with deformation of throat opening more than 15 percent in excess of normal opening or more than 10 degree twist from plane of unbent hook shall be removed from service.
 - b. Ropes shall be inspected for proper lubrication, excessive wear, broken strands, and proper reeving. Many variable factors are involved in determining the exact time for replacement of rope and timely replacement for safety. Conditions such as the following shall be sufficient reason for replacement:
 - i. In running ropes, 6 randomly distributed broken wires in one rope lay, or 3 broken wires in one strand in one lay.
 - ii. Wear of 1/3 the original diameter of outside individual wires.
 - iii. Kinking, crushing, bird caging, or other damage resulting in distortion of the rope structure. Evidence of any heat damage.
 - iv. Reductions from nominal diameter of more than:
 - 1/64 inch for diameters up to 5/16 inch
 - 1/32 inch for diameters 3/8 inch to 1/2 inch
 - 3/64 inch for diameters 9/16 inch to 3/4 inch
 - 1/16 inch for diameters 7/8 inch to 1 1/8 inch
 - 3/32 inch for diameters 1 1/4 inch to 1 1/2 inch
 - v. In standing ropes, more than 2 broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection.
 - vi. Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.
 - c. In order to establish data for judging the proper time for replacement of hoisting rope, a continuing inspection record shall be maintained.
 - d. Whenever it is considered and whenever it is practical and advisable to avoid disassembly of equipment, removal of pins, etc., examination of structure or parts by electronic, ultrasonic, or other nondestructive methods shall be carried out.
38. A preventive maintenance program shall be established and dated. Detailed records shall be maintained.
39. Adjustments and repairs shall be done as follows:
- a. Adjustments and repairs shall be done by Qualified Persons.
 - b. Before adjustments and repairs are started on a crane, the following precautions shall be taken as applicable:
 - i. Cranes shall be placed where they will cause the least interference to and be least interfered with by other equipment or operations in the area.

- ii. Boom and load block shall be lowered to the ground or floor, if possible, or otherwise secured against dropping.
 - iii. All power controls shall be locked or otherwise secured in the stop position and starting means rendered inoperative.
 - iv. Warnings and barriers shall be placed to warn others from danger area and protect the crane under repair from being struck by other machines or equipment.
 - c. After all repairs and adjustments have been made, the crane shall not be operated until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed, including all loose material.
 - d. Adjustments shall be maintained to assure correct functioning of the following components:
 - i. All functional operating mechanisms.
 - ii. Safety devices.
 - iii. Control systems.
 - iv. Power plants.
 - v. Brakes.
 - e. When welding repair procedures are required on load sustaining members, instructions shall be provided by the certified agent and those instructions shall be followed where applicable. Welds on all critical crane parts shall be performed only by qualified welders who are certified to perform high quality welding.
 - f. All repair welds performed on critically stressed members, such as boom chord, mast chord, and main deck girders (where permitted by a certified agent), shall be magnetic particle tested or tested by ultrasonic or other suitable nondestructive means as well as visually inspected. All indicated repairs shall be made promptly and records of the most recent test shall be kept until a new test is conducted or until the part is permanently removed from service.
40. Prior to further use, boom sections or boom suspension components that have been damaged shall be repaired, restoring them to not less than the capacity of the original section or components.
- a. Repairs to critically stressed members of a boom or boom extension, such as a boom chord, mast chord, or boom sections, shall be performed in accordance with the manufacturers' or certified agent's recommendations.
 - b. New or replacement booms or boom extensions shall be tested before use.

For any questions, please contact EHS at 415-831-2780.