

California Institute of Technology

CRANE AND HOIST SAFETY PROGRAM



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Table of Contents

- CRANE AND HOIST SAFETY PROGRAM..... 4
- INTRODUCTION 4
- OBJECTIVES AND METRICS 4
- SCOPE 4
- ROLES AND RESPONSIBILITIES..... 7
 - Environment, Health and Safety (EHS)..... 7
 - Division Responsibilities 7
 - Supervisors 7
 - Crane / Hoist Operators 7
 - Contractors and Sub-Contractors..... 8
- INSPECTIONS 8
 - Initial Inspection 8
 - Functional Inspection 9
 - Frequent Inspection 10
 - Periodic Inspections 11
 - Inspection of Cranes Not in Regular Use..... 12
 - Sling Inspection – General..... 12
 - Wire Rope Sling Inspection 12
 - Alloy Steel Chain Slings..... 13
 - Synthetic Web Sling Inspection (Typically Nylon or Polyester)..... 13
 - Natural and Synthetic Fiber Rope Sling Inspection 14
 - Metal Mesh Sling Inspection 14
- PROCEDURES 14
 - Fitness for Duty 14
 - Rated Load Marking 15
 - General..... 15
 - Rigging the Load 15
 - Lifting and Lowering a Load 16
 - Parking the Load..... 17
 - Hand Signals 17
 - Maintenance 17
- TRAINING..... 18
- RECORDS AND DOCUMENT CONTROL 18
- DEFINITIONS 18
 - Rope Parts. 20
- CRANE INSPECTION FORM 22

CRANE AND HOIST SAFETY PROGRAM

INTRODUCTION

The purpose of the Crane and Hoist Safety Program is to establish safe work practices and inspection procedures to help ensure that the operators of overhead cranes as well as the Caltech community are protected from potential hazards associated with the movement of equipment and material using a crane, hoist, and related equipment.

OBJECTIVES AND METRICS

This program will ensure compliance with applicable federal, state and local regulations, including:

- OSHA 29 CFR 1910.179: Overhead and Gantry Cranes
- OSHA 29 CFR 1926.550: Cranes and Derricks
- OSHA 29 CFR 1903.1: The General Duty Clause
- ANSI ANSI/ASME B30 series: Cranes, Derricks, Hoists
- CCR TITLE 8 Group 13: Cranes and Hoisting Equipment

The Crane and Hoist Safety Program is intended to:

- Ensure a safe work environment for personnel who operate, maintain, and/or work around cranes and hoists.
- Establish inspection procedures for cranes, hoists, chains, slings, etc.
- Ensure a safe environment for the Caltech community.

SCOPE

This program applies to Caltech employees, students and campus facilities including remote properties of the Institute that operate and use overhead cranes, hoists and associated lifting equipment.

This program is applicable to all overhead and gantry cranes, including semi-gantry, cantilever gantry, wall cranes, bridge cranes, electric hoists, manual hoists, pneumatic hoists, chains and slings, and other hoisting equipment that have similar fundamental characteristics.

See photo descriptions (NEXT TWO PAGES).

Gantry Cranes



Semi-Gantry Crane



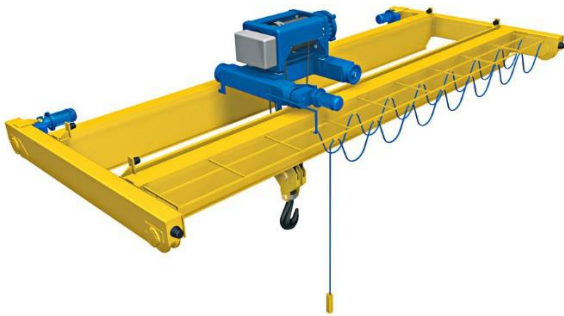
Cantilever Gantry Crane



Wall Crane

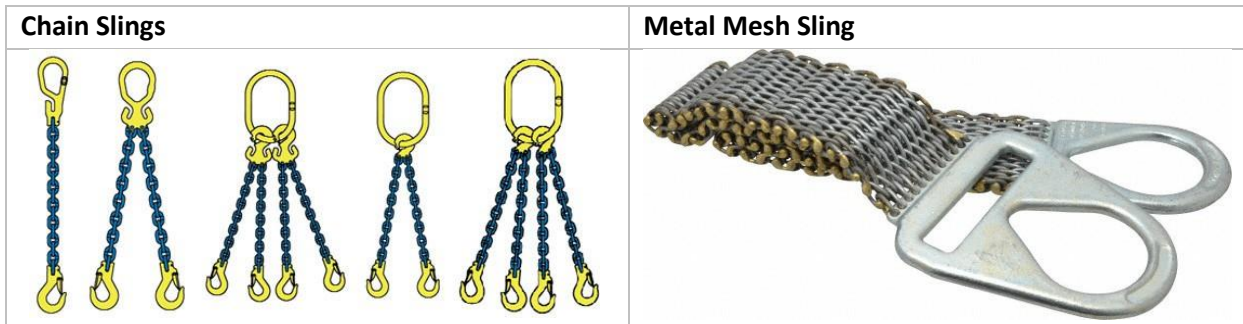


Bridge Crane



Electric Overhead Hoist





- Does not include Mobile Cranes.
- Does not include Engine Hoists.
- Does not include Powered Industrial Trucks (PIT), Aerial Work Platforms (AWP) or other Mobile Equipment covered in other Institute programs.

ROLES AND RESPONSIBILITIES

Environment, Health and Safety (EHS)

- Review the Crane and Hoist Safety Program on a periodic basis and revise as necessary.
- Provide technical assistance regarding the regulatory requirements of cranes, hoists, chains, and slings.
- Provide or arrange training for the safe operation of overhead cranes, and the inspection procedures for cranes, hoists, chains, and slings.
- Periodically audit crane operations to ensure compliance with all applicable regulations and safety practices.

Division Responsibilities

- Ensure any crane and hoist within their area of responsibility is inspected by a qualified competent person.

Supervisors

- Designate and identify personnel competent to operate cranes, hoists and slings within your area of responsibility a.k.a. competent operators.
- Ensure competent operators have received proper training.
- Ensure cranes, hoists and slings are maintained in proper working order and repaired or replaced when necessary.
- Ensure scheduled inspections and testing is conducted as required.
- Ensure that the requirements of the program are observed, particularly with respect to inspections.
- Establish and maintain an inspection record keeping system for those cranes and hoists within your responsibility. To include the date of inspection, and the signature of the person who performed the inspection.
- Ensure the fitness for duty of crane operators. Refer to the Procedures section of this manual.

Crane / Hoist Operators

- Attend training on the requirements of the Crane and Hoist Safety Program.
- Work only on equipment for which they have received training.
- Follow all crane operating procedures.
- Conduct the appropriate inspections when they are required and complete the required documentation when necessary.
- Notify their supervisor of any deficiencies identified during inspections.
- Report all incidents involving cranes and hoists to supervisors immediately.

Contractors and Sub-Contractors

- Responsible for complying with all state, local and federal requirements for cranes, hoists and associated equipment.
- Ensure the Caltech community is protected from their operation with cranes, hoists and associated equipment.

INSPECTIONS

Cranes must be consistently inspected to prevent equipment failure and incidents and to determine whether cranes and crane components can be expected to perform as intended. Crane and Hoist inspections are divided into five general classifications:

1. Initial Inspection
2. Functional Inspection – Pre-use Inspection
3. Frequent Inspection – After 750 hours of use between periodic inspections
4. Periodic Inspection – Quarterly
5. Inspection of equipment not in regular use

In addition, the inspection provisions as outlined in the manufacturer owner's manual specific to the equipment shall be followed.

All inspections shall be completed by a competent person (unless otherwise specified) and all deficiencies corrected before further use by a qualified person.

If any adjustments have to be made to the unit, the crane or crane components will not be operated until all the guards have been installed, all safety devices reactivated, and all maintenance equipment moved. If any defect is found, the crane will not be operated until the repair or the adjustment is complete.

Initial Inspection

- New, reinstalled, altered, repaired, and modified equipment shall be inspected prior to initial use to verify whether the crane or hoist can be expected to perform as intended.
- The operational inspection shall include the following function tests (with an empty hook) as applicable:
 - a. Lifting and lowering
 - b. Trolley travel
 - c. Bridge travel
 - d. Hoist-limit devices
 - e. Travel-limiting devices
 - f. Locking and indicating devices, if provided

New equipment shall also be load tested prior to initial use. Load testing for altered, repaired or modified cranes or hoists may be limited to the functions affected by the alternation, repair or modification, as determined by a qualified person.

- g. The load shall not be less than 100% of the rated load of the crane or hoist(s), whichever is larger, or more than 125% of the rated load of the crane or hoist(s), whichever is smaller, unless otherwise recommended by the manufacturer or qualified person.
- h. During a load test, the person conducting the load test shall prepare a written report of the load sustained during the test and the operations performed during the test. Reports shall be placed on file for that particular crane or hoist(s).
- i. Operations to perform during a load test include (unless otherwise modified by a qualified person):
 - i. Hoist the test load a distance to ensure that the load is supported by the crane and held by the hoist brakes.
 - ii. Transport the test load by means of the trolley for the full length of the bridge.
 - iii. Transport the test load by means of the bridge for the full length of the runway in one direction with the trolley as close to the extreme right-hand end of the crane as practical, and in the other direction with the trolley as close to the extreme left-hand end of the crane as practical.
 - iv. Lower the test load, and stop and hold the load with the brakes.

Functional Inspection

Functional inspections shall be conducted at the beginning of each shift, or before the crane is first used during each shift. Items that shall be inspected include:

- a. Operational controls: hoisting and lowering, trolley travel, bridge travel, limit switches.
- b. Operational verification of the upper limit device under no-load conditions. The load shall be inched into the limit or run in at a slow speed.
- c. Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems.
- d. Ropes, looking for the following removal criteria:
 - i. Distortion of the rope, such as kinking, crushing, unstranding, bird-caging, main strand displacement, or core protrusion.
 - ii. Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.
 - iii. General corrosion.
 - iv. Broken or cut strands.
 - v. Apparent heat damage from any heat source.
 - vi. Number, distribution, and type of visible broken wires:
 - a. In running ropes, twelve randomly distributed broken wires in one lay or four broken wires in one strand in one lay.
 - b. One outer wire broken at the contact point with the core of the rope, which has worked its way out of the rope structure and protrudes or loops from the rope structure.

- e. Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper functions, or stretched beyond manufacturer's recommendations.
- f. Hooks and latches, looking for the following removal criteria:
 - i. Excessive throat opening
 - ii. Damaged or missing safety latch
 - iii. Wear, deformation, or corrosion

Frequent Inspection

Equipment shall be inspected at intervals dependent on the use of the equipment as follows:

- a. Normal service – After 750 hours of use between periodic inspections
- b. Heavy service – Weekly to monthly
- c. Severe service – Daily to weekly

The following shall be inspected:

- a. Operating controls for proper operation, proper adjustment, and unusual sounds e.g. squeaking, grinding, grating, etc.
- b. Verify operation of the upper limit device under no-load conditions. The load shall be inched into the limit or run in at a slow speed.
- c. Tanks, valves, pumps, lines, and other parts of air or hydraulic systems for leakage.
- d. Hooks and latches, looking for the following removal criteria:
 - i. Missing or illegible hook manufacturer's identification or secondary manufacturer's identification.
 - ii. Missing or illegible rated load identification.
 - iii. Excessive pitting or corrosion.
 - iv. Cracks, nicks, or gouges.
 - v. Wear – any wear exceeding 10% of the original section dimension of the hook or its load pin.
 - vi. Deformation – any visible apparent bend or twist from the plane of the unbent hook.
 - vii. Throat opening – any distortion causing an increase in the throat opening of 5% of the original opening (not to exceed ¼ inch).
 - viii. Inability to lock – any self-locking hook that does not lock.
 - ix. Inoperative latch – any damaged latch or malfunctioning latch that does not close the hook's throat.
 - x. Damaged, missing, or malfunctioning hook attachment and securing means.
 - xi. Thread wear, damage or corrosion.
 - xii. Evidence of excessive heat exposure or unauthorized welding.
 - xiii. Evidence of unauthorized alternations such as drilling, machining, grinding, or other modifications.
- e. Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper functions, or stretched beyond manufacturer's recommendations.

- f. Rope for proper spooling onto the drums and sheaves.
- g. Warning devices for proper operation.
- h. Ropes, looking for the following removal criteria:
 - i. Distortion of the rope, such as kinking, crushing, unstranding, bird-caging, main strand displacement, or core protrusion.
 - ii. Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.
 - iii. General corrosion.
 - iv. Broken or cut strands.
 - v. Apparent heat damage from any heat source.
 - vi. Number, distribution, and type of visible broken wires:
 - In running ropes, twelve randomly distributed broken wires in one lay or four broken wires in one strand in one lay.
 - One outer wire broken at the contact point with the core of the rope, which has worked its way out of the rope structure and protrudes or loops from the rope structure.

Periodic Inspections

Periodic inspections shall be conducted by a qualified person and equipment shall be inspected at intervals dependent on the use of the equipment as follows:

- a. Normal service – Quarterly
- b. Heavy service – Monthly
- c. Severe service – Weekly

The inspection shall include the items listed under the Frequent Inspection section of this Program as well as the following items as applicable:

- a. Deformed, cracked, corroded, worn or loose members or parts.
- b. Loose or missing fasteners; bolts, nuts, pins or rivets.
- c. Cracked or worn sheaves and drums.
- d. Worn, cracked or distorted parts such as pins, bearings, wheels, shafts, gears, rollers, locking and clamping devices, bumpers and stops.
- e. Hooks and latches, looking for the following removal criteria
 - Missing or illegible hook manufacturer's identification or secondary manufacturer's identification.
 - Missing or illegible rated load identification.
 - Excessive pitting or corrosion.
 - Cracks, nicks, or gouges.
 - Wear – any wear exceeding 10% of the original section dimension of the hook or its load pin.
 - Deformation – any visible apparent bend or twist from the plane of the unbent hook.
 - Throat opening – any distortion causing an increase in the throat opening of 5% of the original opening (not to exceed ¼ inch).
 - Inability to lock – any self-locking hook that does not lock.

- Inoperative latch – any damaged latch or malfunctioning latch that does not close the hook’s throat.
 - Damaged, missing, or malfunctioning hook attachment and securing means.
 - Thread wear, damage or corrosion.
 - Evidence of excessive heat exposure or unauthorized welding.
 - Evidence of unauthorized alternations such as drilling, machining, grinding, or other modifications.
- f. Excessive wear of brake system parts.
 - g. Excessive wear of drive chain sprockets and excessive drive chain stretch.
 - h. Deterioration of controllers, master switches, contacts, limit switches, and push-button stations.
 - i. Gasoline, diesel, electric or other power plants for proper operation.
 - j. Motion limit devices.
 - k. Rope reeving.
 - l. Function, instruction and safety information signs, labels or plates for legibility and replacement.
 - m. Rope and end connections.

Ensure the inspection is documented to provide a basis for continuing evaluation and retained on file.

Inspection of Cranes Not in Regular Use

A crane that has been idle for a period of 1 month or more, but less than 6 months, shall be inspected before being placed in service following the requirements as outlined in the Frequent Inspection section of this Program.

A crane that has been idle for 6 months or more shall be inspected before being placed in service following the requirements as outlined in the Periodic Inspection section of this Program.

Sling Inspection – General

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

Wire Rope Sling Inspection

A wire rope sling shall be removed from service if conditions such as the following are present:

- a. Missing or illegible sling identification.
- b. Broken wires:
 - i. For strand-laid and single-part slings, 10 randomly distributed broken wires in one rope lay, or 5 broken wires in one strand in one rope lay.
 - ii. For cable-laid slings, 20 broken wires per lay.
 - iii. For less than eight-part braided slings, 20 broken wires per braid.
 - iv. For eight-part or more than eight braided slings, 40 broken wires per braid.
- c. Severe localized abrasion or scraping.
- d. Kinking, crushing, bird caging, or any other damage is noted.

- e. Corrosion of the rope or end attachments.
- f. Evidence of heat damage.
- g. End attachments are cracked, deformed or worn.
- h. Evidence of hook removal criteria as defined in the Frequent Inspection section of this Program.
- i. Other conditions, including visible damage, that cause doubt as to the safety of continued use.

Alloy Steel Chain Slings

An alloy steel chain sling shall be removed from service if conditions such as the following are present:

- a. Missing or illegible sling identification.
- b. Cracks or breaks
- c. Excessive wear, nicks, or gouges.
- d. Stretched chain links or components
- e. Bent, twisted, or deformed chain links or components.
- f. Evidence of heat damage.
- g. Excessive pitting or corrosion.
- h. Lack of ability of chain or components to hinge (articulate) freely.
- i. Weld splatter.
- j. Evidence of hook removal criteria as defined in the Frequent Inspection section of this Program.
- k. Other conditions, including visible damage, that cause doubt as to the safety of continued use.

Synthetic Web Sling Inspection (Typically Nylon or Polyester)

A synthetic web or round sling shall be removed from service if conditions such as the following are present:

- a. Missing or illegible sling identification.
- b. Acid or caustic burns.
- c. Melting or charring of any part of the sling.
- d. Holes, tears, cuts, or snags.
- e. Broken or worn stitching in load bearing splices.
- f. Weld splatter that exposes core yarns.
- g. Excessive abrasive wear.
- h. Knots in any part of the sling.
- i. Discoloration & brittle or stiff areas on any part of the sling, may mean chemical or ultraviolet/sunlight damage.
- j. Fittings that are pitted, corroded, cracked, bent, twisted, gouged, or broken.
- k. Evidence of hook removal criteria as defined in the Frequent Inspection section of this Program.
- l. Other conditions, including visible damage, that cause doubt as to the safety of continued use.

Natural and Synthetic Fiber Rope Sling Inspection

Each sling should be marked or coded to show the rated capacities for each type of hitch and type of material. Fiber rope slings should not be spliced in any manner. Natural and synthetic fiber rope slings shall be immediately removed from service if there is:

- a. Abnormal wear.
- b. Powdered fiber between strands.
- c. Variation in the size or roundness of strands.
- d. Discoloration or rotting.
- e. Distortion of hardware in the sling.
- f. Any other conditions, including visible damage, that cause doubt as to the safety of continued use.

Only fiber rope slings made from new rope shall be used. Use of repaired or reconditioned fiber rope slings is prohibited.

Metal Mesh Sling Inspection

A metal mesh sling shall be removed from service if any condition such as the following is present:

- a. Missing or illegible sling identification.
- b. Broken weld or a broken brazed joint along the sling edge
- c. Broken wire in any part of the mesh.
- d. Reduction in wire diameter of 25% due to abrasion or 15% due to corrosion.
- e. Lack of flexibility due to distortion of the mesh.
- f. Distortion of the choker fitting so the depth of the slot is increased by more than 10%.
- g. Distortion of either end fitting so the width of the eye opening is decreased by more than 10%.
- h. A 15% reduction of the original cross-sectional area of any point around the hook opening of the end fitting.
- i. Visible distortion of either end fitting out of its plane.
- j. Cracked end fitting.
- k. Spirals that are locked or without free articulation.
- l. Fitting that are pitted, corroded, cracked, bent, twisted, gouged, or broken.
- m. Any other conditions, including visible damage, that cause doubt as to the safety of continued use.

PROCEDURES

Fitness for Duty

The operator of overhead cranes must be a thoroughly trained, competent and physically capable individual and not under the influence of any substance that could impair physical, visual, or mental reactions or capabilities, and must understand all the regulations regarding crane safety.

Rated Load Marking

The rated load of the crane shall be plainly marked on each side of the crane.

- a. Each hoist and each hoist attachment should have the rated load clearly marked.
- b. These markings shall be clearly legible from the floor or ground.
- c. The load shall never exceed the rated load of the crane or hoist or attachment equipment, except during the load test procedures as noted in the Initial Inspection section of this Program.
- d. Modifications. Cranes and hoists may only be modified by a qualified engineer or equipment manufacturer. The new rated load shall be displayed in accordance with this section.

General

Equipment shall only be operated by a competent operator or trainee that is under the direct supervision of the competent operator. The operator, when operating the equipment, shall maintain full attention to the task being performed (e.g., no use of headsets, music, or other distractions). The operator shall ensure that hand signals used during the lift are understood and followed by all involved. See the Hand Signals section of this Program.

If the crane or hoist has been locked and tagged out, the operator shall not remove the lock or tag unless the lock or tag has been placed there by the operator.

- a. Operators shall not pass under a suspended load.
- b. No personnel shall be allowed to walk or be under a suspended load.
- c. All employees who handle wire slings and hoist cables shall wear leather gloves to prevent any hand injury.
- d. Proper guards must be in place for exposed gears, belts, electrical equipment, couplings and fans.
- e. Suspended loads shall be kept clear of all unnecessary obstructions and personnel.
- f. Hands or fingers shall not be placed between the sling and its load while the sling is being tightened around the load.
- g. Shock loading is prohibited.
- h. A sling shall not be pulled from under a load when the load is resting on the sling.

Rigging the Load

Determine the accurate weight of the load and ensure crane weight limitations are not exceeded (except when load testing) and determine the appropriate size and number of slings and associated components. The competent operator must be familiar with the appropriate rigging and hoisting techniques to safely move a load.

- a. Ensure slings and hooks are in proper working condition with no excessive wear as determined in the inspection.
- b. Slings shall be securely attached to their loads.
- c. Slings shall not be loaded in excess of their rated capacities.
- d. Sharp edges on loads being lifted/lowered shall be padded to prevent wear on slings.
- e. Slings used in a basket hitch shall have the loads balanced to prevent slippage.

- f. The hoist chain or hoist rope shall be free of kinks or twists.
- g. Slings shall not be shortened with knots, belts or other makeshift devices.
- i. Hoist chains or ropes shall not be wrapped around the load.
- j. Hoist chain or ropes shall be free from kinks or twists.
- k. The load shall be attached to the load block hook by means of slings or other approved devices.
- l. Determine the center of gravity of the load and ensure rigging maintains the load level during movement.
- m. Once slings are in place, lift the load only slightly off the ground to test the rigging and balance; re-work the rigging if necessary.
- n. Use a tag line when loads must traverse long distance or be otherwise controlled.
- o. Prior to lifting the load, the operator shall make certain that the load, sling, attachments, lifting devices and the load block are unobstructed.

Lifting and Lowering a Load

Cranes shall only be operated by a competent operator. Use a dedicated spotter if the load is out of view from the operator or there are conditions that warrant assistance (power lines, pedestrians, lift that exceeds 75% of rated capacity of the crane or hoisting equipment, or requires the use of more than one crane or hoist). The person responsible for directing the lift shall make sure that the load is properly secured, balanced and positioned in the sling or lifting device before it is lifted more than a few inches.

Before starting the lift, the person directing the lift shall make sure the hoist chain or ropes are not kinked or twisted. The load block shall be brought over the load in such a manner as to prevent swinging. The hoist chain or rope shall be inspected to ensure that it is properly seated in the chain sprocket or drum groove. Avoid sudden acceleration or deceleration of the moving load.

A minimum clearance of 3 inches overhead and 2 inches laterally must be provided and maintained between the crane and any unnecessary obstruction. Lift equipment shall not be used for side pulls. The operator shall not move the load while a person is on the load or hook.

No personnel, including the spotter(s) or operators, are to touch or manipulate a load with their hands/body unless they can demonstrate that it is infeasible to do otherwise. Taglines, shepherd hooks or the like shall be used to keep employees outside the fall zone.

The operator shall not carry loads over people. The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes. The load shall not be lowered below the point where less than 2 full wraps remain on the hoisting drum, unless a lower limit device is provided. If a lower limit device is provided, no less than one wrap shall remain.




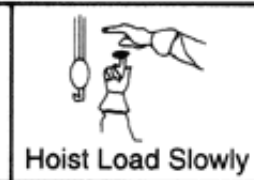
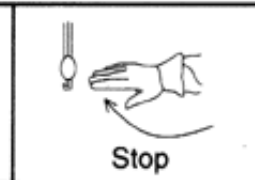
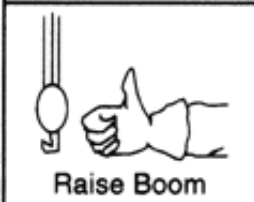
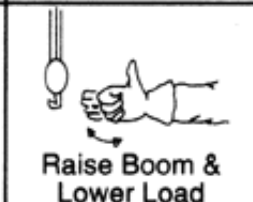
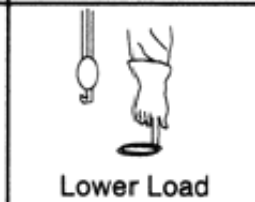
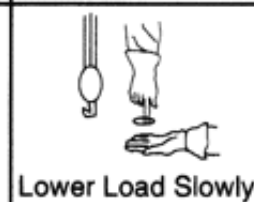

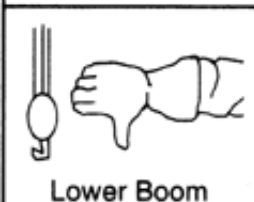
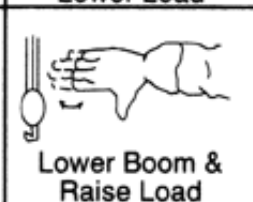
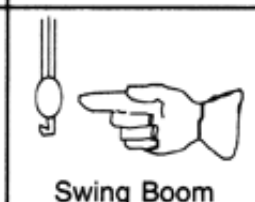
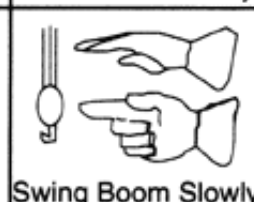

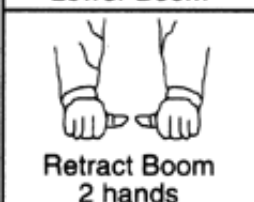
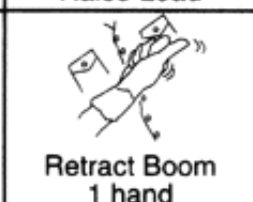



Trolley stops and/or bumpers shall be provided to limit the travel of the trolley along the runway and be capable of sufficiently stopping the trolley. Crane electronic controllers shall be equipped to shut the crane to the "off" position as a fail-safe.

Parking the Load

Operators shall not leave their position at the controls while the load is suspended. Before leaving a load unattended, the operator shall land any load, place the controls or master switch in the off position and open the main line device of the specific crane or hoist. The main line disconnect shall not be closed until the operator has made sure that no one is on or adjacent to the crane or hoist. The load block of the hoist shall be raised above head level when not in use.

Hand Signals

If audio (voice/radio) communication between crane operator and spotter is not possible, hand signals should be utilized. Signals must be discernible or audible at all times by both the crane operator and spotter. Hand signals shall follow standard signals. See below or refer to OSHA 1926, Subpart CC for more detail on standard hand signals.

 Main Hoist	 Auxiliary Hoist	 Hoist Load	 Hoist Load Slowly	 Stop
 Raise Boom	 Raise Boom & Lower Load	 Lower Load	 Lower Load Slowly	 Emergency Stop
 Lower Boom	 Lower Boom & Raise Load	 Swing Boom	 Swing Boom Slowly	 Travel (mobile eqpt)
 Retract Boom 2 hands	 Retract Boom 1 hand	 Extend Boom 2 hands	 Extend Boom 1 hand	 Dog Everything

Maintenance

Preventive maintenance shall be performed as prescribed by the manufacturer as detailed in the owner's manual. The crane to be repaired shall be run to a location where it will cause the least interference with other cranes and operations in the area. All controllers shall be at the off position. The main or emergency switch shall be open and locked in the open position.

During maintenance warning or "out of order" signs shall be placed on the crane, also on the floor beneath or on the hook where visible from the floor. After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices

reactivated and maintenance equipment removed. Any unsafe condition noted during the inspection of the crane shall be repaired before the crane is used.

TRAINING

All operators must be familiar with and be trained to operate the equipment they are assigned to use. New operators should receive training on the safe operation and uses of cranes, hoists and slings. Competent Crane and Hoist Operators must receive the following training.

- A classroom delivered course.
- Hands-on instruction by a Competent Crane and Hoist Operator.

Competent Crane and Hoist Operators will follow this written program and other safety rules pertaining to inspections, operation and routine maintenance of cranes, hoists and slings.

RECORDS AND DOCUMENT CONTROL

Form Name	Retention	Maintain Location
Initial Safety Check List	Retain while equipment is installed or a new Initial Inspection is completed for the equipment.	Equipment File
Quarterly Safety Check List	Retain until full, and then replace with new.	On/near Equipment

DEFINITIONS

ASME. American Society of Mechanical Engineers.

ANSI. American National Standards Institute.

Brake. A device used for retarding or stopping motion by friction or power means.

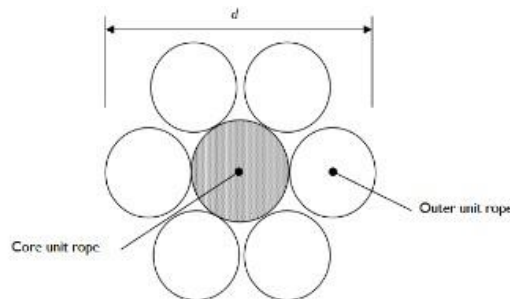
Bridge. The part of a crane consisting of girders, trucks, end ties, foot walks and a drive mechanism which carries the trolley(s).

Bridge crane. Crane with bridge mounted on tracks which enables three-dimensional handling.

Bridge travel. Crane movement in a direction parallel to the crane runway.

Bumper (buffer). An energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel; or when two moving cranes or trolleys come in contact.

Cable Laid Sling. Cable laid slings are formed from wire rope constructed of six unit ropes laid as outers over one core unit rope, with a termination at each end, usually in the form of a spliced eye, as shown:



Cantilever Gantry Crane. A gantry or semi-gantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides.

Chain Sprocket or Drum Groove: Grooved or notched wheel in which the hoist rope or chain is seated.

Clearance. The distance from any part of the crane to a point of the nearest obstruction.

Competent Operators: A person who has been selected and is qualified, by way of training, to operate or work with and around cranes, hoists and related equipment. This person is capable of identifying existing and potential hazards associated with the movement of equipment and material using a crane, hoist and related equipment. This person is also given the authorization to take prompt corrective measures to eliminate those hazards associated with the movement of equipment and material using a crane, hoist and/or related equipment.

Crane. A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an essential part of the machine. Cranes whether fixed or mobile are driven manually or by power.

Crane Service:

Normal Service. Operating at less than 85 percent of rated load and not more than 10 lift cycles/hr except for isolated instances.

Heavy Service. Operating at 85 to 100 percent of rated load or in excess of 10 lift cycles/hr as a regular specified procedure.

Severe Service. Operating at normal or heavy service under abnormal operating conditions (i.e., extreme temperatures, corrosive atmospheres).

Drum. Cylindrical member around which rope/chains are wound for raising/lowering loads.

Engineered Lift: A test load that has been identified and evaluated for use in determining the lifting capacity of the hoisting equipment.

Exposed. Capable of being contacted inadvertently. Applied to hazardous objects not adequately guarded or isolated.

Fail-Safe. A provision designed to automatically stop or safely control any motion in which a malfunction occurs.

Floor-operated Crane. A crane which is pendant or nonconductive rope controlled by an operator on the floor or an independent platform.

Gantry Crane: Similar to an overhead crane, except that the bridge for carrying the trolley(s) is rigidly supported on two or more legs running on fixed rails or other runway.

Hand-held hoist. Lever operated roller chain hoist.

Hoist. Apparatus, which may be part of a crane, exerting a force for lifting or lowering

Hoist Chain. The load bearing chain in a hoist.

Limit Switch. A switch which is operated by some part or motion of a power-driven machine or equipment to alter the electric circuit associated with the machine or equipment.

Load. The total superimposed weight on the load block or hook.

Load Block: The assembly of hook, shackle, swivel, bearing, sheaves, pins, and frame suspended by the hoisting rope and used to attach the load to the hoisting cable or chain.

Main Line Disconnect: The controller used to isolate power to the hoisting equipment

Mobile Crane: A cable-controlled crane mounted on crawlers or rubber-tired carriers or a hydraulic-powered crane with a telescoping boom mounted on truck-type carriers or as self-propelled models.

Overhead Crane: A crane with a movable bridge carrying a movable or fixed hoisting device that travels on an overhead fixed runway structure.

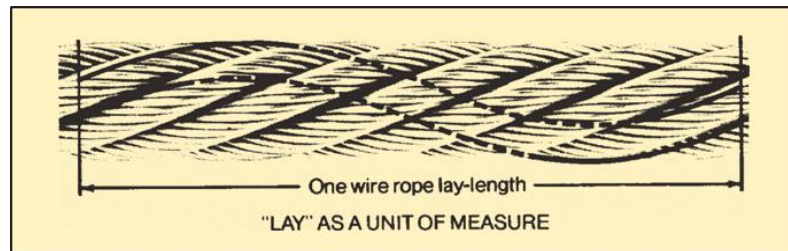
Pendant. Controls suspended from an electric hoist.

Power-operated crane. A crane whose mechanism is driven by electric, air, hydraulic or internal combustion.

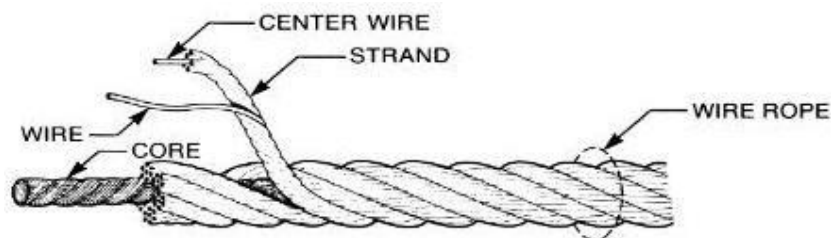
Rated load. The maximum load for which a crane or individual hoist is designed and built by the manufacturer and shown on the equipment nameplate(s).

Rope. Refers to wire rope, unless otherwise specified.

Rope Lay. Unit of measure for rope. A lay is the helix or spiral of the wires and strands in a rope.



Rope Parts.



Rope Reeving. A rope reeving system is a system in which wire rope travels around drums and sheaves, or pulleys, for the purpose of hoisting or hauling.

Running Rope. A rope that moves over sheaves or drums.

Runway. An assembly of rails, beams, girders, brackets, and framework on which the crane or trolley travels.

Semi-gantry Crane. A gantry crane with one end of the bridge rigidly supported on one or more legs that run along a fixed rail or runway, the other end of the bridge supported by a truck running on an elevated runway or rail.

Side Pull. That portion of the hoist pull acting horizontally when the hoist lines are not operated vertically.

Sling. Lifting devices such as chain, wire rope, metal mesh, fiber rope and synthetic web utilized to secure a load to be moved.

Stop. A device to limit travel of a trolley or crane bridge. The device normally is attached to a fixed structure and normally does not have energy absorbing ability.

Tower Crane. A vertical crane with a horizontal boom. The boom is balanced asymmetrically across the top of the tower. Its short arm carries a counterweight while the long arm carries the lifting gear.

Trolley. The unit which travels on the bridge rails and carries the hoisting mechanism.

Trolley Travel. The trolley movement at right angles to the crane runway.

Truck. The unit consisting of a frame, wheels, bearing and axels which supports the bridge girders or trolleys.

Qualified Person. Person who, by possession of a recognized degree, certificate or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his or her ability to solve or resolve problems relating to the subject matter, the work, or the project.

Wall Crane. A crane having a jib with or without trolley and supported from a sidewall or line of columns of a building. It is a traveling type and operates on a runway attached to the sidewall or columns.

CRANE INSPECTION FORM

California Institute of Technology

Crane Location: _____

Rating: _____

QUARTERLY SAFETY CHECKLIST – CRANE AND HOIST					
INSPECTION ITEMS	DATE	DATE	DATE	DATE	DATE
1. Check wire rope and hook for damage (deformation, cracks).					
2. Check that rope loads onto drum correctly.					
3. Check for leaking grease and/or oil.					
4. Check pendant buttons for damage.					
5. Check that all safety guards are in place.					
6. Check trolleys.					
7. Check emergency stop button.					
8. Check access to wall disconnect.					
9. Check hoist (and travel) limit switches.					
10. Check hoist or load attachment chains (excessive wear, twist, distorted or stretched links)					
11. Check slings, fastenings and attachments (excessive wear, broken wires, stretching, kinking, or twisting)					
12. Check that the brakes are operating correctly					
13. (Other)					
NOTES:					
INSPECTED BY: _____					

Report Any Problems to: _____