EthosEnergy
Power Plant Services

Crane and Hoisting Equipment Safety
Table of Contents

1 Purpose........................................................................................................................................... 3

2 Scope.................................................................................................................................................. 3

2.1 Applicability.................................................................................................................................. 3

2.2 References...................................................................................................................................... 3

3 Definitions .......................................................................................................................................... 3

4 Responsibilities .................................................................................................................................. 5

5 Process ............................................................................................................................................... 7

6 Procedure .......................................................................................................................................... 7

6.1 General Rules............................................................................................................................... 7

6.2 Mobile Cranes .............................................................................................................................. 8

6.3 Manually/Electrically/Air Powered Chain/Wire Hoists (Underhung Lifting Devices) ................. 8

6.4 Slings and Rigging Hardware ......................................................................................................... 9

6.5 Markings ....................................................................................................................................... 10

6.6 Load Control ................................................................................................................................. 11

6.7 Signals .......................................................................................................................................... 12

6.8 Pre-Use Inspections of All Cranes .............................................................................................. 12

6.9 Frequent and Periodic Inspection and Testing of Facility Overhead and Gantry Cranes .......... 13

6.10 Inspection and Testing of Mobile and Vendor Cranes ............................................................... 15

6.11 Maintenance Procedures for Facility Cranes ............................................................................. 18

6.12 Considerations for Cranes used for Construction Activities .................................................... 18

6.13 Critical Lift Planning .................................................................................................................. 19

7 Records.......................................................................................................................................... 20

8 Training ........................................................................................................................................... 21

8.1 Initial Training ............................................................................................................................... 21

8.2 Refresher Training ........................................................................................................................ 22

9 Records of Change .......................................................................................................................... 22

10 Implementation .............................................................................................................................. 23

11 Attachments................................................................................................................................... 24
1 Purpose
This procedure establishes the requirements to be followed to protect the safety and health of all employees during the operation of cranes, hoists and mechanical lifting devices. This procedure also provides guidance on the development of critical lift plans.

2 Scope
This procedure applies to all EthosEnergy Power Plant Services owned and operated facilities, its employees and its contractors except where superseded by more stringent local standards.

2.1 Applicability
This procedure applies to all EthosEnergy Power Plant Services owned and/or operated facilities, field service operations, its employees and its contractors except where superseded by more stringent local standards.

2.2 References
This procedure is written to comply with the requirements of following documents and directives:

- 29 CFR 1910 Subpart N, Materials Handling and Storage T8 CCR Group 13, Cranes and other Hoisting Equipment
- 29 CFR 1926 Subpart CC, Cranes and Derricks in Construction; T8 CCR Article 15 (Construction)
- 29 CFR 1919, Gear Certification
- ANSI B30.11 Monorail Systems and Underhung Cranes
- ANSI B30.16 Overhead Hoists
- ANSI B30.17 Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
- Power Crane and Shovel Association “Mobile Hydraulic Crane Standards”

3 Definitions
Abnormal Operating Conditions, for the purposes of determining inspection requirements for manually, electrically, or air powered chain or wire rope underhung lifting devices (hereinafter referred to “underhung lifting devices”), means environmental conditions that are unfavorable, harmful or detrimental to the operation of a hoist, such as excessively high or low ambient temperatures, exposure to weather, corrosive fumes, dust-laden or moisture laden atmospheres and hazardous locations.

Bird Caging is the untwisting of a portion of a metal cable, allowing exposure of one or more single strand of cable.

A Bridge is that part of a crane consisting of girders, trucks, end ties, footwalks and drive mechanisms that carry the trolley.

A Cantilever Gantry Crane is a gantry or semi gantry crane in which the bridge girders or trusses extend transversely beyond the crane runway on one or both sides.
Clearance, for the purposes of this procedure, is the distance from any part of the crane to a point of the nearest obstruction.

A Competent Person is one who by knowledge, training and experience has demonstrated the ability to solve problems and perform functions related to the subject matter and work. The competent person may or may not be an EthosEnergy Power Plant Services employee.

A Crane is a machine for lifting and lowering a load and moving it, with the hoisting mechanism as an integral part of the machine.

A Frequent Inspection is one that is performed at daily or monthly intervals on a crane that is in regular service.

A Gantry Crane is a crane similar to an overhead crane except that the bridge for carrying the trolley or trolleys is rigidly supported on two or more legs running on fixed rails or other runway.

Heavy Service, for the purpose of determining inspection requirements for underhung lifting devices, is service that involves operation within the rated load limit, which exceeds normal service.

Hoist (action) or Hoisting refers to all crane or derrick functions such as lowering, lifting, swinging, booming in and out or up and down or suspending a personnel platform.

A Hoist (device) is an apparatus that may be part of a crane, exerting a force for lifting or lowering.

A Jib Crane is a type of crane where a horizontal member (jib or boom), supporting a moveable hoist, is fixed to a wall or to a floor-mounted pillar and is also referred to as a “Wall Crane”.

Lay, when referring to wire rope rigging, is the complete wrap of a strand around the rope core. One rope lay is equal to one complete wrap of a strand around the core.

Normal Service, for the purpose of determining inspection requirements for underhung lifting devices, is Service that involves operation with randomly distributed loads within the rated load limit or uniform loads less than 65% of rated load for not more than 15% of the time for manually operated hosts and 25% of the time for electric or air-powered hoists.

The Maximum Intended Load is the total load of all employees, tools, materials and other loads reasonably anticipated to be applied to a personnel platform or personnel platform component at any one time.

A Mobile Crane consists of a rotating superstructure with power plant, operating machinery, and boom, mounted on a base, equipped with crawler treads or wheels for travel. Its function is to hoist and swing loads at various radii.

Outriggers are extendable or fixed metal arms, attached to the mounting base, that rest on supports at the outer ends and provide stability to the material handling equipment.

An Overhead Crane is a crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

A Periodic Inspection is one performed at one to 12 month intervals on an overhead or gantry or mobile crane that is in regular service.
A **Ratchet Lever Hoist**, commonly referred to as a “Come-A-Long” is a hand powered hoist with a ratchet wheel with the advantage that they can usually be operated in any orientation, for pulling, lifting or binding.

The **Rated Load** is the maximum load for which a device is designed and build by the manufacturer and shown on the equipment nameplate.

A crane is **“Regular Service”**, for the purposes of this procedure, is a mobile, overhead and/or gantry crane which is used at a frequency of at least monthly.

**Rigging** is any type of device, such as a strap or chain, which allows for a lifting device, such as a crane or a hoist, to be attached to the material being lifted.

A **Runway** is a firm, level surface designed, prepared and designated as a path of travel for the weight and configuration of the crane or an assembly of rails, beams, girders, brackets and framework on which the crane travels.

A **Semi Gantry Crane** is a gantry crane with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by an elevated rail or runway.

**Severe Service**, for the purpose of determining inspection requirements for underhung lifting devices, is service that involves normal or heavy service with abnormal operating conditions.

A **Sling** is an assembly that connects a load to material handling equipment.

A **Standby Crane** means a mobile, overhead and/or gantry crane which is not in regular service but which is used occasionally or intermittently as required.

**Tag Lines** are ropes used to guide and prevent rotating and swinging of a load.

A **Trolley** is the unit that travels on bridge rails and carries the overhead crane hoisting mechanism.

**“Underhung Lifting Devices”** is the term used in this procedure to describe those underhung cranes, manual/electric/air powered chain/wire hoists, and monorails which are exempt from OSHA’s overhead and gantry crane inspection specifications, but are covered by the American National Standards Institute (ANSI)...

A **Wall Crane** is a crane having a jib supported from a side wall (see “Jib Crane” above).

### 4 Responsibilities

**Corporate HSE** performs the following functions:

- Reviews applicable regulations and ensures that procedures meet all Federal regulatory requirements.
- Revises procedures as applicable.
- Distributes updates and changes.
- Provides technical assistance to site Safety Representatives and Facility Managers.

A **Competent Person** shall ensure that deficiencies are repaired or defective parts replaced before any crane, hoist or lifting device is used. A Competent Person (e.g., manufacturer’s representative or licensed professional engineer) shall perform the annual inspections on all cranes, hoists and lifting equipment.
**Employees** are responsible for following the requirements of this procedure and for attending required training.

The **Facility Manager** shall ensure that the requirements of this procedure are implemented fully.

**Operators** of equipment covered by this procedure shall inspect all equipment before each use and shall not use equipment that fails the inspection. All damage to the equipment as well as crane-caused damage to structures or other equipment shall be reported to the Facility Manager as soon as possible. In addition, operators are responsible for performing the following:

- Never attempt to handle any load that the machine may not be able to carry safely until a supervisor is consulted.
- Report all physical problems (illness, hand or foot injuries or any condition that could interfere with safe operation) to the supervisor before beginning crane, hoist or lifting operations.
- Secure all equipment when leaving the machine, during maintenance or when repairs are being made. This includes:
  - Setting the brake
  - Securing the boom
  - Lowering the bucket
  - Taking the machine out of gear
  - Whatever else is necessary to prevent accidental movement of the equipment

The next level of management below the Facility Manager with maintenance responsibilities (e.g., the **Operations & Maintenance Manager or Maintenance Manager**) is responsible for assuring that this procedure is followed by his or her staff.

**Riggers** have joint responsibility with operators of equipment covered by this procedure to secure all hitches and remove all loose material before loads are moved or lifted and shall take the following steps to ensure safe operation:

- Do not use damaged equipment.
- Check all hardware, equipment, tackle and slings before use.
- Destroy defective equipment.
- Do not try to lengthen or repair damaged load chain.

The **Safety Representative** (or designee) shall maintain inspection records for all cranes, hoists, draglines, shovels, backhoes and other lifting devices and provide appropriate training for the licensing of operators. The Safety Representative will be involved in the development of Critical Lift Plan(s), when required.

**Signalers** shall be experienced and fully qualified for the job being performed. In addition, they shall:

- Wear high visibility gloves.
- Use hand signals only when such signals are clearly visible by the operator.
- Be responsible for keeping all unauthorized personnel outside the crane’s operating radius.
- Direct the load so that it never passes over anyone.
- Maintain constant communication with the crane operator, either via hand signals or other communication method.
5 Process

Not Applicable

6 Procedure

6.1 General Rules

EthosEnergy Power Plant Services uses a variety of cranes and hoisting equipment (e.g., overhead, gantry, jib, mobile and manual) in facilities and in the field to complete maintenance and repair activities, and to move materials. This section provides general rules that are applicable to the operation of these devices.

All cranes shall be operated only by qualified operators.

Crane Operators shall always take the necessary precautions to ensure their safety and the safety of others including shutting down operations if necessary. Operators shall use a signal or sound a warning to alert other workers whenever the bridge is moved, or when a load is approaching workers. Workers shall be warned of all overhead crane work before it begins and, where practical, the area shall be secured with barricade tape to prevent individuals walking below material being handled. Work will be performed on level ground or on cribbing that will support the load. Loads shall not be swung over workers. Workers shall not work under overhead loads.

Crane Operators shall not eat, read, smoke, use cell phones or perform any other activity while operating the equipment and shall not operate the equipment when physically unfit or ill.

Outdoor cranes and lifting equipment shall not be operated in high winds, and shall be secured whenever not in use.

Fire extinguishers shall be readily accessible in areas where cranes are operated. For cranes equipped with a cab, a fire extinguisher rated at least 5 BC (e.g., capable of extinguishing 12.5 square feet of class B and class C fires) must be present in the cab.

“Riding the ball” is grounds for dismissal. The operator and the violator are subject to immediate dismissal.

Ensure that all crane hooks are equipped with a spring-loaded, self-closing safety latch. Heat must never be applied to the hook (no welding or torch cutting). No modifications to the hook should be made without the manufacturer’s written approval.

Hard hats are not required for the operators while running the equipment; however they should have one with them inside the cab as they enter and exit the crane.

Lighting shall be sufficient for safe operation.

A preventative maintenance program, based on the crane and hoist manufacturer’s recommendations, shall be in place for all cranes used at EthosEnergy Power Plant Services facilities. Refer to “Maintenance Procedures” below.

Overhead crane electrical equipment shall not exceed 600 volts. Pendant pushbutton controls for overhead cranes shall not exceed 150 volts AC or 300 volts DC. Controls shall fail in the “safe” position.
and return to the “off” position when released. Guards for all electrical equipment in overhead cranes shall have the capacity to support a 200-pound person.

Control systems for cranes, including pendant controls, lever-operated controls, and push buttons, shall have control actions clearly and legibly marked and shall be maintained to ensure that the power is controlled and to prevent inadvertent operation of the equipment.

**Note:** In the event of a power failure, the operator shall place the control system in the “off” position.

The crane operator or his/her supervisor shall report all damage done to any part of a structure by the crane’s operation to the Facility Manager as soon as possible.

The manufacturer should have installed guards for all belts, pulleys, gears, shafts, sprockets, spindles, drums, fly wheels, chains, and other reciprocating, rotating, or other moving parts. If a guard is removed, it shall be replaced before the crane is operated.

### 6.2 Mobile Cranes

In addition to the requirements above, the following applies as related to the use of mobile cranes at EthosEnergy Power Plant Services facilities:

The EthosEnergy Power Plant Services job lead shall ensure that vendor provided and/or operated mobile cranes are operated only by fully trained and qualified operators and that required inspections are performed by the vendor.

The Operating Manual for crane shall be in the cab at all times.

All booms must be kept at least twenty (20) feet from high voltage lines unless the lines have been de-energized or effectively guarded to prevent accidental contact. If any part of a crane is capable of having parts of its structure elevated near energized overhead lines, the equipment will be properly grounded. Employees working near the point of grounding may not stand near the point of grounding whenever there is the possibility of overhead line contact and additional precautions, such as the use of barricades or insulation, shall be used to protect employees from hazardous ground potentials.

Booms shall be marked with a load capacity that shall not be exceeded. Never subject booms to side loads.

Outriggers on mobile equipment must be used at all times when lifting. They must be fully extended and set in place before any work is begun.

Cranes shall never be set up or left near the edge of excavations or unstable areas that could cause the crane to become unstable.

### 6.3 Manually/Electrically/Air Powered Chain/Wire Hoists (Underhung Lifting Devices)

EthosEnergy Power Plant Services personnel commonly use underhung lifting devices. These may be manually, electrically, or air powered. The hand or power operated chain/wire hoist is used for vertically lifting loads and is the most commonly used type of chain hoist. The ratchet lever operated chain hoist, or
“come-along”, is operated by means of a lever, similar to an automobile jack. This type of hoist can be used to either lift loads vertically or move them horizontally.

At no time shall loads greater than the hoist rating be lifted or moved. When suspending a hoist from an overhead beam, the following shall be followed:

- Ensure the beam can support the combined weight of the hoist and the maximum load that will be lifted.
- All personnel who work near a chain hoist or assist in hooking or arranging a load shall keep clear and out from under the load.

Chain hoists shall be operated using the manufacturer's supplied equipment. Extensions, “cheater bars”, or other ad-hoc devices the increase leverage, adjust angle, or apply greater force shall not be used.

Chain hoists that are not permanently hung shall be kept clean and maintained to protect them from damage (e.g., rust, corrosion). For long-duration jobs, hoists may be left in place, but shall be protected from damage, dirt, and water.

- Hand (manual) chain-operated and electric- or air-powered hoists shall be visually inspected before each use (see “Pre-use Inspections of all Cranes” below and optional form Attachment 3.

Documentation of these visual inspections is not required. In addition, a documented inspection is required annually for “normal service” units, semi-annually for “heavy service” units, and quarterly for “severe service” units using Attachment 1.

### 6.4 Slings and Rigging Hardware

Slings and rigging hardware must be visually inspected prior to use. Documentation of pre-use inspections is not required.

In addition, periodic, documented inspections shall be conducted on all slings and rigging hardware by a qualified person. Inspection forms are provided as Attachment 2 (NOTE: Attachment 2 shall be used for all inspections performed by in-house personnel. Inspections performed by outside vendors must evaluate the same items listed on the inspection form, but alternative means of documentation may be used (e.g., vendor report, tagging of sling, etc.)). Determination of inspection frequency shall be the responsibility of the Facility Manager (or designee), but shall be conducted at least annually. The frequency of these inspections is to be based on:

- frequency of use
- severity of service conditions
- nature of lifts being made
- experience gained on the service life of slings used in similar applications

Wire ropes shall be removed from service and cut up into non-usable sections when any of the following conditions exist:

- Abrasion, scrubbing, or peening cause the loss of more than one-third of the original diameter of the outside individual wires;
- Six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay (‘one rope lay’ illustrated below);
- Evidence of corrosion;
- Kinking, crushing, bird caging, or other damage results in distortion of the rope structure.

When slings are used, protection must be provided between the sling and any sharp surface of the load to be lifted.

Slings must be labeled with the following:
- Name or trademark of manufacturer
- Rated loads for the type of hitch used and the angle upon which it is based
- Diameter or size of sling

When installing clamps, the saddle portion of the clamp assembly is placed on the load-bearing or "live" side as illustrated below, not on the non-load-bearing or "dead" side of the cable.

Chains shall have means by which size, grade, rating, capacity, and reach are identified and know by operators.

Hooks, rings, welded or mechanical coupling links, or other attachments shall have a rated capacity of at least equal to the chain.

Rigging materials (slings, ropes, wires, etc.) not in use shall be stored to protect them from damage.

Rigging hardware shall be marked with the manufacturer's name or trademark, size or rated load.

### 6.5 Markings

The rated load capability of all cranes, hoists, and other lifting devices and supporting structure (e.g., bridge, trolley, etc.) shall be marked on each visible side of the crane and must never be exceeded. Markings must be visible from the ground or the floor. Operators shall pick up only those loads whose weight is known to be compatible with the rated load capability of all crane components. In addition, the following marking requirements also apply to all cranes:
- If the crane has more than one hoisting unit, each hoist shall be marked with its rated capacity.
• Manufacturer identification including name, address, model number or serial number, and voltage of AC or DC power supply and phase (for electric powered hoists) or rated air pressure (for air powered hoists).

• Floor-operated and remote-operated cranes shall have a safety label or labels affixed to the pendant station, portable operating station, or load block (see EXHIBIT 1 for a sample label). The label or labels shall include cautionary language against:
  • lifting more than rated load
  • operating hoist when load is not centered under hoist
  • operating hoist with twisted, kinked, or damaged chain or rope
  • operating damaged or malfunctioning crane
  • lifting people
  • lifting loads over people
  • operating a rope hoist with a rope that is not properly seated in its groove
  • operating manual motions with other than manual power
  • removing or obscuring safety label

6.6 Load Control

The operator has responsibility for all safety matters concerning the equipment. The operator and rigger have joint responsibility to secure all hitches and remove all loose materials before loads are moved or lifted. Operators and riggers shall observe the following precautions:

• Suspended loads shall be controlled with tag lines whenever possible. **Never use hands to control suspended loads and never leave a suspended load unattended.**

• The swing radius of the counterweight must be barricaded at all times and loads shall never be swung over the heads of workers.

• Riggers must remain alert to shifting loads while hooking on and be alert to pinch points, keeping hands and feet clear of the sling while it is being tightened. **Never guide lines by hand or foot onto drums.** Always use a stick or an iron bar to guide lines onto drums.

• The sling angle shall be kept over 45º. If this is not possible, consult with a Competent Person before proceeding with the lift.

• Gantry and overhead cranes shall have power control braking systems capable of maintaining safe lowering speeds of rated loads.

• Trolleys and bridges shall have effective braking systems.

• All persons working out of a cage being hoisted or supported by a crane must be secured by a safety line.

When an operator leaves a crane unattended he or she must land any attached load, place the controllers in the “off” position, and open the main switch. Before closing a main switch the operator must make sure all controllers are in the “off” position. The main switch does not need to be opened on a pendant-controlled crane if the crane is left unattended for short periods.

Operators shall be aware of how much rope/cable is left on the drum when lowering loads and shall ensure that at least two full wraps remain on the drum. Use longer slings if the load cannot be landed within these limits.
6.7 Signals

Signals shall be used whenever the view of the crane operator is obstructed such that he/she cannot clearly view the path of travel of any part of the crane, its load, or components.

The operator and the signal person shall use an intercom or radio communication, when available. When these systems are not available, hand signals shall be used. When using hand signals, the following shall be considered:

- Each facility shall establish site-specific hand signals in accordance with the American National Standards Institute (ANSI) (see EXHIBIT 2 for suggested hand signals).
- Hand signal information shall be posted prominently in appropriate locations at the facility.
- Hand signals shall be given to the operator by a clearly trained and designated person with the ability to see the load.

The signaler should have full view of the intended path of travel of the crane, load, or components, yet should remain clear of the path of travel.

The operator shall maneuver the hoisting apparatus at the direction of the signal person and only one person will give signal directions to a crane operator.

Note: The only exception to this is in an emergency. The operator shall obey all stop and emergency stop signals from anyone at any time.

6.8 Pre-Use Inspections of All Cranes

Visual Pre-Use Inspections shall be performed on all cranes regardless of their frequency of use and shall be performed each day the crane is used. Pre-use inspections are not required to be documented; however, ATTACHMENT 3 is provided as an optional document to guide pre-use inspections of overhead and gantry cranes and ratchet and manually operated chain hoists. The Facility Manager may elect to implement this checklist as a requirement at his/her discretion. The operator shall inspect the entire crane before each use to make adjustments to mechanisms that could interfere with operations and ensure that all parts of the crane or hoisting system are properly operational.

The following inspections shall be performed prior to using equipment covered by this procedure:

- All administrative requirements of this procedure (e.g., presence of warning labels, posting/marking of capacity, fire extinguisher nearby, etc.)
- All functional and safety operating mechanisms for maladjustment or excessive wear of components interfering with proper operation (e.g., limit switches, etc.).
- Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems.
- Hooks with deformation or cracks (refer to EXHIBIT 3).
- Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer’s recommendations.
- Rope reeving for noncompliance with manufacturer’s recommendations as well as all ropes/cables for other deterioration (e.g., kinking, birdcaging, etc.).
• The sling and all fastenings and attachments shall be inspected for damage or defects. Additional inspections shall be performed during sling use, where service conditions warrant. Damaged or defective slings shall be immediately removed from service.
• Proper lubrication, as demonstrated by free operation. Check that motions are smooth and regular with no hesitations, vibration, binding, unusual noise, or other irregularity.
• If equipped with a breaking and locking device, the mechanism will be tested prior to performing the hoisting.

6.9 Frequent and Periodic Inspection and Testing of Facility Overhead and Gantry Cranes

For the purposes of this section, “overhead and gantry cranes” are the following: overhead cranes; jib/wall cranes; gantry cranes; semi gantry cranes; and cantilever gantry cranes. This section does not apply to underhung lifting devices, manually operated hoists (e.g., ratchet lever hoists), or any crane other than those listed in the preceding sentence. Refer to the definitions section above or to Exhibit 4 for additional guidance.

Note: Inspection requirements are based on the frequency of crane use, which is generally categorized as either “standby” or “regular” use. Therefore, each EthosEnergy Power Plant Services facility must develop a method to continually document the frequency (e.g., “last used on date” tagging) of use of each crane covered by this procedure, which will determine what inspection requirements apply. Many cranes at EthosEnergy Power Plant Services facilities are considered “standby” use cranes because they are used very infrequently and/or only as needed (e.g., HRSG SCR catalyst removal). However, it is the responsibility of the Facility Manager and Safety Representative to ensure that required tests and inspections are performed based on the following, as well as manufacturer recommendations and environmental conditions, which may necessitate more frequent inspections. In addition, the reverse of ATTACHMENTS 4 and 5 provide decision flow charts for identifying applicable inspection requirements.

6.9.1 Cranes in Regular Service AND Standby Cranes

Initial Load Tests shall be performed on new, altered, repaired, modified or re-rated cranes regardless of their frequency of use. Load testing of altered, repaired, or modified cranes may be limited to the functions affected by the alteration, repair, or modification. Rated load tests shall be done under the direction of a qualified person, typically a vendor or manufacturer’s representative. A written report furnished by such person confirms the load rating of the lifter. Generally, manufacturers of ratchet operated hoists perform such testing at the time of manufacture and will provide a load test certificate at the time of sale.

Overhead and gantry cranes should not be rated in excess of 80% of the test load. Therefore, in order to rate a crane to 100 percent of the design intended loading, the test load must be 125% of the rated load. The only exception to this requirement would be when a crane manufacturer specifies a different test loading criteria. In that case, the crane manufacturer's procedures shall be adhered to.

Note: In California only, all cranes and hoists with a capacity greater than 2722 kg (3 tons) should be load tested every four years to 125% of the rated capacity.
In addition, prior to initial use the following functions shall be tested for all new and altered cranes:

- Hoisting and lowering.
- Trolley travel.
- Bridge travel.
- Limit switches, locking and safety devices.

A record of hoist repair, inspection and testing shall be documented using ATTACHMENT 6 or an equivalent.

### 6.9.2 Cranes in Regular Service

Inspections for **cranes in regular service** are divided into two general classifications based upon the intervals at which inspection should be performed; herein designated as "frequent" and "periodic". Cranes in regular service (i.e., used at a frequency of at least monthly) require both “frequent” and “periodic” inspections.

Visual **Frequent daily inspections** shall be performed each day the regular service crane is used, and shall include the items prescribed above for pre-use inspections. Frequent daily inspections are not required to be documented; however, ATTACHMENT 3 is provided as an optional document to guide pre-use inspections of overhead and gantry cranes and ratchet and manually operated chain hoists. The Facility Manager may elect to implement this checklist as a requirement at his/her discretion.

**Frequent monthly inspections** shall be documented using ATTACHMENT 4, Column 2, and shall focus on determining whether the following present a safety hazard:

- Hooks with deformation or cracks.
- Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer’s recommendations.
- Rope condition.

The frequent monthly inspection record MUST include the date of the inspection, the name or signature of the person who performed the inspection, and the serial number (or other identifier) of the equipment (e.g., chain and hook) inspected.

A fully qualified licensed professional engineer or manufacturer’s representative selected shall perform periodic **inspections annually**, which evaluate all of the following requirements for fixed overhead and gantry cranes to determine whether they constitute a safety hazard:

- Deformed, cracked, or corroded members (including support structure).
- Loose bolts or rivets.
- Cracked or worn sheaves and drums.
- Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices.
- Excessive wear on brake system parts, linings, pawls, and ratchets.
- Load, wind, and other indicators over their full range for any significant inaccuracies.
- Gasoline, diesel, electric or other power sources for improper performance or noncompliance with applicable safety requirements.
• Excessive wear of chain drive sprockets and excessive chain stretch.
• Electrical apparatus for signs of pitting or any deterioration of controller contactors, limit switches, and pushbutton stations.

The Inspector shall file a record of the results at the facility.

6.9.3 Cranes Not in Regular Service

Reminder: for the purposes of this procedure, a “standby crane” is one which is not used at least monthly. Examples of common “standby cranes” at EthosEnergy Power Plant Services O&M facilities are HRSG cranes used to change SCR catalysts.

Standby cranes that are permanently assembled at EthosEnergy Power Plant Services facilities (i.e., not dismantled or in long-term storage) shall be inspected at least semi-annually using ATTACHMENT 4, Column 1 for the following hazards, as applicable:

• All functional operating mechanisms for maladjustment interfering with proper operation.
• Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems.
• Hooks with deformation or cracks.
• Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations.
• All functional operating mechanisms for excessive wear of components.
• Rope reeving for noncompliance with manufacturer's recommendations as well as all ropes for other deterioration.

In addition, standby cranes shall be inspected as follows:

• A crane which has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming to the semi-annual requirements above using ATTACHMENT 4, Column 1, before placing in service.
• A crane which has been idle for a period of over 6 months shall be given a complete inspection conforming to the semi-annual requirements above using ATTACHMENT 4, Column 1, AND undergo a vendor performed annual periodic inspection, before being placed in service. Under this condition, the vendor may perform BOTH the semi-annual aspects and annual periodic inspection items as one inspection.

6.10 Inspection and Testing of Mobile and Vendor Cranes

Note: The following inspection and testing information is provided as requirements for those facilities that own and operate mobile cranes. For facilities that rely solely on third-party vendors to provide and operate mobile crane equipment, the EthosEnergy Power Plant Services Job Lead is responsible for ensuring that the vendor provides confirmation that the crane meets the following inspection requirements, and that daily inspections are performed by the vendor as applicable.
6.10.1 Mobile Cranes in Regular Service AND Standby Mobile Cranes

Initial Inspections shall be performed prior to initial use of all new and altered mobile cranes to ensure compliance with the requirements listed below for “frequent” and “periodic” inspections.

6.10.2 Mobile Cranes in Regular Service

Inspections for cranes in regular service are divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as "frequent" and "periodic". Mobile cranes in regular service (i.e., used at a frequency of at least monthly) require both “frequent” and “periodic” inspections.

Frequent daily inspections shall be performed each day by the operator that the regular service mobile crane is used, and shall include:

- All control mechanisms for maladjustment interfering with proper operation.
- Deterioration or leakage in air or hydraulic systems.

Note: As a matter of Company Policy, EthosEnergy Power Plant Services employees who operate mobile cranes owned and/or operated by EthosEnergy Power Plant Services shall document the daily pre-use inspection using ATTACHMENT5, Column 2.

Frequent monthly inspections shall be documented using ATTACHMENT 5, Column 3, (or equivalent for vendor mobile cranes on site for one month or longer) and shall focus on determining whether the following present a safety hazard:

- All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.
- All safety devices for malfunction
- Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook (refer to EXHIBIT 3).
- Rope reeving for noncompliance with manufacturer's recommendations as well as all ropes for other deterioration.
- Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.

The frequent monthly inspection record MUST include the date of the inspection, the signature of the person who performed the inspection, and the serial number (or other identifier) of the equipment (e.g., chain and hook) inspected.

A fully qualified licensed professional engineer or manufacturer's representative shall perform and document periodic inspections annually, which evaluate all of the following requirements for mobile cranes to determine whether they constitute a safety hazard:

- All control mechanisms for maladjustment interfering with proper operation.
- All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.
• All safety devices for malfunction.
• Deterioration or leakage in air or hydraulic systems.
• Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook (refer to EXHIBIT 3).
• Rope reeving for noncompliance with manufacturer's recommendations as well as all ropes for other deterioration.
• Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.
• Deformed, cracked, or corroded members in the crane structure or boom.
• Loose belts or rivets.
• Cracked or worn sheaves and drums.
• Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, and locking devices.
• Excessive wear on break and clutch system parts, linings, pawls, and ratchets.
• Load, boom angle, and other indicators over their full range, for any significant inaccuracies.
• Gasoline, diesel, electric, or other power sources for improper performance or noncompliance with safety requirements.
• Excessive wear of chain-driven sprockets and excessive chain stretch.
• Travel steering, braking, and locking devices for malfunction.
• Excessively worn or damaged tires.

6.10.3 Mobile Cranes Not in Regular Use

If owned and operated by a EthosEnergy Power Plant Services facility, Standby mobile cranes shall be inspected at least semi-annually using ATTACHMENT 5, Column 1, for the following hazards, as applicable:

• All control mechanisms for maladjustment interfering with proper operation.
• All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.
• All safety devices for malfunction.
• Deterioration or leakage in air or hydraulic systems.
• Crane hooks with deformations or cracks. For hooks with cracks or having more than 15 percent in excess of normal throat opening or more than 10° twist from the plane of the unbent hook (refer to EXHIBIT 3).
• Rope reeving for noncompliance with manufacturer's recommendations as well as all ropes for other deterioration.
• Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.

In addition, standby mobile cranes that are not in regular service shall be inspected as follows:

• A crane which has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming to the semi-annual requirements above using ATTACHMENT 5, Column 1, before placing in service.
- A crane which has been idle for a period of over 6 months shall be given a complete inspection conforming to the semi-annual requirements above using ATTACHMENT 5, Column 3, before placing in service.

### 6.11 Maintenance Procedures for Facility Cranes

A preventative maintenance program based on the crane manufacturer’s recommendations shall be established. Before any preventative maintenance-related adjustments or repairs are started, the following precautions shall be taken:

- 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 (refer to HS06 – Lockout/Tagout) in the open position.
- Warning or “out of order” signs shall be placed on the crane AND on the floor beneath or hook where visible from the floor.

### 6.12 Considerations for Cranes used for Construction Activities

The section applies only to certain cranes and derricks used in construction at US facilities.

**Caution:** while the day-to-day use of cranes at EthosEnergy Power Plant Services facilities falls under OSHA’s general industry (not construction) regulations, if any “construction” activities are performed at a facility that require the use of a crane, the updated construction crane and derricks requirements would apply.

Per OSHA, “construction” work activities are defined as “construction, alteration, and/or repair, including painting and decorating.” “Construction work” is not limited to new construction. It includes the repair of existing facilities or equipment. The replacement of structures and their components is also considered construction work. Maintenance work is not considered construction. Therefore, any cranes used for maintenance work are not subject to this section.

This section applies to several types of power operated equipment, when used in construction, that can hoist, lower and horizontally move a suspended load, including, but not limited to, the following cranes commonly used:

- Articulating cranes (such as knuckle-boom cranes);
- Crawler cranes;
- Mobile cranes (such as wheel mounted, rough-terrain, all-terrain, commercial truck-mounted, and boom truck cranes); and
- Powered industrial trucks (forklifts), when configured to hoist and lower (by means of a winch or hook) and horizontally move a suspended load.

**Exceptions:** Permanently installed overhead gantry cranes, even if used for construction work are not covered by this section. In addition, this section does not apply to power shovels, excavators, wheel loaders, backhoes, loader backhoes, or track loaders, even if used for construction activities. This
machinery is also excluded when used with chains, slings or other rigging to lift suspended loads. Machinery that hoists by using a come-a-long or chainfall is also excluded.

**Requirements for Cranes used in Construction**

The following requirements apply when the above-referenced cranes are used in construction at EthosEnergy Power Plant Services facilities, and shall be confirmed if utilizing vendors for crane operations during construction activities:

- a pre-erection inspection of tower crane parts (tower cranes are generally not used at EthosEnergy Power Plant Services facilities)
- synthetic slings shall be used in accordance with the manufacturer's instructions during assembly/disassembly work
- ground conditions must be assessed when cranes are on the ground
  - Ground conditions must be firm, drained, and graded to a sufficient extent so that, in conjunction (if necessary) with the use of supporting materials, the equipment manufacturer’s specifications for adequate support and degree of level of the equipment are met.
  - There is no requirement for specialized training, such as with excavations, to classify soil types.
- crane operators must be qualified or certified (see training section below) by August 8, 2014
  - If the city or state where the facility is located has its own licensing or certification program, compliance with that city or state's requirements is mandatory if it meets the requirements listed under the training section below.
  - the facility must pay for certification or qualification of employees who operate cranes
- a qualified rigger shall be used for rigging operations during assembly/disassembly
- signalers, when required, shall be qualified (see training section below)
- procedures for working in the vicinity of power lines shall be developed and followed (see also EthosEnergy Power Plant Services procedure “Electrical Safety”)

**6.13 Critical Lift Planning**

A Critical Lift Plan must be developed for highly hazardous lift operations. Specifically, the Plan is required when:

- A lift is to be made such that the fall zone encompasses operating equipment or pipe racks
- Any lift where the crane exceeds 75% of the rated chart capacity for the given load and radius
- Any lift requiring over 150 feet of boom and jib in combination
- Any lift requiring two lifting cranes (excluding a lift crane and a tailing crane)
- Any lift in excess of Twenty (20) tons

A Competent Person, Safety Representative, and Facility Manager shall ensure that a written Plan is developed, communicated and understood. The Plan shall be developed prior to permitting any covered lift activities and must discuss means for meeting the following objectives:

- Ensure that objectives of the Critical Lift are achieved

Copies of this procedure are uncontrolled unless maintained in a document controlled intranet site or binder.
• Ensure that proper reviews are conducted to minimize the occurrence of incidents during the Critical Lift.
• Protect lives and equipment during Critical Lift activities.

The Plan must call for and document the following elements, at a minimum:

• **Hazard Analysis:** A detailed hazard analysis shall be conducted and will include, at a minimum, the completion of a location Hazard Assessment and Job Safety Analysis (see HS43).

• **Critical Lift Approval:** The Critical Lift Plan will be signed by the Facility Representative (or designee) and all Critical Lift work will be authorized under the EthosEnergy Power Plant Services Work Authorization Program (see HS28).

• **Critical Lift Review Meeting:** The purpose of the meeting is to ensure that the project team is prepared to conduct the lift. Discussion topics include the hazard analysis and mitigation steps. The meeting should be completed within one week prior to the Critical Lift and must include: the Vendor and Crane Operator, Control Room Operator, Competent Person, Safety Representative, and the O&M (or Maintenance) Manager.

• **Document Review:** The following documentation must be provided and reviewed by the Safety Representative: crane operator’s license/training certificate; crane inspection verification, and sling and associated hardware load test results.

• **Day of Lift Pre-lift Safety Meeting(s):** Each day of a Critical Lift, a pre-lift safety meeting will be held. The Safety Representative, Control Room Operator, Competent Person and O&M (or Maintenance) Manager will attend along with all vendor personnel. This is equivalent to a pre-job briefing and shall address the following:
  o The lift will be authorized for a maximum of 12 hours;
  o Changes in the scope of the lift require the job to be stopped and a new authorization obtained;
  o No unauthorized personnel will be permitted in the lift area, which will be barricaded;
  o All near miss events must be reported to the EthosEnergy Power Plant Services representative; and
  o Varying conditions, such as increase wind speed, lighting, or weather may require the lift to be stopped and reauthorized when safe.

• **Safety Oversight:** The EthosEnergy Power Plant Services safety representative will be present during the Critical Lift to observe the operation.

• **Lessons Learned:** Should significant issues or problems arise during the lift; a debriefing will be held to discuss the problems and lessons learned. Any significant incidents, such as near misses, shall be shared with the Facility’s HSE Department Single Point of Contact.

### 7 Records

All current operators’ licenses or qualifying documentation shall be filed at the facility.

Operator and rigger training records shall be retained at the facility for the duration of their employment.

The following inspection records shall be retained for five years:

• Records of crane repair or alteration, inspection and testing.
8 Training

8.1 Initial Training

Training Requirements for Non-Construction Crane Use

Operators shall be qualified (and/or licensed per local requirements) to operate the equipment to which they are assigned, and must be familiar with the proper use of fire extinguishers. Furthermore, operators and signalers shall be trained in the facility-specific accepted hand signals for crane and hoisting equipment operation.

Riggers shall be trained in the safe handling of slings, hitches, ropes, suspended loads and any other handling equipment as well as the facility-specific accepted hand signals for crane and hoisting equipment operation.

Initial procedure training shall involve the reading of this procedure and testing to demonstrate understanding of its requirements. The target audience for initial training shall include: (1) those individuals who have management responsibility for ensuring compliance with this procedure (e.g., Facility Manager, Maintenance Manager) and (2) those individuals who are assigned responsibilities and or tasks covered under this procedure. Procedure refresher training is required annually, or when an employee cannot or does not demonstrate competency in its requirements.

Training Requirements for Construction Crane Use

The following training requirements apply to EthosEnergy Power Plant Services personnel at facilities in the US who perform one or more of the following duties. In addition, vendors who perform these duties at EthosEnergy Power Plant Services facilities in the US must demonstrate compliance with the following:

Operators of most types of cranes must be qualified or certified under one of the methods set forth by OSHA under 29 CFR 1926.1427. Employers have up to August 8, 2014, to ensure that their operators are qualified or certified, unless operating in a state or city that has operator requirements.

Riggers are not required to be certified. However, riggers must be a qualified person for the performance of specified hoisting activities such as during assembly/disassembly work and those that require employees to be in the fall zone to handle a load. The rigger would be considered qualified through possession of a recognized degree, certificate, or professional standing; or by extensive knowledge, training, and experience, successfully demonstrating the ability to solve/resolve problems related to rigging work and related activities.

Signal persons do not have to be certified. However, the employer of a signal person must ensure that the signal person is qualified. This qualification must be done by a qualified evaluator, which may be a third party or an employee of the signal person’s employer. The evaluator must demonstrate that he or she can accurately assess whether an individual meets the qualification requirements for signal persons.

For any use of a crane on site, whether construction related or not, the site should obtain copies of all crane related training certificates for vendor operators, riggers and signal persons. These documents shall be retained on site in the HS 09 file for a minimum of 3 years.
### 8.2 Refresher Training

Awareness training is required annually of those employees above and may be completed via GPI module OS08 – Cranes Lesson and Test, or by qualified vendor classroom training. In addition, those employees with responsibilities under this procedure shall be familiar with the manufacturer’s operating and maintenance manuals.

### 9 Records of Change

<table>
<thead>
<tr>
<th>Revision</th>
<th>Issue Date</th>
<th>Description of Change</th>
<th>Changed By</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 9</td>
<td>Various</td>
<td>See archived red-line versions of annual revisions</td>
<td>Various</td>
</tr>
<tr>
<td>10</td>
<td>June 2014</td>
<td>Update to new format; Rebranding</td>
<td>Scott Bailey, Don Fritz</td>
</tr>
<tr>
<td>11</td>
<td>Jan 2015</td>
<td>Updated spelling errors and to REV 11</td>
<td>Scott Bailey</td>
</tr>
</tbody>
</table>
10 Implementation

This non-mandatory checklist is designed to help locations implement this procedure. When all applicable items are completed, this procedure is considered fully implemented by the location.

(PENDING NEXT REVISION)

<table>
<thead>
<tr>
<th>Applicable</th>
<th>Requirement</th>
<th>Description</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Assessment</td>
<td>Perform the assessment described in Section 5, Process.</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Documentation</td>
<td>Ensure that the following documentation is in place:</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Update the HSE Procedure Binder(s)</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Signage &amp; Postings</td>
<td>Purchase and install the following signs and other postings:</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Equipment &amp; Supplies</td>
<td>Purchase the following equipment &amp; supplies:</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Compliance Tasks</td>
<td>Enter the following tasks in the Compliance Tool:</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Training &amp; Qualification</td>
<td>Add the following training and/or certifications to GPiLearn:</td>
<td></td>
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<tr>
<td>Yes</td>
<td>Work Authorization System (WAS)</td>
<td>Update the WAS to include the following:</td>
<td></td>
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<tr>
<td>Yes</td>
<td>Vendor(s)</td>
<td>Establish a relationship with a qualified vendor(s) for:</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>Other</td>
<td>Perform the following additional implementation actions:</td>
<td></td>
</tr>
</tbody>
</table>
11 Attachments

- Attachment 1, Hand Chain Operated and Electric- or Air-powered Hoist Inspection Form
- Attachment 2, Sling and Rigging Hardware Inspection Form
- Attachment 3, Optional Checklist to Document Pre-Use Inspections of Overhead/Gantry and Ratchet/Manually Operated Chain Hoists
- Attachment 4, Overhead and Gantry Crane Inspection Checklist and Decision Flow (reverse)
- Attachment 5, Mobile Crane Inspection Checklist and Decision Flow (reverse)
- Attachment 6, Record of Hoist Repair, Inspection, and Test
- Exhibit 1, Sample Warning Label
- Exhibit 2, Hand Signals for Cranes
- Exhibit 3, Hook Replacement Criteria
## Attachment 1 - Hand Chain Operated and Electric- or Air-powered Hoist Inspection Form

Manufacturer: ___________________ Serial Number: ___________________ Capacity (Tons): ____________  
Name of Inspector: ___________________ Date of Inspection: ___________________  
Type of Inspection: [ ] Normal Use (Annual) [ ] Heavy Use (Semi-annual) [ ] Severe Use (Quarterly)

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Comments</th>
<th>O K</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>All functional operating mechanisms for maladjustment and unusual sounds.</td>
<td></td>
<td></td>
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<tr>
<td>Load Chain for inadequate lubrication, excessive wear or stretches, cracked/damaged/twisted links, corrosion.</td>
<td></td>
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<tr>
<td>Hooks for excessive throat opening, bent or twisted, damaged latch, wear, cracks, chemical damage</td>
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<tr>
<td>Breaking system for proper operation</td>
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<tr>
<td>Rope or load chain reeving for compliance with manufacturer recommendations</td>
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<tr>
<td>Evidence of worn, corroded, cracked, or distorted parts.</td>
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<tr>
<td>Evidence of damage to hook retraining nuts or collars and pins, welds or rivets</td>
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<tr>
<td>Evidence of damage or excessive wear of load sprockets, idler sprockets, or hand chain wheel.</td>
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<tr>
<td>Evidence of worn, glazed, or oil-contaminated friction discs; worn pawls, cams, or ratchet; corroded, stretched, or broken pawl springs in brake mechanism</td>
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<tr>
<td>Evidence of damage of supporting structure or trolley, if used</td>
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<tr>
<td>Labeling and marking requirements</td>
<td></td>
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<tr>
<td>End connections of rope or load chain</td>
<td></td>
<td></td>
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<tr>
<td>Air lines, valves, and other parts for leakage (Electric- or Air-Powered units only)</td>
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<td></td>
<td></td>
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<tr>
<td>Limit devices for operation (Electric- or Air-Powered units only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function labels on pendant control stations for legibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Electric- or Air-Powered units only)</td>
<td></td>
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</tbody>
</table>

**NOTES:**
### Attachment 2 - Sling and Rigging Hardware Inspection Form

(Repeat inspection annually at a minimum.)

Name of Inspector: __________________________ Date of Inspection: __________________________

**SYNTHETIC WEB SLING INSPECTION** (check for the following on each sling)

<table>
<thead>
<tr>
<th>Sling ID</th>
<th>Label</th>
<th>Acid Burns</th>
<th>Melting or Charring</th>
<th>Snags</th>
<th>Punctures</th>
<th>Tears or Cuts</th>
<th>Broken or Worn Stitches</th>
<th>Distorted or Worn Fittings</th>
<th>Mark if Deficiency Noted</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>

**WIRE ROPE SLING INSPECTION FORM** (check for the following on each sling)

<table>
<thead>
<tr>
<th>Sling ID</th>
<th>Kinking</th>
<th>Crushed</th>
<th>Birdcage Heat Damage</th>
<th>End Attachment</th>
<th>Hook Condition</th>
<th>Broken Wire (#) Lay</th>
<th>Broken Wire (#) Strand</th>
<th>Mark if Deficiency Noted</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

1 Take out of service if more than six randomly distributed broken wires in one rope lay or three broken wires in one strand in one rope lay are identified.
## Attachment 3 – Optional(*) Checklist to Document Pre-Use Inspections of all Cranes

### Manufacturer: _____________________  Serial Number: _____________________  Capacity (Tons): ____________

**Name of Inspector:** _________________________  **Date of Inspection:** _________________________

<table>
<thead>
<tr>
<th>Item</th>
<th>Possible Deficiencies</th>
<th>OK</th>
<th>See Note</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative</td>
<td>Charged fire extinguisher is nearby the powered overhead or gantry crane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>If needed, ensure that a signaler is used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>A warning is sounded prior to use to alert employees in the area of the planned lift. Barricade area with caution tape if feasible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>A proper work authorization has been issued</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>Caution labels and rated load capacity markings are present and visible</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural</td>
<td>Bridge/hoist support free of debris, hoist properly attached, support rated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hooks</td>
<td>Swivel freely, are equipped with self-closing safety latch, and are free of obvious deformations or cracks.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slings/Fasteners</td>
<td>No excessive wear, twisting, or stretching, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain/Rope/Cable</td>
<td>No excessive wear, twisting, stretching, birdcaging, etc.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain/Rope/Cable</td>
<td>At least two full wraps remain on the drum when load is fully lowered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls/Operating Equip.</td>
<td>Evidence of leakage or maladjustment interfering with proper operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls/Operating Equip.</td>
<td>Load limit devices, anti-two block function/device.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls/Operating Equip.</td>
<td>Pendant or other controls are marked, free of defect and operational</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operational</td>
<td>Proper lubrication as demonstrated by free operation with no hesitations, vibration, binding, unusual noise, or other irregularity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaking</td>
<td>If equipped with a breaking and locking device, test prior to performing lifting</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Facility may add additional inspection items per manufacturer recommendations, as applicable here:

<table>
<thead>
<tr>
<th>Item</th>
<th>Possible Deficiencies</th>
<th>OK</th>
<th>See Note</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

(*) Pre-use inspections ARE NOT optional; however, documenting them via this or an equivalent checklist IS optional, may assist in ensuring that all inspection items are completed, and may be required at the Facility Manager’s discretion.

**DO NOT OPERATE IF PRE-USE INSPECTION REVEALS DEFIENCIES**
Attachment 4 - Overhead & Gantry Crane Inspection Checklist (front) and Decision Flow (reverse)

Manufacturer: _______________ Serial Number: _______________ Capacity (Tons): _______________ Name of Inspector: _______________
Date of Inspection: _______________

Type of Inspection: [ ] Semi-Annual  [ ] Frequent  [ ] Periodic/Return to Service

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency of Inspection</th>
<th>Possible Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standby</td>
<td>Regular Use</td>
</tr>
<tr>
<td></td>
<td>Semi-Annual</td>
<td>Frequent</td>
</tr>
<tr>
<td></td>
<td>(1) 6 months</td>
<td>(2) Monthly</td>
</tr>
<tr>
<td>Controls &amp; Operating Mechanism(s) Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Load Chain</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hooks</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hook Retainers</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Lines, Tanks, Valves &amp; Other Parts in Air or Hydraulic Systems</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Ratchet Handle Pawl &amp; Load Pawl</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pawl Springs</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Retaining Rings</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sheave, Pinion, Shaft, Chain Attachments</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Gearing</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Bearings, Shafts</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Housing, Load Block, Hook</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
### Swivels
- rivets. Internal build up of foreign substances

### Nuts, Bolts, Rivets
- X Looseness, stripped or damaged threads

### Supporting Structure (if mounted)
- X Damage or wear which restricts ability to support imposed loads

### Capacity Plate & Decals
- X Missing, damaged or illegible

Note: Refer to maintenance and inspection sections of the manufacturer manual for further details. Enter WO or otherwise document deficiencies for correction.

**Notes:**
Attachment 4 - Overhead & Gantry Crane Inspection Checklist (back)

Overhead & Gantry Crane Documented Inspection - Decision Tree

- Crane is now, modified, or altered? Yes → Vendor perform documented initial load test (before use).
  
  No → Crane is located in California and has capacity >/= 3 tons? Yes → Vendor perform documented load test every four (4) years.
  
  No → Crane is used at least once per month? Yes → The crane is considered to be in "Regular Use". Complete ATTACHMENT 3, Column 1 monthly and vendor to perform and document annual inspection.
  
  No → Crane is considered a "Standby Crane". Perform semi-annual (every 6 months) inspection using ATTACHMENT 3, Column 1.

...and, in addition ask...

- Crane is idle for > 6 months. Qualified vendor shall perform requirements of periodic inspection before placing crane in service.
  
  No → Crane is idle for > 1 month, but < 6 months? Yes → Complete ATTACHMENT 3, Columns 1 and 2 before placing crane in service.
### Attachment 5 – Mobile Crane Inspection Checklist (front)

Manufacturer: __________________________ Serial Number: __________________________ Capacity (Tons): ____________

Name of Inspector: __________________________ Date of Inspection: __________________________

Type of Inspection: [ ] Semi-Annual [ ] Frequent [ ] Periodic/Return to Service

<table>
<thead>
<tr>
<th>Item</th>
<th>Frequency of Inspection</th>
<th>Possible Deficiencies</th>
<th>OK</th>
<th>See Note</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standby Crane</td>
<td>Regular Use Crane</td>
<td>Semi-Annual</td>
<td>Daily when in use</td>
<td>Monthly and Return to Service</td>
</tr>
<tr>
<td></td>
<td>(1) 6 months</td>
<td>(2) Daily when in use</td>
<td>(3) Monthly and Return to Service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls &amp; Operating Mechanism(s)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Improperly adjusted or excessive wear</td>
<td></td>
</tr>
<tr>
<td>Lines, Tanks, Valves, and Other Parts in Air or Hydraulic Systems</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Deterioration or leakage</td>
<td></td>
</tr>
<tr>
<td>Hooks</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Deformed or cracked, safety clips in poor condition, 15% in excess of normal throat opening, over 10% twisted</td>
<td></td>
</tr>
<tr>
<td>Chains and End Connections</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Excessive wear, twist, stretch, or distortion of links beyond mfr’s specs</td>
<td></td>
</tr>
<tr>
<td>Ropes, Reeving, Slings, and End Connections</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Excessive wear, twist, stretch, kinks, birdcaging, or broken wires</td>
<td></td>
</tr>
<tr>
<td>Safety Devices, Belt/Chain/Gear Guarding</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Improperly adjusted, missing, or broken</td>
<td></td>
</tr>
<tr>
<td>Tires</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Inflation and condition</td>
<td></td>
</tr>
<tr>
<td>Outriggers</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Locking devices and general condition</td>
<td></td>
</tr>
<tr>
<td>Fire Extinguisher</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Missing, discharged, inspection current</td>
<td></td>
</tr>
<tr>
<td>Cab Windows</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Broken, missing, cloudy</td>
<td></td>
</tr>
<tr>
<td>Lubrication</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Engine oil level and moving crane parts</td>
<td></td>
</tr>
<tr>
<td>Boom and Crane Structure</td>
<td>X</td>
<td></td>
<td></td>
<td>Bent or twisted parts, broken welds, cracks, heavy rust</td>
<td></td>
</tr>
<tr>
<td>Bolts &amp; Rivets</td>
<td></td>
<td></td>
<td></td>
<td>Loose</td>
<td></td>
</tr>
<tr>
<td>Sheaves and Drums</td>
<td>X</td>
<td></td>
<td></td>
<td>Excessive wear, cracks</td>
<td></td>
</tr>
<tr>
<td>Pins, Bearings, Shafts, Rollers, Gears, Locking and Clamping Devices</td>
<td>X</td>
<td></td>
<td></td>
<td>Excessive wear, distortion, cracks</td>
<td></td>
</tr>
<tr>
<td>Brake Systems</td>
<td>X</td>
<td></td>
<td></td>
<td>Excessive wear</td>
<td></td>
</tr>
<tr>
<td>Indicators (Load, Wind, Boom Angle)</td>
<td>X</td>
<td></td>
<td></td>
<td>Significant inaccuracy</td>
<td></td>
</tr>
<tr>
<td>Power Source (Gas, Diesel, Electric, Other)</td>
<td>X</td>
<td></td>
<td></td>
<td>Poor performance, non-compliance with general safety rules</td>
<td></td>
</tr>
<tr>
<td>Chain Drives, Sprockets</td>
<td>X</td>
<td></td>
<td></td>
<td>Excessive wear</td>
<td></td>
</tr>
<tr>
<td>Electrical Apparatus</td>
<td>X</td>
<td></td>
<td></td>
<td>Deterioration of wiring, worn or dirty controls, poor connection</td>
<td></td>
</tr>
</tbody>
</table>
Attachment 5 – Mobile Crane Inspection Checklist (back)

Notes:

Mobile Crane Documented Inspection - Decision Tree

- Crane is new, modified, or altered? 
  - Yes: Vendor perform documented initial load test (before use).
  - No:
    - Crane is located in California and has capacity >= 3 tons? 
      - Yes: Vendor perform documented load test every four (4) years.
      - No:
        - Crane is used at least once per month? 
          - Yes: The crane is considered to be in "Regular Use". Complete ATTACHMENT 5, Column (2) daily before use, Column (3) monthly and qualified vendor inspection annually.
          - No:
            - Crane is considered a "Standby Crane". Perform semi-annual (every 6 months) inspection using ATTACHMENT 5, Column (1)

- ...and, in addition ask...
  - Crane is idle for > 6 months. Complete ATTACHMENT 5, Column (3) before placing crane in service.
  - Crane is idle for > 1 month, but <= 6 months?
    - Yes: Complete ATTACHMENT 5, Column (1) before placing crane in service.
    - No:
Attachment 6 – Record of Hoist Repair, Inspection, and Test

FACILITY NAME: ________________________________

HOIST MANUFACTURER: ________________________________

MODEL: ________________________________

HOIST SERIAL NUMBER: ________________________________

CAPACITY: ________________________________

TYPE OF HOIST:  
- Electric [ ]  
- Air [ ]  
- Manual [ ]

TYPE OF HOIST SUSPENSION:  
- Hook [ ]  
- Trolley [ ]  
- Other: ____________ [ ]

REPAIRS AND ADJUSTMENTS PERFORMED:
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

TESTS PERFORMED:  
- Operational [ ]  
- Static Load of 125% of Rated Capacity [ ]  
- Dynamic Load of 125% of Rated Capacity [ ]  
- Dynamic Load of 100% of Rated Capacity [ ]  
- Test of Load Limiting Devices [ ]  
- No Adjustments or Repairs Required Based on Inspection & Testing [ ]

CERTIFICATION: I do hereby certify that the above repairs, adjustments, inspection and/or test were performed on the hoist described above.

By: (Print Name): __________________________(Signature) __________________________ Date: __________________
Exhibit 1 – Sample Warning Label

CAUTION
FOLLOW THE FOLLOWING SAFETY RULES TO AVOID INJURY OR EQUIPMENT DAMAGE

DO NOT operate without performing visual inspection

DO NOT use for lifting more than rated load

DO NOT operate hoist when load is not centered under hoist

DO NOT operate hoist with twisted, kinked, or damaged chain or rope

DO NOT operate damaged or malfunctioning crane

DO NOT use for lifting people

DO NOT lift loads over people

DO NOT operate a rope hoist with a rope that is not properly seated in its groove

DO NOT operate manual motions with other than manual power

DO NOT remove or obscure this safety label
Exhibit 2 – Hand Signals (sample)

Stop (A)
Extend one arm and hold palm of hand vertical.

Stop (B)
(Specifically for high operations)
Arm extended palm down, fist clenched, move hand right and left.

Hold Everything
Clasp hands in front of body.

Hoist
With forearm vertical, forefinger pointing up, move hand in small horizontal circles.

Lower
With arm extended downwards, forefinger pointing down, move arm in horizontal circles.

Move Slowly
Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal.

Raise Boom
(Luff Up)
Arm extended, fingers closed, thumb pointing upwards.

Lower Boom
(Luff Down)
Arm extended, fingers closed, thumb pointing downwards.

Slew
Arm extended, point with finger in direction of boom swing. (For overhead gantry crane move in direction indicated.)

Raise Boom
Lower Load
Right arm extended, thumb pointing upward, left arm extended downward swinging in horizontal circles.

Lower Boom
Raise Load
Right arm extended, thumb pointing downward and left forearm and forefinger vertical, left hand in small horizontal circles.

Extend Boom or Trolley Out
(Telescoping booms)
Both fists in front of body with thumbs pointing outwards.

Retract Boom or Trolley In
(Telescoping booms)
Both fists in front of body with thumbs pointing towards each other.

Use Main Hoist
Tap fist on head, then use regular signals.

Use Auxiliary Hoist
Tap elbow with one hand, then use regular signals.
Exhibit 3 - Hook Replacement Criteria

If the hook point is twisted off center more than 10%, the hook shall be replaced.

If the ‘A’ dimension exceeds the ‘B’ dimension by more than 15%, the hook shall be replaced.

Missing hook latches shall be replaced.

Inoperative hook latches shall be repaired or replaced.

Hook latches that do not close the throat opening of the hook shall be removed from service until the latch is repaired or replaced.

Hooks showing damage from chemicals, corrosion or deformation shall be repaired or replaced.

If the ‘D’ dimension is less than 90% of the original ‘D’ dimension (10% wear in the load bearing area of the hook), the hook shall be replaced.

If any dimension, ‘A’, ‘B’, ‘C’, or ‘D’, of the hook is reduced by more than 10% of the original dimension, the hook shall be replaced.
Exhibit 4 - Example Cranes Subject to Frequent and Periodic Documented Inspections

Example Jib Crane

Example Wall Crane

Example Overhead (Bridge) Crane (1)

Example Overhead (Bridge) Crane (2)

Example Semi Gantry Crane

Example Gantry Crane