

LIFTING / MOBILE EQUIPMENT

Truck & Crawler Cranes

A. INTRODUCTION

The purpose of this procedure is to identify for Eagle Industrial Instrumentation personnel the requirements for working safely with cranes, hoists, slings, and related equipment and aid **EAGLE INDUSTRIAL INSTRUMENTATION** in complying with ANSI B30.5. This procedure also provides information to enable Eagle Industrial Instrumentation personnel to work safely in the vicinity of cranes and other lifting equipment. It also applies to material handling and related equipment on customer and Eagle Industrial Instrumentation premises.

B. RESPONSIBILITIES

Eagle Industrial Instrumentation management is responsible for ensuring that employees have completed the training required by this procedure.

1. Additional responsibilities include:
 - a. Ensuring that employees have been properly trained.
 - b. The implementation of this Policy.
 - c. Take corrective actions on all violations or suspected violations of this procedure.
 - d. Documentation of completion by each employee.

The safety Coordinator is responsible for aiding in the implementation of this procedure. Supervisors are responsible for providing assistance in the implementation of this policy.

2. Additional responsibilities include:
 - a. Ensuring that all Eagle Industrial Instrumentation owned or leased cranes in their operations meet OSHA criteria.
 - b. Ensuring that proper inspections and maintenance records are completed and maintained for future reference.

EAGLE INDUSTRIAL INSTRUMENTATION personnel are responsible for recognizing and anticipating all job hazards including situations that involve cranes, hoists, and rigging.

C. OPERATOR QUALIFICATION/TRAINING REQUIREMENTS

1. **Qualifications**

Operators will have a Medical Evaluation and meet the following physical requirements:

- a. Vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without glasses.
- b. Be able to distinguish red, yellow, and green if color differentiation is required for crane operations.
- c. Hearing, with or without a hearing aid, adequate for the specific operation.
- d. No history of a disabling medical condition, which may be sufficient reason for disqualification.
- e. Qualified operators will be required to have a medical re-evaluation every four years.
- f. The evaluation will cover hearing and sight.

2. **Training Requirements**

Crane Operators will be trained on the following topics:

- a. Crane Components
- b. Operating and Maintenance procedures appropriate for the type and capacity of the crane to be operated
- c. All major issues addressed in API RP 2C and D (5th Edition)
- d. Hands on proficiency in the use of fire extinguishers.
- e. Coverage of lubrication points
- f. Principles of crane operation
- g. Boom operating procedures
- h. Safety devices and anti-two blocking systems
- i. Proper use and understanding of crane lifting capacity and reeving charts, boom and indicator charts.
- j. Working safely around cranes
- k. Standard crane operation hand signals
- l. Hands-on workshop on the proper inspection, use and maintenance of slings, shackles, hooks, nylon slings, and etc.
- m. Basic safety requirements for load rigging
- n. Limitations of their training
- o. Hands-on demonstration of proficiency in the safe operation of the particular model of crane to be operated.
- p. Contents of this procedure
- q. Written Examination

3. **Operator Training Frequency**

Operators will be trained according to the following schedule:

- a. Before operating a crane

- b. Every four years

4. **Training Requirements/Riggers-Roustabouts**

Field Service personnel will be trained on the following topics:

- a. Working safely around cranes
- b. Standard crane operation hand signals
- c. Safe use of hoists and slings, including inspection requirements
- d. Basic safety requirements for load rigging
- e. Limitations of their training

5. **Training Frequency/Rigger-Roustabouts**

Eagle Industrial Instrumentation personnel will be trained according to the following schedule:

- a. Initially upon hire
- b. Every 2 years

D. LOAD CHARTS/BOOM ANGLE INDICATORS

1. **Load Charts**

Cranes of all types will have a Load Chart with clearly legible letters and figures clearly visible to the crane operator.

- a. All cranes will have a substantial and durable load chart, stating the safe loads at various radii from the center pin of the turn table, mounted in the cab of the crane.
- b. It will be securely fixed to the crane cab, located in a position that the operator can refer to it without losing sight while seated at his control station.
- c. It will indicate boom length, boom angle, and capacity requirement and limitations.
- d. Where structural competence governs lifting performance, load ratings are reduced and the rating chart should so indicate.
- e. The person in charge of the operation will determine the weight of the lift to be made, and make everyone involved aware of the lift weight.
- f. The crane operator is responsible to determine the lift weight in relationship to boom angle and length.
 - 1. If the load exceeds proper limitations he/she should not make the lift.

2. **Boom Angle Indicator**

All cranes shall have a boom angle indicator mounted on the side of the boom near the hinge, with a pointer actuated by gravity suspended freely in front of it.

- a. The operator must be trained in how to use it.
- b. The weight of the load should be known and clearly marked on each lift, so the crane operator can easily see it.
- c. A CO₂ fire extinguisher shall be kept in the cab of the crane. Also in truck mounted cranes there must also be one located in the truck cab.

E. INSPECTIONS

Inspection is required on all hoisting equipment and related components at least once every month by a person or firm experienced in inspecting hoists.

1. Records

- a. Records of these inspections will be maintained, including date of inspection and signature of inspector.
- b. The inspection should include examination of the following components, as applicable:
 - 1. Hoisting and lowering mechanisms.
 - 2. Trolley travel or monorail travel.
 - 3. Limit switches and locking and safety devices.
 - 4. Structural members.
 - 5. Bolts or rivets.
 - 6. Sheaves and drums.
 - 7. Parts such as pins, bearings, shafts, gears, rollers, locking devices, and clamping devices.
 - 8. Brake system parts, linings, pawls, and ratchets.
 - 9. Load, wind, and other indicators over their full range.
 - 10. Gasoline, diesel, electric, or other power plants.
 - 11. Chain-driven sprockets.
 - 12. Crane and hoist hooks.
 - 13. Electrical apparatus such as controller contractors, limit switches, and push button stations.
 - 14. Wire rope.
 - 15. Hoist chains.
 - 16. All load hooks will have safety latches.
 - 17. Running ropes on all lifting equipment.

2. Load Tests

Annually **EAGLE INDUSTRIAL INSTRUMENTATION** will conduct a rated load test on all cranes. The test will:

- a. Have a written report completed and maintained.
- b. Show the procedures used to conduct the test.
- c. Confirm the adequacy of any repairs or alterations.
- d. The date the test was conducted.
- e. Tests will be signed by the person conducting the test.

3. Wire Rope Inspections

Monthly wire rope inspections by qualified inspectors will be done according to the following:

- a. Have a written report completed and maintained
- b. The date the test was conducted.
- c. Tests will be signed by the person conducting the test.

All wire rope that has not been in service or has been in storage will be thoroughly inspected before it is put back in service. The certified inspection will have the following:

- a. A written report completed and maintained.
- b. The ID of the rope inspected.
- c. The date the test was conducted.
- d. Signed by the person conducting the test.

All safety devices, insulating links, and proximity warning devices, shall also be tested in this manner, and at intervals prescribed by the manufacturer. Rated load markings of the crane shall be marked on the side of the crane so it is clearly legible from the ground or floor.

Sheaves and drums will also be regularly inspected for wear ie:

- a. If found to be enlarged or corrugated from excessive pressure, they will be replaced.
- b. Excessive wear will cause even new cable to fail and sheaves or drums could fail under impact loading.

F. MAINTENANCE

Never attempt to operate a hoist or close a switch that has an “Out of Order” or “Do Not Operate” tag on it.

- a. Only qualified crane mechanics should remove these cards, after the repairs are made.
- b. This will ensure that no one is still working on the unit, when someone puts it in service.
- c. All repairs or maintenance is to be done by a qualified crane mechanic.
- d. Before starting maintenance or repair work on a crane, workers will mark the crane as out of service and apply their personal padlocks to the main power switch while it is in the "Off" position.
- e. Power sources must be made inactive before this is done, unless power is required in the adjustment.
- f. Guards and safety devices shall not be removed or made ineffective on any unit, except to make repairs, lubrication, or adjustments.
- g. All guards and safety devices shall be replaced immediately after completion of repairs and adjustments.
- h. When replacing cables and slings, use only the types recommended by the manufacturer.
- i. No changes or modifications will be made to the equipment without consulting the manufacturer, and only then with management approval.
- j. Written records of all maintenance must be documented and kept on file. This information must contain the date of maintenance, the maintenance done, and by whom.

G. OVERHEAD ELECTRICAL LINES

Compliance with recommended practices (ie 1910.333(c)(3)) and not dependence on other devices, shall be followed in determining proximity of the crane and its protuberances, including load, to electric power lines.

- a. Any overhead wire should be considered an energized line, until either the person who owns the line or the electric or utility Eagle Industrial Instrumentation indicates that it is not energized.
- b. A qualified signaler shall be assigned to observe the clearances and give warning before approaching the stated limits.
- c. The boom, load line, and cables shall be kept away from all electrical wires, regardless of their voltage.
- d. OSHA requires that, except where the electrical lines have been deenergized and visibly grounded at the point of the work, where insulating barriers (not part of an attachment to the crane), or protective measures have been erected to prevent physical contact with the lines, in accordance with the following:

1. For lines rated 50 Kv or below, minimum clearance between the lines and any part of the crane must be 10 feet.
 2. For lines rated over 50 Kv, minimum clearance between the lines and any part of the crane must be either 10 feet plus 4 inches for each 1 Kv over 50 Kv, or twice the length of the line insulator but never less than 10 feet.
- e. If the beam, load line, or cable accidentally comes in contact with a wire, the operator should swing the crane to get clear.
- f. If the wire has been broken or the unit cannot be cleared from it, the operator shall stay on the crane and remain calm.
- g. A crawler crane, if the ground is damp, will be electrically grounded and when the boom touches a power line the wire will, in return, be grounded.
- h. If the boom of a wheel-mounted crane on rubber tires should become tangled with “hot” electrical wire, the entire crane may be energized because the rubber tires may, or may not, insulate the crane and chassis from the ground.
1. Depending upon the voltage and the soil conditions, the tires on the crane may burn and melt and thus lose insulation qualities.
 2. Hence the wire and the crane may remain energized.
- i. In some cases, contact with or the breaking of power lines will throw power Eagle Industrial Instrumentation circuit breakers.
1. It is possible for the circuit breaker to close after it cools off, thus making the line hot at one time and deenergized at another.
 2. For this reason, all broken or contacted lines should be considered as hot, until deenergized, insulated, and tested by a representative of the power Eagle Industrial Instrumentation or a qualified electrician.
- j. If a crane is in contact with a wire, stepping from the crane to the ground or touching the crane is often fatal.
- k. For this reason the operator should remain on the crane and no one touch it until the emergency crew from the electric Eagle Industrial Instrumentation arrives and frees the crane from the live wire.
1. If for any reason, the operator must leave the unit, he/she should look for a clear dry spot and jump totally clear of the unit before touching the ground.

H. OVERHEAD & GANTRY CRANES

1. Operator qualification & training requirements

An overhead crane may be operated either from a cab or from the floor. Controls can be pendant push button, control handles or radio controlled.

2. Training

- a. Only qualified personnel will be delegated to operate this equipment. Operators will be trained on safe standards including:
 1. Rigger training
 2. Hand signals
 3. Use of fire extinguishers
 4. Safe and proper crane operations and work practices.
- b. Control handles shall be clearly identified by signs and shape or position so that the operator while maintaining visual contact with the signaler, can identify each control by touch.
- c. Controls on all overhead cranes both cab and floor operated should be marked for proper identification.
- d. All cranes in the same work area should have controls located and marked in the same manner.
- e. The crane must be so designed as to allow the operator to escape in case of an emergency regardless of the cranes location on the runway.
- f. Strict precautions shall be taken to prevent personnel from servicing or riding the crane while it is in motion.
- g. Overhead cranes having a cab will be equipped with foot walks with adequate headroom, along the entire length of the bridge if the trolley is running on top of girders.
 1. The foot walk will be on the drive side of the bridge with safe access to the opposite side of the bridge.
 2. The foot walk will have proper guard rails and toe boards.
 3. Vertical clearance between the floor of walkway and overhead trusses, structural parts or other permanent fixtures shall be at least 6.5 feet.
 4. If structurally impossible overhead obstruction should be painted or striped or padded to aid in them being seen or not hurting an employee.

I. INSPECTIONS

1. **Hooks**

Monthly inspections and certifications of all hooks will be done by qualified inspectors. An inspection will:

- a. Have a written report completed and maintained of deviation or cracks.
- b. The date the test was conducted.
- c. Tests will be signed by the person conducting the test.
- d. The serial number of the identifier of the hook inspected.

2. **Hoist Chains**

Monthly inspections and certifications of hoist chains will be done by qualified inspectors. An inspection and certification will:

- a. Have a written report maintained of the hoist chains, including end connections.
- b. Identify excessive wear.
- c. Identify twist
- d. Identify distorted links interfering with proper function.
- e. Identify stretch beyond the manufacturer's recommendations.
- f. The date test was conducted.
- g. Tests will be signed by the person conducting the test.
- h. Identity of the chain inspected.

3. **Maintenance**

A preventative maintenance program based on the manufacturer's recommendations will be established, with all records of maintenance kept on file.

4. **Signs**

A "**Warning**" or "**Out of Order**" sign will be placed on the crane before repairs are started. This sign will not be removed until all work has been completed, tools/spare parts removed, and all personnel are in the clear.

J. SAFE OPERATION PROCEDURES

The following applicable procedures should be followed when operating a crane:

- a. The crane should be set up on a solid, level surface.
- b. Outriggers can be relied upon when operating on solid ground.

1. If the condition of the ground is in doubt, heavy lumber mats should be used to help support the outriggers.
 2. It may be necessary to map the travel area of a mobile crane, if the ground is unstable or soft.
 3. Extreme caution should be taken before any lifts are made, if these conditions exist.
- c. Maintain a safe distance from trenches and excavations when moving cranes.
1. Before a lift is made, be sure the area is stable and will not sluff off into the trench or excavation.
- d. The operator must have full control of all functions at all times.
- e. The boom should not be lifted by the load hoist line.
- f. Loads should not be lifted by the boom hoist line, unless the crane is designed for this purpose.
- g. The operator must have safe access to, and egress from, the crane cab or seat.
- h. The operator must maintain an unobstructed view of the ground, whether moving backwards or forwards, and the operator must have clear view at all times.
1. If view is obstructed, a signalman is required.
 2. The operator must maintain an unobstructed view of the load hook, point of operation, and signalman at all times.
- i. If the crane tips when hoisting or lowering a load, the operator should lower the load as quickly as possible by snubbing it lightly with the brakes.
1. Don't free fall a load.
- j. Workers should always stay clear of the range of the cab and counterweight swing and out from under the boom and load.
- k. Whether traveling or stationary, the cranes turntable shall remain level if a lift is being handled.
- l. Extended outriggers are considered a part of the counterweight on new crane load charts.
- m. The operator should move the boom in a slow, even motion to prevent excess swinging of the load.
- n. Workers should never be allowed to ride on a load or crane, while a lift is being made or transported.
- o. While operating the crane with the boom at high angle, the operators should take care that the suspended load does not strike the boom and bend the steel lattice bars on its underside.

1. If this occurs or if any bend, no matter how slight, is observed, the crane should be placed out of service and inspected by a qualified technician.
- p. While in transit and with no load and boom lowered, the clearance should be a minimum of 4 feet.
- q. When using a jib on a crane, the loading capacity, boom angle, and radius is severely restricted.
 1. Proper loading charts should be used by the operator.
- r. When an extended boom is used on a crane, new load charts must be supplied to give proper operating conditions to the operator.
- s. Extreme care should be taken in lowering extended booms to the ground.
 1. They are easily bent and could cause tipping of the unit if lowered to the side.

CRANE SIGNALS

ALWAYS STAND IN CLEAR VIEW OF YOUR CRANE HOIST ENGINEER
BE SURE TO STAY A SAFE DISTANCE FROM HOOK, BLOCK OR BOOM

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 In accordance with the American National Standards Institute

HOIST

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

LOWER

LOWER: With arm extended downward, forefinger pointing down, move hand in small horizontal circles.

USE MAIN HOIST

USE MAIN HOIST: Tap fist on head, then use regular signals.

USE WHIP LINE

USE WHIP LINE: (Auxiliary Hoist) Tap elbow with one hand; then use regular signals.

RAISE BOOM

RAISE BOOM: Arm extended, fingers closed, thumb pointing upward.

LOWER BOOM

LOWER BOOM: Arm extended, fingers closed, thumb pointing downward.

MOVE SLOWLY

MOVE SLOWLY: Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example)

RAISE THE BOOM AND LOWER THE LOAD

RAISE THE BOOM AND LOWER THE LOAD: With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

LOWER THE BOOM AND RAISE THE LOAD

LOWER THE BOOM AND RAISE THE LOAD: With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

SWING

SWING: Arm extended, point with finger in direction of swing of boom.

STOP

STOP: Arm extended, palm down, move arm back and forth horizontally.

EMERGENCY STOP

EMERGENCY STOP: Both arms extended, palms down, move arms back and forth horizontally.

TRAVEL

TRAVEL: Arm extended forward, hand open and slightly raised, making pushing motion in direction of travel.

DOG EVERYTHING

DOG EVERYTHING: Clasp hands in front of body.

TELESCOPING BOOM TWO HANDS

EXTEND BOOM
 BOTH FISTS IN FRONT OF BODY WITH THUMBS POINTING OUTWARD

TELESCOPING BOOM TWO HANDS

RETRACT BOOM
 BOTH FISTS IN FRONT OF BODY WITH THUMBS POINTING TOWARD EACH OTHER

TELESCOPING BOOM ONE HAND

EXTEND BOOM
 ONE HAND SIGNAL; ONE FIST IN FRONT OF CHEST WITH THUMB TAPPING CHEST

TELESCOPING BOOM ONE HAND

RETRACT BOOM
 ONE HAND SIGNAL; ONE FIST IN FRONT OF CHEST, WITH THUMB POINTING OUTWARD AND HEEL OF FIST TAPPING CHEST