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Chapter XVII – Occupational Safety and Health Administration, Department of Labor

Part 1910 – Occupational Safety and Health Standards

Subpart N – Materials Handling and Storage

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§ 1910.180 Crawler locomotive and truck cranes.

(a) *Definitions applicable to this section.*

- (1) A *crawler crane* consists of a rotating superstructure with power plant, operating machinery, and boom, mounted on a base, equipped with crawler treads for travel. Its function is to hoist and swing loads at various radii.
- (2) A *locomotive crane* consists of a rotating superstructure with power-plant, operating machinery and boom, mounted on a base or car equipped for travel on railroad track. It may be self-propelled or propelled by an outside source. Its function is to hoist and swing loads at various radii.
- (3) A *truck crane* consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on an automotive truck equipped with a powerplant for travel. Its function is to hoist and swing loads at various radii.
- (4) A *wheel mounted crane* (wagon crane) consists of a rotating superstructure with powerplant, operating machinery and boom, mounted on a base or platform equipped with axles and rubber-tired wheels for travel. The base is usually propelled by the engine in the superstructure, but it may be equipped with a separate engine controlled from the superstructure. Its function is to hoist and swing loads at various radii.
- (5) An *accessory* is a secondary part or assembly of parts which contributes to the overall function and usefulness of a machine.
- (6) *Appointed* means assigned specific responsibilities by the employer or the employer's representative.
- (7) *ANSI* means the American National Standards Institute.
- (8) An *angle indicator* (boom) is an accessory which measures the angle of the boom to the horizontal.
- (9) The *axis of rotation* is the vertical axis around which the crane superstructure rotates.
- (10) *Axle* means the shaft or spindle with which or about which a wheel rotates. On truck- and wheel-mounted cranes it refers to an automotive type of axle assembly including housings, gearing, differential, bearings, and mounting appurtenances.
- (11) *Axle* (bogie) means two or more automotive-type axles mounted in tandem in a frame so as to divide the load between the axles and permit vertical oscillation of the wheels.

- (12) The *base* (mounting) is the traveling base or carrier on which the rotating superstructure is mounted such as a car, truck, crawlers, or wheel platform.
- (13) The *boom* (crane) is a member hinged to the front of the rotating superstructure with the outer end supported by ropes leading to a gantry or A-frame and used for supporting the hoisting tackle.
- (14) The *boom angle* is the angle between the longitudinal centerline of the boom and the horizontal. The boom longitudinal centerline is a straight line between the boom foot pin (heel pin) centerline and boom point sheave pin centerline.
- (15) The *boom hoist* is a hoist drum and rope reeving system used to raise and lower the boom. The rope system may be all live reeving or a combination of live reeving and pendants.
- (16) The *boom stop* is a device used to limit the angle of the boom at the highest position.
- (17) A *brake* is a device used for retarding or stopping motion by friction or power means.
- (18) A *cab* is a housing which covers the rotating superstructure machinery and/or operator's station. On truck-crane trucks a separate cab covers the driver's station.
- (19) The *clutch* is a friction, electromagnetic, hydraulic, pneumatic, or positive mechanical device for engagement or disengagement of power.
- (20) The *counterweight* is a weight used to supplement the weight of the machine in providing stability for lifting working loads.
- (21) **Designated** means selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.
- (22) The *drum* is the cylindrical members around which ropes are wound for raising and lowering the load or boom.
- (23) **Dynamic** (loading) means loads introduced into the machine or its components by forces in motion.
- (24) The *gantry* (A-frame) is a structural frame, extending above the superstructure, to which the boom support ropes are reeved.
- (25) A *jib* is an extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles.
- (26) **Load** (working) means the external load, in pounds, applied to the crane, including the weight of load-attaching equipment such as load blocks, shackles, and slings.
- (27) **Load block** (upper) means the assembly of hook or shackle, swivel, sheaves, pins, and frame suspended from the boom point.
- (28) **Load block** (lower) means the assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.
- (29) A *load hoist* is a hoist drum and rope reeving system used for hoisting and lowering loads.
- (30) **Load ratings** are crane ratings in pounds established by the manufacturer in accordance with paragraph (c) of this section.
- (31) **Outriggers** are extendable or fixed metal arms, attached to the mounting base, which rest on supports at the outer ends.

- (32) **Rail clamp** means a tong-like metal device, mounted on a locomotive crane car, which can be connected to the track.
- (33) **Reeving** means a rope system in which the rope travels around drums and sheaves.
- (34) **Rope** refers to a wire rope unless otherwise specified.
- (35) **Side loading** means a load applied at an angle to the vertical plane of the boom.
- (36) A **standby crane** is a crane which is not in regular service but which is used occasionally or intermittently as required.
- (37) A **standing (guy) rope** is a supporting rope which maintains a constant distance between the points of attachment to the two components connected by the rope.
- (38) **Structural competence** means the ability of the machine and its components to withstand the stresses imposed by applied loads.
- (39) **Superstructure** means the rotating upper frame structure of the machine and the operating machinery mounted thereon.
- (40) **Swing** means the rotation of the superstructure for movement of loads in a horizontal direction about the axis of rotation.
- (41) **Swing mechanism** means the machinery involved in providing rotation of the superstructure.
- (42) **Tackle** is an assembly of ropes and sheaves arranged for hoisting and pulling.
- (43) **Transit** means the moving or transporting of a crane from one jobsite to another.
- (44) **Travel** means the function of the machine moving from one location to another, on a jobsite.
- (45) The **travel mechanism** is the machinery involved in providing travel.
- (46) **Wheelbase** means the distance between centers of front and rear axles. For a multiple axle assembly the axle center for wheelbase measurement is taken as the midpoint of the assembly.
- (47) The **whipline** (auxiliary hoist) is a separate hoist rope system of lighter load capacity and higher speed than provided by the main hoist.
- (48) A **winch head** is a power driven spool for handling of loads by means of friction between fiber or wire rope and spool.

(b) **General requirements** –

- (1) **Application.** This section applies to crawler cranes, locomotive cranes, wheel mounted cranes of both truck and self-propelled wheel type, and any variations thereof which retain the same fundamental characteristics. This section includes only cranes of the above types, which are basically powered by internal combustion engines or electric motors and which utilize drums and ropes. Cranes designed for railway and automobile wreck clearances are excepted. The requirements of this section are applicable only to machines when used as lifting cranes.
- (2) **New and existing equipment.** All new crawler, locomotive, and truck cranes constructed and utilized on or after August 31, 1971, shall meet the design specifications of the American National Standard Safety Code for Crawler, Locomotive, and Truck Cranes, ANSI B30.5–1968, which is incorporated by reference as specified in § 1910.6. Crawler, locomotive, and truck cranes constructed prior to August

31, 1971, should be modified to conform to those design specifications by February 15, 1972, unless it can be shown that the crane cannot feasibly or economically be altered and that the crane substantially complies with the requirements of this section.

(3) **Designated personnel.** Only designated personnel shall be permitted to operate a crane covered by this section.

(c) **Load ratings –**

(1) **Load ratings –where stability governs lifting performance.**

(i) The margin of stability for determination of load ratings, with booms of stipulated lengths at stipulated working radii for the various types of crane mountings, is established by taking a percentage of the loads which will produce a condition of tipping or balance with the boom in the least stable direction, relative to the mounting. The load ratings shall not exceed the following percentages for cranes, with the indicated types of mounting under conditions stipulated in paragraphs (c)(1)(ii) and (iii) of this section.

Type of crane mounting	Maximum load ratings (percent of tipping loads)
Locomotive, without outriggers:	
Booms 60 feet or less	¹ 85
Booms over 60 feet	¹ 85
Locomotive, using outriggers fully extended	80
Crawler, without outriggers	75
Crawler, using outriggers fully extended	85
Truck and wheel mounted without outriggers or using outriggers fully extended	85

¹ Unless this results in less than 30,000 pound-feet net stabilizing moment about the rail, which shall be minimum with such booms.

(ii) The following stipulations shall govern the application of the values in paragraph (c)(1)(i) of this section for locomotive cranes:

- (a) Tipping with or without the use of outriggers occurs when half of the wheels farthest from the load leave the rail.
- (b) The crane shall be standing on track which is level within 1 percent grade.
- (c) Radius of the load is the horizontal distance from a projection of the axis of rotation to the rail support surface, before loading, to the center of vertical hoist line or tackle with load applied.
- (d) Tipping loads from which ratings are determined shall be applied under static conditions only, i.e., without dynamic effect of hoisting, lowering, or swinging.
- (e) The weight of all auxiliary handling devices such as hoist blocks, hooks, and slings shall be considered a part of the load rating.

- (iii) Stipulations governing the application of the values in paragraph (c)(1)(i) of this section for crawler, truck, and wheel-mounted cranes shall be in accordance with Crane Load-Stability Test Code, Society of Automotive Engineers (SAE) J765, which is incorporated by reference as specified in § 1910.6.
- (iv) The effectiveness of these preceding stability factors will be influenced by such additional factors as freely suspended loads, track, wind, or ground conditions, condition and inflation of rubber tires, boom lengths, proper operating speeds for existing conditions, and, in general, careful and competent operation. All of these shall be taken into account by the user.

(2) **Load rating chart.** A substantial and durable rating chart with clearly legible letters and figures shall be provided with each crane and securely fixed to the crane cab in a location easily visible to the operator while seated at his control station.

(d) **Inspection classification –**

(1) **Initial inspection.** Prior to initial use all new and altered cranes shall be inspected to insure compliance with provisions of this section.

(2) **Regular inspection.** Inspection procedure for cranes in regular service is 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”, with respective intervals between inspections as defined below:

(i) Frequent inspection: Daily to monthly intervals.

(ii) Periodic inspection: 1- to 12-month intervals, or as specifically recommended by the manufacturer.

(3) **Frequent inspection.** Items such as the following shall be inspected for defects at intervals as defined in paragraph (d)(2)(i) of this section or as specifically indicated including observation during operation for any defects which might appear between regular inspections. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

(i) All control mechanisms for maladjustment interfering with proper operation: Daily.

(ii) All control mechanisms for excessive wear of components and contamination by lubricants or other foreign matter.

(iii) All safety devices for malfunction.

(iv) Deterioration or leakage in air or hydraulic systems: Daily.

(v) 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.

(vi) Rope reeving for noncompliance with manufacturer's recommendations.

(vii) Electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation.

(4) **Periodic inspection.** Complete inspections of the crane shall be performed at intervals as generally defined in paragraph (d)(2)(ii) of this section depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of paragraph (d)(3) of this section and in addition, items such as the following. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

- (i) Deformed, cracked, or corroded members in the crane structure and boom.
- (ii) Loose bolts or rivets.
- (iii) Cracked or worn sheaves and drums.
- (iv) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers and locking devices.
- (v) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.
- (vi) Load, boom angle, and other indicators over their full range, for any significant inaccuracies.
- (vii) Gasoline, diesel, electric, or other power plants for improper performance or noncompliance with safety requirements.
- (viii) Excessive wear of chain-drive sprockets and excessive chain stretch.
- (ix) Travel steering, braking, and locking devices, for malfunction.
- (x) Excessively worn or damaged tires.

(5) **Cranes not in regular use.**

- (i) A crane which has been idle for a period of one month or more, but less than 6 months, shall be given an inspection conforming with requirements of paragraph (d)(3) of this section and paragraph (g)(2)(ii) of this section before placing in service.
- (ii) A crane which has been idle for a period of six months shall be given a complete inspection conforming with requirements of paragraphs (d) (3) and (4) of this section and paragraph (g)(2)(ii) of this section before placing in service.
- (iii) Standby cranes shall be inspected at least semiannually in accordance with requirements of paragraph (d)(3) of this section and paragraph (g)(2)(ii) of this section. Such cranes which are exposed to adverse environment should be inspected more frequently.

(6) **Inspection records.** Certification records which include the date of inspection, the signature of the person who performed the inspection and the serial number, or other identifier, of the crane which was inspected shall be made monthly on critical items in use such as brakes, crane hooks, and ropes. This certification record shall be kept readily available.

(e) **Testing –**

(1) **Operational tests.**

- (i) In addition to prototype tests and quality-control measures, each new production crane shall be tested by the manufacturer to the extent necessary to insure compliance with the operational requirements of this paragraph including functions such as the following:
 - (a) Load hoisting and lowering mechanisms.

- (b) Boom hoisting and lower mechanisms.
- (c) Swinging mechanism.
- (d) Travel mechanism.
- (e) Safety devices.
- (ii) Where the complete production crane is not supplied by one manufacturer such tests shall be conducted at final assembly.
- (iii) Certified production-crane test results shall be made available.

(2) **Rated load test.**

- (i) Written reports shall be available showing test procedures and confirming the adequacy of repairs or alterations.
- (ii) Test loads shall not exceed 110 percent of the rated load at any selected working radius.
- (iii) Where rerating is necessary:
 - (a) Crawler, truck, and wheel-mounted cranes shall be tested in accordance with SAE Recommended Practice, Crane Load Stability Test Code J765 (April 1961).
 - (b) Locomotive cranes shall be tested in accordance with paragraph (c)(1) (i) and (ii) of this section.
 - (c) Rerating test report shall be readily available.
- (iv) No cranes shall be rerated in excess of the original load ratings unless such rating changes are approved by the crane manufacturer or final assembler.

(f) **Maintenance procedure—General.** After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated, and maintenance equipment removed.

(g) **Rope inspection –**

(1) **Running ropes.** A thorough inspection of all ropes in use shall be made at least once a month and a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier for the ropes shall be prepared and kept on file where readily available. All inspections shall be performed by an appointed or authorized person. Any deterioration, resulting in appreciable loss of original strength shall be carefully observed and determination made as to whether further use of the rope would constitute a safety hazard. Some of the conditions that could result in an appreciable loss of strength are the following:

- (i) Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires.
- (ii) A number of broken outside wires and the degree of distribution of concentration of such broken wires.
- (iii) Worn outside wires.
- (iv) Corroded or broken wires at end connections.
- (v) Corroded, cracked, bent, worn, or improperly applied end connections.

(vi) Severe kinking, crushing, cutting, or unstranding.

(2) **Other ropes.**

(i) Heavy wear and/or broken wires may occur in sections in contact with equalizer sheaves or other sheaves where rope travel is limited, or with saddles. Particular care shall be taken to inspect ropes at these locations.

(ii) All rope which has been idle for a period of a month or more due to shutdown or storage of a crane on which it is installed shall be given a thorough inspection before it is used. This inspection shall be for all types of deterioration and shall be performed by an appointed or authorized person whose approval shall be required for further use of the rope. A certification record which includes the date of inspection, the signature of the person who performed the inspection, and an identifier for the rope which was inspected shall be prepared and kept readily available.

(iii) Particular care shall be taken in the inspection of nonrotating rope.

(h) **Handling the load –**

(1) **Size of load.**

(i) No crane shall be loaded beyond the rated load, except for test purposes as provided in paragraph (e) of this section.

(ii) When loads which are limited by structural competence rather than by stability are to be handled, it shall be ascertained that the weight of the load has been determined within plus or minus 10 percent before it is lifted.

(2) **Attaching the load.**

(i) The hoist rope shall not be wrapped around the load.

(ii) The load shall be attached to the hook by means of slings or other approved devices.

(3) **Moving the load.**

(i) The employer shall assure that:

(a) The crane is level and where necessary blocked properly.

(b) The load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches.

(ii) Before starting to hoist, the following conditions shall be noted:

(a) Hoist rope shall not be kinked.

(b) Multiple part lines shall not be twisted around each other.

(c) The hook shall be brought over the load in such a manner as to prevent swinging.

(iii) During hoisting care shall be taken that:

(a) There is no sudden acceleration or deceleration of the moving load.

(b) The load does not contact any obstructions.

- (iv) Side loading of booms shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways.
- (v) No hoisting, lowering, swinging, or traveling shall be done while anyone is on the load or hook.
- (vi) The operator should avoid carrying loads over people.
- (vii) On truck-mounted cranes, no loads shall be lifted over the front area except as approved by the crane manufacturer.
- (viii) The operator shall test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes.
- (ix) Outriggers shall be used when the load to be handled at that particular radius exceeds the rated load without outriggers as given by the manufacturer for that crane. Where floats are used they shall be securely attached to the outriggers. Wood blocks used to support outriggers shall:
 - (a) Be strong enough to prevent crushing.
 - (b) Be free from defects.
 - (c) Be of sufficient width and length to prevent shifting or toppling under load.
- (x) Neither the load nor the boom shall be lowered below the point where less than two full wraps of rope remain on their respective drums.
- (xi) Before lifting loads with locomotive cranes without using outriggers, means shall be applied to prevent the load from being carried by the truck springs.
- (xii) When two or more cranes are used to lift one load, one designated person shall be responsible for the operation. He shall be required to analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.
- (xiii) In transit the following additional precautions shall be exercised:
 - (a) The boom shall be carried in line with the direction of motion.
 - (b) The superstructure shall be secured against rotation, except when negotiating turns when there is an operator in the cab or the boom is supported on a dolly.
 - (c) The empty hook shall be lashed or otherwise restrained so that it cannot swing freely.
- (xiv) Before traveling a crane with load, a designated person shall be responsible for determining and controlling safety. Decisions such as position of load, boom location, ground support, travel route, and speed of movement shall be in accord with his determinations.
- (xv) A crane with or without load shall not be traveled with the boom so high that it may bounce back over the cab.
- (xvi) When rotating the crane, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radii at which it can be controlled. A tag or restraint line shall be used when rotation of the load is hazardous.
- (xvii) When a crane is to be operated at a fixed radius, the boom-hoist pawl or other positive locking device shall be engaged.
- (xviii) Ropes shall not be handled on a winch head without the knowledge of the operator.

- (xix) While a winch head is being used, the operator shall be within convenient reach of the power unit control lever.

(4) **Holding the load.**

- (i) The operator shall not be permitted to leave his position at the controls while the load is suspended.
- (ii) No person should be permitted to stand or pass under a load on the hook.
- (iii) If the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the positive controllable means of the operator's station.

(i) **Other requirements –**

- (1) **Rail clamps.** Rail clamps shall not be used as a means of restraining tipping of a locomotive crane.

- (2) **Ballast or counterweight.** Cranes shall not be operated without the full amount of any ballast or counterweight in place as specified by the maker, but truck cranes that have dropped the ballast or counterweight may be operated temporarily with special care and only for light loads without full ballast or counterweight in place. The ballast or counterweight in place specified by the manufacturer shall not be exceeded.

(3) **Cabs.**

- (i) Necessary clothing and personal belongings shall be stored in such a manner as to not interfere with access or operation.
- (ii) Tools, oil cans, waste, extra fuses, and other necessary articles shall be stored in the tool box, and shall not be permitted to lie loose in or about the cab.

(4) **Refueling.**

- (i) Refueling with small portable containers shall be done with an approved safety type can equipped with an automatic closing cap and flame arrester. Refer to § 1910.155(c)(3) for definition of approved.
- (ii) Machines shall not be refueled with the engine running.

(5) **Fire extinguishers.**

- (i) A carbon dioxide, dry chemical, or equivalent fire extinguisher shall be kept in the cab or vicinity of the crane.
- (ii) Operating and maintenance personnel shall be made familiar with the use and care of the fire extinguishers provided.

- (6) **Swinging locomotive cranes.** A locomotive crane shall not be swung into a position where railway cars on an adjacent track might strike it, until it has been ascertained that cars are not being moved on the adjacent track and proper flag protection has been established.

(j) **Operations near overhead lines.** For operations near overhead electric lines, see § 1910.333(c)(3).

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