

13.1: Introduction to Cranes and Hoists

Cranes in Construction

The use of cranes on construction sites is becoming more and more prevalent. All types and sizes of cranes are constructed today to meet the many different needs of the construction industry. Overall, these cranes have an excellent safety record on the job. Unfortunately, due to the nature of the work they perform, when there is an accident, fatalities often occur and the extent and cost of the damage to the equipment and the construction site can be extensive. The purpose of this discussion will be to review some basics of crane safety that can help personnel at construction sites determine what hazards could exist as a result of the use of the crane. It is not the intent of this review to prepare anyone to perform inspections of cranes to determine their working condition. That task can take years of experience and should only be performed by competent persons who have been properly trained.

Applicable Regulations

Subpart N, contains seven separate standards related to the use of cranes, derricks, hoists, elevators and conveyors. The standards which are most closely related to construction work will be covered in this lesson.

Cranes and Derricks - General Provisions

Specifications and limitations

The employer shall comply with the manufacturer's specifications and limitations applicable to the operation of any and all cranes and derricks. Where manufacturer's specifications are not available, the limitations assigned to the equipment shall be based on the determinations of a qualified engineer competent in this field and such determinations will be appropriately documented and recorded. Attachments used with cranes shall not exceed the capacity, rating, or scope recommended by the manufacturer.

Rated capacities

Rated load capacities, and recommended operating speeds, special hazard warnings or instructions, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while he is at his control station.

Hand Signals

Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standard for the type of crane in use. An illustration of the signals shall be posted at the job site.

Inspection of machinery

The employer shall designate a competent person who shall inspect all machinery and equipment prior to each use, and during use, to make sure it is in safe operating condition. Any deficiencies shall be repaired, or defective parts replaced, before continued use. A thorough annual inspection of the hoisting machinery shall be made by a competent person, or by a government or private agency recognized by the U. S. Department of Labor. The employer shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment.

Guarding

Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard.

Swing Radius

Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted shall be barricaded in such a manner as to prevent an employee from being struck or crushed by the crane.

Equipment exhaust

Whenever internal combustion engine powered equipment emits exhausts in enclosed spaces, tests shall be made and recorded to see that employees are not exposed to unsafe concentrations of toxic gases or oxygen deficient atmospheres.

Fire Protection

An accessible fire extinguisher of 5BC rating, or higher, shall be available at all operator stations or cabs of equipment. All employees shall be kept clear of loads about to be lifted and of suspended loads.

Cranes and Derricks - Working Clearances

Working in proximity to energized electrical lines

Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, and are not a part of or an attachment to the equipment or machinery, and have been erected to prevent physical contact with the lines, equipment or machines shall be operated proximate to power lines only in accordance with the following:

1. For lines rated 50kV or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.
2. For lines rated over 50kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1kV over 50kV, or twice the length of the line insulator, but never less than 10 feet.
3. In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50kV, and 10 feet for voltages over 50kV, up to and including 345kV, and 16 feet for voltages up to and including 750kV.

Designated person

A person shall be designated to observe clearance of the equipment and give timely warning for all operations when it is difficult for the operator to maintain the desired clearance by visual means. Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation.

Overhead Wire

Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.

Transmitter Towers

Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

1. The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom; and
2. Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.
3. Combustible and flammable materials shall be removed from the immediate area prior to operations.

Equipment modifications

No modifications or additions, which affect the capacity or safe operation of the equipment, shall be made by the employer without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.

Crane or Derrick Suspended Personnel Platforms

General requirements

The use of a crane or derrick to hoist employees on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the worksite, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous, or is not possible because of structural design or worksite conditions.

Hoisting of personnel

Hoisting of the personnel platform shall be performed in a slow, controlled cautious manner with no sudden movements of the crane or derrick, or the platform.

Load lines

Load lines shall be capable of supporting, without failure, at least seven times the maximum intended load, except that where rotation resistant rope is used, the lines shall be capable of supporting without failure, at least ten times the maximum intended load.

Brakes and locking devices

Load and boom hoist drum brakes, swing brakes, and locking devices such as pawls or dogs shall be engaged when the occupied personnel platform is in a stationary position.

Crane leveling

The crane shall be uniformly level within one percent of level grade and located on firm footing. Cranes equipped with outriggers shall have them all fully deployed following manufacturer's specifications, insofar as applicable, when hoisting employees.

Load capacity

The total weight of the loaded personnel platform and related rigging shall not exceed 50 percent of the rated capacity for the radius and configuration of the crane or derrick.

Live Booms

The use of machines having live booms (booms in which lowering is controlled by a brake without aid from other devices which slow the lowering speeds) is prohibited.

Positive acting device

A positive acting device shall be used which prevents contact between the load block or overhaul ball and the boom tip (anti-two-blocking device), or a system shall be used which deactivates the hoisting action before damage occurs in the event of a two-blocking situation (two-block damage prevention feature).

Lowering of hoist

The load line hoist drum shall have a system or device on the power train other than the load hoist brake, which regulates the lowering rate of speed of the hoist mechanism (controlled load lowering). Free fall is prohibited.

This page titled [13.1: Introduction to Cranes and Hoists](#) is shared under a [CC BY 4.0](#) license and was authored, remixed, and/or curated by [Kimberly Mosley](#) ([ASCCC Open Educational Resources Initiative \(OERI\)](#)) .

- [12.1: Introduction to Cranes and Hoists](#) by [Kimberly Mosley](#) is licensed [CC BY 4.0](#).