Cranes

10-Hour Construction Outreach

Cranes

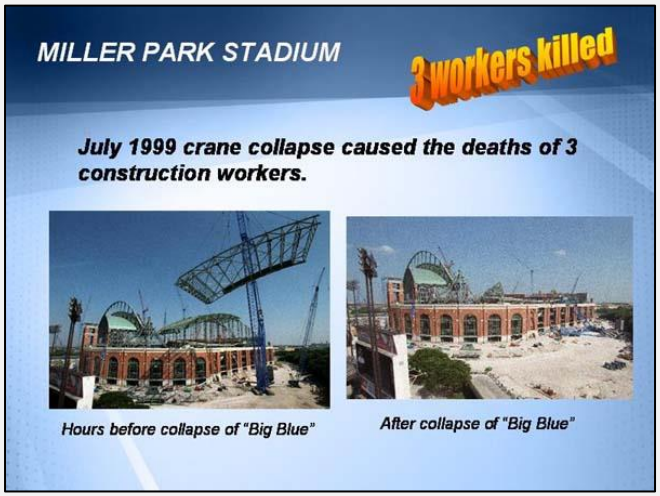
Source of photos: OSHA

Cranes

- Discuss "Big Blue" crane collapse

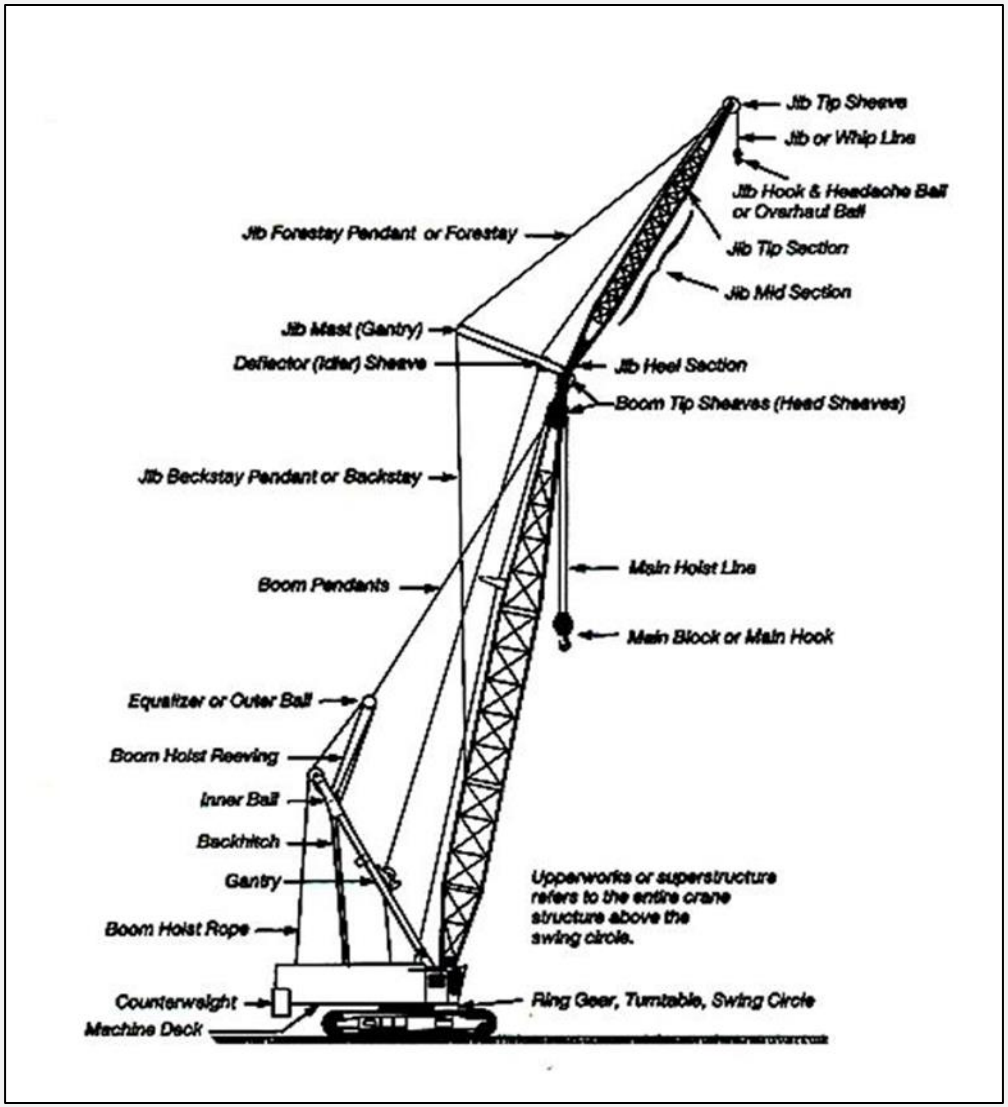
Case Study

https://www.osha.gov/dcsp/success_stories/compliance_assistance/abbott/abbott_casestudies/slide30.html



Source of photos: OSHA

Cranes



Source: OSHA

Cranes

Lesson Overview

- Common Causes of Crane Accidents
- Crane Use
- Crane Use Near Power Lines
- Employer Requirements
- Training Requirements

Common Causes of Crane Accidents

Four Major Types of Crane Accidents

1. Contact with power lines
2. Overturns
3. Mechanical Failures
4. Falls

Common Causes of Crane Accidents

Reasons accidents occur:

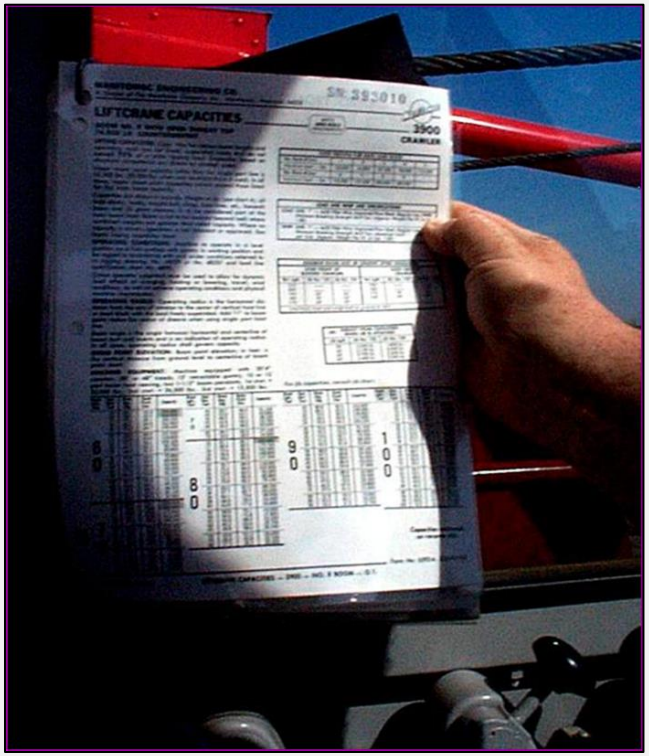
1. Poor Load Planning/Instability
2. Lack of communication
3. Lack of training
4. Inadequate maintenance or inspection of equipment

Hazardous Environments for Crane Operations

1. Improper loading rating
2. Excessive speeds
3. No hand signals
4. Inadequate inspection and maintenance
5. Unguarded parts
6. Unguarded swinging radius
7. Working too close to power lines
8. Improper exhaust systems
9. Shattered windows
10. No steps or guardrails on walkways
11. No boom angle indicator
12. Not using outriggers

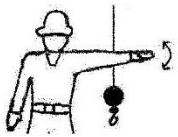
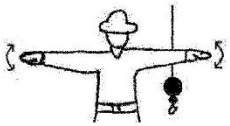
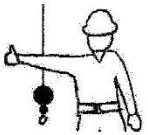
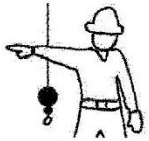
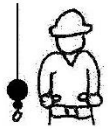
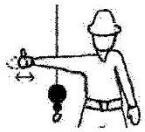
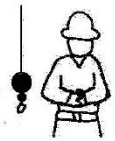
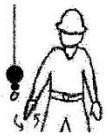
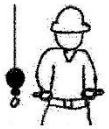
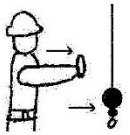
Load Capacity – Speed - Warnings

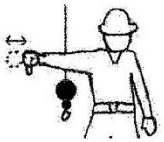
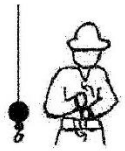
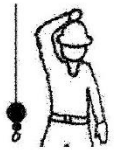
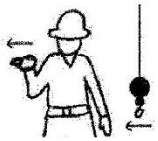
- Make sure the crane operator can see the:
  - Rated Load Capacities
  - Operating Speeds
  - Special Hazard Warning
  - Instructions
  - Operator's manual



Source: OSHA

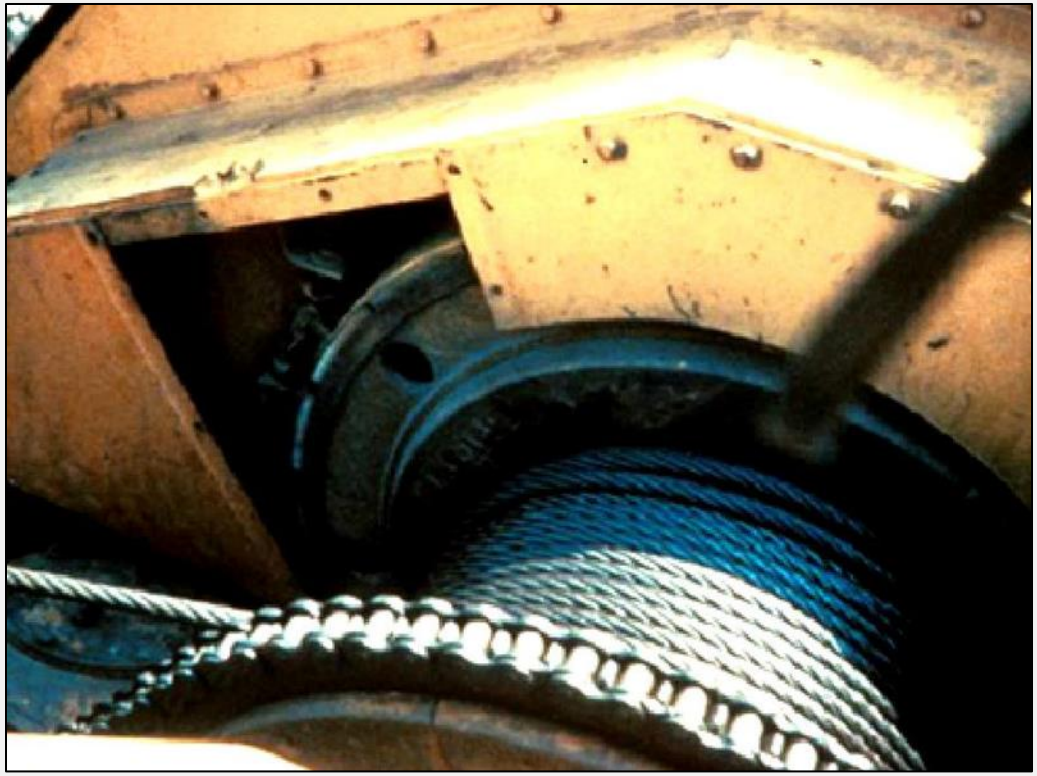
Hand Signals

 **STOP –** With arm extended horizontally to the side, palm down, arm is swung back and forth.	 **EMERGENCY STOP** – With both arms extended horizontally to the side, palms down, arms are swung back and forth.	 **HOIST –** With upper arm extended to the side, forearm and index finger pointing straight up, hand and finger make small circles.
 **RAISE BOOM –** With arm extended horizontally to the side, thumb points up with other fingers closed.	 **SWING –** With arm extended horizontally, index finger points in direction that boom is to swing.	 **RETRACT TELESCOPING BOOM** – With hands to the front at waist level, thumbs point at each other with other fingers closed.
 **RAISE THE BOOM AND LOWER THE LOAD –** With arm extended horizontally to the side and thumb pointing up, fingers open and close while load movement is desired.	 **DOG EVERYTHING –** Hands held together at waist level.	 **LOWER –** With arm and index finger pointing down, hand and finger make small circles.
 **LOWER BOOM –** With arm extended horizontally to the side, thumb points down with other fingers closed.	 **EXTEND TELESCOPING BOOM –** With hands to the front at waist level, thumbs point outward with other fingers closed.	 **TRAVEL/TOWER TRAVEL –** With all fingers pointing up, arm is extended horizontally out and back to make a pushing motion in the direction of travel.

 **LOWER THE BOOM AND RAISE THE LOAD –** With arm extended horizontally to the side and thumb pointing down, fingers open and close while load movement is desired.	 **MOVE SLOWLY –** A hand is placed in front of the hand that is giving the action signal.	 **USE AUXILIARY HOIST** (whipline) – With arm bent at elbow and forearm vertical, elbow is tapped with other hand. Then regular signal is used to indicate desired action.
 **CRAWLER CRANE TRAVEL, BOTH TRACKS –** Rotate fists around each other in front of body; direction of rotation away from body indicates travel forward; rotation towards body indicates travel backward.	 **USE MAIN HOIST –** A hand taps on top of the head. Then regular signal is given to indicate desired action.	 **CRAWLER CRANE TRAVEL, ONE TRACK –** Indicate track to be locked by raising fist on that side. Rotate other fist in front of body in direction that other track is to travel.
 **TROLLEY TRAVEL –** With palm up, fingers closed and thumb pointing in direction of motion, hand is jerked horizontally in direction trolley is to travel.		

Source: Federal Register - OSHA

Guard Moving Parts



Source: OSHA

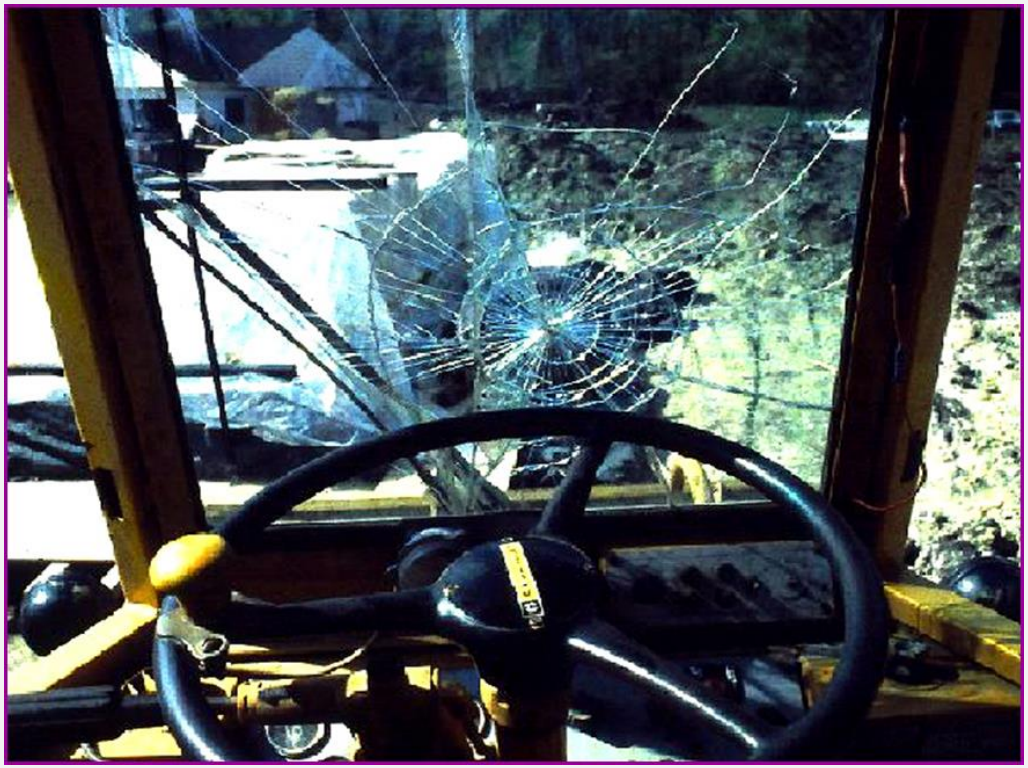
Swing Radius

- Stay out of the swing radius of the crane.
- Make sure there are barrier guards showing the swing radius.

Source: OSHA

Operator Visibility

Make sure broken windows or other obstructions do not prevent the operator from seeing.



Source: OSHA

Guardrails

Runways and steps need to have guardrails, handholds and slip resistant surfaces.

Source: OSHA

Guardrails

Use ladders to get to the upper portion of the cab.

Source: OSHA

Crane Use

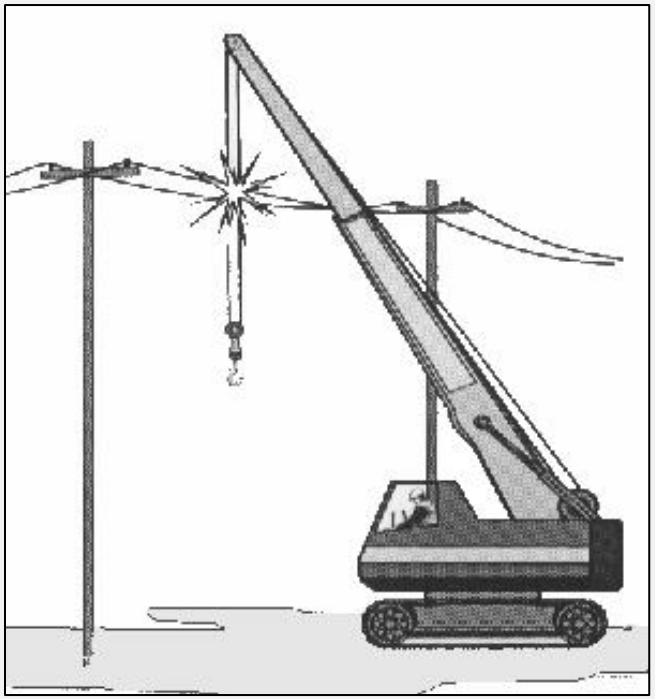
1. Capacities and limitations of the crane and job site restrictions.
2. Operators, signal persons, and riggers – qualifications/certifications
3. Level the crane and check the support surface
4. Check for power line precautions
5. Communicate hoisting activities in work area
6. Barricade swing area
7. Maintenance and inspection
8. Identify safe store and pick up/put down area for materials and machinery

Crane Operations

1. Load capacity/speed of operation
2. Weight of load
3. Basic lifting principles
4. Hand signals
5. Power lines
6. Swing radius
7. Suspended loads

Crane Use Near Power Lines

Boom or crane contact with energized power lines accounts for nearly 45% of crane accidents.



Source: NIOSH

Crane Use Near Power Lines

Pre-operational requirements:

1. Identify work zone
2. Determine proximity to power lines, if closer than 20 feet, if so, must do one of the following three:
   a. De-energize and ground
   b. Ensure no part of equipment, load line, or load gets closer than 20 feet to power line
   c. Determine line's voltage and minimum approach distance permitted under Table A.

Crane Use Near Power Lines

Pre-operational requirements:

TABLE A – MINIMUM CLEARANCE DISTANCES

Voltage (nominal, kV, alternating current)	**Minimum Clearance Distance** (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
Over 1,000	(as established by the utility owner/operator or qualified registered professional engineer who is a qualified person with respect to electrical power transmission and distribution)

Employer Requirements

Comply with all applicable employer requirements.

Designate a competent person to inspect all machinery and equipment prior to each use.

Training Requirements

1. Employer must provide training
2. Training administration

Hazard Recognition

Photo courtesy of OSHA.
This picture shows actual disaster site work conditions and may not illustrate proper safety and health procedures.

Hazard Recognition

Photo source: OSHA

Hazard Recognition

Photo source: NIOSH

Hazard Recognition

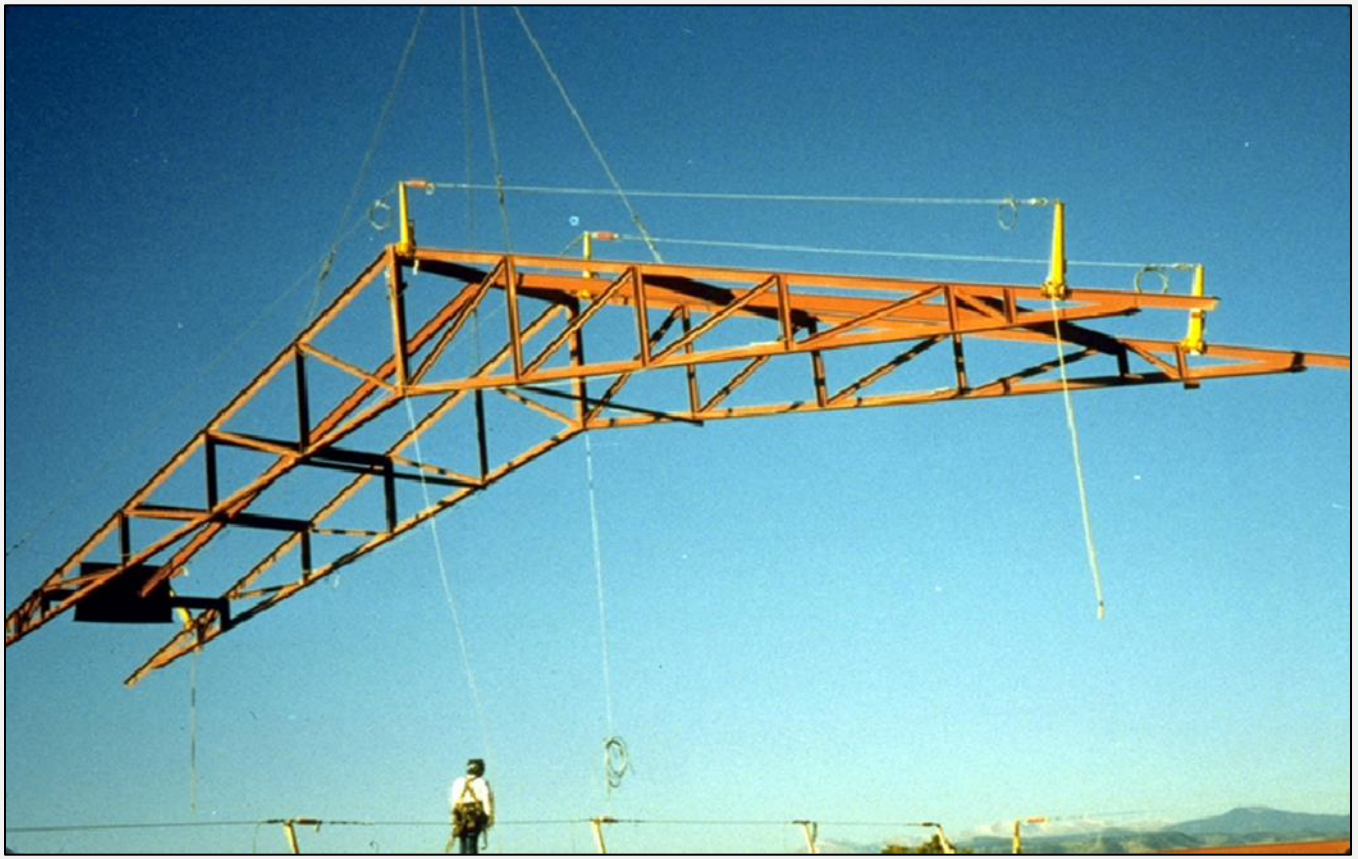


Photo source: OSHA

Hazard Recognition

Photo source: OSHA

Knowledge Check

1. Nearly 45% of crane accidents are the result of the boom or crane making contact with __.
   a. other cranes
   b. work zone barricades
   c. energized power lines
   d. workers on the ground

c. energized power lines

Knowledge Check

2. Before beginning equipment operations, the employer must ___.
   a. identify the work zone and determine proximity to power lines
   b. notify utility company of lift and estimate voltage of power lines
   c. locate the fall zone and test load by lifting it at least 20 feet off the ground
   d. remove hazard area barriers and observe weather conditions

a. identify the work zone and determine proximity to power lines

Knowledge Check

3. A broken window that distorts the operator's visibility of the task is acceptable for operation.
   a. True
   b. False

b. False

Knowledge Check

4. Which of the following must be readily available to the crane operator for use at all times?
   a. Load charts and recommended operating speeds
   b. Special hazard warnings
   c. Instructions and operator's manual
   d. All of the above

d. All of the above

Knowledge Check

5. Who is responsible for inspecting all machinery and equipment prior to each use and during use, to make sure it is in safe operating condition?
   a. Certified person
   b. Qualified person
   c. Proficient person
   d. Competent person

d. Competent person