

SAFE CRANE OPERATION

J.A. Rosa Construction, LLC

From 2011 to 2017, the Census of Fatal Occupational Injuries (CFOI) reported 297 total crane-related deaths, an average of 42 per year over this 7-year period. Crane-related injuries are often catastrophic due to the immense weight and forces involved, with common injuries including head trauma, spinal cord injuries, fractures, amputations, internal organ damage, and electrocution. These severe injuries result from being struck by falling loads or equipment, being crushed by a collapsing crane, or contacting electrical power sources.

According to Crane Training Universities, a review of these 297 crane incidents revealed 838 OSHA violations, which resulted in 164 injuries and 133 fatalities. The breakdown of these incidents included:

- 37% of workers being crushed by loads*
- 27% due to dropped loads caused by rigging failure*
- 12% from falls from height, including from cranes*
- 11% due to workers being struck or run over by cranes*

22.1 Types of Cranes

1. Mobile Cranes

Mobile cranes are mounted on wheels and can move freely between locations. There are three common types of mobile cranes.

- Crawler Crane: Uses a tracked undercarriage to carry loads, which enhances the weight distribution to allow for greater stability and mobility
- Hydraulic Crane: Uses a hydraulic system to carry loads in various construction, industrial, and material handling applications
- All-Terrain Crane: Built for both roads and off-road terrain, these cranes are extremely mobile, stable, and have a high lift capacity

2. Fixed Cranes

Fixed cranes are permanently attached to the ground and move loads along a fixed path. Three common types of fixed cranes include:

- Tower Crane: Has a high lifting capacity and reach that enable it to accommodate heavy loads at tall heights
- Jib Crane: Featuring a horizontal arm—or jib—that rotates, this crane lifts and moves loads within confined spaces
- Overhead Crane: Mounted on an overhead beam, this crane offers efficient lifting in various settings

Under OSHA regulations 29 CFR 1926 Subpart CC, crane operators are required to follow strict safety guidelines and procedures.

22.2 Operator Certification

Crane operators must gain the proper certification to ensure that they can safely maneuver these vehicles around a construction site. In Connecticut, crane operators must have two years of work experience, pass the CT Hoisting Equipment Operator written and practical exams, and hold a certification from the National Commission for the Certification of Crane Operators (NCCCO). Hoisting licenses are administered by Connecticut's Office of State Fire Marshall. A Commercial Driver's License (CDL) may also be required if the crane is mounted on a commercial motor vehicle and driven on public roads, but not if the crane is stationary.

To pass the certification and license requirements, crane operators must understand:

- Load charts
- Signaling procedures
- Operational procedures
- Safety measures

Furthermore, they must be qualified to operate the specific type and model of crane or hoisting equipment they are using on a job site.

Contractors are responsible for verifying that crane operators have the proper training and credentials before they can begin operating on the job site.

22.3 Safety Conditions

Prior to any lift, the operator must perform a daily inspection of the crane, assess the site for hazards, confirm the ground is stable and level, and identify any overhead obstacles. They must identify overhead powerline hazards, especially power lines within 15 feet of the lift travel path, determine wind speed¹, and methods for restricting access of non-essential personnel. JA Rosa's supervisor or his delegate should assist in a site walk-through with the operator and observe the crane's daily inspection.

22.3.1 Crane Operator

JA Rosa's supervisor or his delegate should verify the crane operator's credentials including:

- Current Connecticut Hoisting license.
- Valid training certificate from an NCCCO approved facility.

¹ Ideal wind speed is below 20 mph. Cancel lift if winds exceed 30 mph.

22.3.2 On-Site Inspection

JA Rosa's supervisor or his delegate should verify the operator has inspected the crane for

Structural Integrity:

- Boom: Look for cracks, damage, or deformation.
- Frame & Welds: Inspect the main frame, carrier, and base for damage, cracks, or wear.
- Counterweights: Ensure they are properly secured.

Operating Systems:

- Brakes: Check the hoist, trolley, and bridge brakes for wear, proper function, and engagement/release.
- Controls: Verify all control mechanisms are working correctly and free from damage.
- Limit Switches: Test upper and lower limit switches for proper operation.

Load Handling Equipment:

- Hook & Latch: Inspect cracks, deformation, and ensure the safety latch functions correctly.
- Wire Rope/Chain: Look for kinks, bird caging², stretching, or wear.
- Below-the-Hook (BTH) Devices: Ensure compatibility with the crane and the load.

Electrical & Hydraulic Systems:

- Cables & Wiring: Check for insulation damage and secure connections.
- Electrical Panels: Look for signs of overheating or arcing.
- Hydraulic Hoses & Leaks: Inspect for leaks, cracks, and damage.

Safety & Communication:

- Load Indicator (SLI): Verify is operational.
- Emergency Stop: Confirm the emergency stop button is functional.

22.3.3 Annual Inspection

JA Rosa's foreman or his delegate should verify the operator is in possession of a third party annual inspection exhibiting a review of structural components (frame, boom, counterweights), operating mechanisms (control and drive systems), all air and hydraulic systems (lines, tanks, valves), safety devices, hooks and latches, wire rope and reeving systems, and electrical components.

² Bird caging is a type of damage where the individual strands and wires of the rope open and separate, forming a hollow, cage-like structure, which indicates the rope has lost its integrity and must be immediately removed from service

22.4 Lift Plan

A crane lift plan requires details on the load (weight, center of gravity, dimensions), the crane (make, model, load chart, capacity), site conditions (ground stability, obstacles, weather), the lift path, and the lift team (qualifications, assigned roles). Specifics for the lift include the boom length and radius, rigging information, the setup location and travel path. The plan should be reviewed by all personnel involved in the lift and documented before the lift to prevent accidents and ensure compliance with safety regulations.

Developing a comprehensive lifting plan is a crucial step to guarantee smooth and secure operations, minimizing risks and maximizing productivity.

Step 1: Assess the Lifting Task

Before embarking on any rigging and lifting activity, it is essential to conduct a thorough assessment of the lifting task at hand. Start by defining the objectives of the lifting operation and understanding the type of load to be lifted. Determine the weight, dimensions, and center of gravity of the load to identify the appropriate rigging equipment and lifting method.

Step 2: Identify Potential Hazards

Identifying potential hazards is a critical part of lifting plan development. Conduct a detailed hazard analysis to identify potential risks associated with the lifting task, such as uneven ground, overhead obstacles, electrical hazards (see table below), and adverse weather conditions. Analyze the work environment and take necessary measures to eliminate or mitigate these risks.

Table A –Minimum Clearance Distances 1926.1408-.1409

Voltage (kV)	Minimum Clearance Distance (feet)
Up to 50 kV	10 (3m)
50-200 kV	15' (4.5m)
200-350 kV	20' (6.0m)
350-500 kV	25' (7.5m)

Step 3: Select Suitable Rigging Equipment

Based on the load assessment and hazard analysis, the operator will choose the most appropriate rigging equipment for the lifting operation. Consider factors like load weight capacity, rigging material, and compatibility with the load and lifting equipment. Ensure that all selected rigging gear is inspected, certified, and in good working condition.

Step 4: Plan the Lifting Procedure

Define the sequence of activities, including the setup of lifting equipment, attachment of rigging gear to the load, and positioning of personnel during the lift. Create a detailed diagram or sketch that illustrates the lifting process, ensuring all team members are on the same page.

Step 5: Establish Communication Protocols

Effective communication is paramount during rigging and lifting operations. Establish clear communication protocols among all team members involved in the lifting task. Use standard hand signals or two-way radios to facilitate real-time communication and avoid misunderstandings that could lead to accidents.

Step 6: Assign Roles and Responsibilities

Designate specific roles and responsibilities to each team member involved in the lifting operation. Assign a competent and experienced individual to lead the lifting team and supervise the entire process. Ensure that everyone understands their responsibilities and has the necessary training and qualifications to perform their tasks safely.

Step 7: Obtain Necessary Permits and Clearances

Depending on the lifting operation's nature and location, you may require permits and clearances from local authorities or property owners. Obtain all necessary permits well in advance to prevent delays and legal issues during the lifting process.

Step 8: Plan for Emergency Situations

Emergencies can occur unexpectedly. Develop a comprehensive contingency plan for potential emergencies, such as equipment failure, sudden weather changes, or accidents.

Step 9: Conduct Pre-Lift Meeting

Before commencing the lifting operation, all team members should gather for a pre-lift meeting. Review the lifting plan, discuss roles and responsibilities, and address any concerns or questions. This meeting fosters a sense of teamwork, enhances coordination, and reaffirms the importance of safety throughout the lifting process.

Step 10: Execute the Lifting Plan

With all preparations in place, execute the lifting plan. Follow the planned procedure diligently, adhering to safety protocols and communication guidelines. Monitor the lifting operation closely, and if any unforeseen issues arise, pause the lift and address them promptly before resuming.

Before hoisting the material to its target destination, use the **3-3-3** rule for lifting. First 3 – Personnel should maintain a safe distance of 3 meters away from the lifted load. Second 3 - Lift the load 300mm above the ground. Third 3 - hold the load in position for 3 seconds to check for load stability.

The infographic is a vertical yellow rectangle with a black border. At the top right, it features the logo for FYIND.COM, a B2B marketplace. Below the logo, the text 'Learn how to lift safely to avoid injury' is centered. The main title, 'WHAT IS THE 3 3 3 RULE FOR LIFTING?', is prominently displayed in large, bold, black letters. The infographic is divided into three horizontal sections, each containing a numbered rule. Rule 1: A black square with the number '1' in yellow, followed by the text 'Keep 3m away from materials being lifted.' Rule 2: A black square with the number '2' in yellow, followed by the text 'Lift up the materials 300mm from ground.' Rule 3: A black square with the number '3' in yellow, followed by the text 'Wait for 3 seconds for stabilizing the lifting object before lifting.' At the bottom left, it says 'Powered by LUNAD'. At the bottom right, it provides contact information: '+9714 283 2133 | info@fyind.ae | www.fyind.com'.

Powered by **LUNAD**

FYIND.COM
B2B marketplace

Learn how to lift safely to avoid injury

WHAT IS THE 3 3 3 RULE FOR LIFTING?

- 1** Keep 3m away from materials being lifted.
- 2** Lift up the materials 300mm from ground.
- 3** Wait for 3 seconds for stabilizing the lifting object before lifting.

+9714 283 2133 | info@fyind.ae | www.fyind.com