
Cranes and Derricks

- ***29 CFR 1926 - Subpart CC***

Presented by:



Occupational Safety
& Health Division

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This presentation was created by the N.C. Department of Labor for safety and health training.

Objectives

1926.1400

- At the end of this course, students will be able to:
 - Familiarize themselves with the scope of the standard
 - Identify proper ground conditions
 - Recognize assembly/disassembly hazards
 - Recognize power line safety hazards
 - Understand the importance of Inspections
 - Incorporate fall protection into their crane program
 - Understand operator and signal person qualifications
 - Understand signals and their importance to safe operations
 - Understand tower cranes hazards
 - Identify training elements specific to cranes

Amputations Special Emphasis Program

- Goal to reduce occupational exposures to amputations
- Struck by and caught between injuries
 - Lockout/tagout
 - Machine guarding
- Increase outreach to employers and employees
 - Training events (Internal and external)
 - Compliance inspections
 - Consultation visits
 - Publications
- Amputations must be reported within 24 hours

Scope

1926.1400(a)-(b)

- Applies to power-operated equipment, when used in construction, that can hoist, lower and horizontally move a suspended load
- Applies to the same equipment when used with attachments



Scope

1926.1400(c)

- Specific exclusions

- Machinery while it is converted or adapted for non-hoisting/lifting use
 - » Such as power shovels, excavators and concrete pumps

- Limited exclusions

- Digger derricks, articulating/knuckle-boom truck cranes



Equipment *Not* Covered

1926.1400(c)(4)

- Digger derricks
 - Equipped with auger for drilling holes to set poles
 - Handling materials installed or removed from poles



Equipment *Not* Covered

1926.1400(c)(17)(i)-(ii)

- Articulating/knuckle-boom truck crane
 - Delivering materials to construction site
 - Transferring materials from truck crane to ground or onto structure using fork/cradle at end of boom



Equipment Covered

1926.1400(c)(17)(iii)(A)–(C)

- Articulating/knuckle-boom truck crane
 - Holding, supporting or stabilizing material to facilitate construction activity
 - Handling prefabricated components
 - Handling structural steel members



Definitions

1926.1401

● Competent person

- A person who is capable of *identifying existing and predictable hazards ...* and who has *authorization* to take prompt corrective measures to eliminate them.



● Qualified person

- A person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, successfully demonstrated an *ability to solve/resolve problems* relating to the subject matter, the work, or the project.



Definitions

1926.1401

- **Dedicated spotter (power lines)**
 - Person who meets requirements of 1926.1428 (signal person qualifications).
 - » Responsibility to watch separation between power line and equipment.
 - » Ensure communication with operator that minimum approach distance not breached.



Ground Conditions

1926.1402(c)(1)

- Controlling entity
 - Provide adequate conditions
 - » Firm, drained, and graded
 - » So that with the use of supporting materials, the equipment manufacturer's specifications for adequate support and degree of level of the **equipment** are met



Ground Conditions

1926.1402(c)(2)

- Inform user of the equipment and operator of the location of hazards beneath the equipment set-up area.
 - Voids
 - Tanks
 - Utilities



Assembly/Disassembly

1926.1403

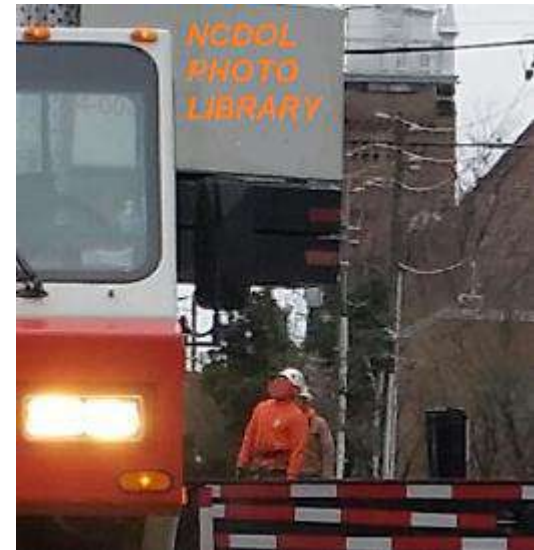
- Two options
 - Manufacturer procedures
 - Employer procedures



Assembly/Disassembly

1926.1403, .1404, .1435

- Crane assembly and disassembly procedures
 - Comply with manufacturer or employer procedures
 - Supervision—Competent-qualified person = A/D director
 - » Knowledge of procedures
 - » Review of procedures
 - » Ensure crew members understand their tasks and hazards associated with tasks
- Tower crane
 - Pre-erection inspection
 - » Each crane component inspected by qualified person



Assembly/Disassembly

1926.1404(h)

- Site and ground conditions must be adequate
- When required, block under outrigger floats



How is this set up?

1926.1404



Power Line Safety

1926.1407(f)

- Power lines presumed energized
 - Unless utility owner/operator confirms lines deenergized
 - Visibly grounded at worksite



Power Line Safety

1926.1408

- Identify the work zone
 - Demarcating boundaries (such as with flags, or a device such as a range limit device or range control warning device) **or**
 - Define the work zone as the area 360 degrees around the equipment, up to equipment's maximum working radius.



Power Line Safety

1926.1408



**Could you get
within 20 feet of
power line?**

YES

NO

Option #1

De-energize and ground

Option #2

20-foot clearance

Option #3

Ask utility for voltage and use Table A (with minimum clearance distance)

**Encroachment
prevention measures
(equipment operations)**

- Planning meeting
- If tag lines used - Non-conductive
- Elevated warning lines, barricade or line of signs
- *PLUS* (Choose one):
- Proximity alarm, spotter, warning device, range limiter, or insulating link

No further action

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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 registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.)

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Intentionally Working Closer Than Table A Zone

Must Show:

- Staying outside zone is infeasible
- Infeasible to deenergize and ground



All of the following are required:

1. Power line owner – **sets minimum approach distance**
2. Planning meeting – minimum procedures
 - Deactivate automatic re-energizer
 - Dedicated spotter
 - Elevated warning line or barricade
 - Insulating link/device
 - Nonconductive rigging
 - Range limiter (if equipped)
 - Nonconductive tag line (if used)
 - Barricades - 10 feet from equipment
 - Limit access to essential workers
 - Prohibit non-operator workers from touching above insulating link
 - Properly ground crane
 - Insulating line cover-up installed

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Power Line Safety

1926.1411(a)–(b)

- Equipment traveling under power line with no load
 - Boom/mast and boom/mast support system lowered sufficiently to meet requirements
 - Clearances in Table T maintained
 - Effects of speed and terrain on equipment movement
 - Dedicated spotter
 - Precautions for traveling in poor visibility



Table T – Minimum Clearance Distances While Traveling With No Load

| Voltage (nominal, kV, alternating current) | While traveling – Minimum clearance distance (feet) |
|--|---|
| up to 0.75 | 4 |
| over .75 to 50 | 6 |
| over 50 to 345 | 10 |
| over 345 to 750 | 16 |
| over 750 to 1,000 | 20 |
| over 1,000 | |

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(As established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution.)

Electric Utilities

1926.1400(g)

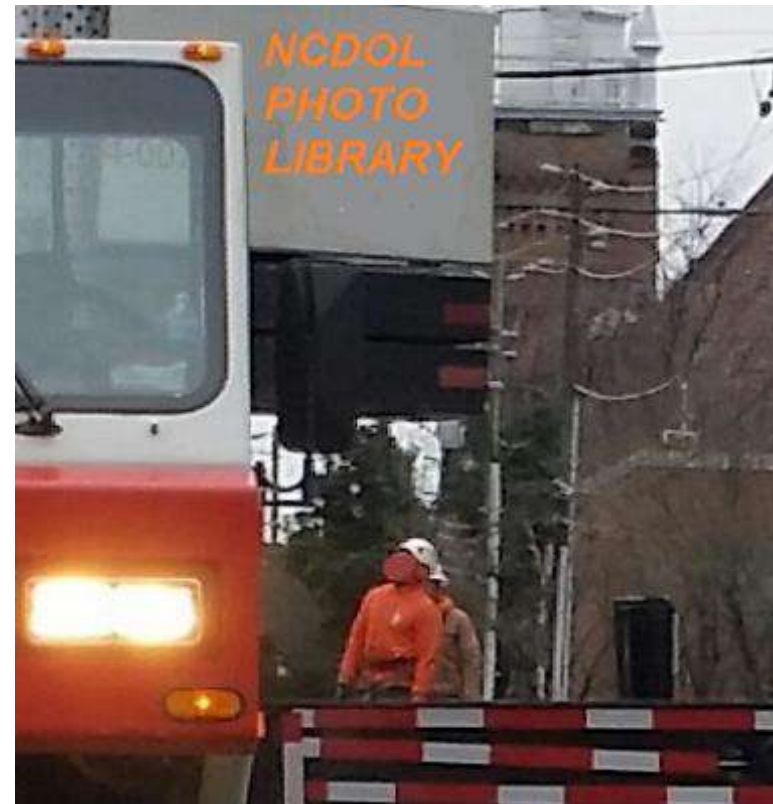
- Employers whose employees are qualified to perform power distribution and transmission work
 - Deemed compliance with 1926.1407 through 1926.1411 when performing work covered by Subpart V work in accordance with 1910.269(p)



Inspections

1926.1412(d)–(e)

- Visual inspection by *competent person* prior to each shift and completed before or during shift.
- Monthly inspection by *competent person* with documentation.



Inspections

1926.1412(a)–(c)

- Other inspections required under this section done by *qualified person* – with documentation
 - Annual/comprehensive
 - Post-assembly
 - Repaired/adjusted equipment
 - Modified equipment
 - Severe service
 - Equipment not in regular use



Inspections

1926.1412(a)–(c)

| Type of Inspection | Who Inspects |
|-------------------------------|------------------|
| Modified or repaired/adjusted | Qualified person |
| Post-assembly | Qualified person |
| Shift | Competent person |
| Monthly | Competent person |
| Annual | Qualified person |

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Safety Devices

1926.1415(a)–(b)

- Required and are in proper working order at all times
- Includes:
 - Crane level indicator
 - Boom stops (except for derricks and hydraulic booms)
 - Jib stops (except for derricks)
 - Foot pedal brakes with locks
 - Hydraulic outrigger jacks/hydraulic stabilizer jacks with integral holding device
 - Equipment on rails with rail clamps/stops
 - Horn



Operational Aids

1926.1416(b)

- Operations must not begin unless the listed operational aids are in proper working order, except when being repaired and a specified temporary alternative measure is used.

IF THE LIMITING DEVICE IS NOT FUNCTIONING, STOP!



Operational Aids

1926.1416(d)–(e)

● Category 1

- Boom hoist limiting device, luffing jib limiting device, and anti two-blocking device
 - » Must be repaired no later than 7 calendar days after the deficiency occurs

● Category 2

- Boom angle or radius indicator, boom length indicator, load weighing devices, jib angle indicator, outrigger/stabilizer position sensor/monitor, and hoist drum rotation indicator
 - » Must be repaired no later than 30 calendar days after the deficiency occurs

Operations

1926.1417(a)–(c)

- When manufacturer procedures are unavailable, the employer must develop and ensure compliance with procedures necessary for safe operation of equipment and attachments.
- Procedures for the operational controls must be developed by a qualified person.
- Procedures, including rated capacities, recommended operating speeds, special hazard warnings, instructions, and operator's manual, must be available in the cab at all times for use by the operator.

Operations

1926.1417(d)

- Operator must not engage in any practice or activity that diverts their attention while engaged in operating the equipment, such as the use of cellular phones (other than when used for signal communications).



Fall Protection

1926.1423(b)-(c)

- Boom walkways
- Steps, handholds, ladders, grab rails, guardrails, and railings



Fall Protection

1926.1423(d)–(k)

- Personal fall arrest and positioning device systems
- Anchorage criteria
- Training



Keeping Clear of the Load

1926.1425(c)–(d)

- When employees are hooking, unhooking, or guiding the load, or in the initial connection of a load to a component/structure and are within the fall zone:
 - Materials being hoisted must be rigged by a qualified rigger
 - Hooks with self-closing latches must be used
- Only employees receiving a load are permitted within the fall zone when a load is being landed

Rigging

1926.1404(r) & 1425(c)

- Rigging work done by qualified rigger
 - During assembly/disassembly
 - When workers are within the fall zone to handle a load



Tower Crane Requirements

1926.1435

- Foundations and structural supports
 - Designed by manufacturer or professional engineer
- Plumb tolerance
 - Verified by qualified person
- Climbing procedures
- Pre- and post-erection inspection
 - By qualified person
- Post-erection load test
- Monthly/annual inspection



Operator Qualification and Certification

1926.1427

- Knowledge (written test)
 - Controls/performance characteristics
 - Calculate capacity
 - Preventing power line contact
 - Ground conditions and equipment support
 - Use and locate info in operating manual
 - Appendix C subjects

- Practical test

Operator Qualification/Certification 1926.1427

| | Portable | Valid |
|---|--|--|
| <i>Accredited Testing Organization</i> | YES * | 5 years |
| <i>Audited Employer Program</i> | NO | 5 years |
| <i>U.S. Military License</i> | NO * | Set by issuing entity |
| <i>Government License</i> | NO * Valid only in jurisdiction | Set by issuing entity, not > 5 years |

****Subject to state and local requirements and whether or not the military/state training meets accredited requirements.***

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Operator Qualification/Certification 1926.1427

- Operator qualification or certification *not* required:
 - Equipment with rated hoisting/lifting capacity of 2,000 pounds or less
 - Derricks
 - Side-boom cranes
- Operator trained on safe operation of equipment



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Operator Qualification/Certification 1926.1427(a)(4)

- Employer must provide the qualification or certification at no cost to operators.



Language Requirements

1926.1427(h)

- Tests under this section may be administered in any language the operator candidate understands.
- Operator's certificate must note the language in which the test was given.
- Equipment operation materials must be in the language of certification.

Signals

1926.1419 and .1422












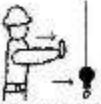
- Signal person provided
 - Load not in view of operator
 - View in direction of travel is obstructed
 - Due to site-specific safety concerns
- Types of signals
 - Hand
 - Voice
 - Audible
 - New signals
- Hand signal chart posted on equipment or at site



Signal Person Qualifications

1926.1428(c)

- Know and understand type of signals used
- Competent in using signals
- Basic understanding of equipment operation and limitations
- Know and understand relevant requirements
- Demonstrate knowledge through an oral or written test and practical test

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

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Signal Person Qualifications

1926.1428(c)

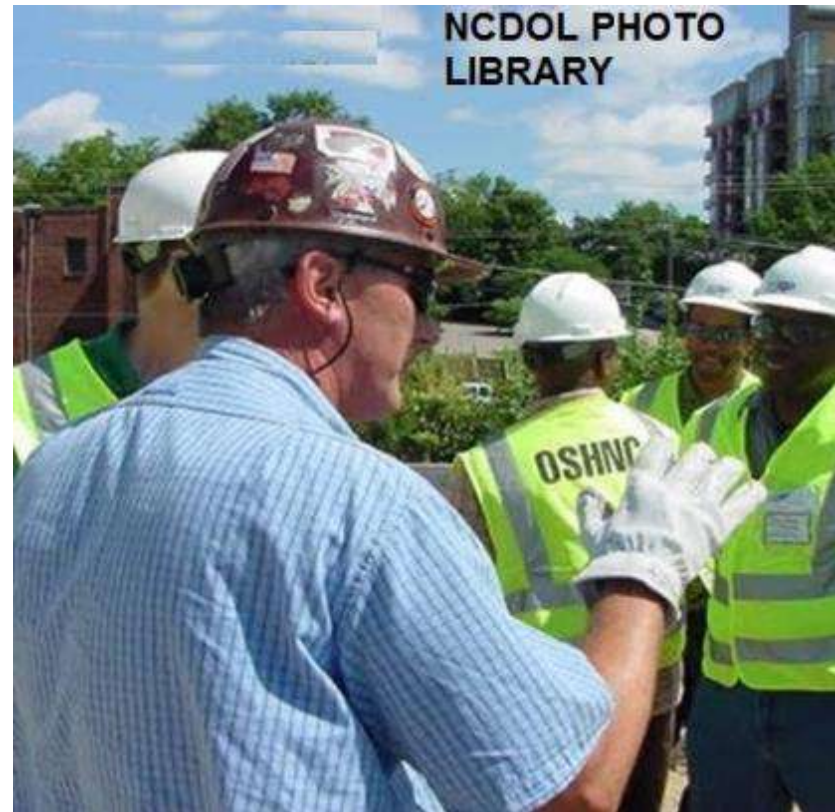
| Option | Documentation | Portable |
|--|---------------|----------|
| Option (1): <i>Third party qualified evaluator</i> | Yes | Yes |
| Option (2): <i>Employer's qualified evaluator</i> | Yes | No |

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Training Requirements

1926.1430(a)–(f)

- Overhead powerlines
- Signal persons
- Operators
- Competent persons/
qualified persons
- Crush/pinch points
- Tag-out



Training Administration

1926.1430(g)

- Employees trained and evaluated on their understanding of the information provided
- Refresher training
- Training provided at no cost to employee



Summary

1926.1400

- In this course, we discussed the following:
 - Scope of the standard
 - Ground conditions
 - Assembly/disassembly
 - Power line safety
 - Inspections
 - Fall protection
 - Operator and signal person qualifications
 - Signals
 - Tower cranes
 - Training



Thank You For Attending!

Final Questions?