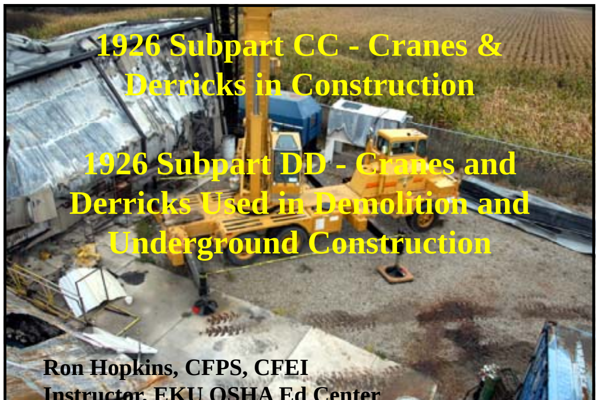


1926 Subpart CC - Cranes & Derricks in Construction

1926 Subpart DD - Cranes and Derricks Used in Demolition and Underground Construction

Ron Hopkins, CFPS, CFEI
Instructor, EKU OSHA Ed Center
Eastern Kentucky University

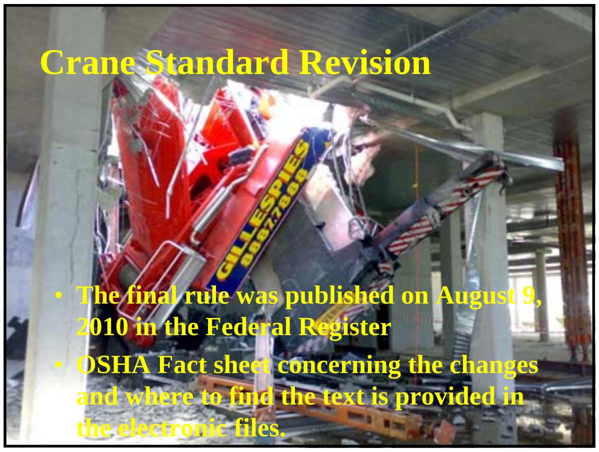
Cranes, Subpart CC and DD

Upon successful completion of this module, each participant will be able to:

- Explain the common hazards and citations involving cranes.
- Identify required functional checks for crane operations.
- Explain general requirements for construction crane operation.
- Describe basic service limits for running and standing ropes.
- Identify proper safety precautions for operation of cranes in proximity to power lines.
- Discuss safe work practices related to cranes.
- Explain training requirements relating to cranes and related equipment.

Background

- Cranes are involved in 25 to 33% of fatal injuries in construction and maintenance.
- For the 11 years 1984-94, 502 deaths occurred in 479 incidents involving cranes in the construction industry.
- Electrocution by power-line contact was the most common type of incident, with 198 deaths (39%) reported.



Crane Standard Revision

- The final rule was published on August 9, 2010 in the Federal Register
- OSHA Fact sheet concerning the changes and where to find the text is provided in the electronic files.

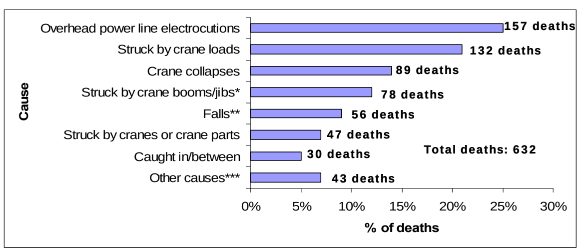
Cranes: General Industry

1910.179 Overhead and gantry cranes
1910.180 Crawler, locomotive, and truck cranes
1910.181 Derricks
1910.183 Helicopters
1910.184 Slings

Circumstances of injury, crane-related deaths, US construction, 1984-94

Electrocution	38%
Assembly/Dismantling	12%
Boom Collapse	8%
Crane Overturn	7%
Rigging	7%
Other	28%

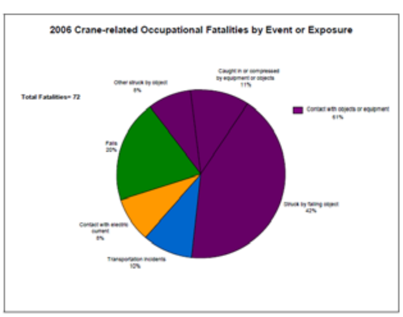
Causes of Crane-Related Deaths in Construction, 1992-2006



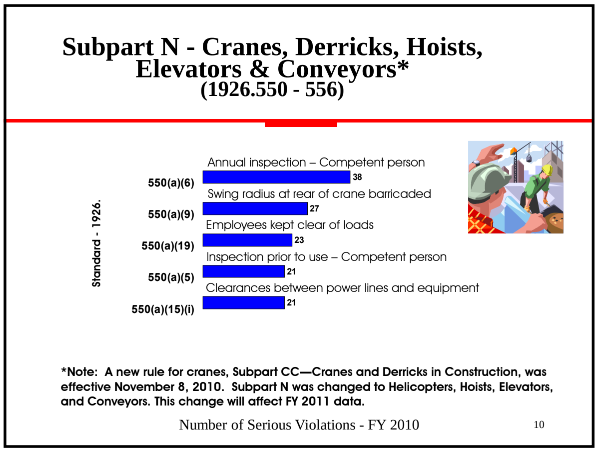
* Included 64 struck by falling booms/jibs
** Included 21 falls from cranes, 9 falls from crane baskets, 8 from crane loads.
***Other causes included 9 highway incidents.
Source: U.S. Bureau of Labor Statistics Census of Fatal Occupational Injuries Research File

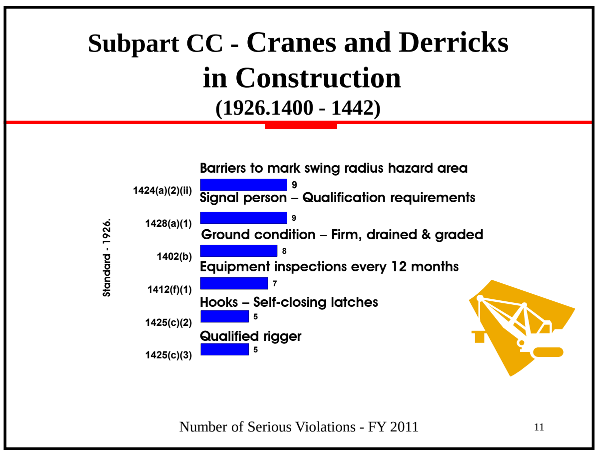
Crane Incidents 2006

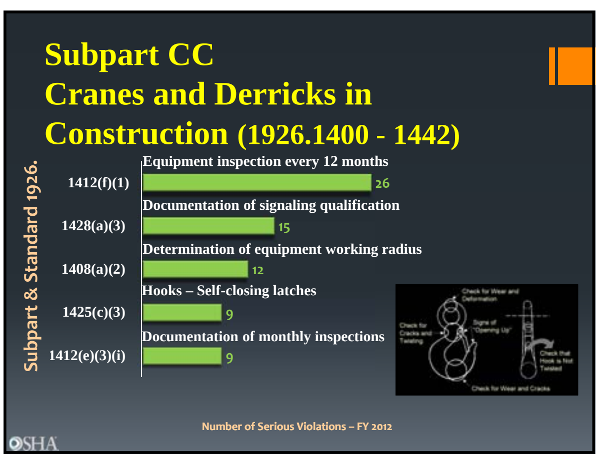
In 2006, crane accidents caused the deaths of 72 construction workers. This includes deaths where the source of the injury was a construction crane accident, the secondary source of the injury was a construction crane accident, or where the construction worker killed was operating a crane.



Ron.Hopkins@eku.edu
www.TRACEfireandsafety.com


Subpart N - Cranes, Derricks, Hoists, Elevators & Conveyors*
(1926.550 - 556)
Standard - 1926.
550(a)(6)
Annual inspection – Competent person
38
550(a)(9)
Swing radius at rear of crane barricaded
27
550(a)(19)
Employees kept clear of loads
23
550(a)(5)
Inspection prior to use – Competent person
21
550(a)(15)(i)
Clearances between power lines and equipment
21
*Note: A new rule for cranes, Subpart CC—Cranes and Derricks in Construction, was effective November 8, 2010. Subpart N was changed to Helicopters, Hoists, Elevators, and Conveyors. This change will affect FY 2011 data.
Number of Serious Violations - FY 2010
10


Subpart CC - Cranes and Derricks in Construction
(1926.1400 - 1442)
Standard - 1926.
1424(a)(2)(ii)
Barriers to mark swing radius hazard area
9
1428(a)(1)
Signal person – Qualification requirements
9
1402(b)
Ground condition – Firm, drained & graded
8
1412(f)(1)
Equipment inspections every 12 months
7
1425(c)(2)
Hooks – Self-closing latches
5
1425(c)(3)
Qualified rigger
5
Number of Serious Violations - FY 2011
11


Subpart CC
Cranes and Derricks in Construction (1926.1400 - 1442)
Subpart & Standard 1926.
1412(f)(1)
Equipment inspection every 12 months
26
1428(a)(3)
Documentation of signaling qualification
15
1408(a)(2)
Determination of equipment working radius
12
1425(c)(3)
Hooks – Self-closing latches
9
1412(e)(3)(i)
Documentation of monthly inspections
9
Check for Wear and Deformation
Check for Cracks and Twisting
Signs of "Opening Up"
Check that Hook is Not Twisted
Check for Wear and Cracks
Number of Serious Violations – FY 2012
OSHA

Crane Safety

Operator Qualifications

Original Proposal

- OPTION 1: Accredited testing organization
- OPTION 2: Audited employer program
- OPTION 3: U.S. military
- OPTION 4: State/Local Government license

Operator Qualifications

The final rule now requires that employers must comply with local and state licensing regulations that meet requirements of § 1926.1427(e) and (j). (§ 1926.1427(a))

Signs

- The size and location of signs installed on tower cranes must be in accordance with manufacturer specifications. Where these are unavailable, a registered professional engineer familiar with the type of equipment involved must approve in writing the size and location of any signs.

Cranes and derricks.

- Competent person inspect all machinery and equipment:
  - prior to each use, and
  - during use,
- Any deficiencies shall be repaired, or defective parts replaced, *before continued use.*

1926.1412(d) Each shift

Inspections, 1926.1412

- Beginning of each shift
  - Operate hoist motion up & down to determine if normal operating speeds available
  - Raise hook to upper end of travel slowly to test limit switch
  - If overhead type operate trolley & bridge travel
  - Observe drift after power release to determine brake adjustment

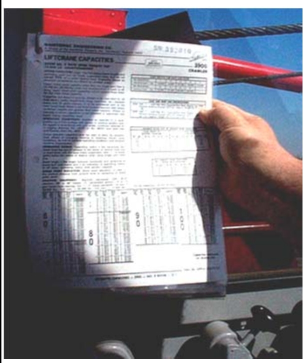
Daily Inspections:

- Operation of crane, controls, movement
- Visual inspection of all lines for leaks
- Check limit switch
- Check brakes for coasting
- Twisted, broken, kinked wire rope
- Deformed, stretched, or cracked hooks
- Observe correct spooling
- Check keepers

Cranes and derricks.

- **Annual inspection of the hoisting machinery shall be made by a competent person** 1926.1412(f)
- ***The employer shall maintain a record of the dates and results of inspections for each hoisting machine and piece of equipment*.**

Rated Load Capacities.



- **Rated load capacities, and recommended operating speeds, special hazard warnings, or instruction, shall be conspicuously posted on all equipment. Instructions or warnings shall be visible to the operator while he is at his control station. 1926.1501(a)(2)**

Hand signals, 1926.1419(c)

- **When using hand signals, the Standard Method must be used** (see Appendix A of this subpart)
- **Non Standard Hand Signal Use** See 1926.1419(c)(2)

CMAA Recommended Inspection Schedule

Class	Description	Typical Schedule
A	Standby or infrequent service	Annually
B	Light service - 2-5 lifts hr.	Annually
C	Moderate service - 50% capacity, 5-10 lifts hr.	Annually
D	Heavy service - 50% capacity, 10-20 lifts hr.	Semiannually
E	Severe service - Near capacity, 20+ lifts hr.	Quarterly
F	Continuous severe service - Near capacity and continuous service throughout day	Bi-monthly

Basics of Crane Safety

Always Check Load Rating

1926.1413 Wire Rope Inspection.

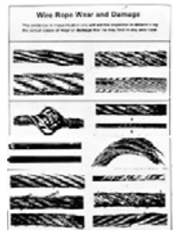
(a)(4) Removal from Service

Wire rope shall be taken out of service when any of the following conditions exist:

- In running ropes, six randomly distributed broken wires in one lay or three broken wires in one strand in one lay;
- Wire rope safety factors in accordance with ANSI B 30.5-1968 or SAE J959-1966.

Wire Rope Inspection.

Evidence of any heat damage from any cause, remove wire rope from service



Crane Warning Signs

- This equipment operated by properly trained personnel only.
- Do not lift loads over people, warn personnel of approaching loads.
- Do not make side pulls, lift all loads vertically.
- Do not use limit switches as normal stopping devices

Crane Warning Signs

- Do not operate with damaged, kinked or twisted rope
- Position controls in off position, and open main line switch when leaving crane.
- Do not remove obscure or deface warning labels

1926.1433(d)(5) Posted warnings. Posted warnings required by this subpart as well as those originally supplied with the equipment by the manufacturer must be maintained in legible condition.

Guarding.

- Moving parts or equipment guarded if exposed to contact by employees, or otherwise create a hazard. 1926.1501(a)(8)

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. 1926.1424(a)

Swing radius hazards

Exhaust Pipes.

All exhaust pipes shall be guarded or insulated in areas where contact by employees is possible in the performance of normal duties. 1926.1501(a)(10)

Exhaust.

- Whenever internal combustion engine powered equipment 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. 1926.1501(a)(10) and (11)

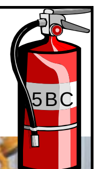
Windows.

- All windows in cabs shall be of safety glass, or equivalent, that introduces no visible distortion that will interfere with the safe operation of the machine. 1926.1433(d)(7)(iii) Windows

Fall Protection. 1926.1423(c)

- For rigging or service, ladder, or steps, provided to give access to a cab roof.
- Guardrails, handholds, and steps provided for easy access to the car and cab
- Platforms and walkways anti-skid surfaces.

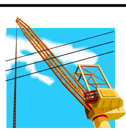
Fire Extinguisher



- An accessible fire extinguisher of 5BC rating, or higher, available at all operator stations or cabs of equipment.

1926.1433(d)(6)

1926.1501(a)(14)(i)



Cranes and Overhead Power Lines

1926.1407 - Power line safety (up to 350 kV)--assembly and disassembly.
1926.1408 - Power line safety (up to 350 kV)--equipment operations.
1926.1409 - Power line safety (over 350 kV).
1926.1410 - Power line safety (all voltages)-equipment operations closer than the Table A zone.
1926.1411 - Power line safety-while traveling under or near power lines with no load.

Ron.Hopkins@eku.edu
www.TRACEfireandsafety.com

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).

Energized Electric Equipment

- Except where electrical distribution and transmission lines have been de-energized and visibly grounded at point of work or where insulating barriers, not a part of or an attachment to the equipment or machinery, 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:

Crane Overhead Power Line Safety Procedures

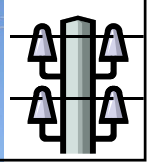
- Where it is difficult for a crane operator to maintain clearance by visual means a person shall be designated to observe the clearance between the energized power lines, and the crane and its load.

1926.1408(b) Preventing encroachment/electrocution.

- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet
- A person shall be designated to observe clearance

Energized Power Lines

- Any overhead power line shall be considered energized unless the owner of the line or the electric utility company indicates that it has been de-energized and it is visibly grounded

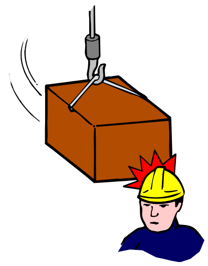


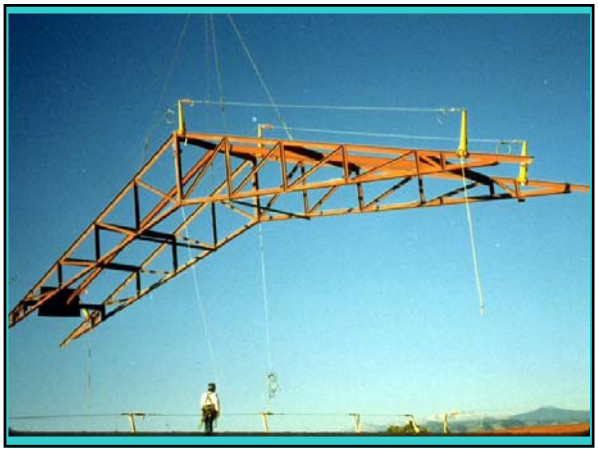
ANSI Guidance

- De-energizing power lines before work begins
- Erecting insulated barriers to prevent contact with the energized lines
- Maintaining safe clearance between the energized line and boomed equipment

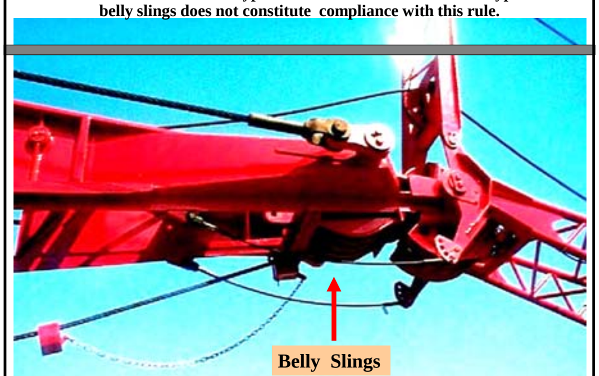
Keeping clear of the load.

- All employees shall be kept clear of loads about to be lifted and of suspended loads.
  1926.1425





1926.1501(b)(1) All jibs shall have positive stops to prevent their movement of more than 5 deg above the straight line of the jib and boom on conventional type crane booms. The use of cable type belly slings does not constitute compliance with this rule.



Crawler, Locomotive & Truck Cranes, 1926.1501(b)

Certified Inspections

The employer shall prepare a certification record which includes:

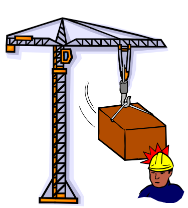
- The date the crane items were inspected;
- The signature of the person who inspected the crane items; and,
- A serial number, or other identifier, for the crane inspected.
- The most recent certification record shall be maintained on file until a new one is prepared.

Inspections 1926.1412

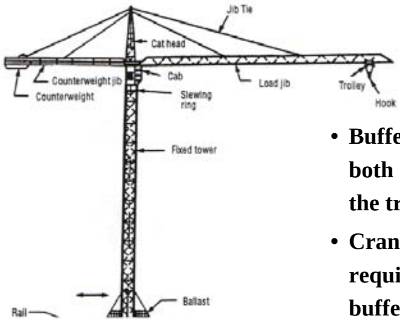
Crawler Crane

Hammerhead Tower Cranes, 1926.1501(c)

Adequate clearance shall be maintained between moving and rotating structures of the crane and fixed objects to allow the passage of employees without harm.



Hammerhead Tower Cranes, 1926.1501(c)



- Buffers provided at both ends of travel of the trolley.
- Cranes on tracks require buffers at track ends

- 1926.1438 - Overhead and Gantry Cranes.
- 1926.1501(d) Overhead and gantry cranes.

Overhead and Gantry Cranes

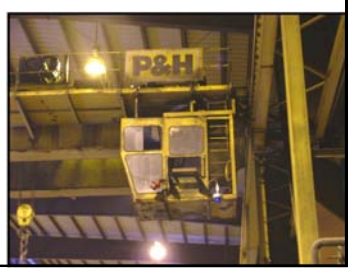
- The **rated load** of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block, and this marking shall be clearly legible from the ground or floor.

Overhead and Gantry Cranes

- **Bridge trucks shall be equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.**

Overhead and Gantry Cranes

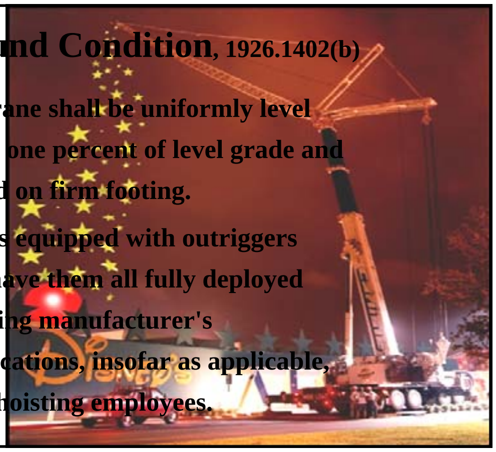
- **Except for floor-operated cranes, a gong or other effective audible warning signal shall be provided for each crane equipped with a power traveling mechanism.**



Floating cranes and derricks, 1926.1501(f)

- **When a mobile crane is mounted on a barge, the rated load of the crane shall not exceed the original capacity specified by the manufacturer.**

Ground Condition, 1926.1402(b)



- 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.

B30.5 - 5-1.2
Crane to be standing on firm supporting surface level within 1% grade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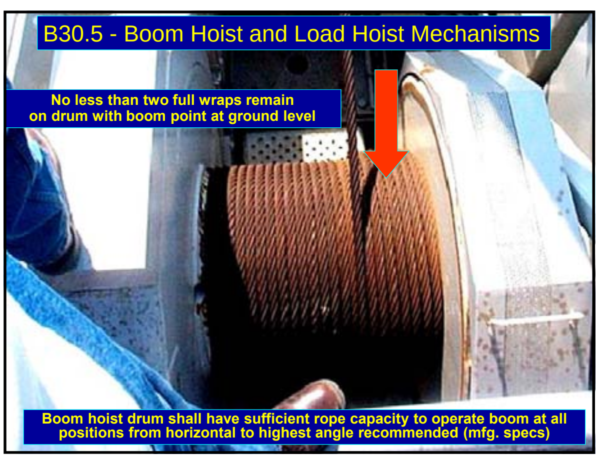
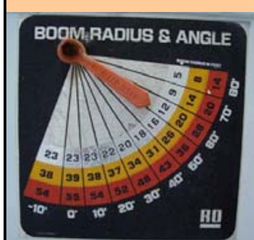
.com
HATTONS
CRANE & RIGGING
800-533-1633
HCR


B30.5 - Boom Hoist and Load Hoist Mechanisms
No less than two full wraps remain on drum with boom point at ground level
Boom hoist drum shall have sufficient rope capacity to operate boom at all positions from horizontal to highest angle recommended (mfg. specs)

Instruments and components, 1926.1501(g)(3)(ii)

- Cranes and derricks with variable angle booms shall be equipped with a boom angle indicator, readily visible to the operator.

Boom angle indicators



Hoisting Personnel, 1926.1431

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 Personnel, 1926.1431

- 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.

Hoisting Personnel, 1926.1431(g)

- Hooks on overhaul ball assemblies, lower load blocks, or other attachment assemblies shall be of a type that can be closed and locked, eliminating the hook throat opening.
- All hardware capable of 5 times maximum intended load

Hoisting Personnel, 1926.1431

1926.1431(g)(4) and (5)

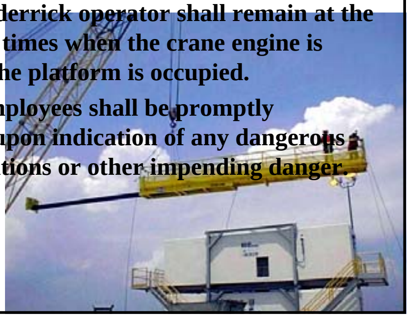
- All eyes in wire rope slings shall be fabricated with thimbles.
- Bridles and associated rigging for attaching the personnel platform to the hoist line shall be used only for the platform and the necessary employees, their tools and the materials necessary to do their work and shall not be used for any other purpose when not hoisting personnel

CORRECT METHOD OF ATTACHING WIRE ROPE CLIPS

U-Bolt of all clips on dead end of rope

Hoisting Personnel, 1926.1431

- Tag lines shall be used unless their use creates an unsafe condition.
- The crane or derrick operator shall remain at the controls at all times when the crane engine is running and the platform is occupied.
- Hoisting of employees shall be promptly discontinued upon indication of any dangerous weather conditions or other impending danger.

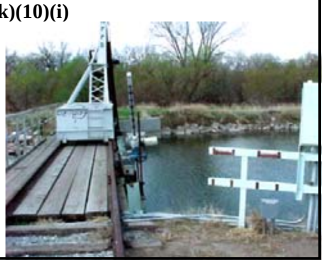


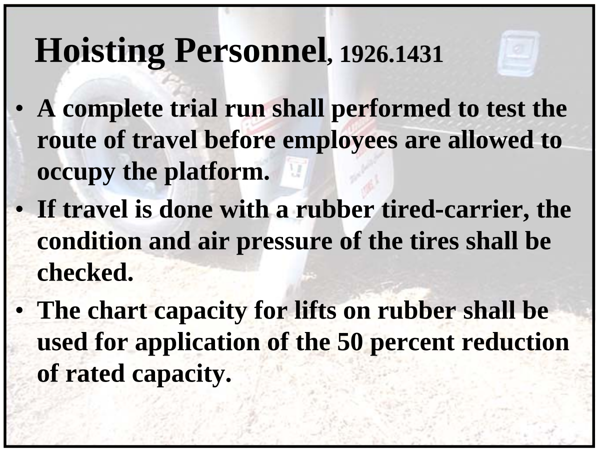
Hoisting Personnel, 1926.1431

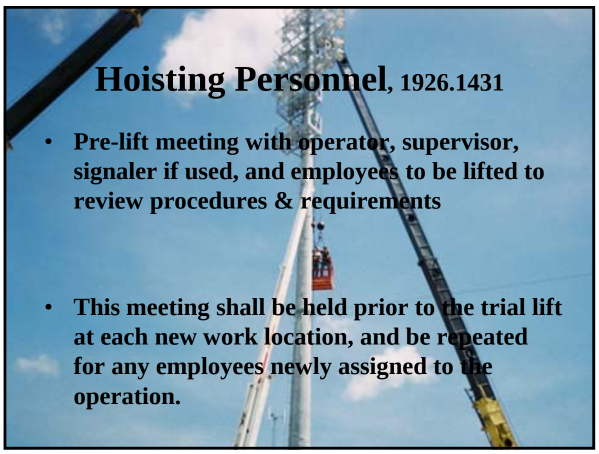
- Employees being hoisted shall remain in continuous sight of and in direct communication with the operator or signal person.
- In those situations where direct visual contact with the operator is not possible, and the use of a signal person would create a greater hazard for the person, direct communication alone such as by radio may be used.

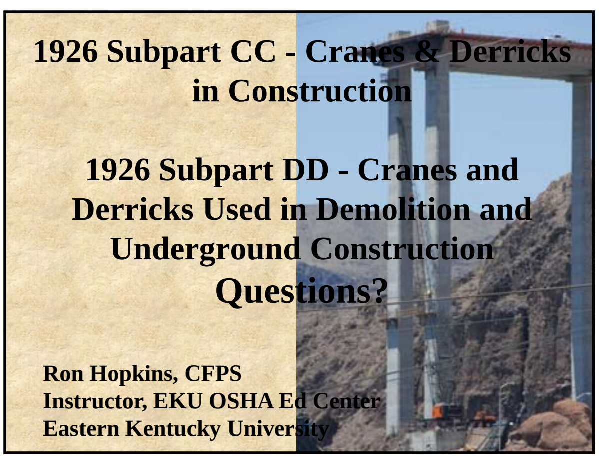
Hoisting Personnel, 1926.1431

Except over water, employees occupying the personnel platform shall use a body belt/harness system with lanyard appropriately attached to the lower load block or overhaul ball, 1926.1431(k)(10)(i)









Ron.Hopkins@eku.edu
www.TRACEfireandsafety.com