

*Oregon* OSHA's

# Cranes and derrick in construction

**Oregon OSHA's guide to key requirements in Subdivision CC: the cranes and derricks standard**



### About this guide

*Cranes and derricks in construction* is an Oregon OSHA Standards and Technical Resources publication.

#### Why should you read it?

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- You want to know more about Subpart CC — *Cranes and Derricks in Construction*.
- You use a crane or derrick for construction work. Subdivision CC probably applies to you.

#### What does it cover?

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This guide covers Subdivision CC's key requirements — requirements that are especially relevant for small-business contractors. The guide also highlights eight common crane accidents. It describes why they happen and includes the requirements in Subdivision CC that can prevent them from happening.

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### What's covered in Subdivision CC?

Subdivision CC covers cranes and derricks used for construction activities and any other power-operated equipment that can hoist, lower, and horizontally move a suspended load.

Subdivision CC covers only cranes that you use for construction activities. Subdivision CC doesn't apply when you use cranes for any other activities.

### Examples of cranes covered in Subdivision CC:

- Articulating knuckle-boom cranes
- Crawler cranes
- Derricks
- Mobile cranes
- Overhead and gantry cranes
- Self-erecting cranes
- Tower cranes

### Related Subdivision CC requirements

1926.1400 – Scope



Photo: Melanie Mesaros, Oregon OSHA

### What's not covered in Subdivision CC?

Subdivision CC doesn't cover cranes and derricks converted for non-hoisting or non-lifting use. Also not covered are:

- Digger derricks used for drilling holes for poles carrying electric and telecommunication lines, placing and removing the poles, and handling materials installed on or removed from the poles. Federal OSHA expanded this exemption to cover digger derrick operations covered by Division 3, Subdivision V — Construction of electric transmission and distribution lines and equipment.
- Forklifts — except when they're configured to hoist, lower, and horizontally move a suspended load with a winch and hook.
- Mechanic's trucks that have hoists used only for equipment maintenance and repair.
- Power shovels, excavators, backhoes, and track hoes — even when they're used with chains, slings, or other rigging to lift loads.
- Articulating/knuckle-boom truck cranes used to deliver materials to a construction site when they:
  - Transfer materials from the truck to the ground without arranging it in a particular order for hoisting.
  - Transfer materials (including sheet goods, bags of cement and roofing shingles) from the truck onto a structure *using a fork or cradle with functioning automatic overload prevention device.*

### Related Subdivision CC requirements

1926.1400 – Scope



Knuckle-boom crane

### Employer responsibilities — Q&A

**Q:** I own and operate a crane on a construction site. The crane operator is my employee. What are my responsibilities?

**A:** You must comply with all Subdivision CC requirements because you control the hazards the crane may create.

**Q:** I operate a leased crane on a construction site. The leasing company tells me that the crane meets Oregon OSHA's requirements. Can I assume that the crane meets Subdivision CC requirements?

**A:** No. You are the employer operating the crane and you are responsible for complying with all requirements. Even if the leasing company tells you that the crane meets Subdivision CC requirements, you must verify the claim. For example, you can ask the company for the most recent monthly and annual inspection reports, which will identify any problems found by the inspectors that either needed to be fixed or that need to be checked in future inspections. These documents must be made available to all people who conduct inspections required by Subdivision CC. If the company cannot produce the required inspection documents, you will need to conduct an annual inspection and document the results of that inspection before operating the crane.

**Q:** I deliver prefabricated roof trusses and wall panels to a construction site using a flatbed truck equipped with an articulating crane. At the site, I use the crane to place the material either onto the ground or onto the structure being erected. Do I need to comply with Subdivision CC?

**A:** Articulating/knuckle-boom truck cranes used to deliver materials to a construction site are not covered by Subdivision CC when they:

- Transfer materials from the truck to the ground without arranging it in a particular order for hoisting.
- Transfer materials (including sheet goods, bags of cement, and roofing shingles) from the truck onto a structure *using a fork or cradle with functioning automatic overload prevention device.*  
Note: Articulating truck cranes are covered by Subdivision CC if they unload material onto a structure without a functioning automatic overload prevention device.

### Competent persons and qualified persons



Many rules in Subdivision CC include requirements for competent persons and qualified persons. Federal OSHA created these terms to designate those who can evaluate hazardous conditions and mechanical systems, inspect equipment, and train others to work safely.

- A competent person means “one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.” [See *Definitions*, 1926.1401]
- A qualified person means “a person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, successfully demonstrated the ability to solve/resolve problems relating to the subject matter, the work, or the project.” [See *Definitions*, 1926.1401]

The table on the following page shows the rules in Subdivision CC that have requirements for competent persons and qualified persons.

## Cranes and derricks in construction: key requirements

| <b>Subdivision CC rule</b>  | <b>Competent person</b> | <b>Qualified person</b> |
|---|-------------------------|-------------------------|
| 1926.1404 <i>Assembly/Disassembly, general requirements</i>                               | ✓                       | ✓                       |
| 1926.1406 <i>Assembly/Disassembly, employer procedures</i>                                |                         | ✓                       |
| 1926.1408 <i>Power line safety, equipment operations</i>                                  |                         | ✓                       |
| 1926.1409 <i>Power line safety over 350 kV</i>  |                         | ✓                       |
| 1926.1410 <i>Power line safety, equipment operations closer than Table A zone</i>         |                         | ✓                       |
| 1926.1412 <i>Inspections</i>  | ✓                       | ✓                       |
| 1926.1413 <i>Wire rope, inspection</i>  | ✓                       | ✓                       |
| 1926.1414 <i>Wire rope, selection and installation criteria</i>                           |                         | ✓                       |
| 1926.1417 <i>Operation</i>  | ✓                       | ✓                       |
| 1926.1418 <i>Authority to stop operation</i>  |                         | ✓                       |
| 1926.1423 <i>Fall protection</i>  | ✓                       |                         |
| 1926.1429 <i>Qualifications of maintenance and repair employees</i>                       |                         | ✓                       |
| 1926.1430 <i>Training</i>   | ✓                       | ✓                       |
| 1926.1431 <i>Hoisting personnel</i>   | ✓                       | ✓                       |
| 1926.1432 <i>Multiple-crane/derrick lifts</i>   | ✓                       | ✓                       |
| 1926.1433 <i>Design, construction, and testing</i>  |                         | ✓                       |
| 1926.1435 <i>Tower cranes</i>   | ✓                       | ✓                       |
| 1926.1436 <i>Derricks</i>   | ✓                       | ✓                       |
| 1926.1437 <i>Floating cranes/derricks and land cranes/derricks on barges</i>              | ✓                       | ✓                       |
| 1926.1441 <i>Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less</i> |                         | ✓                       |



### Controlling entity

A controlling entity is an employer who has overall responsibility for a construction project. Examples of controlling entities are primary contractors, general contractors, and construction managers, or any other legal entity.

A controlling entity's duties include:

- Ensuring that **ground conditions** are firm, drained, and graded to meet the crane manufacturer's specifications.
- Informing crane operators about the location of hazards below the set-up area such as underground tanks or utilities.
- Establishing a system to coordinate operations when any part of a crane is within working radius of another crane.
- Taking steps to control known or potential hazards at the site.

**Ground conditions** mean the ground's ability to support a crane. Ground conditions include the ground's slope, compaction, and firmness. Assembling or using a crane is prohibited unless the ground conditions are firm, drained, and graded. When you use supporting materials such as blocks, mats, and cribs, you must also follow any manufacturer's specifications covering ground conditions.

### Related Subdivision CC requirements

1926.1402 – *Ground conditions*

### Training

Subdivision CC has specific training requirements for operators, signal persons, and competent and qualified persons in addition to required training on crane-related hazards.

These employees must understand the training they receive and you must offer refresher training to those who need it. All required training must be provided at no cost to the employee.

*Operators.* All operators must know the crane manufacturer's emergency stopping procedures (if they're available) and know how to test the boom hoist brake. Operators-in-training must go through a pre-certification training period.

*Signal persons.* Before giving any signals, a signal person must be assessed by a qualified evaluator or a third-party evaluator.

*Competent persons and qualified persons.* Competent persons and qualified persons must be trained so that they know their roles and responsibilities.

### Related Subdivision CC requirements

1926.1430 – *Training*

### Crane operators: qualifications and certifications

In Oregon, crane operators must be certified before they can operate a crane on their own. There are two options:

1. Be certified by a nationally accredited crane operator testing organization
2. Be certified by an audited employer program

These requirements don't apply to operators of derricks, sideboom cranes, or cranes with a manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less.

#### Option 1. Certification by an nationally accredited crane operator testing organization

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Operators are qualified after the testing organization certifies them for a specific type of crane or for a higher-capacity crane of the same type. The operator's certificate must show the type and capacity of crane for which the operator is certified.

The certificate is **portable** and valid for five years. **Portable** means that any employer can use the certificate to show that an operator is qualified.

#### Option 2. Certification by an audited employer program

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You can set up your own program to qualify operators if it meets certain requirements:

- Written and practical tests must be developed by an accredited crane operator testing organization or approved by an auditor.
- The program must be audited within three months after it begins and at least every three years thereafter.
- The program must have procedures for operators to be requalified.

The auditor must keep records of program audits for three years and make them available to Oregon OSHA on request.

Certification is **not portable** and is valid for five years. **Not portable** means that only the employer issuing the qualification can use it.

#### Related Subdivision CC requirements

1926.1427 – *Operator qualification and certification*

### Crane operators: responsibilities

#### Crane operators' responsibilities include:

- Follow the manufacturer's procedures for operating the crane and the attachments.
- Keep the operator's manual and all procedures for operating the crane (such as load charts, recommended operating speeds, and hazard warnings) in the cab and readily available.
- Don't do anything distracting, such as texting or talking on a mobile phone, while operating the crane.
- Don't leave the controls while the load is suspended.
- Before starting the engine, verify that all controls are in the proper position and workers are in the clear.
- If crane adjustments or repairs are necessary, inform, in writing, the person responsible for receiving the information and the operator on the next shift.
- Don't operate a crane beyond its rated capacity.
- Don't use a crane to drag or pull loads sideways.
- Don't let the boom and any other parts of a crane contact an obstruction.
- Don't lift loads over the front area of wheel-mounted cranes unless the manufacturer permits it.
- When handling a load that is 90 percent or more of the maximum line pull, test the brakes by lifting the load a few inches and applying the brakes; repetitive lifts of such loads need to be tested only the first time.
- Don't lower the load or the boom below the point where fewer than two full wraps of rope remain on their respective drums.
- Control the crane's rotational speed so that the load doesn't swing out beyond the radius.
- Use a tag line if necessary to prevent a load from turning excessively.

*Refusing to handle loads.* A crane operator concerned about hazards involving a crane can refuse to handle loads until a qualified person determines there isn't a hazard or the hazard has been corrected.

*Stopping multiple-crane lifts.* The crane operator and the lift director have the authority to stop a multiple-crane lift if either determines the lift can't be done according to the lift plan.

#### Related Subdivision CC requirements

- 1926.1417 – *Operation*
- 1926.1418 – *Authority to stop operation*
- 1926.1432 – *Multiple crane/derrick lifts*

### **Maintenance and repair workers: qualifications**

Maintenance and repair workers must meet the requirements for a qualified person regarding their maintenance and repair tasks.

Maintenance and repair workers are allowed to operate cranes to do maintenance work, to do an inspection, or to verify that the crane is working properly. When operating a crane, they must be supervised by an operator who meets the requirements of 1926.1427, *Operator qualification and certification*, or be familiar with the crane's operation, characteristics, and hazards.

Maintenance and repair workers must not operate a crane during regular operations unless they are qualified under 1926.1427, *Operator qualification and certification*.

#### **Related Subdivision CC requirements**

1926.1429 – *Qualifications of maintenance and repair employees*

### Signal persons: qualifications

Before giving any signals, a signal person must be assessed by a **qualified evaluator** or a **third-party qualified evaluator**. A **qualified evaluator** is someone who is competent in assessing whether a worker meets Subdivision CC requirements for a signal person. A **third-party qualified evaluator** is an individual, company, or organization (other than you) that can assess whether a worker meets the standard's requirements for a signal person.

#### The evaluator must document that the signal person:

- Knows and understands the signals used at the worksite
- Is competent in using the signals
- Understands the dynamics involved in swinging, raising, lowering, and stopping loads and the boom deflection from hoisting loads
- Understands the relevant qualification requirements for signal persons in 1926.1419-1422 and 1926.1428
- Has passed an oral or written test and a practical test

The documentation must be **available** at the site and must specify each type of signal for which the signal person meets the requirements. "**Available**" means it is physically present on the site or can be accessed by an on-site computer.

#### Signal persons are required when:

- The load's travel path, or the area where the load is placed, is not in full view of the operator
- The crane is traveling and the operator's view in the direction of travel is obstructed
- The operator or the person handling the load determines that a signal person is necessary

### Types of signals

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**Hand, voice, audible, or new signals are permitted.** The type of signals used and means of transmitting the signals to the operator (such as direct line of sight, video, radio), must be appropriate for the site conditions. All directions given to the operator by the signal person must be given from the operator's view.

### Related Subdivision CC requirements

1926.1428 – *Signal person qualifications*

### Riggers: qualifications

A rigger who meets the criteria for a qualified person is considered a qualified rigger.

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

#### A rigger is required when:

- Rigging is part of assembly or disassembly work involving a crane
- Workers are within the fall zone and are hooking, unhooking, or guiding a load

A rigger doesn't have to be qualified to do all rigging jobs. You must determine whether a person is qualified to perform specific rigging tasks. Each qualified rigger may have different credentials or experience.

#### Related Subdivision CC requirements

- 1926.1401 – *Definitions*
- 1926.1404 – *Assembly/disassembly, general requirements*
- 1926.1425 – *Keeping clear of the load*



## Power line safety when operating near overhead power lines — evaluating the work zone

If the crane will be operating near an overhead power line, do both of the following before the work begins:

1. **Determine the power line’s voltage.** (Ask the utility owner or utility operator for the information. Allow the utility two working days to give you the information.)
2. **Use Table A to determine the crane’s minimum approach distance to the power line.**

**Table A: Power line voltage and minimum approach distances**

| Power line voltage (nominal, kV, alternating current)  | Minimum approach distance (feet) |
|--|----------------------------------|
| up to 50   | 10                               |
| more than 50 to 200  | 15                               |
| more than 200 to 350   | 20                               |
| more than 350 to 500   | 25                               |
| more than 500 to 750   | 35                               |
| more than 750 to 1,000   | 45                               |
| <b>more than 1,000:</b> Determined by the utility owner or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution |                                  |

- ➔ ***If any part of the crane, including rigging and lifting accessories, could get closer to the power line than the minimum approach distance in Table A — ask the utility to de-energize and ground the power line. Do this before you begin work.***
- ➔ ***If the utility can’t ground and deenergize the power line, or if you’re unable to confirm from the utility that the power line is de-energized, you must identify the work zone by doing “A” or “B” on the following page.***



## Cranes and derricks in construction: key requirements

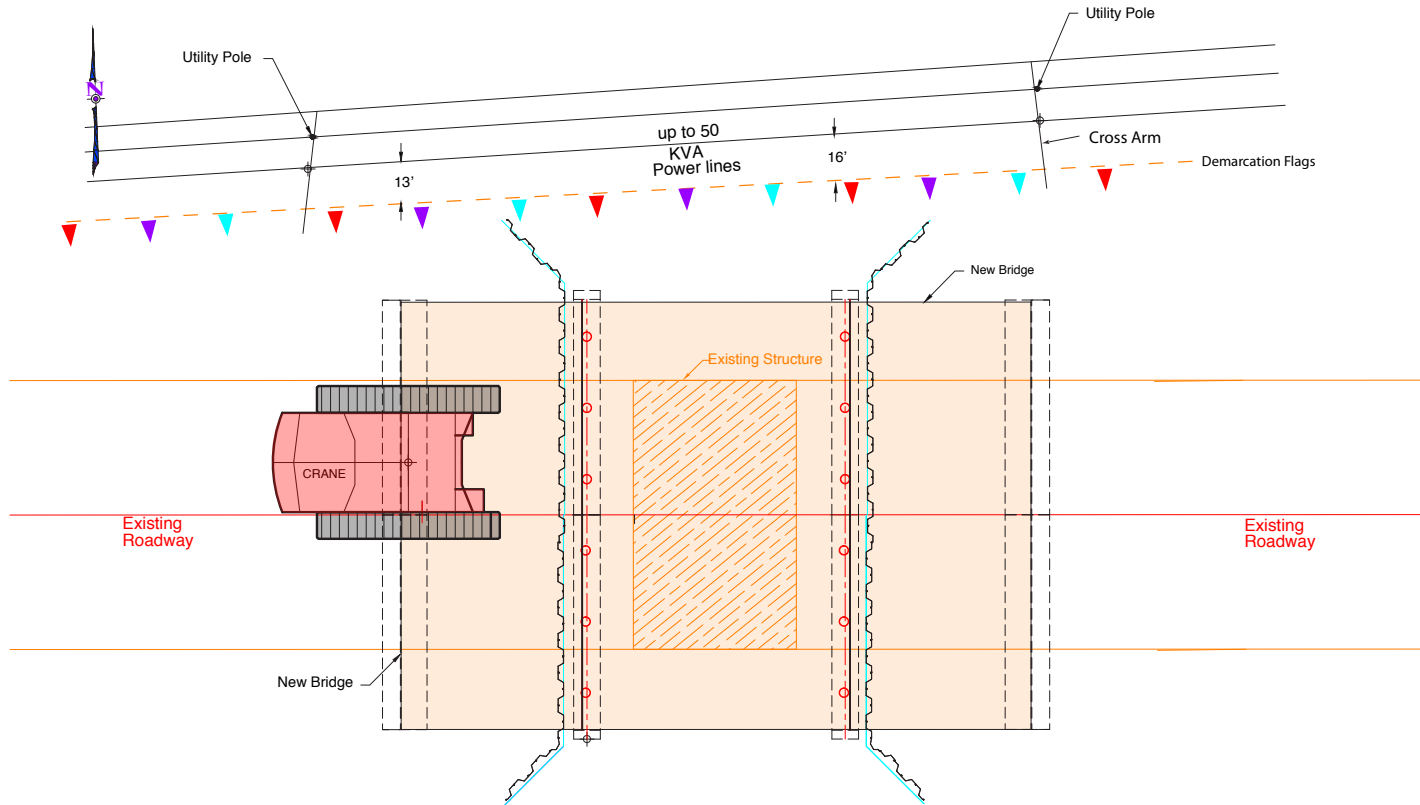
- A.** Mark the boundaries of the work zone using items such as flags, a range-limit device, or a range-control warning device and prohibit the crane operator from operating beyond those boundaries. Once you have established the boundary (based on Table A) and prohibited crane operations from going beyond that boundary, you do not need to do anything else. (See diagram on page 18.)
- B.** Define the work zone as an area 360 degrees around the crane, up to the crane's maximum working radius for the actual crane work. If the crane can get within 20 feet of the power line, do one of the following:
  - Ground and de-energize the power line
  - Maintain 20 feet and ensure that no part of the crane, load line, or load (including rigging and lifting accessories), gets closer than 20 feet by following the requirements for preventing encroachment or electrocution below
  - Maintain the required minimum approach distance in Table A and ensure that no part of the crane, load line, or load (including rigging and lifting accessories), gets closer than the required Table A distance by following the requirements for preventing encroachment or electrocution below

### Requirements for preventing encroachment or electrocution

- 1.** *Conduct a planning meeting.* Meet with the operator and other workers who will be in the area to review the location of the power line and the steps necessary to prevent encroachment or electrocution.
- 2.** *Use nonconductive tag lines.* If you use tag lines, they must be nonconductive.
- 3.** *Erect an elevated warning line, barricade, or line of signs, in view of the operator.* The warning line must have flags or similar high-visibility markings at the minimum approach distance under Table A. If the operator can't see the warning line, you must use a dedicated spotter who is in continuous contact with the operator.
- 4.** *Do at least one of the following:*
  - Use a proximity alarm that warns the operator when to stop movement.
  - Use a dedicated spotter who is in continuous contact with the operator. The spotter must use a clearly visible visual aid to identify the minimum clearance distance, be positioned to gauge the distance accurately, and ensure that the operator maintains the distance. Examples of visual aids are lines painted on the ground, stanchions, and line-of-sight landmarks.
  - Use a device, such as a range-control warning device, that automatically warns the operator when to stop movement.
  - Use a device that automatically limits range of movement.
  - Use an insulating link or device, installed between the end of the load line (or below) and the load.

## Cranes and derricks in construction: key requirements

### Power-line safety: Example of a diagram identifying the work zone



This diagram illustrates a simple solution related to power-line safety under 1926.1408.

- The job is a bridge replacement on a two-lane road.
- The power lines were initially seven feet from the proposed work.
- The construction company contacted the power company and arranged to move the 12.5kV line (north) six feet making the minimum clearance 13 feet.
- At the same time, the power company agreed to install cross arms and hang a series of flags parallel to the power line.
- The flags hang from the utility pole at eye level to the operator establishing the crane's **work zone**.

This demarcation boundary, along with prohibiting the operator from going beyond this boundary, fulfills the requirements for power-line safety in 1926.1408.

## Cranes and derricks in construction: key requirements

### Related Subdivision CC requirements

- 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*

### Traveling under or near power lines

If a crane travels under or near a power line on a construction site without a load, you must ensure:

- The boom/mast and boom/mast support system are lowered sufficiently to meet the clearance distances in Table T.
- The clearance distances in Table T are maintained while the crane is moving under the line
- Power lines are illuminated or identified at night or when visibility is poor
- A safe path of travel is identified and used at night or when visibility is poor

**Table T: Minimum clearance distances while traveling with no load**

| Power line voltage (nominal, kV, alternating current) | Minimum clearance distance (feet)  |
|---|--|
| up to 0.75  | 4  |
| more than 0.75 to 50                                  | 6  |
| more than 50 to 345                                   | 10   |
| more than 345 to 750                                  | 16   |
| more than 750 to 1,000                                | 35   |
| more than 1,000:                                      | Determined by the utility owner or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution |

### Related Subdivision CC requirements

1926.1411 — *Power-line safety, while traveling under or near power lines with no load*

### Inspecting cranes and related equipment

Cranes and related equipment must be inspected by a qualified or competent person. Required inspections cover:

- Modified equipment
- Repaired or adjusted equipment
- Post-assembly inspections
- Inspections before each shift
- Monthly inspections
- Yearly inspections
- Equipment subject to extreme conditions
- Idle equipment

#### Inspecting modified equipment

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A qualified person must inspect any crane equipment that has been modified before it can be used, including:

- Safety devices
- Operational aids
- Critical parts of control systems
- Power plants
- Braking systems
- Load-sustaining structural components

The inspection must also include a functional test of the equipment.

Any modified equipment must meet the requirements of 1926.1434, *Equipment modifications*.

#### Inspecting repaired or adjusted equipment

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A qualified person must inspect any equipment that has been repaired or adjusted and ensure that the repairs are done as required by the manufacturer.

Repairs and adjustments must restore equipment to its original design specifications. Work that doesn't restore equipment to its original design specifications is considered a modification.

The inspection must also include a functional test of the repaired parts and any components that might be affected by the repair.

### Post-assembly inspections

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After a crane is assembled, a qualified person must inspect it to ensure that the work was done according to the crane manufacturer's specifications.

If the manufacturer's specifications aren't available, the qualified person must decide if a registered professional engineer is needed to develop them. If the qualified person decides a registered professional engineer isn't needed, the qualified person must develop them.

The crane can't be used until the inspection is completed.

### Inspections before each shift

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Before each shift begins, a competent person must do a visual inspection of the equipment that will be used during the shift. A crane operator who is also a competent person can do the inspection. Unsafe equipment must be taken out of service immediately and can't be used until the problem has been corrected.

### Monthly inspections

---

Every month a competent person must do a visual inspection of the equipment, document the findings, and keep the information for at least three months. Documentation must include:

- The items checked and the results of the inspection
- The inspector's name and signature
- The inspection date

### Yearly inspections

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Every year, a qualified person must do a comprehensive inspection of the equipment. Defective equipment that the inspector considers unsafe must be removed from service. Equipment that the inspector thinks could become unsafe must be monitored during monthly inspections.

The inspection must be documented and the information kept for at least 12 months. Include the items checked, the inspection results, the inspector's name, and the date of the inspection.

### **Inspecting equipment subject to extreme conditions**

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Equipment subject to extreme conditions — such as loading that exceeds a rated capacity or prolonged exposure to a corrosive atmosphere — must be inspected for structural damage by a qualified person. Damaged equipment that the inspector considers unsafe must be removed from service. Equipment that the inspector thinks could become unsafe must be monitored during monthly inspections.

### **Inspecting idle equipment**

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A qualified person must also do a visual inspection of any equipment that sits idle for three months or longer, following the monthly inspection procedure.

### **Manufacturer's inspection procedures**

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The inspector must follow a manufacturer's inspection procedures if they are more comprehensive or scheduled more frequently than the procedures above.

### **Related Subdivision CC requirements**

1926.1412 – *Inspections*

### Fall protection

Workers must use personal fall-arrest systems or restraint systems when they're doing any tasks on a crane's unprotected **walking/working surface** and they're more than 10 feet above a lower level. **Walking/working surface** means any surface, horizontal or vertical, on which employees walk or work to do their jobs.

Personal fall-arrest systems and restraint systems must have personal fall arrest components that meet the requirements in Subdivision M, *Fall protection*.

### Anchoring to the load line

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A personal fall arrest system can be anchored to a crane's hook (or other part of the load line) when all of the following apply:

- A qualified person determines that the set up and rated capacity of the crane (including the hook, load line and rigging) meets the criteria for anchorages in 1926.502(d)(15).
- The crane operator is not more than 25 feet from the cab, can see the hook, and knows it's being used as an anchor.
- No load is suspended from the crane when the personal fall arrest system is being used.
- The crane does not move when the hook is being used as an anchor.

### Related Subdivision CC requirements

- 1926.1423 – *Fall protection*
- 1926.1431 – *Hoisting personnel*



### Swing radius hazards

Train your workers so that they're aware of **swing radius hazards**. Use control lines, warning lines, railings, or other barriers to prevent them from entering these areas. If it isn't feasible to use barriers, clearly identify the areas on the crane with warning signs and other high visibility markings.

**Swing radius hazards** are areas in which the crane's rotating superstructure can strike, pinch, or crush a worker against another part of the crane or against another object.

### Protecting workers who enter the hazard area

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Before a worker enters an area that the operator can't see, that worker must first tell the operator or ensure that another person tells the operator where the worker will be.

The operator must not rotate the superstructure until the operator is informed that the worker is out of the hazard area.

### Related Subdivision CC requirements

1926.1424 – *Work area control*

### Keeping clear of the load

Workers must use hoisting routes that don't endanger the public and that minimize their exposure to the hoisted loads.

Only workers who receive a load can be in the fall zone when a load is landed.

Workers must stay out of the **fall zone** except when they are:

- Hooking, unhooking, or guiding a load
- Initially attaching the load to a component or a structure
- Operating a concrete hopper or a concrete bucket

The **fall zone** includes the area directly under the load as well as other areas into which it is “reasonably foreseeable” that suspended materials could fall.

### During tilt up or tilt down work

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Workers must not be directly under the load at any time.

Only workers “essential to the operation” are allowed in the fall zone. This means they must be doing one of the following tasks and it's infeasible to do the task from outside the zone:

- Physically guiding the load
- Monitoring and giving instructions about the load's movement
- Detaching it from or initially attaching it to another component or structure

### Related Subdivision CC requirements

1926.1425 – *Keeping clear of the load*

### Safety devices

Safety devices are required equipment on cranes and must work properly. Defective safety devices must be removed from service or tagged out if they can't be removed. The crane must stop operation until all safety devices are working properly.

**These safety devices are required on cranes and derricks:**

- A crane level indicator
- Boom stops — except on derricks and hydraulic booms
- Jib stops if a jib is attached — except on derricks
- Brake locks on cranes and derricks that have foot pedal brakes
- An integral holding device or check valve on hydraulic outrigger jacks and hydraulic stabilizer jacks
- Rail clamps and rail stops on cranes that use rails — except on portal cranes
- A horn

Devices that aren't essential safety equipment are called **operational aids**.

Crane level indicators and horns don't have to be built in (carpenter's levels and hand-held air horns are acceptable) but must be immediately available to the operator.

### Related Subdivision CC requirements

1926.1415 – *Safety devices*

### Operational aids and temporary alternative measures

Operational aids are required on most cranes and derricks. They do two things: some give the crane operator information about the crane and others automatically take control of a crane function as a safety feature.

When an operational aid fails, the crane operator can use a temporary alternative measure for a limited time while the operational aid is repaired. Every operational aid has one or more temporary alternative measures.

**There are two categories of operational aids:**

- *Category I* operational aids must be repaired no later than seven calendar days after they fail. If you need to order a part and you've documented that you ordered it within that time, you must complete the repair no later than seven days after you receive the part.
- *Category II* operational aids must be repaired within 30 calendar days. If you order a replacement part and it doesn't arrive within 30 days, you must complete the repair no later than seven days after you receive it. You must also document that you ordered the part no later than seven days after it failed.

If a replacement is no longer available, you can substitute a part that performs the same function as the original.

The table shows operational aids required on most cranes and derricks and gives an example of an appropriate temporary alternative measure (see 1926.1416, *Operational aids*, for more information).

| Operational aid   | Category type | Example of a temporary alternative measure  |
|---|---------------|---|
| Boom hoist limiting devices                                   | Category I    | Use a boom angle indicator.   |
| Luffing jib limiting devices on cranes that have luffing jibs | Category I    | Measure the radii or jib angle.   |
| Anti two-blocking devices on telescopic boom cranes           | Category I    | Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom. |
| Anti two-blocking devices on lattice boom cranes              | Category I    | Clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, and use a spotter when extending the boom. |

## Cranes and derricks in construction: key requirements

| Operational aid  | Category type | Example of a temporary alternative measure   |
|--|---------------|--|
| Anti two-blocking devices on articulating cranes manufactured after Dec. 31, 1999  | Category I    | When two-blocking could only occur with movement of the load hoist, clearly mark the cable (so that it can easily be seen by the operator) at a point that will give the operator sufficient time to stop the hoist to prevent two-blocking, or use a spotter. |
| Boom angle or radius indicators  | Category II   | Measure the radii or boom angle.   |
| Jib angle indicators on cranes and derricks that have luffing jibs   | Category II   | Determine the main boom angle then measure the radii or jib angle.   |
| Boom length indicators on cranes and derricks that have telescopic booms   | Category II   | Put marks on the boom to determine lengths.  |
| Load weighing devices on cranes (other than derricks and articulating cranes) manufactured after March 29, 2003, with a rated capacity greater than 6,000 pounds | Category II   | Use a calculation recognized by the industry to determine the weight of the load.  |
| Outrigger position sensors on cranes manufactured after Nov. 8, 2011   | Category II   | Verify the position of the outriggers is correct before beginning operations requiring outriggers.   |
| Hoist drum rotation indicator if the hoist drum is not visible from the operator's station   | Category II   | Mark the drum to indicate the rotation of the drum and install mirrors or video cameras, if necessary, so the operator can see the mark.   |

### Related Subdivision CC requirements

1926.1416 – *Operational aids*

### Modifications or additions to a crane

Modifications or additions to a crane that affect its capacity or safe operation are prohibited unless:

- The manufacturer approves the modifications in writing
- The modifications are covered in the load charts, procedures, and other instruction materials if necessary
- The crane's original safety factor is not reduced

### Related Subdivision CC requirements

1926.1434 – *Equipment modifications*

### Overhead and gantry cranes

Overhead and gantry cranes that are permanently installed in a facility are covered by Oregon OSHA's general industry rule: *Overhead and Gantry Cranes*, 1910.179.

**Overhead and gantry cranes not permanently installed in a facility are covered by the following Subdivision CC rules:**

- 1926.1400-1414
- 1926.1417-1425
- 1926.1426(d)
- 1926.1427-1434
- 1926.1437
- 1926.1438
- 1926.1439
- 1926.1441

### Cranes with rated hoisting/lifting capacities of 2,000 pounds or less

Many requirements in Subdivision CC are modified for cranes with hoisting or lifting capacities of 2,000 pounds or less. The significant changes are:

- The operator qualification and certification requirement in 1926.1427 does not apply. However, you must train the operator about the safe operation of the crane before the operator can use it.
- The requirements for shift, monthly, and annual inspections in 1926.1412 do not apply. However, you must do the post-assembly inspections and the wire rope inspections required by 1926.1413.
- The safety devices and operational aids listed in 1926.1415 -1416 are not required, except for two-block protection. However, safety devices and operational aids that are part of the original equipment must be maintained in accordance with manufacturer procedures.
- Signal persons must be adequately trained but they do not need to meet the qualification requirements of 1926.1428.

#### Related Subdivision CC requirement

1926.1441 – *Equipment with a hoisting/lifting capacity of 2,000 pounds or less*



# Crane accidents and how they happen

### Eight common crane accidents

- Power line contact
- Overloading
- Improper assembly — outriggers and soft ground
- Two-blocking
- Caught in pinch points
- Obstruction of vision
- Overturning — mobile hydraulic cranes
- Disassembling latticework booms

### Power line contact

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#### What happens?

A metal part of a crane contacts a high-voltage power line.

#### How it happens

Typically, a crane is moving materials next to or under an energized power line and the hoist line or boom touches the line. Someone touching (or getting on or off) the crane can be electrocuted. Contact can also happen during a pick-and-carry under an energized power line. A single contact can cause multiple deaths or injuries.

### Related Subdivision CC requirements

- *Power-line safety up to 350 kV — crane assembly and disassembly* [1926.1407]
- *Power-line safety up to 350 kV — equipment operations* [1926.1408]
- *Power-line safety over 350 kV* [1926.1409]
- *Power-line safety — traveling under or near power lines with no load* [1926.1411]

### Overloading

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#### What happens?

The load exceeds the crane's rated lifting capacity and there's a structural failure or the crane tips over.

#### How it happens

Overloading happens when an operator exceeds the crane's lifting capacity. The operator must always know the weight of the load before hoisting.

Today, most U.S. crane manufacturers offer load-measuring systems as standard equipment on new cranes.

#### Related Subdivision CC requirements

- *Operation* [1926.1417]
- *Design, construction, and testing* [1926.1433]

### Improper assembly — outriggers and soft ground

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#### What happens?

The operator doesn't extend the outriggers or the crane is set up on soft ground and the crane tips over.

#### How it happens

The crane operator swings the cab or extends or lowers the boom without extending the outriggers. This increases the lifting radius, decreases the load capacity, and the crane tips over. Cranes also tip over when their capacity is exceeded, when they're set up on soft ground, or the outriggers are defective.

#### Related Subdivision CC requirements

- *Assembly/Disassembly — general requirements* [1926.1404]
- *Design, construction, and testing* [1926.1433]

### Two-blocking

#### What happens?

The hoist block or the hook assembly contacts the boom tip, which could cause the hoist line to break and the hook and the load to fall.

#### How it happens

The crane operator can't see the load and the signal person is distracted as the hook approaches the boom tip.

Two-blocking often happens on cranes that have latticework or hydraulic booms. On latticework booms, the hoist line picks up the weight of the boom and lets the pendant guys go slack. The weight of the load and the boom can cause the hoist line to break. Hydraulic rams that extend hydraulic booms can also break a hoist line if the operator doesn't pay out the load line while extending the boom.

Latticework and hydraulic boom cranes will also two-block when the hook is near the tip and the boom is lowered.

#### Related Subdivision CC requirements

- *Operational aids* [1926.1416]
- *Signal person qualifications* [1926.1428]
- *Hoisting personnel* [1926.1431]
- *Equipment with a rated hoisting/lifting capacity of 2,000 pounds or less* [1926.1441]

### Caught in pinch points

#### What happens?

A worker entering the opening between a crane's superstructure and another object to get tools, do repairs, or access outrigger controls is crushed when the superstructure turns.

#### How it happens

The operator doesn't see the worker, rotates the superstructure, and crushes the worker in the **pinch point**. Many workers have also been caught in a crane's unguarded moving parts.

A **pinch point** is a narrow opening between one or more moving parts. Typical pinch points are between a crane's rotating superstructure and other stationary objects.

#### Related Subdivision CC requirements

*Work area control* [1926.1424]

### Obstruction of vision

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#### What happens?

The crane or another object in the work area creates a blind spot that makes it impossible for the operator to see the task.

#### How it happens

- The task may require that loads be lifted to or from an area that is outside the operator's view.
- The crane boom may obstruct the operator's view.
- Other workers may be working nearby but outside the operator's view.

#### Related Subdivision CC requirements

- *Operation* [1926.1417]
- *Signals — general requirements* [1926.1419]
- *Signal person qualifications* [1926.1428]

### Overturning — mobile hydraulic cranes

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#### What happens?

Because of its high center of gravity, a mobile hydraulic crane tips over and crushes the operator or others.

#### How it happens

Most mobile hydraulic cranes aren't stable on slopes. When a mobile hydraulic crane upsets, the cab can be crushed, trapping the operator or others.

#### Related Subdivision CC requirements

- *Assembly/Disassembly — general requirements* [1926.1404]
- *Operation* [1926.1417]
- *Qualifications of maintenance and repair workers* [1926.1429]

### Disassembling latticework booms

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#### What happens?

A suspended boom collapses on workers who are removing the pins.

#### How it happens

Booms can collapse when they're lowered to a horizontal position and suspended from the boom tip with pendant guys, but not blocked. When the lower pins connecting the boom sections are knocked out by workers under it, the boom can collapse.

#### Related Subdivision CC requirements

- *Operation* [1926.1417]
- *Assembly/Disassembly — general requirements* [1926.1404]
- *Assembly/Disassembly — additional requirements for dismantling booms and jibs* [1926.140]

# *Oregon* OSHA Services

Oregon OSHA offers a wide variety of safety and health services to employers and employees:

## **Appeals**

**503-947-7426; 800-922-2689; [admin.web@state.or.us](mailto:admin.web@state.or.us)**

- Provides the opportunity for employers to hold informal meetings with Oregon OSHA on concerns about workplace safety and health.
- Discusses Oregon OSHA's requirements and clarifies workplace safety or health violations.
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

## **Conferences**

**503-378-3272; 888-292-5247, Option 1; [oregon.conferences@state.or.us](mailto:oregon.conferences@state.or.us)**

- Co-hosts conferences throughout Oregon that enable employees and employers to learn and share ideas with local and nationally recognized safety and health professionals.

## **Consultative Services**

**503-378-3272; 800-922-2689; [consult.web@state.or.us](mailto:consult.web@state.or.us)**

- Offers no-cost, on-site safety and health assistance to help Oregon employers recognize and correct workplace safety and health problems.
- Provides consultations in the areas of safety, industrial hygiene, ergonomics, occupational safety and health programs, assistance to new businesses, the Safety and Health Achievement Recognition Program (SHARP), and the Voluntary Protection Program (VPP).

## **Enforcement**

**503-378-3272; 800-922-2689; [enforce.web@state.or.us](mailto:enforce.web@state.or.us)**

- Offers pre-job conferences for mobile employers in industries such as logging and construction.
- Inspects places of employment for occupational safety and health hazards and investigates workplace complaints and accidents.
- Provides abatement assistance to employers who have received citations and provides compliance and technical assistance by phone.

### Public Education

**503-947-7443; 888-292-5247, Option 2; ed.web@state.or.us**

- Provides workshops and materials covering management of basic safety and health programs, safety committees, accident investigation, technical topics, and job safety analysis.

### Standards and Technical Resources

**503-378-3272; 800-922-2689; tech.web@state.or.us**

- Develops, interprets, and gives technical advice on Oregon OSHA's safety and health rules.
- Publishes safe-practices guides, pamphlets, and other materials for employers and employees
- Manages the Oregon OSHA Resource Center, which offers safety videos, books, periodicals, and research assistance for employers and employees.

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**Need more information? Call your nearest Oregon OSHA office.**

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