



Overhead Crane Safety Training Employer Supplement



Overhead Crane Safety Training Employer Supplement

This supplement serves as a guide to provide extra information and presentation leads for any trainers that will be conducting an in person presentation. This training was developed from the human factors approach. A key element to making this training successful and relevant for the trainee is to incorporate real world examples into the presentation. These real examples will allow the trainee to connect with the materials and better retain the information after they have completed the training.

The end of the training will present the trainees with case studies to illustrate the concepts of the training. Each case study will have one slide that explains the situation, then will be followed by a slide with questions for the group. These case studies serve as one of the human factors reinforcers for this learning experience. Feel free to include any extra questions to the case studies, or to modify the case studies to fit the needs of your organization.

Modification of PowerPoint Presentation

Many of the images that are used in this presentation are just basic examples. It is encouraged for you to replace any image examples with ones that are more related to your workplace to help illustrate the concepts.

About the PowerPoint

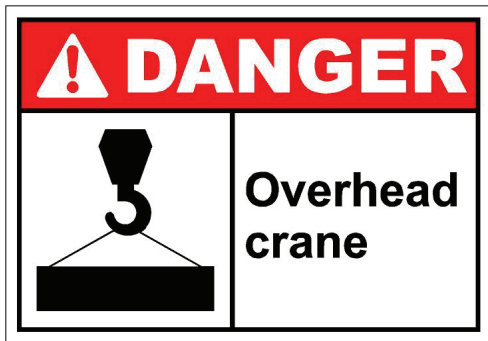
The PowerPoint version of this training was developed with the idea that the instructor would supplement the basic information. The slides and topics have been organized in sections to create a basic learning flow for the trainees. Most of the slides contain basic information for the topic, like a definition or standard, and it is up to the trainer to add another level of explanation to the topic. You as the trainer can augment the experience for the trainees by including real life experiences (stories) and application explanations to your presentation. Many trainers, over time, will take stories from trainees that illustrate the concepts well and incorporate them as their own into future presentation. The more relevant “stories” or examples that you can incorporate into the training, the better that the trainee will internalize the content and concepts.

Initiating discussion with the trainees will help to increase the effectiveness of the training. A number of the slides in this supplement include some example discussion questions. Feel free to use any that are appropriate for your audience and to use any that you have of your own. The earlier in the training that you can start initiating discussion with the audience the more that interaction will continue through the rest of the training. Be sure to incorporate as much interaction as you can.

In the PowerPoint there are certain slides that have multiple items that will appear on each slide. While this does not happen on all slides, there are a few. To make the flow of the presentation smooth, so the extra slide items are not a surprise, a star graphic has been included in the bottom left hand corner of the slide as a reminder that there are multiple items on this slide. See the example below as an illustration.



Star located in Bottom Left Hand Corner of presentation slide.



Overhead Crane Safety



Title Slide:
Overhead Crane Safety

Slide 1 of 70

Notes:

This training will focus on basic safety and prevention when working with overhead cranes in the workplace. This training does not teach how to operate an overhead crane, but teaches the safe procedures required when working around overhead cranes. The training was developed specifically for people that will be working in a workplace with an overhead crane. As well, there is some extra content in this training dedicated to helping employees to identify possible abnormalities with the machine. This was done with the idea of helping the employee become an extra set of eyes to identify possible problems with the machinery.

Note: There will be some instances of repetition of concepts within the presentation. This was done to increase the repetition of some of the concepts and for organization of broader concepts within the training as a whole. Feel free to use these repetitions as you see fit for your training.

Training Objectives

Part I – Crane Basics

- Types of Cranes
- The Parts of the Crane
- Inspecting the Crane
- Maintaining the Crane

Part II – Crane Safety Communication

- Basic Crane Safety
- Crane Safety Tools
- Warning Markers and Hand Signs

Part III – Safe Crane Operational Procedures

- Loads and Lifts
- Testing
- Operational Qualifications
- Conduct of Operators



Training Objectives

Slide 2 of 70

Notes:

This training is split into three parts. The first part will serve as an introduction to the crane. The second section is dedicated to safety communications that are associated with the crane, and the final section will focus on the safe crane operational procedures.

Part I Crane Basics



**Part I:
Crane Basics**

Slide 3 of 70

Notes:

Part I is dedicated to teaching the basics of overhead cranes. Slide topics will include introduction of the different types of overhead cranes, the important parts of the crane, inspection of the crane, including examples of wire rope abnormalities, and finally the required procedures involved with crane maintenance.

Types of Cranes

Gantry Cranes



Jib Cranes



Bridge Cranes



Monorail Cranes



Types of Cranes

Slide 4 of 70

Notes:

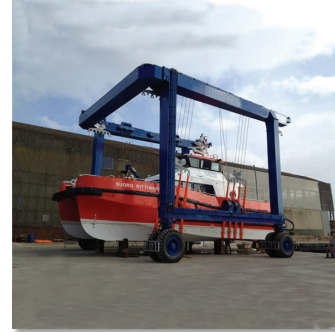
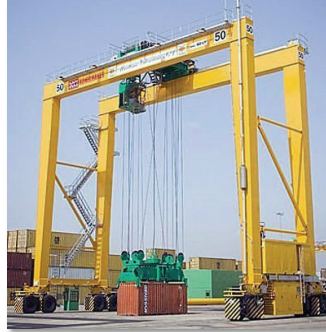
The four types of overhead cranes that are covered in this training include Gantry Cranes, Jib Cranes, Bridge Cranes, and Monorail Cranes.

Note: Feel free to edit slides, images, and types of cranes to customize this training to fit the needs of your organization.

Types of Cranes

Gantry Cranes

A type of crane that is built upon a bridge-like overhead structure (gantry).



Types of Cranes: Gantry Cranes

Slide 5 of 70

Notes:

In this training gantry cranes are emphasized as mobile cranes, as opposed to fixed. This slide illustrates the different uses and sizes of gantry cranes.

Types of Cranes

Bridge Cranes

An overhead crane that consists of parallel runways with a traveling bridge.



**Types of Cranes:
Bridge Cranes**

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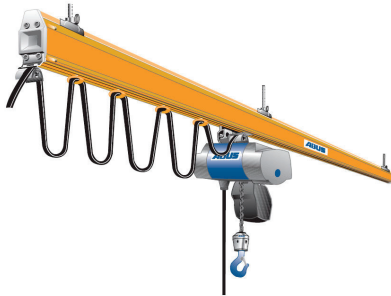
Notes:

Bridge Crane: An overhead crane that consists of parallel runways with a traveling bridge.

Depending on the size of the bridge crane, it can be operated from the floor using a pendant, or from an overhead cab.

Types of Cranes

Monorail Cranes



A type of overhead crane that travels suspended on a single rail.



**Types of Cranes:
Monorail Cranes**

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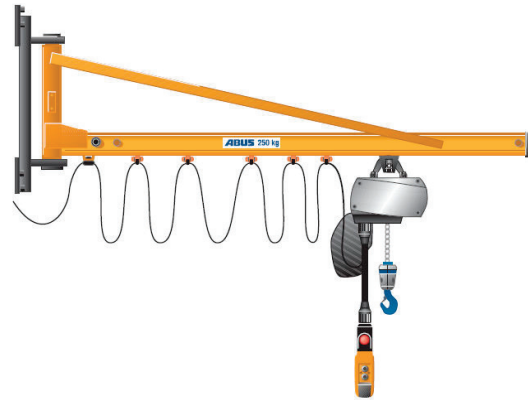
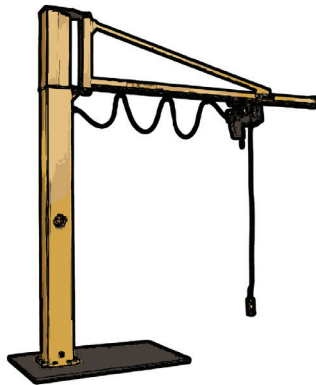
Notes:

Monorail cranes are a type of overhead crane that travels suspended on a single rail. Monorail cranes are frequently used in repetitive tasks and can range in size depending on the workplace.

Types of Cranes

Jib Cranes

A type of crane where a horizontal beam extends out to lift and move a load along the beam.



**Types of Cranes:
Jib Cranes**

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Notes:

A jib crane is identified as a type of crane where a horizontal beam extends out to lift and move a load along the beam. Some jib cranes can pivot at the end adding some lateral movement.

Jib cranes can come in two versions, floor mounted and wall mounted.

Crane Operators



Hoist Operator

The employee that uses the hoist to lift, lower, and move a load by means of an overhead crane.



Rigger

The employee that is responsible for balancing and securing the load to the hook, and will direct the hoist operator during the lift.



Crane Operators

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Notes:

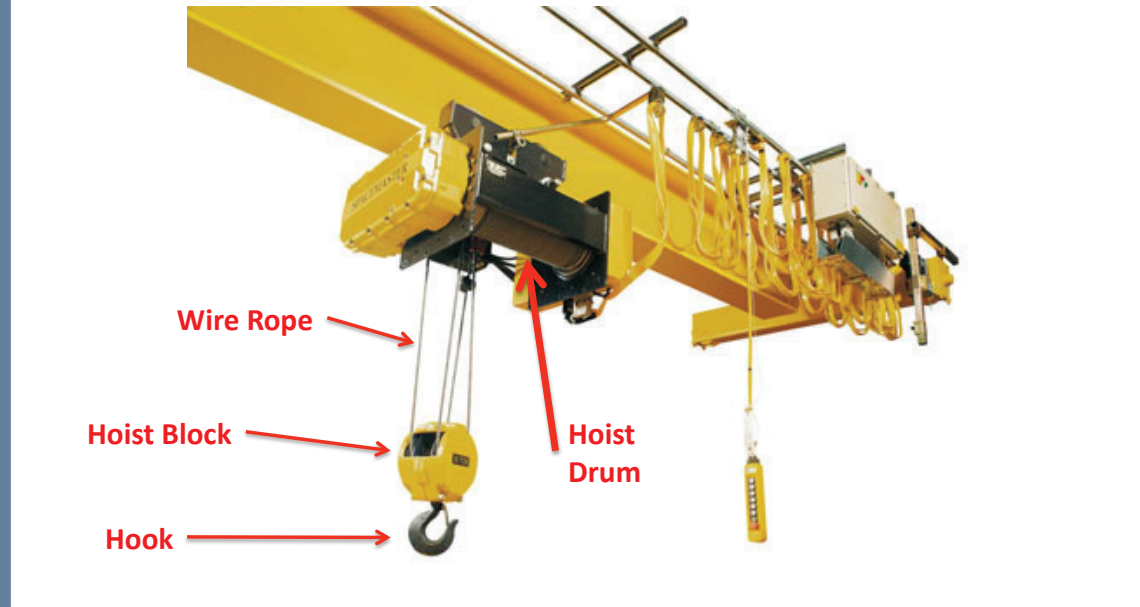
For this training two roles are defined with crane operation. While many times the hoist operator and the rigger might be the same person, the roles have been defined as such to help clarify to the trainees that specific training is required with the overhead crane operation. They should carefully observe any direction from the hoist operator and or rigger during any lifts.

Hoist Operator: The employee that uses the hoist to lift, lower, and move the load by means of an overhead crane.

Rigger: The employee that is responsible for balancing and securing the load to the hook, and will direct the hoist operator during the lift.

The Parts of the Crane

Hoisting Mechanisms



The Parts of the Crane: Hoisting Mechanisms

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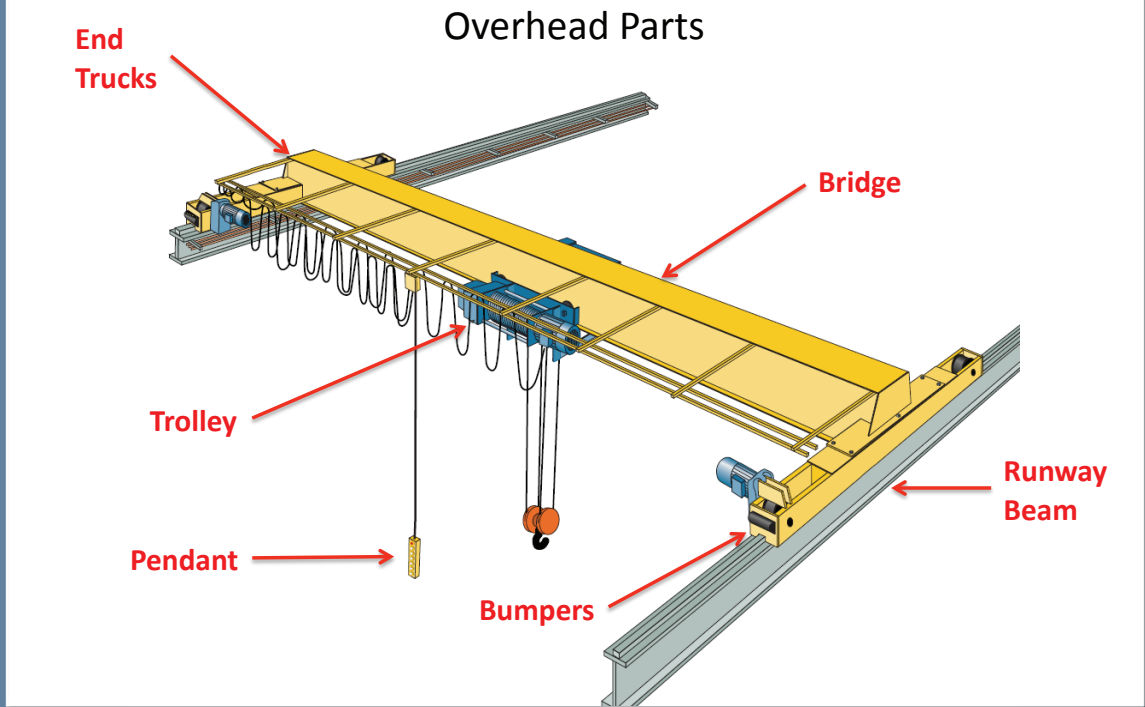
Notes:

Note: The parts of the crane illustrated in the following slides are for the purpose of a basic training.

Parts of the crane covered in this slide (more on the next slide):

- Hoist Drum
- Wire Rope
- Hoist/Load Block
- Hook

The Parts of the Crane



★
**The Parts of the Crane:
Overhead Parts**

Slide 11 of 70

Notes:

Parts of the crane covered in this slide:

- Trolley
- Bridge
- Runway Beam
- Bumpers (Bridge/Trolley/Carriage)
- Pendant (Controler)

The Parts of the Crane

Safety Parts



Power Supply



Fire Extinguisher



Load Rating



**The Parts of the Crane:
Safety Parts**

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Notes:

The safety parts of the crane covered on this slide:

- Power Supply
- Fire Extinguisher
- Load Rating

Inspecting the Crane

Inspections are one of the tools that are used to help prevent machine breakdowns and accidents

Two Types of Inspections:

1. Frequent Inspections
2. Periodic Inspections



Inspecting the Crane

Slide 13 of 70

Notes:

In this section we emphasize the two types of inspections. Inspection procedure for cranes in regular service is divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as “frequent” and “periodic” with respective intervals between inspections as defined on the following slides.

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23519: Inspections)*

Inspecting the Crane

Frequent Inspections

Frequent Inspections are inspections conducted by an operator or other designated personnel on a daily to monthly basis. All deficiencies shall be carefully examined and determination made as to whether they constitute a safety hazard.

Frequent Inspections should include:

- All functional operating mechanisms for maladjustment interfering with proper operation.
- Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems.
- Hooks with deformation or cracks.
- Hoist or load attachment chains, including end connections.
- Rope slings, including end connections, for excessive wear, broken wires, stretch, kinking, or twisting.
- All functional operating mechanisms for excessive wear of components.
- Rope reeving for noncompliance with manufacturer's recommendations.



Inspecting the Crane: Frequent Inspections

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Notes:

Frequent Inspections are inspections conducted by an operator or other designated personnel on a daily to monthly basis. All deficiencies shall be carefully examined and determination made as to whether they constitute a safety hazard.

Frequent Inspections should include: (how frequent each component is indicated in parentheses)

- All functional operating mechanisms for maladjustment interfering with proper operation. (Daily)
- Deterioration of leakage in lines, tanks, valves, drain pumps, and other parts of air or hydraulic systems. (Daily)
- Hooks with deformation or cracks.
(Visually Inspection Daily, Monthly Inspection with Signed Reports)
- Hoist or load attachment chains, including end connections.
(Visually Inspection Daily, Monthly Inspection with Signed Reports)
- Rope slings, including end connections, for excessive wear, broken wires, stretch, kinking, or twisting.
(Visually Inspection Daily, Monthly Inspection with Signed Reports)
- All functional operating mechanisms for excessive wear of components.
- Rope reeving for noncompliance with manufacturer's recommendations.

Note: The information on this slide is from the WAC standards. (WAC 296-24-23519: Inspections)

Inspecting the Crane

Periodic Inspections

Periodic Inspections are inspections of the crane in intervals of 1-12 months, depending upon its activity, severity of service, and environment, by a designated person making records of apparent external conditions to provide the basis for a continuing evaluation.

Periodic Inspections should include:

- Deformed, cracked or corroded members.
- Loose or missing bolts, nuts, pins or rivets.
- Cracked or worn sheaves and drums.
- Worn, cracked, or distorted parts.
- Excessive wear of brake system parts.
- Wind indicators for any significant inaccuracies.
- Gasoline, diesel, electric, or other power plants for proper operation.
- Excessive wear of drive chain sprockets and excessive drive chain stretch.
- Crane hooks.
- Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.



Inspecting the Crane: Periodic Inspections

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Notes:

Periodic Inspections are visual inspections of the crane in intervals of 1-12 months, depending upon its activity, severity of service, and environment, by a designated person making records of apparent external conditions to provide the basis for a continuing evaluation. Periodic inspections shall include the requirements of a frequent inspection along with the items listed below.

Periodic Inspections should include:

- Deformed, cracked or corroded members.
- Loose or missing bolts, nuts, pins or rivets.
- Cracked or worn sheaves and drums.
- Worn, cracked, or distorted parts.
- Excessive wear of brake system parts.
- Wind indicators for any significant inaccuracies.
- Gasoline, diesel, electric, or other power plants for proper operation.
- Excessive wear of drive chain sprockets and excessive drive chain stretch.
- Crane hooks.
- Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and push-button stations.

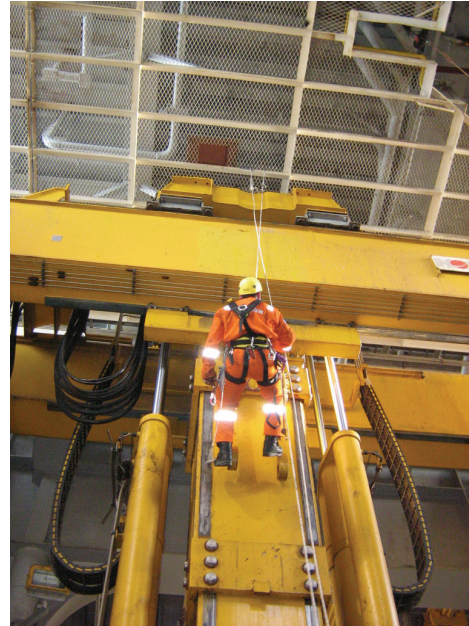
Note: The information on this slide is from the WAC standards. (WAC 296-24-23519: Inspections)

Inspecting the Crane

Cranes Not in Regular Service

*Cranes that have been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming with requirements for a **frequent inspection** before placing in service.*

*Cranes that have been idle for a period of over 6 months shall be given a complete inspection conforming with requirements for a **frequent and periodic inspection** before placing in service.*



Inspecting the Crane: Cranes Not in Regular Service

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Notes:

Cranes that have been idle for a period of 1 month or more, but less than 6 months., shall be given an inspection conforming with requirements for a **frequent inspection** before placing in service.

Cranes that have been idle for a period of over 6 months shall be given a complete inspection conforming with requirements for a **frequent and periodic inspection** before placing in service.

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23519 (4) Inspection)*

Inspecting the Crane

Wire Rope Inspections



Properly inspecting the rope, and keeping an eye out for changes in the rope, is important to maintaining a safe work environment.

Inspecting the Crane: Wire Rope Inspections

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Notes:

This section will illustrate to the trainees the different types of abnormalities in the wire rope that might occur with an overhead crane. Encourage trainees to report any possible abnormalities in the wire rope to a supervisor or foreman for proper inspection.

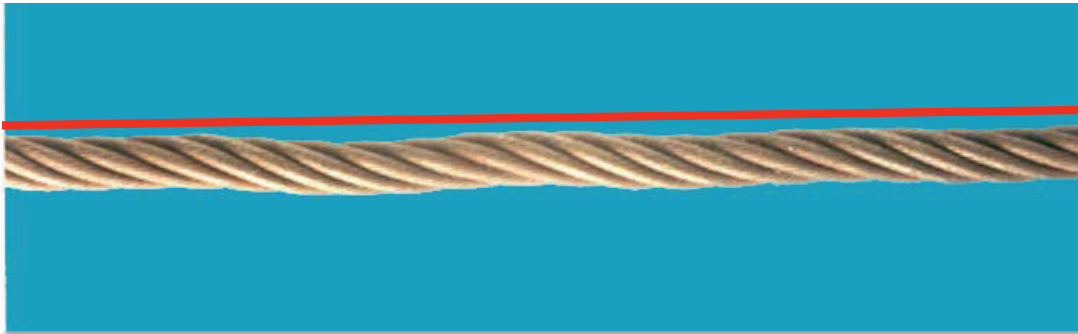
Types of wire rope abnormalities covered in this section:

- Waviness
- Basket/Lantern Deformation (Birdcage)
- Core Protrusion/Distortion
- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspections

Waviness

Waviness is a deformation in which the longitudinal axis of the wire rope takes the shape of a helix under either a loaded or unloaded condition.



**Wire Rope Inspection:
Waviness**

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Notes:

The red line in this slide is intended to give a reference to the waviness in the wire rope. The red line is straight in this image.

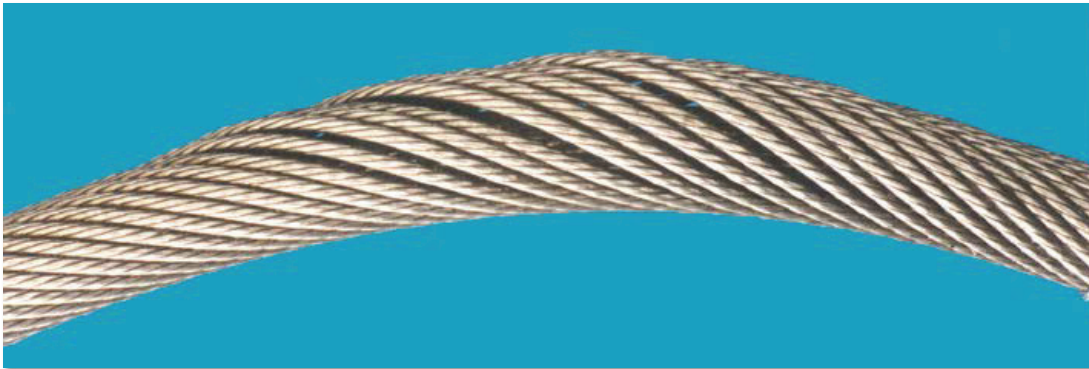
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- Kinks

Wire Rope Inspection

Basket/Lantern Deformation (Birdcage)

A basket, or lantern deformation, also known as a birdcage, develops when the outer layer of strands in the wire rope becomes longer than the inner layer(s).



Wire Rope Inspection: Basket/Lantern Deformation (Birdcage)

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Notes:

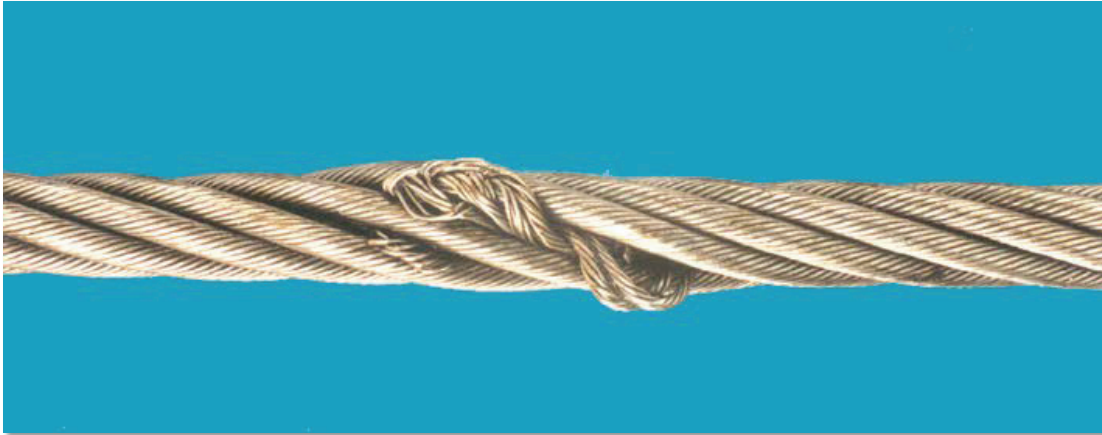
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- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspection

Core Protrusion/Distortion

A core protrusion is a special type of basket or lantern deformation. In this case the rope imbalance is indicated by a protrusion of the core of the wire rope.



Wire Rope Inspection: Core Protrusion/Distortion

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Notes:

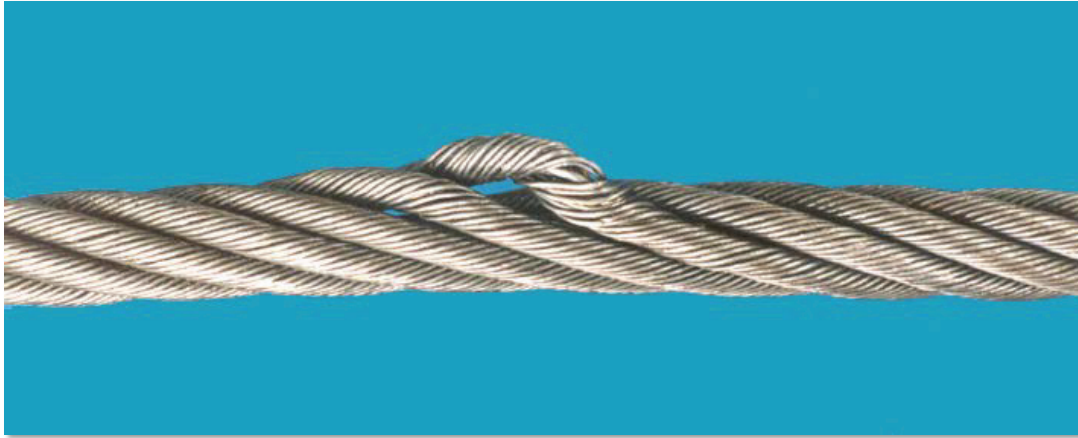
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- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspection

Strand Protrusion/Distortion

A strand protrusion, or distortion, is when one of the outer strands of the wire rope protrudes out.



Wire Rope Inspection: Strand Protrusion/Distortion

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Notes:

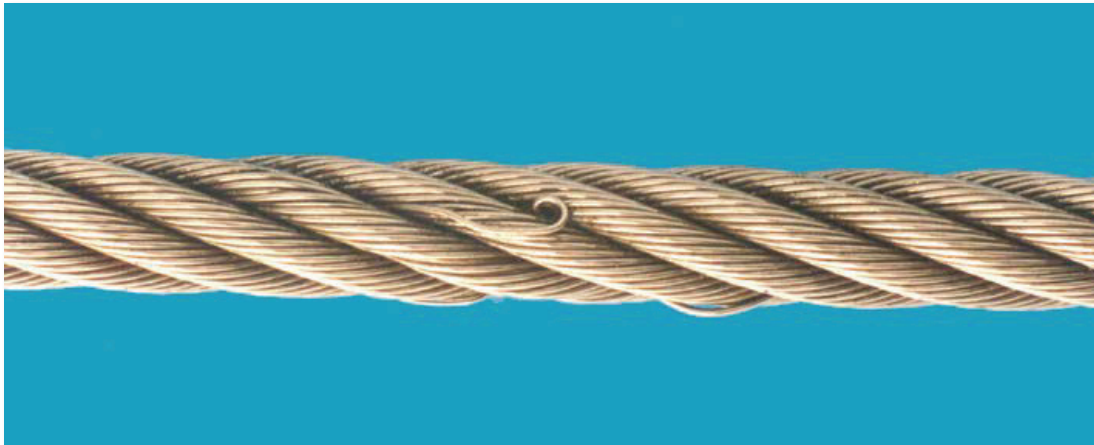
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- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspection

Wire Protrusion

When certain wires, or groups of wires, will rise up on the side of the rope opposite to the sheave groove in the form of loops.



Wire Rope Inspection: Wire Protrusion

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Notes:

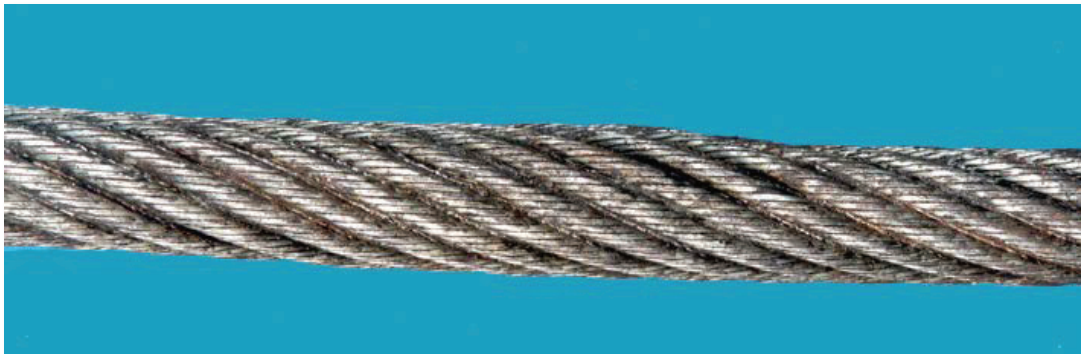
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- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspection

Local Increase in Diameter of Rope

A local increase in rope diameter can occur and might affect a relatively long length of the rope.



Wire Rope Inspection: Local Increase in Diameter of Rope

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Notes:

Types of wire rope abnormalities covered in this section:

- Waviness
- Basket/Lantern Deformation (Birdcage)
- Core Protrusion/Distortion
- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspection

Flattened Portion

A flattened portion of a rope is a section of the rope that has lost its circular form.



Wire Rope Inspection: Flattened Portion

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Notes:

Types of wire rope abnormalities covered in this section:

- Waviness
- Basket/Lantern Deformation (Birdcage)
- Core Protrusion/Distortion
- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspection

Kinks

A kink is a deformation created by a loop in the rope which has been tightened without allowing for rotation about its axis.



Wire Rope Inspection: Kinks

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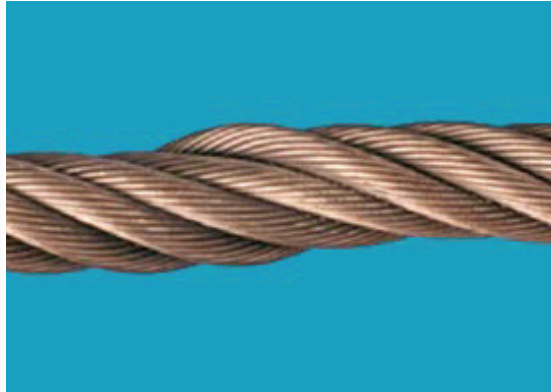
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- Core Protrusion/Distortion
- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Wire Rope Inspection

Other Kink Examples



Positive Kink



Negative Kink

Wire Rope Inspection: Other Kink Examples

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Notes:

Types of wire rope abnormalities covered in this section:

- Waviness
- Basket/Lantern Deformation (Birdcage)
- Core Protrusion/Distortion
- Strand Protrusion/Distortion
- Wire Protrusion
- Local Increase in Diameter of Rope
- Flattened Portion
- Kinks

Maintenance



Maintenance Topics with Overhead Cranes:

1. Preventive Maintenance
2. Maintenance Procedures
3. Adjustments and Repairs
4. Wire Rope Maintenance and Replacement

Maintenance

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Notes:

Maintenance Topics with Overhead Cranes:

1. Preventive Maintenance
2. Maintenance Procedures
3. Adjustments and Repairs
4. Wire Rope Maintenance and Replacement

Maintenance

Preventive

Preventive Maintenance is maintenance that is conducted before an issue is identified.

This includes, but is not limited to:

- Fluid Replacement
- Frequently Worked Parts
- Pads
- Hoses
- Warning Devices and Signs



Maintenance: Preventive

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Notes:

Preventive Maintenance is maintenance that is conducted before an issue is identified.

This includes, but is not limited to:

- Fluid Replacement
- Frequently Worked Parts
- Pads
- Hoses
- Warning Devices and Signs

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23523: Maintenance)*

Maintenance

Maintenance Procedures

The following precautions shall be taken before performing any maintenance on a crane:

- (1) The crane shall be moved to a location where it will cause the least interference with other cranes and operations in the area.
- (2) If a load is attached to the crane, it shall be landed.
- (3) All controllers shall be placed in the off position.
- (4) A lockout/tagout procedure shall be performed.
- (5) Warning signs and barriers shall be utilized on the floor beneath the crane where overhead maintenance work creates a hazard.
- (6) If the runway remains energized, stops or a signalperson, located full-time at a visual vantage point for observing the approach of an active crane, shall be provided to help the persons performing maintenance with the machine.
- (7) A guard or barrier shall be installed between adjacent runways for the length of any established work area.

Maintenance: Maintenance Procedures

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Notes:

The following precautions shall be taken before performing any maintenance on a crane:

1. The crane shall be moved to a location where it will cause the least interference with other cranes and operations in the area.
2. If a load is attached to the crane, it shall be landed.
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7. A guard or barrier shall be installed between adjacent runways for the length of any established work area.

Note: The information on this slide is from the WAC standards.

(WAC 296-24-23523: Maintenance)

Maintenance

Adjustments and Repairs

The following list is an example of components that might need adjustment or repairs:

- (1) Operating mechanisms on the crane
- (2) Limit devices
- (3) Control systems
- (4) Brakes
- (5) Damaged or worn hooks
- (6) Critical parts that are cracked, broken, bent, or excessively worn
- (7) Pitted or burned electrical contacts
- (8) Function, instruction, caution, and warning labels



Maintenance: Adjustments and Repairs

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Notes:

The following list is an example of components that might need adjustment or repairs:

1. Operating mechanisms on the crane
2. Limit devices
3. Control systems
4. Brakes
5. Damaged or worn hooks
6. Critical parts that are cracked, broken, bent, or excessively worn
7. Pitted or burned electrical contacts
8. Function, instruction, caution, and warning labels

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23523: Maintenance)*

Maintenance

Wire Rope Maintenance and Replacement

While maintenance precautions on the rope can be taken, the strain on the rope will eventually lead to the need for it to be replaced.

If left in service long enough, wire ropes will deteriorate and eventually break.



Maintenance:
Wire Rope Maintenance and Replacement

Slide 31 of 70

Notes:

While maintenance precautions on the rope can be taken, the strain on the rope will eventually lead to the need for it to be replaced.

If left in service long enough, wire ropes will deteriorate and eventually break.



Part II

Crane Safety Communications

Part II:
Crane Safety Communications

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Notes:

Part II of this training is dedicated to teaching the various communications that are involved with operation of an overhead crane. Slide topics in this section include basic communication safety concepts, crane safety tools, including the various warning tools, and a section that teaches the standard hand signs for crane operation.

Basic Crane Safety

1. Cranes should be operated only by regular operators, authorized substitutes, crane repairmen, and inspectors.
2. Do not carry a load over people on the floor. Sound warning devices to alert persons nearby.
3. Do not allow anyone to ride on a load carried by the crane or on the crane hook.
4. Never try to stop the load with your hands or body.
5. Inspect equipment daily before use. Always keep an eye out for changes in the equipment and safety area.
6. Never pull a hoist by the pendant cable.
7. Never leave the controls unattended while a load is suspended. Lower the load to the floor if it is necessary to leave the controls.
8. Before moving the trolley or bridge, be sure that the hook is high enough to clear all obstacles.
9. Do not drag slings, chains, or lifting devices out from under loads that have been landed.
10. If you are asked to do something that you do not feel comfortable or safe about, contact a foreman or supervisor for advice.

Basic Crane Safety

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Notes:

1. Cranes should be operated only by regular operators, authorized substitutes, crane repairmen, and inspectors.
2. Do not carry a load over people on the floor. Sound warning devices to alert persons nearby.
3. Do not allow anyone to ride on a load carried by the crane or on the crane hook.
4. Never try to stop the load with your hands or body.
5. Inspect equipment daily before use. Always keep an eye out for changes in the equipment and safety area.
6. Never pull a hoist by the pendant cable.
7. Never leave the controls unattended while a load is suspended. Lower the load to the floor if it is necessary to leave the controls.
8. Before moving the trolley or bridge, be sure that the hook is high enough to clear all obstacles.
9. Do not drag slings, chains, or lifting devices out from under loads that have been landed.
10. If you are asked to do something that you do not feel comfortable or safe about, contact a foreman or supervisor for advice.

Crane Safety Tools

The following section discusses some of the safety tools used around overhead cranes in the workplace.

- Tagged Crane or Hoist
- Warning Devices
- Warning Signs and Markings
- Hand Signals



Crane Safety Tools

Slide 34 of 70

Notes:

The following section discusses some of the safety tools used around overhead cranes in the workplace.

- Tagged Crane or Hoist
- Warning Devices
- Warning Signs and Markings
- Hand Signals

Crane Safety Tools

Tagged Cranes and Hoists

A crane, and/or equipment, that is shutdown for various reasons should be locked out and tagged out.

Do not operate or use any equipment that is locked and/or tagged out. Speak with a supervisor or foreman regarding the operations of any equipment.



Crane Safety Tools: Tagged Cranes and Hoists

Slide 35 of 70

Notes:

Refer to your company's lockout/tagout (energy control) program for specific requirements.

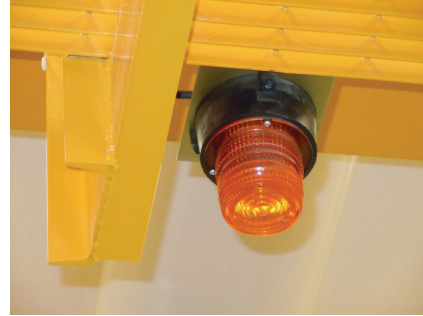
A crane, and/or equipment, that is shutdown for various reasons should be locked out and tagged out.

Do not operate or use any equipment that is locked and/or tagged out. Speak with a supervisor or foreman regarding the operations of any equipment.

Crane Safety Tools

Warning Devices

A warning device is any device that alerts people in the area of a crane that is in operation.



- (1) Manually operated gong
- (2) Power-operated bell, siren, or horn
- (3) Rotating beacon
- (4) Strobe light

Crane Safety Tools: Warning Devices

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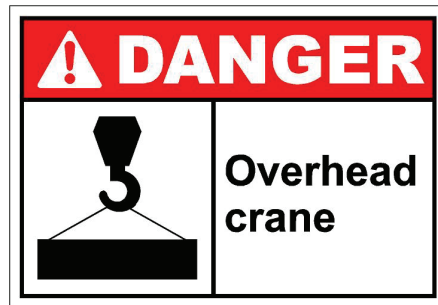
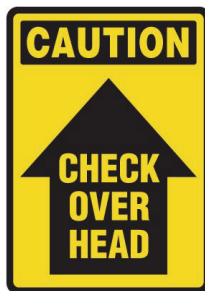
Notes:

A warning device is any device that alerts people in the area of a crane that is in operation.

1. Manually operated gong
2. Power-operated bell, siren, or horn
3. Rotating beacon
4. Strobe light

Warning Signs and Markings

Warning signs and markings should be present in all workplaces operating a crane to communicate dangers and hazards with the machine.



Warning Signs and Markings

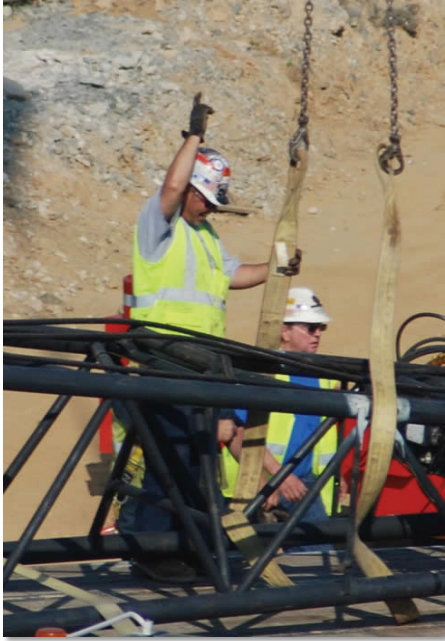
Slide 37 of 70

Notes:

Warning signs and marking should be present in all workplaces operating a crane to communicate dangers and hazards with the machine.

Hand Signals

Standard



Hand signals are used when voice communications cannot be heard.

**Hand Signals:
Standard**

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Notes:

The following section will teach the standard hand signals. It is recommended to demonstrate each of the hand signals for the trainees. You can even have the trainees stand and practice each of the hand signals.

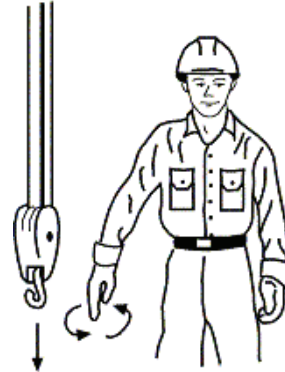
Hand Signals

Standard



Hoist

With forearm vertical, forefinger pointing up, move hand in small horizontal circle.



Lower

With arm extended downward, forefinger pointing down, move hand in small horizontal circle.

Hand Signals: Standard

Slide 39 of 70

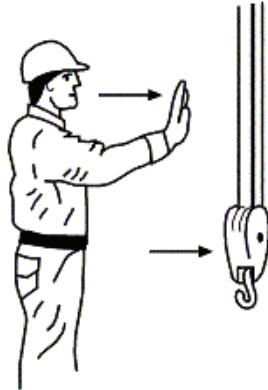
Notes:

Hoist: With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

Lower: With arm extended downward, forefinger pointing down, move hand in small horizontal circle.

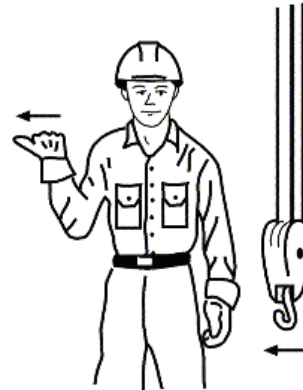
Hand Signals

Standard



Bridge Travel

Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.



Trolley Travel

Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.

Hand Signals: Standard

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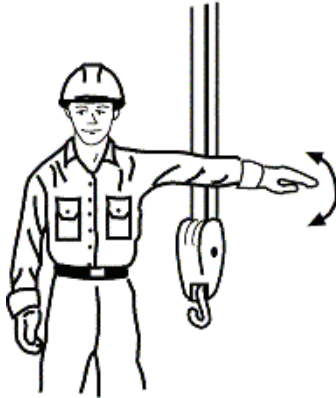
Notes:

Bridge Travel: Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.

Trolley Travel: Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.

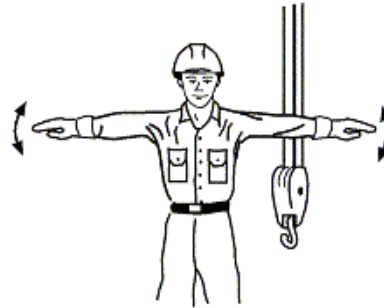
Hand Signals

Standard



Stop

Arm extended, palm down, move arm back and forth horizontally.



Emergency Stop

Both arms extended, palms down, move arms back and forth horizontally.

Hand Signals: Standard

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Notes:

Stop: Arm extended, palm down, move arm back and forth horizontally.

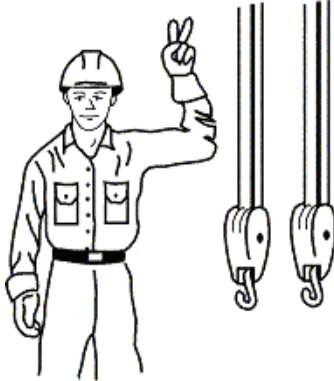
Emergency Stop: Both arms extended, palms down, move arms back and forth horizontally.

DISCUSSION QUESTION:

When would you use the Stop signal as opposed to the Emergency Stop signal?

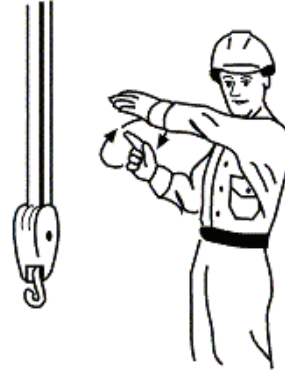
Hand Signals

Standard



Multiple Trolleys

Hold up one finger for block marked "1" and two fingers for block marked "2". Regular signals follow.



Move Slowly

Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal.

Hand Signals: Standard

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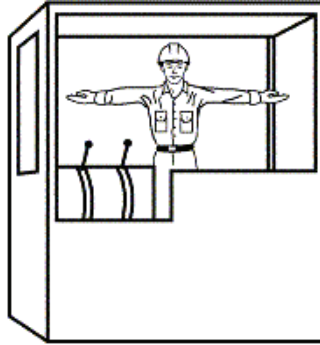
Notes:

Multiple Trolleys: Hold up one finger for block marked "1" and two fingers for block marked "2". Regular signals follow.

Move Slowly: Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal.

Hand Signals

Standard



Magnet is Disconnected

Crane operator spreads both hands apart – palms up.

Hand Signals: Standard

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Notes:

Magnet is Disconnected: Crane operator spreads both hands apart - palms up.

KNOWLEDGE CHECK:

This is an excellent place in the training for a quick knowledge check. Choose a handful of the hand signals and demonstrate for the trainees. See if they can identify the hand signal that you are demonstrating. You can increase the difficulty by combining the multiple signals (i.e. the Multiple Trolley signal and Move Slowly signal).

Hand Signals

Special

In some cases more communication is needed past the standard hand signals.

1. Special operations may require additions to or modifications of standard signals.
2. Special signals shall be agreed upon and understood by the signal person and the operator.
3. Special signals shall not conflict with standard signals.



Hand Signals: Special

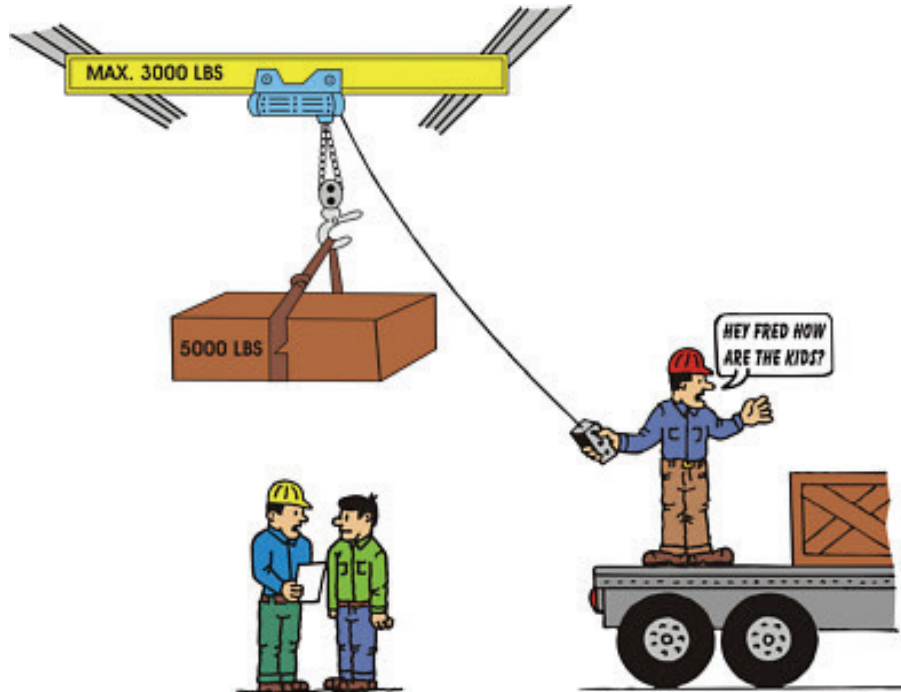
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Notes:

Special Hand Signals:

In some cases more communication is needed past the standard hand signals.

1. Special operations may require additions to or modifications of standard signals.
2. Special signals shall be agreed upon and understood by the signal person and the operator.
3. Special signals shall not conflict with standard signals.



Discussion: Can you identify the safety violations in this drawing?

Discussion

Slide 45 of 70

Notes:

This slide serves as a discussion piece for the training. Discuss with the trainees the safety errors that have been covered up to this point in the training.

Safety violations from the drawing that violate code or company policy:

1. Load exceeds maximum rating for the crane.
2. Hook latch not closed.
3. Hook appears to be opening up.
3. Lifting load over people.
4. 1 person not wearing a hard hat.
5. Operator distracted and not paying attention to suspended load.
6. Operator working from bed of truck and not ground.
7. Operator pulling crane by pendant cable.
8. Tear in sling.
9. Knot in sling.
10. Load not properly secured and will fall out of the sling.
11. People under load not paying attention.



Part III

Safe Crane Operational Procedures

**Part III:
Safe Crane Operational Procedures**

Slide 46 of 70

Notes:

Part III of this training is dedicated to teaching the safe operational procedures when working with an overhead crane. This is not intended to train how to operate the crane, but trains on proper procedures when working around a crane. Slide topics in this section include loads, including testing and attaching, testing of the crane, conduct of operators, and finally, qualifications for crane operators.

Loads

As much as we discuss safety with the crane itself, the preparation and handling of the load is just as much of a factor in the safety of a lift.



Loads

Slide 47 of 70

Notes:

This next section of the training will look at loads and some of the operations involving the load. The topics covered include Load Marking and Weight of Loads, Attaching the Load, and Moving the Load.

Loads

Load Marking and Weight of Loads



Load Markings are posted on all sides of the crane and on the hoist block.



Knowing the load weight is important to preventing accidents with the lift.

Loads:
Load Marking and Weight of Loads

Slide 48 of 70

Notes:

Load Markings are posted on all sides of the crane and on the hoist block.

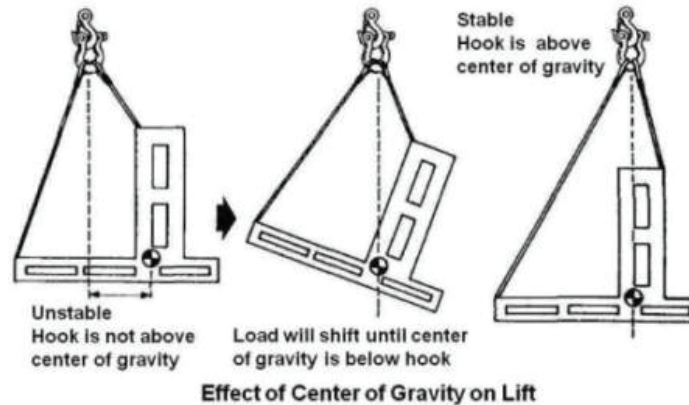
Knowing the load weight is important to preventing accidents with the lift.

Loads

Attaching the Load

Important Factors:

1. Use appropriate sling/hardware (Work Load Limit)
2. Sling Angle
3. Center of Gravity Alignment



Loads: Attaching the Load

Slide 49 of 70

Notes:

Important factors for attaching the load:

1. Use appropriate sling/hardware (Work Load Limit)
2. Sling angle
3. Center of Gravity Alignment

Definitions:

Center of Gravity: The average location of the weight of an object.

Work Load Limit: The maximum weight that can be lifted by the device.

Sling Angle: The angle of the sling in relation to the edge of the load and the hook. The sling angle affects the total work load limit of the sling.

Loads

Moving the Load

1. The appointed person directing the lift shall ascertain that the load and hoist devices are attached and functioning properly.
2. During the lift there should be no sudden acceleration or deceleration of the load.
3. Cranes shall not be used for side pulls except when specifically authorized.
4. The operator should avoid carrying loads over people.
5. The load shall not be lowered below the point where two wraps of rope remain on the hoisting drum.
6. No suspended load should ever be left unattended by the crane operator.



Loads: Moving the Load

Slide 50 of 70

Notes:

1. The appointed person directing the lift shall ascertain that the load and hoist devices are attached and functioning properly.
2. During the lift there should be no sudden acceleration or deceleration of the load.
3. Cranes shall not be used for side pulls except when specifically authorized.
4. The operator should avoid carrying loads over people.
5. The load shall not be lowered below the point where two wraps of rope remain on the hoisting drum.
6. No suspended load should ever be left unattended by the crane operator.

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23527: Handling the load)*

Planned Engineered Lifts

In the case that a lift needs to be made that is heavier than the rated load of the crane a planned engineered lift may be possible. These lifts shall be treated as a special and separate event.



Planned Engineered Lifts

Slide 51 of 70

Notes:

In the case that a lift needs to be made that is heavier than the rated load of the crane a planned engineered lift may be possible. These lifts shall be treated as a special and separate event.

Note: It is important to emphasize that planned engineered lifts are not part of normal operation with an overhead crane. All planned engineered lifts shall be made under controlled conditions and under the direction of a designated person in accordance with a previously prepared lift plan.

Testing



While inspections are visual assessments of the crane and equipment, tests examine the operation and function of the machine.

Testing

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Notes:

This next section of the training will focus on testing the crane. The two types of testing covered include operational tests and load tests.

Testing

Operational Tests

Operational testing are tests that examine the operation of all of the crane parts without a load.

- (1)Lifting and lowering
- (2)Trolley travel
- (3)Bridge travel
- (4)Hoist-limit devices
- (5)Travel-limiting devices
- (6)Locking and indicating devices

Testing:
Operational Tests

Slide 53 of 70

Notes:

Operational testing are tests that examine the operation of all of the crane parts without a load.

1. Lifting and lowering
2. Trolley travel
3. Bridge travel
4. Hoist-limit devices
5. Travel-limiting devices
6. Locking and indicating devices

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23521: Testing)*

Testing

Load Tests

A load test examines the cranes ability to lift and move a load.

- (1) Hoist the test load a distance to assure that the load is supported.
- (2) Transport the test load by means of the trolley for the full length of the bridge.
- (3) Transport the test load by means of the bridge for the full length of the runway.
- (4) Lower the test load, and stop and hold the test load with the brakes.



Testing: Load Tests

Slide 54 of 70

Notes:

A load test examines the cranes ability to lift and move a load.

1. Hoist the test load a distance to assure that the load is supported.
2. Transport the test load by means of the trolley for the full length of the bridge.
3. Transport the test load by means of the bridge for the full length of the runway.
4. Lower the test load, and stop and hold the test load with the brakes.

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23521: Testing)*

Operational Qualifications

Each type of crane and work setting have different qualifications for operating overhead cranes.

Cranes shall be operated only by the following qualified persons:

- (1) Designated persons
- (2) Trainees under the direct supervision of a designated person
- (3) Maintenance and test personnel

Check with your employer for more information on the requirements for working with overhead cranes in your workplace.

Operational Qualifications

Slide 55 of 70

Notes:

Each type of crane and work setting have different qualifications for operating overhead cranes.

Cranes shall be operated only by the following qualified persons:

1. Designated persons
2. Trainees under the direct supervision of a designated person
3. Maintenance and test personnel

Check with your employer for more information on the requirements for working with overhead cranes in your workplace.

Operational Qualifications

Floor and Remote Operators



Floor and Remote Hoist Operators shall be required by the employer to pass a practical operating examination.

The use of remote-control equipment involves such a wide variety of service requirement and conditions that each installation should be carefully analyzed.

**Operational Qualifications:
Floor and Remote Operators**

Slide 56 of 70

Notes:

Floor and remote hoist operators shall be required by the employer to pass a practical operating examination.

The use of remote-control equipment involves such a wide variety of service requirements and conditions that each installation should be carefully analyzed.

Operational Qualifications

- (1) Have vision of at least 20/30 in one eye and 20/50 in the other, with or without corrective lenses.
- (2) Be able to distinguish color, regardless of position of colors, if color differential is required for operation.
- (3) Be able to hear adequately, with or without hearing aides, for a specific operation.
- (4) Have sufficient strength, endurance, agility, coordination and speed of reaction to meet the demands of the equipment operation.
- (5) Have normal depth perception, field of vision, reaction time, manual dexterity, coordination and no tendencies to dizziness or similar undesirable characteristics.
- (6) Have no evidence of physical defects, or emotional instability, which could render the operator or trainee a hazard to their self or others.



Operational Qualifications

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Notes:

- (1) Have vision of at least 20/30 in one eye and 20/50 in the other, with or without corrective lenses.
- (2) Be able to distinguish color, regardless of position of colors, if color differential is required for operation.
- (3) Be able to hear adequately, with or without hearing aides, for a specific operation.
- (4) Have sufficient strength, endurance, agility, coordination and speed of reaction to meet the demands of the equipment operation.
- (5) Have normal depth perception, field of vision, reaction time, manual dexterity, coordination and no tendencies to dizziness or similar undesirable characteristics.
- (6) Have no evidence of physical defects, or emotional instability, which could render the operator or trainee a hazard to their self or others.

*Note: The information on this slide is from the WAC standards.
(WAC 296-24-23529: Operators)*

Conduct of the Operators

- (1) The operators and employees shall not engage in any practice that will divert attention while actually engaged in operating the crane.
- (2) When physically, or otherwise unfit, an operator shall not engage in the operation of the equipment.
- (3) The operator shall be familiar with, and follow all signals from appropriate people during a lift.
- (4) Each operator shall be responsible for those operations under the operator's control.
- (5) Each operator shall activate the warning device before starting the bridge/trolley, and intermittently during travel of the crane.

Conduct of the Operators (Part I)

Slide 58 of 70

Notes:

- (1) The operators and employees shall not engage in any practice that will divert attention while actually engaged in operating the crane.
- (2) When physically, or otherwise, unfit, an operator shall not engage in the operation of the equipment.
- (3) The operator shall be familiar with, and follow all signals from appropriate people during a lift.
- (4) Each operator shall be responsible for those operations under the operator's control.
- (5) Each operator shall activate the warning device before starting the bridge/trolley, and intermittently during travel of the crane.

Conduct of the Operators

- (6) The operator shall not close the main switch until certain that no worker is on or adjacent to the crane.
- (7) The operator shall be familiar with the equipment and its proper care.
- (8) Contacts with runway stops or other cranes shall be made with extreme caution.
- (9) Before the operator performs any maintenance work on the crane, the operator shall lock and tag the main switch in the de-energized position.

Conduct of Operators (Part 2)

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Notes:

- (6) The operator shall not close the main switch until certain that no worker is on or adjacent to the crane.
- (7) The operator shall be familiar with the equipment and its proper care.
- (8) Contact with runway stops or other cranes shall be made with extreme caution.
- (9) Before the operator performs any maintenance work on the crane, the operator shall lock and tag the main switch in the de-energized position.



Part IV Case Studies

**Part IV:
Case Studies**

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Notes:

The following is the final section of the training. Four case studies will be used to add a human factors approach to helping the trainees reinforce and retain the information in this training. Each case study will be presented, then followed with some discussion questions on the next slide. The answer to the questions should appear with a mouse click in the order of the questions.

Case Study #1

An employee was being trained for the first time in the work area by the head mechanic. The employee would replace the mechanic when he went on vacation. The employee and the mechanic were working on a catwalk in the vicinity of an overhead crane. The overhead crane operator signaled to the mechanic that he needed to pass over the mechanic and the employee. They both bent down on the catwalk. As the first section of the overhead crane passed over them, the bottom of the crane knocked a pair of wire cutters off the gear box. The employee stood up to see what fell. The mechanic tried to tell him to get back down before the second section of the crane passed over; however, the employee was struck in the head and killed.

Case Study #1

Slide 61 of 70

Notes:

Case Study #1

An employee was being trained for the first time in the work area by the head mechanic. The employee would replace the mechanic when he went on vacation. The employee and the mechanic were working on a catwalk in the vicinity of an overhead crane. The overhead crane operator signaled to the mechanic that he needed to pass over the mechanic and the employee. They both bent down on the catwalk. As the first section of the overhead crane passed over them, the bottom of the crane knocked a pair of wire cutters off the gear box. The employee stood up to see what fell. The mechanic tried to tell him to get back down before the second section of the crane passed over; however, the employee was struck in the head and killed.

Case Study #1 - Questions

1. Identify the safety failure in this accident.

The crane should not have passed overhead of the workers on the catwalk.

2. What safety Maintenance Precaution should have been added to this situation?

A signal person with full view of the operation shall be provided to help the persons performing maintenance with the machine;

The crane shall be moved to a location where it will cause the least interference with other cranes and operations in the area.



Case Study #1 Questions

Slide 62 of 70

Notes:

1. Identify the safety failure in this accident.

The crane should not have passed overhead of the workers on the catwalk.

2. What safety Maintenance Precaution should have been added to this situation?

A signal person with full view of the operation shall be provided to help the persons performing maintenance with the machine.

The crane shall be moved to a location where it will cause the least interference with other cranes and operations in the area.

Case Study #2

An employee was working inside a large concrete pipe mold setting up the core. The core was put in place by an overhead bridge crane. The employee had unhooked the core from the slings and the crane operator, operating from a cab, had moved the cab over the mold to make sure it was straight. The operator was moving the cab back toward the wall and raising the block out of the mold at the same time. He accidentally raised the block all the way up. The upper limit switch failed to work; it two-blocked and broke the wire rope, dropping a more than 300 lb block back down inside the mold. The load struck the employee, breaking his neck. He was hospitalized.

Case Study #2

Slide 63 of 70

Notes:

Case Study #2

An employee was working inside a large concrete pipe mold setting up the core. The core was put in place by an overhead bridge crane. The employee had unhooked the core from the slings and the crane operator, operating from a cab, had moved the cab over the mold to make sure it was straight. The operator was moving the cab back toward the wall and raising the block out of the mold at the same time. He accidentally raised the block all the way up. The upper limit switch failed to work; it two-blocked and broke the wire rope, dropping a more than 300 lb block back down inside the mold. The load struck the employee, breaking his neck. He was hospitalized.

Case Study #2 - Questions

1. Identify a failure point in this accident.

Limit Switch failure, Employee working too close to the overhead load.

2. What kind of preventative measure could have identified the limit switch failure?

Testing of the limit switch as part of a Day-To-Day Inspection.

3. Identify the safety error from the hoist operators responsibilities.

Moving the cab and the load at the same time. Lifting a load over a person. Lifting a load higher than is needed.



Case Study #2 Questions

Slide 64 of 70

Notes:

1. Identify a failure point in this accident.

Limit Switch failure, Employee working too close to the overhead load.

2. What kind of preventative measure could have identified the limit switch failure?

Testing of the limit switch as part of a Day-To-Day inspection.

3. Identify the safety error from the hoist operators responsibilities.

Moving the cab and the load at the same time.

Lifting a load over a person.

Lifting a load higher than is needed.

Case Study #3

An employee was to remove a telescoping cylinder from a trailer for repair. The front of the trailer was raised approximately 6 ft off the chassis using a 3-ton overhead crane with a pendant controlled hoist. The lifting sling was a shop-made sling comprised of a transport chain (3/8 in. links) with a hook attached at each end of the sling. While the front of the trailer was raised, a link broke causing the trailer to collapse onto the chassis, then fell over onto the employee. The employee later died from the accident.

Case Study #3

Slide 65 of 70

Notes:

Case Study #3

An employee was to remove a telescoping cylinder from a trailer for repair. The front of the trailer was raised approximately 6 ft off the chassis using a 3-ton overhead crane with a pendant controlled hoist. The lifting sling was a shop-made sling comprised of a transport chain (3/8 in. links) with a hook attached at each end of the sling. While the front of the trailer was raised, a link broke causing the trailer to collapse onto the chassis, then fell over onto the employee. The employee later died from the accident.

Case Study #3 - Questions

1. Identify the failure points in this accident.

The sling was not rated, proof tested, or inspected; Employee was not working at a safe distance from the suspended load.

2. What kind of preventative measure could have identified the defect with the sling?

Inspect all hoisting devices for accordance with ASME standards.

3. Identify the preventative safety measure that was missed in this accident.

Selecting a sling that meets the Weight Lift Limit of the load, Employee should have been standing a safe distance from the load.



Case Study #3 Questions

Slide 66 of 70

Notes:

1. Identify the failure points in this accident.

The sling was not rated, proof tested, or inspected.

Employee was not working at a safe distance from the suspended load.

2. What kind of preventative measure could have identified the defect with the sling?

Inspect all hoisting devices for accordance with ASME standards.

3. Identify the preventative safety measure that was missed in this accident.

Selecting a sling that meets the Weight Lift Limit of the load.

Employee should have been standing a safe distance from the load.

Case Study #4

An employee, who had been on the job for 1 1/2 months was operating a 15-ton capacity overhead top running bridge crane with a suspended load of 6 tons. The crane was operated by a floor-operated pendant control device. The load was a railroad switch panel 30 feet long by 12 feet wide. The employee was operating the pendant control crane in a 4 1/2 ft wide aisle between a pile of railroad panels and a railroad gondola. There were tripping hazards on the floor. The employee lifted the panel from a flat position up to a 30 degree angle. The load then shifted and struck the employee, killing him.

Case Study #4

Slide 67 of 70

Notes:

Case Study #4

An employee, who had been on the job for 1 1/2 months was operating a 15-ton capacity overhead top running bridge crane with a suspended load of 6 tons. The crane was operated by a floor-operated pendant control device. The load was a railroad switch panel 30 feet long by 12 feet wide. The employee was operating the pendant control crane in a 4 1/2 ft wide aisle between a pile of railroad panels and a railroad gondola. There were tripping hazards on the floor. The employee lifted the panel from a flat position up to a 30 degree angle. The load then shifted and struck the employee, killing him.

Case Study #4 - Questions

1. Identify the failure point in this accident.

Improper center of gravity balance.

2. Identify one safety issue that was present in this particular shop.

Tripping hazards on the shop floor, Inadequate room for the employee to maneuver.

3. In this situation what should the employee have done to help prevent this accident?

The employee should have lowered the load and re-aligned the hoist/sling when he noticed it was starting to raise at an angle.



Case Study #4 Questions

Slide 68 of 70

Notes:

1. Identify the failure point in this accident.

Improper center of gravity balance.

2. Identify one safety issue that was present in this particular shop.

Tripping hazards on the shop floor.

Inadequate room for the employee to maneuver.

3. In this situation, what should the employee have done to help prevent this accident?

The employee should have lowered the load and re-aligned the hoist/sling when he noticed it was starting to raise at an angle.

This brings an end to this training.
Does anyone have any last questions
or comments to wrap up?



End of Training

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Notes: