SAFE USE & OPERATION OF INDUSTRIAL CRANES

This easy-to-use Leader's Guide is provided to assist in conducting a successful presentation. Featured are:

INTRODUCTION: A brief description of the program and the subject that it addresses.

PROGRAM OUTLINE: Summarizes the program content. If the program outline is discussed before the video is presented, the entire program will be more meaningful and successful.

PREPARING FOR AND CONDUCTING THE PRESENTATION: These sections will help you set up the training environment, help you relate the program to site-specific incidents, and provide program objectives for focusing your presentation.

REVIEW QUESTIONS AND ANSWERS: Questions may be copied and given to participants to document how well they understood the information that was presented. Answers to the review questions are provided separately.

INTRODUCTION

Cranes come in a wide variety of sizes, configurations and capacities to lift and transport various products and materials used in industry. Because of the serious hazards presented by crane operation, crane operators must be fully qualified and 100 percent committed to the safe operation of their crane. That is the purpose of this program—to review the safety rules, precautions and safe operating practices common to all cranes in order to help crane operators work safely with the specific cranes they operate.

Topics include pre-operational inspection, inspection of slings and chains, rigging the load, checking for hazards prior to operation, lifting and transporting the load and use of hand signals and taglines.

PROGRAM OUTLINE

BECOMING QUALIFIED TO OPERATE A CRANE

- It is important for all workers to understand that they must be trained and authorized by their company or organization before using any type of crane.

- Unqualified operators are the cause of many crane incidents involving property damage or injury. Never operate any type of crane unless you have been properly trained and are authorized to do so.

- Some employers and jurisdictions require operators to carry a card or permit that indicates they are trained and authorized to use a crane or hoist.

- To become a qualified operator, you will be trained on the hazards, functions, operating controls and characteristics of the specific crane you will be operating.

PRE-OPERATIONAL INSPECTION OF THE CRANE

- You should perform a pre-operational inspection before using any crane.

- During the inspection, test each of the crane's controls to ensure they function properly and cause the intended reaction.

- Make sure the hoist travels properly in both directions on the bridge or trolley.

- Cranes have limit switches to prevent the hook from being raised too high. Test the function of this limit switch by raising the hook without a load.

- Test the function of any other travel limit switches as well as the emergency stop controls.

- Slowly raise and lower the hook while visually inspecting the wire rope of the hoist for kinks, breaks or other damage.

- Make sure the hook's safety latch is functional and not bent or stretched.

• The hook itself should not be stretched more than 15 percent of its original size or twisted more than 10 percent in either direction. If it is, it must be replaced.

• On mobile cranes, check that the fluid level and tire pressure meet the manufacturer's recommendations.

• The driving controls of mobile cranes should also be tested.

• If your pre-operational inspection of the crane reveals any problems or damage do not use the crane. Follow your organization's policies for marking the crane out of service and arranging for a qualified person to rectify the issues.

INSPECTING WEB SLINGS

• Before using a crane to lift a load, all of the rigging components must be inspected to ensure they are in good condition.

• Web slings made of nylon and polyester are one of the most commonly used lifting devices.

• When inspecting this type of webbed sling, look for frayed webbing, cuts, broken stitches and excessive wear.

• Lifting slings must have an attached capacity tag. During the inspection, make sure this tag is attached and is legible.

• If you discover any damage or defects to the sling during your inspection, or if it has no capacity tag, it must be removed from service immediately.

INSPECTING WIRE ROPE SLINGS

• Another commonly used lifting device is the wire-rope sling.

• Wire rope is made up of small wires twisted together to form strands. Several strands are then twisted around a core to form a wire rope.

• Each time a particular strand of wire makes a complete wrap around the core, it is referred to as one "lay."

• Before inspecting or handling wire rope, you should put on a pair of heavy leather gloves to protect against punctures or cuts caused by broken wires.

• An excessive number of broken wires can reduce the capacity of a wire rope sling. During your inspection, if you discover that a particular strand contains more than five broken wires within one lay, one revolution around the core, then the wire rope sling must be removed from service.

• In addition, if 10 or more randomly distributed broken wires are discovered within one lay, the wire rope sling must also be removed from service.

• One type of damage to a wire rope is called a "birdcage" and can be caused by overloading or shock loading.

• Other types of damage may include kinks, separated strands, excessive localized wear, or corrosion.

• Wire-rope slings must also have a capacity tag. If you discover a wire rope sling without a capacity tag, it must also be removed from service until re-tagged by the manufacturer or someone who is qualified to certify its weight capacity.

INSPECTING CHAIN SLINGS

• Chains used as lifting devices must be inspected for excessive wear and signs of overloading.

• Inspect each link in the chain. Links that have been overloaded will be bent slightly inward instead of maintaining their normal oval shape.

• Also, look for excessive wear where the chain's links join together or are connected to a hook or other connecting device.

• Chains with excessive wear or showing signs of overloading must be removed from service.

• Chains used for lifting must also have a capacity tag attached. If your inspection finds a chain without a capacity tag, it must be removed from service.

• Various types of connecting devices and shackles are often attached to chains. These should also be inspected for excessive wear or damage, paying close attention to any pins or cotter pins.

• All components used for lifting must display a proper capacity rating and be certified load tested. This is why you must never use homemade lifting devices or add non-approved components to rigging assemblies.

• If your inspection of webbed slings, wire rope, chains or connecting devices reveals any problems or damage do not use the device. Follow your organization's policies for removing the item from service and securing a proper replacement.

FREQUENT AND PERIODIC INSPECTIONS

• Be aware that all cranes must undergo two additional types of inspections, a frequent inspection and a periodic inspection.

• Frequent inspections are typically performed on a monthly basis. During a frequent inspection, the crane hook, hoisting mechanism, control functions, limit switches and other components are inspected for signs of wear.

• Periodic inspections are typically conducted annually. Periodic inspections check for excessive wear on the parts of the crane not typically visible to the operator.

• Frequent and periodic inspections must be performed by a properly qualified person.

RIGGING THE LOAD

• Once you have performed the pre-operational inspection of the crane, slings and connecting devices, the next step prior to lifting the load is to connect the load to the crane hook.

• Connecting the load is often called "rigging the load."

• First, you need to choose an appropriate lifting device. Keep in mind that the weight of the device you select must be added to the total weight of the load.

• Make sure the device you choose is in good condition and has the capacity to lift the load in the configuration you intend to rig it.

• One reason rigging requires specialized training is because the configuration used to connect a sling to a load directly affects its lifting capacity.

• The various configurations used to attach slings to a load are called "hitches." The lifting capacity of the sling while using three of the most common hitches will be listed on the sling's capacity tag.

• It is imperative that you check the capacity tag for the specific hitch you intend to use.

• The simplest type of hitch is the vertical hitch, which is formed by attaching the sling directly from the hook to the load.

• A second type of hitch is the basket hitch. A basket hitch is formed by running the sling under a load and attaching both ends to the crane hook.

• When using a basket hitch, two slings are typically used. The position of the two slings is adjusted to help balance the load.

• A third type of hitch is the choker hitch. A choker hitch is formed by passing one end of a sling through another and attaching it to the crane hook. When a choker hitch is pulled tight it helps to grip the load.

• To better balance a load or to reduce the force placed on any one sling, multiple slings are often used to lift a load.

• When multiple slings are used, the amount of force placed on any particular sling depends on the sling angle that is created.

• When discussing sling angles, such as when referencing a sling manufacturer's published table of sling capacity, it is critical to understand which angle is being referenced.

• The vertical sling angle is the angle formed between the sling and a vertical line drawn through the crane hook to the load.

• The vertical included angle is the larger angle formed between the two slings connected to a crane hook.

• The horizontal sling angle is the angle formed between a sling leg and a horizontal line drawn at the top of the load.

• When a 1000-pound load is lifted with a single sling, the force placed on that sling is 1000 pounds.

• When a 1000-pound load is lifted using two slings and a spreader bar, it is possible for each sling to have a 90 degree horizontal sling angle. When this is the case the force placed on each sling is 500 pounds or 50 percent of the weight of the load.

• If the spreader bar is removed and each sling is connected to the crane hook the horizontal sling angle is reduced and the load placed on each sling increases.

• For a horizontal sling angle of 60 degrees, the force placed on each sling increases to 578 pounds or 57.8 percent of the weight of the load.

• For a horizontal sling angle of 45 degrees, the force placed on each sling increases to 707 pounds or 70.7 percent of the weight of the load.

• For a horizontal sling angle of 30 degrees, the force placed on each sling increases to 1,000 pounds or 100 percent of the weight of the load.

• The lesson to be learned here is that a sling can easily be overloaded and break if rigged with too small of a horizontal sling angle. A good rule of thumb is to select a sling rated for the full weight of the load and rig it with a horizontal sling angle of 60 degrees or more.

• When attaching the load to the hook, make sure to place the sling or connecting device in the deepest part, known as the throat, of the hook. This is the only portion of the hook that will safely hold loads at its rated capacity.

CHECK FOR HAZARDS PRIOR TO OPERATION

• Before operating the crane be sure to scan the area for hazards and any personnel who may be in the travel path.

• Inform co-workers in the surrounding area that you are preparing to operate the crane and clear any workers from the immediate area before beginning your lift.

• Make sure there are no obstructions in the planned path of travel and be sure to also check for overheard hazards or other cranes that may impede the travel path.

CHECKING BALANCE AND BRAKES

• Once you have determined that it is safe to operate the crane, you must test the balance of the load and the crane's brakes.

• Place the crane directly over the load and lift it several inches off of the floor to make sure the load is properly balanced and doesn't swing.

• If the load is out of balance or swings, lower it back to the floor and adjust the rigging.

• Once you have the load properly balanced, leave it suspended a few inches off the floor for about 30 seconds to make sure the brakes are holding and functioning properly.

• When switching from a lighter load to a heavier load, you should test the brakes again.

LIFTING AND TRASPORTING THE LOAD

• Once the load is balanced and the brakes have checked out, you are ready to lift and transport the load.

• When lifting a load, make sure the crane is directly over it. If you attempt to lift a load from any angle other than vertical, the load can swing out of control damaging the crane, causing property damage or injury.

• Use the controls to lift the load slowly and smoothly, avoiding sudden stops and abrupt jerks.

• Make sure that the crane is traveling at a rate of speed that allows you to observe the load and its travel path simultaneously.

• While the load is in motion, make sure it is elevated just high enough to clear obstructions in your path.

• Never allow co-workers to pass underneath loads and never pass loads over them.

• Crane operators must always maintain a safe distance from the load to avoid being crushed between it and a solid object. Operators of remote-controlled cranes must be especially wary of this danger.

• All employees involved in a lifting operation must be mindful of pinch points created in the rigging when the load is lifted off the floor. Make sure all workers are safely clear before lifting.

• Of course, nobody is ever allowed to ride the load. This practice often has serious and sometimes deadly consequences…and is strictly prohibited.

· When you get the load to its destination, land it as soon as possible and never leave a suspended load unattended.

• To prevent damage to the crane, the load must not be lowered below a point where less than two full wraps of wire rope remain on the hoisting drum.

• All employees involved in landing the load must be aware of the location of their hands and feet while it is being placed. Lowering a load creates a pinch or crush hazard which must be avoided.

• After the load has been landed and secured, remove all lifting devices and return them and the crane to their proper storage area.

• Be sure to elevate the hoist block to a position in which pedestrians and work vehicles can pass underneath safely.

SIGNALS AND TAGLINES

• In some cases, such as when visibility may be obstructed or when the load must be moved in tight quarters, the crane operator may require the assistance of a co-worker to move the load safely.

• If this is the case, this person must be properly trained in the use of the signals that will be used to help the operator guide the load to its destination.

- Once a signal person is selected, the crane operator should only respond to the signals given by the signaler and should ignore other workers who may try to help by signaling.

- The only exception to this rule is when an emergency stop signal is given. Always obey an emergency stop signal no matter who gives it.

- HOIST: With the forearm vertical and the forefinger pointing up, move your hand in a small horizontal circle.

- LOWER: With your arm extended downward and the forefinger pointing down, move your hand in a small horizontal circle.

- BRIDGE TRAVEL: With your arm extended forward, and your hand open and slightly raised, make a pushing motion in the direction of travel.

- TROLLEY TRAVEL: With your palm up, and fingers closed point your thumb in the direction of travel and jerk your hand horizontally.

- STOP: With your arm extended and your palm facing down, hold this position rigidly.

- EMERGENCY STOP: With your arm extended and your palm down, move your hand rapidly right and left.

- MOVE SLOWLY: While using one hand to give a normal motion signal, place your other hand in front of the signaling hand to indicate that the movement should be performed slowly.

- Your facility may have other signals and methods for conveying information during the lift. It's a good idea for the operator and signaler to discuss how they will communicate with each other before the lift begins.

- In some cases, the crane operator will need the assistance of a rigger manning a tagline to help control the load during a move.

- Taglines are straps that can be attached to a load. They are often used to guide the load away from other structures and keep it balanced as the crane moves from the pick-up point to the landing area.

- Workers manning the taglines will maintain tension on them to prevent the load from swinging out of position and to help guide the load into the desired orientation when landing.

- Workers manning taglines must be extremely cautious to avoid trip hazards while moving with the load and to avoid crossing under the raised load.

- They must also keep safely clear while the load is being raised and landed.

SUMMARY

- As a crane operator, one of your most important safety tools is your attitude. Maintaining a good safety attitude helps you avoid risk-taking, shortcuts and other unsafe acts which could cause a serious crane incident. Make a commitment to make every lift a safe lift.

PREPARE FOR THE SAFETY MEETING
Review each section of this Leader's Guide as well as the program. Here are a few suggestions for using the program:

Make everyone aware of the importance the company places on health and safety and how each person must be an active member of the safety team.

Introduce the program. Play it without interruption. Review the program content by presenting the information in the program outline.

Copy the review questions included in this Leader's Guide and ask each participant to complete them.

Make an attendance record and have each participant sign the form. Maintain the attendance record and each participant's test paper as written documentation of the training performed.

Here are some suggestions for preparing your video equipment and the room or area you use:

Check the room or area for quietness, adequate ventilation and temperature, lighting and unobstructed access.

Check the seating arrangement and the audiovisual equipment to ensure that all participants will be able to see and hear the program.

CONDUCTING THE PRESENTATION
Begin the meeting by welcoming the participants. Introduce yourself and give each person the opportunity to become acquainted if there are new people joining the training session.

Explain that the primary purpose of the program is to review the safety rules, precautions and safe operating practices common to all cranes in order to help crane operators work safely with the specific cranes they operate.

Introduce the program. Play it without interruption. Review the program content by presenting the information in the program outline.

Lead discussions about the cranes operated at your facility and precautions operators must take to prevent property damage and injuries.

After watching the program, the viewer will be able to explain the following:

- How to perform a pre-operational inspection;
- How to properly inspect slings and chains;
- What to check for prior to operating the crane;
- How to check the balance of the load and the brakes of the crane;
- How to safely lift and transport the load;
- What the standard signals are for controlling overhead cranes.

SAFE USE & OPERATION OF INDUSTRIAL CRANES
Review Quiz

Name_____Date_____

Please provide answers to the following to show how well you understand the information presented during this program.

1. You must be trained and authorized by your company or organization before using any type of crane.

a. true
b. false

2. A hook must be replaced if it is stretched more than _____ percent of its original size.

a. 5
b. 10
c. 15

3. Lifting slings must have an attached capacity tag.

a. true
b. false

4. You should put on a pair of _____ gloves before handling or inspecting wire rope.

a. rubber
b. heavy leather
c. cloth

5. Links of a chain that has been overloaded will be bent slightly _____..

a. inward
b. outward

6. Frequent inspections are typically performed on a(n) _____ basis.

a. weekly
b. monthly
c. annual

7. The force placed on each of two slings attached to a 1,000 load will equal the weight of the load if the horizontal sling angle is equal to _____ degrees.

a. 30
b. 40
c. 50

8. The throat, which is the deepest part of a hook, is the only portion that will safely hold loads at its rated capacity.

a. true
b. false

9. When switching from a light load to a heavier load, you do not have to re-test the crane's brakes.

a. true
b. false

10. Which signal is given by extending your arm, putting your palm face down and moving your hand rapidly right and left?

a. trolley travel
b. move slowly
c. emergency stop

ANSWERS TO THE REVIEW QUESTIONS

1. a
2. c
3. a
4. b
5. a
6. b
7. a
8. a
9. b
10. c