Training Solutions, Delivered!

INDUSTRIAL CRANE SAFETY

Leader's Guide, Fact Sheet & Quiz

Item Number: 3610

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

PREPARING FOR THE MEETING

Here are a few suggestions for using this program:

a) Review the contents of the Fact Sheet that immediately follows this page to familiarize yourself with the program topic and the training points discussed in the program. The Fact Sheet also includes a list of Program Objectives that details the information that participants should learn from watching the program.

b) If required by your organization, make an attendance record to be signed by each participant to document the training to be conducted.

c) Prepare the area and equipment to be used for the training. Make sure the watching environment is comfortable and free from outside distractions. Also, ensure that participants can see and hear the TV screen or computer monitor without obstructions.

d) Make copies of the Review Quiz included at the end of this Leader's Guide to be completed by participants at the conclusion of the presentation. Be aware that the page containing the answers to the quiz comes *before* the quiz itself, which is on the final page.

CONDUCTING THE PRESENTATION

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

b) Introduce the program by its title and explain to participants what they are expected to learn as stated in the Program Objectives of the Fact Sheet.

c) Play the program without interruption. Upon completion, lead discussions about your organization's specific policies regarding the subject matter. Make sure to note any unique hazards associated with the program's topic that participants may encounter while performing their job duties at your facility.

d) Hand out copies of the review quiz to all of the participants and make sure each one completes it before concluding the training session.

3610 INDUSTRIAL CRANE SAFETY
FACT SHEET

LENGTH: 20 MINUTES

PROGRAM SYNOPSIS:
Cranes and lifting devices are powerful, rugged machines that are critical to many industrial and construction operations. Just as crucial to these processes is the crane operator, because an improperly rigged or hoisted load can have monumental and often deadly consequences. Crane operators must be committed to moving loads in a safe, controlled manner in order to avoid injuries and property damage. This new video demonstrates the safe work practices and precautions necessary to keep these employees and their co-workers out of harm's way while cranes and hoists are being rigged or operated.

Topics include operator training and authorization, three types of crane inspections, the three most common types of hitches, the effect of sling angles on the force of the load, what to do before lifting a load and safely lifting and moving a load.

PROGRAM OBJECTIVES:
After watching the program, the participant will be able to explain the following:
- What to look for when conducting a pre-operational inspection;
- What the three common types of hitches are;
- How sling angles affect the force of the load;
- What to do before lifting a load;
- How to safely lift and move a load.

PROGRAM OUTLINE

TRAINING & AUTHORIZATION
- Before operating any crane, you must be trained and authorized by your employer. Do not attempt to operate any crane unless you are trained and authorized to do so.
- Qualified operators must be trained on a variety to topics related to the specific crane to be operated, including how to determine the crane's lifting capacity, the capacity of all rigging components and determining the weight of the load and its load center.
- You must also understand how various rigging configurations affect the capacity of a sling and the proper operation of the crane's controls; you must also know how to perform a pre-operational inspection of the crane and rigging equipment.

PERIODIC & FREQUENT INSPECTIONS
- All cranes must receive a detailed annual or "periodic" inspection from a qualified person or organization.
- This inspection examines the many parts of the crane that are "off limits" and out of view of most operators.
- This annual inspection must be documented, signed and dated.
- In addition, "frequent" inspections of the crane must be done by a qualified person designated by the employer.
- This frequent inspection, which should be done monthly, should inspect the crane hook, the hoist rope, all limit switches and safety stops. It should also verify the proper operation of the crane's controls.
- This monthly inspection should also be documented, signed and dated.

PRE-OPERATIONAL INSPECTION
- The crane operator should perform a pre-operational inspection before use.
- The operator should test each crane control to make sure it works properly and causes the crane to react as expected.
- This includes all directional controls, such as up and down as well as side to side movement.

- Limit switches and emergency stop controls should also be tested. For example, the upper limit switch should prevent the hook from being raised too high; test this without a load!
- When using a mobile crane, check fluid levels and tire pressures as well as the proper operation of all driving controls in addition to the crane controls.
- Inspect the wire rope of the hoist to ensure it is free of defects. Watch the rope as the hook is raised and lowered, looking for breaks, kinks or other damage.
- All rigging components should also be inspected for good condition.

INSPECTING HOOKS
- A hook should have a properly operating safety latch and it should not be stretched or bent.

• If you discover a hook to be stretched more than 15 percent of its original size or has been twisted more than 10 percent off the vertical, you must replace it.

INSPECTING CHAINS

• If you're using chains, make sure they are in good condition and don't show signs of wear or overloading.
• A chain that has been overloaded will have links that taper in towards the middle rather than maintaining a consistent oval shape.
• Also, look for excessive wear where links join each other or where the chain joins a hook.
• Be aware that chains should never be welded to other chains, spreader bars or hooks. Chains are made of alloy steel and heat from welding can make them very brittle; if you discover a welded chain, remove it from service immediately.
• Chains used as lifting devices must carry a capacity label. Checking for this label or tag is part of the pre-operation inspection.
• Chains frequently utilize various types of connecting devices and shackles. Inspect these devices, especially the pins and cotter keys for damage or excessive wear.
• Make sure these devices are oriented as designed to withstand the load. For example, a shackle is only designed to withstand a vertical load and should never be side-loaded.

INSPECTION & USE OF WIRE ROPE

• Wire rope is another common lifting device that must inspected before use.
• Wire rope is made of small wires twisted together to form strands. Several strands are then twisted around a core material to form a wire rope.
• When a particular strand makes a complete turn about the core, it is referred to as one "lay."
• The capacity of a wire rope depends on several factors, including the size and number of wires per strand, the number of strands and the type of core material.
• Wire rope is not required to have a capacity label affixed to it. Its capacity can be determined by looking it up in a chart or rigging book provided by the wire rope manufacturer or supplier.
• Make sure you fully understand how to determine the capacity of any wire rope you work with before using it to lift a load; ask your supervisor if you have any questions.
• Wire rope must be inspected for an excessive number of broken wires, which will reduce its capacity.
• When wire rope is used as a sling, it must be removed from service if any particular strand contains five or more broken wires within one lay or if there are 10 or more randomly-distributed broken wires within one lay.
• When wire rope becomes kinked, the core and strands may be damaged, reducing its capacity.
• When a wire rope has been overloaded, shock-loaded or side-loaded, the strands can separate or even push apart and a "bird cage" is formed.
• Excessive numbers of broken wires, kinks, separated strands and bird cages all require a wire rope to be removed from service.
• Always wear heavy leather gloves when handling wire rope. Broken wires can easily cut or puncture unprotected hands.

INSPECTING SLINGS

• Perhaps the most common lifting devices are the various types of nylon and webbed slings. These types of slings are strong and lightweight but are susceptible to damage.
• When inspecting this type of sling, look for cuts in the sling, frayed webbing or excessive wear and broken stitches.
• Nylon slings must have a capacity tag attached. If the capacity tag is missing, the sling must be removed from service.
• If the pre-operational inspection turns up any problems with the crane operation or rigging, do not use the crane and/or rigging. Remove it from service until the problem is corrected by a qualified person.

• Before working with any crane or rigging any load, make sure you use the necessary protective equipment required by your employer. Safety glasses, steel-toed boots and a hard hat are usually required; leather gloves may be necessary when handling wire rope or material with sharp edges.

LIFTING DEVICES

• Because loads come in many shapes and sizes, the various devices designed to lift them also come in many shapes and sizes.
• Some lifting devices are fixed in size and shape, while others may be adjustable.
• Some devices rely on pressure to clamp the load to the lifting device, while others rely on chains, hooks, slings or wire rope to do the job.
• The weight of any device attached to the crane hook must be considered part of the load. This is critical when determining if a load exceeds a crane's capacity.
• All components of the lifting device and rigging must be properly rated and certified load-tested to handle the load.
• This is why you should never use homemade lifting devices or attempt to repair any lifting device unless you are trained and authorized to do so. For example, never replace a missing shackle pin with a standard bolt or add a replacement link to a chain; these types of unapproved modifications can lead to disaster.

• The various types of fixed lifting devices will have a capacity tag or label displaying its load-tested capacity. If no capacity can be found, do not use the device.

THREE COMMON HITCHES

• Chains, slings and wire ropes can be connected to a load in various configurations that greatly affect their lifting capacity. This is why only trained and authorized employees are allowed to rig a load to a crane.
• The tag on most slings will list three different capacities for the three most common ways the sling is attached to the load; these different connections are commonly called "hitches."
• A vertical hitch is formed by simply attaching the rope, sling or chain directly from the hook to the load.
• A basket hitch is formed when a sling is passed under a load with both ends placed in the crane hook. Typically, two slings are used and adjusted to balance the load.
• A choker hitch may be used to attach a sling to a load. A choker hitch is formed by passing one end of the sling through another, then attaching that end to the crane hook.
• Be aware that using a choker hitch on a small diameter load while using a wire rope can kink and damage the rope.
• It's important to check the capacity of any sling you use and understand how that capacity changes based on the type of hitch you plan to use.

EFFECT OF SLING ANGLES ON LOAD FORCE

• The number of slings used, and the sling angle has a tremendous effect on the amount of force placed on the sling and must be considered when selecting the proper sling for the job.
• A sling angle is the angle formed between the crane hook and the sling.
• A single sling with a vertical hitch is holding a 1,000-pound load. There is no sling angle; the amount of force placed on the sling is 1,000 pounds.
• When two slings are used and attached on the outside edge of the load, a sling angle is created. For example, a sling angle of 30 degrees is created. The force placed on each leg is 578 pounds.
• If the angle is further increased to 45 degrees, the force placed on each leg increases to 707 pounds.
• If the angle is further increased to 60 degrees, the force placed on each leg increases to 1,000 pounds. This is equal to the full weight of the load.
• As this angle continues to increase, the force on each sling continues to increase and can reach levels far exceeding the weight of the load and can easily overload the sling.
• A good rule of thumb to avoid overloading a sling is to use a sling rated for the full weight of the load and avoid sling angles greater than 45 degrees.
• Another common application is to use a spreader bar. Using the spreader bar can eliminate sling angles, allows the use of shorter slings and can reduce the force placed on the slings.
• For the same 1,000-pound load using a spreader bar, the load is divided equally between the slings; the force on each sling is 500 pounds.

PREPARING FOR THE LIFT

• Before using a crane, look around for hazards and always make sure to look up as well. Look for any overhead hazards or other cranes that may be in your path of travel or in your swing radius.
• Keep a sharp lookout for power lines and other electrical hazards. Never use a crane within 10 feet of electrical power lines or live electrical parts.
• Make sure there are no co-workers or pedestrians in the immediate area before you begin your lift. Workers in the surrounding area should be informed that a crane is being placed in operation.
• Mobile crane operators must ensure that no one is within the swing radius of the crane. Barricades and/or spotters may be used for this function.

ATTACHING THE LOAD

• No matter what type of hitch you are using, place it near the center of the load so it will be balanced when lifted by the crane.
• When connecting the load to the hook, always place the sling or connecting device into the deepest part or "throat" of the hook. This is the strongest part of the hook and the only part designed to hold loads at its rated capacity.
• Lip hooking or connecting the load too close to the lip of the hook can bend and damage the hook.
• Be aware that odd-shaped loads may have a load center that is not in the visual center of the load.

TESTING THE RIG & BRAKES

• Test your rig by slowly lifting the load a few inches off the ground to ensure it stays in balance and doesn't begin to swing.
• If the load is not balanced, lower it back to the ground, adjust the position of the rig and try again.

- If this is the first lift of the day, take a moment to test the crane's brakes by lifting the load a few inches and letting it hang about 30 seconds. If the brakes are functioning properly, the load should not slip.
- It's also a good idea to test the brakes when changing from a lighter load to a heavier load.

LIFTING THE LOAD

- Remember that cranes are only designed to hoist loads straight up. Make sure the crane is directly over the load before you lift.
- When a crane is not placed directly over a load to be lifted, known as "side loading," it can damage parts of the crane and rigging as well as cause the load to swing out of control.
- Lift the load slowly and avoid sudden jerks and quick stops.
- Lifting and stopping loads too quickly, also known as "jerking a load," can damage the crane and the lifting devices.
- This is especially damaging to wire rope, leading to strand separation and bird caging.

MOVING THE LOAD SAFELY

- When moving the load, carry it just high enough to clear obstacles in your path.
- Move the crane at very slow speeds so you can pay attention to the load and its path of travel at the same time.
- Always keep the load's stability as top priority when you are moving the load.
- Often, ropes or lines called "taglines" are connected to a load to help control its orientation while being moved. With the crane holding the weight of the load, it doesn't take much tension on the tagline to prevent swinging or to move the load into proper position for landing.
- Operators and riggers must understand that there is never any reason to ride a load. This dangerous practice is strictly prohibited.
- No matter how much control you think you have, never pass the load over co-workers or pedestrians and never allow them to pass under the load.
- Always be aware that moving a load can easily crush you or a co-worker against a solid object. Operators with handheld remote controls are especially vulnerable and must keep a safe distance, especially when lifting and landing loads.
- Riggers and operators should be aware of pinch points created by slings and attachments as the load is raised and be aware of the location of feet and hands when landing a load.

USE OF SIGNALS

- In tight spots or when operating a crane with limited visibility, have a properly trained co-worker assist you in lifting or placing a load. This co-worker must be trained to use the proper signals to direct the crane operator.
- A placard of these signals must be posted on the job site and the operator and signal person must have a clear understanding of the signals to be used and their meaning.
- To avoid confusion, there should be only one signaler during any lifting operation; however, the crane operator should always obey a stop signal no matter who gives it.

COMPLETING THE LIFT

- When you get the load to its destination, land it as soon as possible. Never leave a suspended load unattended.
- After landing and securing the load, remove slings and lifting devices.
- Return the crane, slings and lifting devices to their respective storage areas.
- Crane attachments are notorious tripping hazards and can quickly become a housekeeping nightmare if not stored properly.
- In addition, webbed slings may become damaged if left on the floor.
- When finished with the crane, make sure the hoist block is returned to a high enough position so pedestrians and work vehicles can pass underneath safely.

ANSWERS TO THE REVIEW QUIZ

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

INDUSTRIAL CRANE SAFETY

REVIEW QUIZ

The following questions are provided to determine how well you understand the information presented in this program.

Name_____Date_____

1. Which type of crane inspection involves examining parts that are “off limits” or out of the view of most operators?

a. Frequent
b. Periodic
c. Pre-operational

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

a. 5
b. 10
c. 15

3. Chains used as lifting devices are not required to carry a capacity label.

a. True
b. False

4. Wire rope is not required to carry a capacity label.

a. True
b. False

5. The weight of any lifting device attached to a crane hook must be considered part of the load.

a. True
b. False

6. A crane that is not placed directly over a load to be lifted is known as _____.

a. Back loading
b. Jerking the load
c. Side loading

7. Riding a load is only permitted when you are sure your weight combined with the load weight doesn’t exceed the capacity of the load and rigging devices.

a. True
b. False

8. A crane operator should always obey a stop signal no matter who gives it.

a. True
b. false