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# **RIGGING SAFETY IN INDUSTRIAL AND CONSTRUCTION ENVIRONMENTS**

**Leader's Guide, Fact Sheet  
& Quiz**

**Item Number: 5091**

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***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.

# 5091 RIGGING SAFETY IN INDUSTRIAL AND CONSTRUCTION ENVIRONMENTS

## FACT SHEET

**LENGTH: 16 MINUTES**

### **PROGRAM SYNOPSIS:**

The loads that cranes lift can come in all shapes and sizes, but one thing they all have in common is the potential to cause serious problems if they are mishandled. Loads that have been improperly rigged can be dumped on the ground, start to spin or swing out of control, all of which creates hazards for anything or anyone near them. To prevent accidents and injuries during crane operations, riggers need to understand the hazards that are associated with lifting and moving loads as well as the equipment and safe work practices that they can use to avoid them. That's the purpose of this program—to review the hazards associated with raising loads and loads that are rigged incorrectly as well as the work procedures employees should follow to prevent rigging accidents.

Topics include the rigger's role in lifting and moving loads, sling selection, how sling angles affect tension, three basic types of hitches, standard hand signals, how to prepare to lift a load and how to lift, move and lower a load safely.

### **PROGRAM OBJECTIVES:**

After watching the program, the participant should:

- Understand the safety standards that OSHA has established for working with cranes.
- Understand the role that a rigger plays in preventing accidents and injuries during crane operations.
- Understand the advantages of different types of slings.
- Know the three basic types of hitches and how to use them.
- Understand why "sling angles" must be taken into account when rigging a load.
- Know the safe work practices they should follow when raising, moving and lowering a crane's load.
- Know how to use standard hand signals during the rigging and handling of a load.

### **PROGRAM OUTLINE:**

#### **BACKGROUND**

- **From freight to equipment to building supplies, loads can come in all shapes and sizes.**
  - And there are a number of different ways to rig them so that a crane can lift and move them securely and safely.
- **Rigging a load improperly can cause things to go very wrong, damaging the load and other property and injuring people who are working in the area.**
  - So riggers play an important role in preventing incidents and injuries when cranes are being used.
- **Every day, thousands of employees in the U.S. work with cranes.**
- **Because of the hazards associated with this type of work, The Occupational Safety and Health Administration (OSHA) has established "crane safety" regulations that apply to both industrial and construction work.**
- **These standards cover a number of areas, including:**
  - Design, construction and safe use of rigging equipment.
  - Best practices for lifting, moving and lowering loads.
  - Standard hand signals that should be used in crane operations and more.
- **Everyone who works with and around cranes needs to understand these regulations and follow the specified procedures.**

#### **THE RIGGER'S ROLE IN LIFTING & MOVING LOADS**

- **Riggers play a special role in lifting and moving loads safely. They:**
  - Verify how much the load weighs.
  - Choose and attach the appropriate slings (when required).
  - Use the hitch that will best balance the load and hold it securely.
- **Riggers also:**
  - Help control the load throughout the lifting and moving process.
  - Assist in landing the load safely at its final destination.
  - Disconnect it from the crane when the move is done.

- **But your safety responsibilities as a rigger begin before you pick up a sling or attach a tagline, with the personal protective equipment (PPE) that you wear. Your PPE should include:**
  - Safety shoes with steel toes to guard against injuries from dropped loads or equipment.
  - A hard hat and safety glasses to protect your head and eyes from falling or hanging objects.
  - Heavy leather gloves to shield your hands from abrasions that can be caused by rope, braided wire and sharp objects.

### **CHOOSING THE RIGHT SLING FOR THE LOAD**

- **In many cases, slings are used to connect a load to a crane's lifting hook.**
  - They support the load's weight while holding it securely and helping to balance it.
- **Different types of slings are intended to lift and carry loads of various sizes, shapes, weights, materials and even temperatures, safely.**
- **Commonly used types of slings include:**
  - Wire rope slings: widely used for lifting loads on construction sites and other rugged environments.
  - Synthetic slings: the lightest and most flexible type of sling, good at gripping a load securely without damaging it.
  - Metal mesh slings: with wide, durable surfaces that provide a good grip and balance for a load.
  - Chain slings: used for lifting very heavy loads or in high-temperature environments.
- **Whatever type of sling you're using, you should inspect it thoroughly for damage and defects that could reduce its strength or make it hazardous to use.**
  - Check wire rope slings for broken wires, crushed sections, kinks or bends.
  - Inspect synthetic slings for abrasions, loose threads, cuts, tears or knots.
  - Make sure chain and metal-mesh slings have not been stretched, gouged, cracked or damaged by excessive heat.
- **If you find problems with the sling you've selected, don't use it!**
  - Take it out of service and replace it.
- **You should also take care to avoid damaging slings yourself:**
  - Never tie a knot in a sling.
  - Avoid kinking and twisting them.
  - Never drag them over rough surfaces.
- **It's important to make sure that the sling you're using has the rated capacity to handle the weight of the load you're lifting. You can find this information:**
  - Stamped or molded into metal chains.
  - Marked on a tag attached to a web or metal mesh sling.
  - Listed in the manufacturer's manual.
- **Overloading a sling can cause it to fail and drop its load.**
  - Sling failure can lead to serious damage, injuries, even fatalities.
  - Before you make a lift, make sure that the weight capacity of all the equipment you use, shackles, hooks, even the crane itself, can handle the load you're working with.

### **HOW SLING ANGLES AFFECT TENSION**

- **Remember that the angles of the slings in relation to the loads they are carrying can significantly affect the amount of tension that is placed on them.**
  - The "sling angle" is the horizontal angle that is formed between the "leg" of the sling and the "top" of the load.
  - For any given load weight, the smaller the sling angle the more strain that is placed on the sling.
- **For example, consider a sling that connects a thousand-pound load to a crane's lifting hook.**
  - If the sling itself is straight up and down, the sling angle is 90 degrees.
  - So the strain on the sling equals the weight of the load, a thousand pounds.
- **Now consider a 1,000-pound load that is rigged using two slings, attached symmetrically over the load's center of gravity.**
  - In this setup, with the sling angles at 60 degrees, the strain on each sling equals 577 pounds.
  - That means the total strain on the rigging will be 1,154 pounds... greater than the weight of the load itself!
- **To rig loads safely, you must take the effects of "sling angles" into consideration.**
  - A sling angle chart or rigging pocket guide can help you to assess these angles and select the right slings for your job.

### THREE BASIC TYPES OF HITCHES

- A "hitch" is what is used to attach, wrap or "reeve" a sling onto a load so that it can be raised. The purpose of a hitch is to:
  - Support a load and keep it under control.
  - Prevent it from tipping or rotating while it is lifted, moved and landed.
- There are three basic types of hitches.
- A "vertical hitch" connects a load to the crane hoist by a single sling leg that hangs straight up-and-down.
  - It is used on loads that are equipped with lifting attachments such as eye bolts or latches.
- A "basket hitch" passes the sling under the load with its ends connected to the crane hook.
  - It can provide the greatest lifting capacity of all hitches.
- A "choker hitch" passes one end of the sling under the load and through an attachment or "eye" on the other end of the sling, so that the sling tightens on the load when it is raised.
  - This hitch is used when you need to get a good "grip" on the load.
  - A variation known as the "double-wrap choker hitch" passes the sling around the load twice for extra support and security.
- In some cases, a sling hitch and a load could damage each other because of the tension that is created during the lift.
  - To prevent this, you can place padding, wood or other "softeners" between the hitch and the load, especially on corners and edges.
- Before connecting a sling to a crane, you need to inspect the lifting hook for signs of cracking, stretching or other damage. Never use a hook that:
  - Is stretched out of shape by 15 percent or more.
  - Is twisted by more than 10 degrees.
  - Has a safety latch that is bent or broken.
- Regardless of what type of hitch you use, you can improve your control of the load by attaching one or more lengths of rope, called "taglines", to it.
  - Tension on the taglines can prevent the load from rotating and allow you to guide it smoothly to its final destination.

### STANDARD HAND SIGNALS

- To lift a load safely, everyone involved in the process must be able to communicate with each other quickly and clearly.
  - So you need to know and use the standard hand signals that have been established by OSHA.
- To show that you want to hoist a load, lift your arm, point up and move your index finger in a small horizontal circle.
- To indicate that you want to lower a load, point your arm downward, extend your index finger and again move it in a small horizontal circle.
- To stop a crane, hold your arm out to the side, face your palm to the ground, then move your arm back and forth horizontally.
- For an emergency stop, hold both of your arms out to the side with palms down and move your arms horizontally.
- If you're using a boom crane:
  - Extend your arm out to the side, then point your thumb up when you want the boom to be raised.
  - Extend your arm out to the side and point your thumb down when you want the boom to be lowered.
- In some cases, electronic communications devices such as walkie-talkies or handheld phones can be used.
  - A crane operator must always use a "hands-free" model.
- Electronic communications equipment should be tested before a lift, to ensure that it works, and everyone is on the same channel.

### PREPARING TO LIFT A LOAD

- When it's time to make a lift, there are a number of safe work practices you should follow to make it safely.
- Start with some simple housekeeping.
  - Clear away any rubbish or unused equipment in the area that could get underfoot or create an obstacle.
  - Any people in the area who are not directly involved in making the lift should be cleared out as well.
- You should always make sure that:
  - The crane hook is positioned directly above the load, so that the lift will be made straight up.
  - All the rigging connections are secure.
  - Your body parts, as well as those of anyone working with you, are clear of any pinch points between the load and the rigging.
- Next you should make a "trial lift", by raising the load about a foot off the ground, to verify that:

- The rigging can support the load safely.
- The load does not hang at an angle of more than 10 degrees from the horizontal.
- The crane can hold it securely using only the brake power on the hoist cable.
- **If you find any problems, set the load down and correct them, then make another trial lift.**

#### **LIFTING, MOVING & LOWERING THE LOAD**

- **When you are satisfied that the rigging is secure and the load is stable, the lift can proceed.**
- **Remember, you should never tie or wrap a tagline around your hand or body while the load is suspended.**
  - If the load moves unexpectedly, the tagline could drag you with it, and you could end up underneath some very heavy material!
- **Coworkers or bystanders should never be allowed underneath a load, and a load should never be moved or stopped over them.**
- **As the load reaches its final destination, stay away from walls, equipment, stacks of materials or other immovable objects that you could be pinned against if the load shifts unexpectedly.**
- **Never "un-rig" a load until it is fully lowered, stable and secure on the ground.**
  - You can then remove the slings and other rigging equipment from the crane hook and return them to their storage area.
- **Be sure to lower every load that you raise, even if it hasn't reached its final destination.**
  - A suspended load is an "accident waiting to happen".
  - Never leave one unattended.

## RIGGING SAFETY IN INDUSTRIAL AND CONSTRUCTION ENVIRONMENTS

### ANSWERS TO THE REVIEW QUIZ

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

**RIGGING SAFETY IN INDUSTRIAL AND CONSTRUCTION ENVIRONMENTS**  
**REVIEW QUIZ**

Name \_\_\_\_\_ Date \_\_\_\_\_

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

1. The crane standards established by OSHA only apply to construction work.
  - a. True
  - b. False
2. To protect themselves from falling and hanging objects, riggers should always wear hard hats on the job.
  - a. True
  - b. False
3. In some situations, a bad "sling angle" can cause the strain that is placed on a load's rigging to be greater than the weight of the load itself.
  - a. True
  - b. False
4. For any given load weight, the smaller the sling angle, the more strain that is placed on the sling.
  - a. True
  - b. False
5. A "vertical hitch" can be used on any type of load.
  - a. True
  - b. False
6. The purpose of a hitch is to support a load and keep it under control while it is being raised, moved and landed.
  - a. True
  - b. False
7. "Taglines" are pieces of material that are placed between a hitch and the load to keep them from damaging each other.
  - a. True
  - b. False
8. The hand signal you should use to indicate that you want the boom of a crane to be raised, is to extend your arm out to the side and point your thumb up.
  - a. True
  - b. False
9. The hand signal you should use to indicate an "emergency stop" when a load is being lifted, is to extend your arm out to the side and point your thumb down.
  - a. True
  - b. False
10. On a busy or crowded worksite, it is okay to allow coworkers to walk underneath raised loads, as long as they are wearing hard hats.
  - a. True
  - b. False