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Crane Safety & Labeling white paper by Graphic Products, Inc.



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DANGER



Overhead Crane Hazard.

Keep clear of this area to avoid death or serious injury.

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Please feel free to share this with someone else who could use it.

Thank you!

CRANE SAFETY & LABELING

Introduction

Tower crane operator Klaus Coleman sits on top of the world, far above the streets of Portland, Oregon. He climbs up to his crane's cab in the early morning, well before the sunrise, to orchestrate a mechanical dance where he controls about a hundred lifts and movements each day, with loads weighing up to 44 tons. Coleman has spent 20 years working with cranes, including those on Portland's 26-story Fox Tower and the city's new cable-stayed bridge, Tilikum Crossing.

But not all cranes stand at the top of skyscrapers. Many of these lumbering giants operate on ground level. Wherever they are, cranes, derricks, and hoists are all critical equipment for moving large and heavy objects. However, swinging loads, falling objects, and moving machinery can crush workers, and the sheer size and movement of cranes increase the risk of accidental electrical contact, leading to shocks and fires. Safety is Coleman's first priority, and the focus of every crane operator, site manager, and team member on a construction site. Everyone needs to be aware of the hazards that cranes represent.

There are two main approaches used to ensure safety with cranes: Administrative Controls and Engineering Controls. Administrative Controls are rules, processes, and instructions that minimize danger, while Engineering Controls are physical

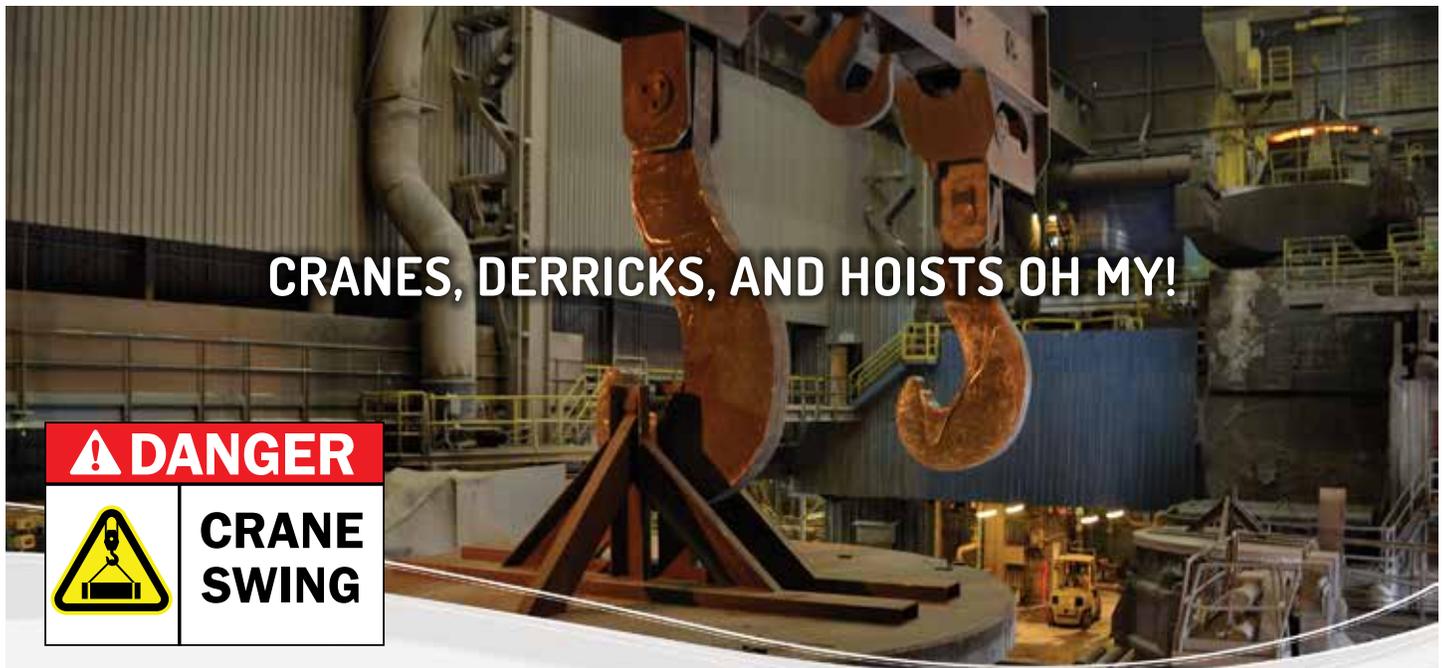
guards, mechanisms, and materials that protect workers. Engineering Controls that physically prevent accidents are preferred, Administrative Controls are needed to cover the situations where a hazard can't be engineered away. Safe work practices, as well as OSHA regulations, use both types of controls.

Engineering Controls

OSHA's requirements for safe crane equipment are exhaustive. These regulations incorporate limits on equipment, as well as demanding safety features like automatic clamps to prevent a rail-traveling crane from leaving its rails. "Safety features should never be bypassed for any reason," said Coleman. Those features are necessary because crane accidents can cause massive damage, and no amount of productivity can make up for a preventable workplace fatality.

Safe Crane Design and Placement

The design and construction of cranes and related equipment is governed by a variety of standards. Rather than developing their own crane-building manual, OSHA has referred to industry standards created by experts in the field,



CRANES, DERRICKS, AND HOISTS OH MY!

| | |
|-------------------------------------------------------------------------------------|--------------------|
| ⚠ DANGER | |
|  | CRANE SWING |

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including the American National Standards Institute (ANSI), the Power Crane and Shovel Association (PCSA), and the Society of Automotive Engineers (SAE).

First and foremost, cranes need to be carefully placed. The surface supporting a crane must be able to support the crane's weight, and withstand the forces involved when the crane lifts and moves heavy loads. Cranes that move on tracks require buffers at each end of the track to prevent over-travel or derailment, and some crane types even require automatic "kill switches" to stop movement past a certain point.

Every crane—like all mechanical equipment—needs enough clearance on all sides to allow it to operate safely. Marking these clearances with paint, labels, or marking tape will help workers keep those areas clear. This kind of marking is required by OSHA for all permanent aisles and passageways. Areas near a crane where a worker could be caught or crushed should be barricaded to prevent worker entry. Depending on the installation, these barricades may be temporary or permanent. When temporary barricades are used, a taped outline can make measuring and setting barricades a simpler and faster process.

Moving crane parts like belts, gears, and pulleys require protective guards to prevent hazards. These guards often include specific warning labels to inform a worker about what is being guarded, and what steps need to be taken in order to safely perform any maintenance.

Safe Lifting Equipment

Coleman once saw a \$35,000 piece of machinery totaled because a superintendent ignored the limits on a set of rigging. The superintendent insisted on moving the machinery immediately, instead of waiting for the appropriate rigging materials. As a result, the rigging broke when the machinery was 40 feet in the air—dropping the 13-ton weight to the ground. Nobody was hurt, but the equipment was destroyed, and the superintendent had to find a new job. If he had followed OSHA's equipment regulations, or listened to the qualified rigger on the site, the accident would never have happened.

Each type of rigging—wire ropes, fiber ropes, chains, and synthetic webs—has its own rules for safe use. The core rule is simple: never exceed the rated capacity of any piece of lifting equipment. In addition, any piece of rigging with visible damage must be immediately removed from use. Most rigging equipment has permanent labels to mark its type, class, capacity, and special limits like chemical warnings or temperature ranges. If those details change, or the labels become illegible over time, the labels may need to be updated or replaced.

When creating labels, choose stock that is appropriate to the environment and has been tested for those conditions. For instance, outdoor environments pose greater environmental challenges to labels, such as moisture and UV rays from sunlight. A durable outdoor label stock should be selected. Overlaminated can further increase the life of a sign or label.

Administrative Controls

Once the machinery and equipment conforms to safety standards, the next step is ensuring that workers follow safe procedures when operating machinery. These safety rules are the minimums enforced by OSHA, but do not represent all possible safe steps.

Inspection Requirements

Before climbing into his cab, Coleman conducts a thorough safety inspection of his crane, as required by OSHA regulations. He starts at the foundation, moving to the bolts and pins that hold the crane together, and continuing to all of the connections and jibs. He checks all of the electrical components, the hoist cable, and the hoist drum brakes; then the trolley and its cable and brakes. Finally, he starts the motors—and checks each control and safety limiter. This hour-long ritual is done before a single load is lifted, before a single life is jeopardized.



When creating labels, choose stock that is appropriate to the environment and has been tested for those conditions.

CRANE SAFETY & LABELING

This daily inspection is part of safe operation. Problems need to be solved before work begins. Without this inspection and repair process, the equipment might fail during use, with enormous costs in productivity, damaged equipment, and injury or even death. As a crane operator, Coleman focuses on his machine, but a designated rigger is required to inspect all of the equipment that will be used to connect a load to the crane for lifting.

At least once each year, an even more thorough inspection of the hoisting machinery must be made. These intensive inspections can catch problems that haven't developed visible signs, or are difficult or impossible to detect during the daily overview. Records of these annual inspections must be kept, and it may be helpful to label the equipment with its inspection date.

Normal Operating Procedures

After the inspection, the real work begins. Certain general procedures for crane operation are required; for instance, the operator of a crane should always know where the load is coming from and where it is going, and what areas it will pass through along the way, before beginning the movement. Everyone, including the crane operator, must stay clear of the load and its path.

It is often necessary to use a spotter or floor person (also known as signal person) to help guide a hoisting operation. Coleman said, "When the crane operator can't see the load, and has to rely on a signal person, that person has to be highly trained." A set of standardized hand signals is often used to communicate, and an illustration of the signals in use must be posted at the worksite. Knowing the signals isn't enough. A spotter must understand the movements, abilities, and limits of the crane in order to help maintain safe operation, improve precision, and keep appropriate clearance between the load and any other objects. "Very good signal people make the job look very easy, when it actually isn't," Coleman added. "Too many supervisors think that anyone can signal a crane. That just isn't true. It's a specialized skill."



Worksite signs can mark the boundaries of a crane operation area. This type of signage is one important part of an overall safety program.

Communication for Safety

Despite the long hours, and the lack of a microwave in his crane cab, Coleman can't really see himself taking a nine-to-five desk job. "What job gives you such an unprecedented view of the world?" he said. "I'm a lucky guy."

Crane safety isn't a matter of luck, though—it relies on both Engineering Controls (physical devices or modifications) and Administrative Controls (rules and procedures) to eliminate and mitigate hazards. In order to use those controls effectively, communication is critical.

In addition to the warnings and instructions required by regulations, other signs and labels can contribute to effective worksite communication. For example, step-by-step instructions can be posted to remind operators of a new procedure. Warnings can be posted at entrances to an area when temporary working conditions are in effect. Contact information for emergency assistance, equipment maintenance, and job management can be shown right at each workstation. Even ordinary labeling to identify storage locations or equipment ratings can contribute to worksite safety by providing effective communication.

A label printer is an effective way to create these notices, allowing customized labels to be printed on demand. The DuraLabel line of printers from Graphic Products includes a variety of options ranging from desktop models to portable, self-contained systems, and supplies are available to match any worksite situation. The team at Graphic Products can offer expert advice to help a site manager or safety officer find the best solutions for signage. Once all the necessary information is shared, truly safe crane operation will be within reach.



DuraLabel Toro and DL9000 PS—The ideal companions for printing OSHA compliant safety labels.

Guide to Hand Signals for Cab-Controlled Cranes

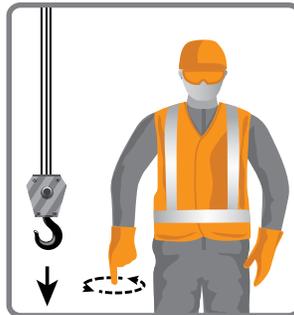
Whenever an overhead crane is controlled from a cab, the crane operator should rely on a floor person to direct the movement of loads. Both the operator and the floor person should learn and use industry-standard hand signals to ensure clear communication. The crane operator should only follow instructions from the designated floor person, with one exception: an “emergency stop” signal should always be obeyed, no matter who gives it.

Below are the nine most common hand signals for overhead cranes. All signals to be used should be agreed upon by the operator and floor person before work begins.



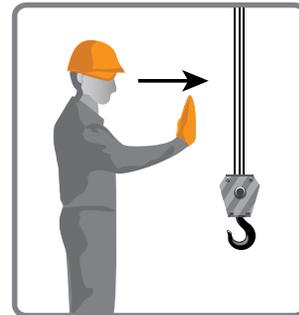
HOIST (RAISE)

Raise one arm and index finger, pointing up, and move hand in a small horizontal circle.



LOWER

Lower one arm and index finger, pointing down, and move hand in a small horizontal circle.



BRIDGE TRAVEL

With arms forward and hands open, make a pushing motion in the direction of intended travel.



TROLLEY TRAVEL

With palm up and fingers closed, extend thumb and jerk hand in the direction of intended travel.



MOVE SLOWLY

Make any movement signal with one hand, holding the other hand motionless over it.



STOP

Extend one arm, palm down, and swing arm back and forth.



EMERGENCY STOP

Extend both arms with palms down, and swing both arms back and forth.



MULTIPLE HOIST CRANES

Raise a number of fingers to indicate which hoist is to be used.



MAGNET DISCONNECTED

Extend both arms to the sides, with palms facing up. (Only the operator should give this signal.)

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