

Working safely with cranes

Knowing the fundamentals of crane operation and how to lift a load safely can help prevent accidents and increase jobsite efficiency

By John A. Koski

Cranes of many types are standard pieces of equipment in most precast operations. Inside the plant, overhead and pedestal cranes are used to move molds, materials, and finished products. Out in the yard, rough-terrain and truck-mounted cranes find frequent use moving and storing finished products and loading them onto truck trailers for delivery.

Anyone who has used a crane knows that working with and around them can be dangerous. Crane accidents can happen in the wink of an eye. When they do, equipment is damaged; products are ruined; fines, penalties, and negative publicity may result; and—worst of all—workers can be injured or killed.

Fortunately, crane accidents are preventable, and the rewards can be significant. For example, a good safety record can improve employee morale, lower insurance rates, be a source of positive publicity, and increase productivity and efficiency.

Some of the primary causes of crane accidents include inexperience, neglecting to preplan a lift, failure to inspect the crane and rigging before beginning a lift, not setting up properly for a lift, an improperly rigged load, and not knowing how to read a load chart. Knowing how to safely operate and work around cranes not only helps build a better safety record, it also increases plant efficiency.

Although these guidelines are not all-inclusive, they can help in developing a crane safety program. Remember, however, to always check with the manufacturer for specific information regarding the maintenance, inspection, and safe operation of the cranes, rigging, and other equipment being used.



When a crane begins to tip, the back end becomes light and rises into the air. This places stress on the crane's components and can cause structural damage, including boom collapse. In addition, adequate blocking should be placed under all outrigger pads and the crane's swing radius should be barricaded.

GENERAL PRINCIPLES

Hand signals. Don't begin any lift unless everyone involved understands accepted crane hand signals. A signalperson should be appointed to signal the crane operator. Everyone should be aware that the crane operator will respond only to the signalperson—except for the stop signal, which can be given at anytime by anyone. Make sure everyone knows who the signalperson is and that the crane operator and signalperson are in constant and clear communication during the lift.

During the lift. Every crane operator should understand and know how to use a crane's load chart. They should know how to take deductions and should always know how much the load weighs before beginning a lift. On rough-terrain and truck-mounted cranes, never test a crane's capacity by lifting a load to find the crane's tipping point. Doing so can cause structural damage to the crane, including causing the boom to collapse or fail.

All loads should be properly rigged. This ensures that the load remains balanced and prevents materials from sliding out of the rigging. Taglines can be used to help keep loads under con-

trol but should not be used to maintain balance while the load is being lifted.

Don't lift, swing, lower, or stop a load too fast. Doing so can cause an accident and result in structural damage to the crane caused by shock loading. In addition, when lifting, swinging, lowering, or traveling with a load, be careful that the hook, rigging, or load don't snag or hit

any obstructions.

OVERHEAD CRANES

Overhead cranes are a mainstay in most precast plants. Often, however, little thought is given to their use. To prevent problems, follow the manufacturer's maintenance guidelines and make sure that all workers authorized to operate overhead cranes have been properly trained.

At the start of each day or shift, visually check the crane for any damage. This can include wire rope that is kinked, flattened, or has broken strands. Examine the block and hook to see that they are in good condition and that the hook's safety latch is working properly.

Next operate the crane through all of its functions (travel, rack, and lift). Listen carefully for any unusual sounds, such as noisy gears or metal rubbing against metal. Make sure that all safety devices, such as the warning lights and horns, are functioning.

Never attempt to pull or slide a load along the floor. As with other types of cranes, overhead cranes are designed for straight lifting only. Side-lifting places the hoist lines at an angle. When this happens, wire rope wound

onto the hoist drum will not lay properly. Instead, it can become wedged between adjacent wraps and become flattened or kinked. Side-loading also may cause the wire rope to be bent over the side of the hoist drum or other crane components. When this occurs, the hoist drum can be damaged, the rope can be flattened, strands within the rope can break, or friction caused by the turning hoist can damage the rope. Any one of these can result in having to replace the wire rope on the hoist drum. Additional time is lost because the crane must be out of service for repairs.

One of the most important rules is that the operator should always know the weight of the object to be lifted and how to properly rig it for lifting. During crane use, instruct operators to be careful not to run the crane against the end bumpers or, where two or more cranes share the same track, into another crane. Operators also should be aware of the work going on around them and plan their lifts accordingly.

On cranes equipped with a pendant control, instruct workers not to let go of the control box unless the pendant line is in a vertical position. Letting go of the control box while the pendant line is at an angle causes it to swing like a pendulum, allowing it to strike other workers or equipment.

On cranes that are radio-controlled, instruct operators to set the control box in a safe place that is easily accessible when the crane is not in use. A damaged or misplaced control box can prevent the crane from being moved should an emergency arise.

ROUGH-TERRAIN AND TRUCK CRANES

At the start of each day or shift, inspect the condition of the crane before starting the engine. Be sure the machine is lubricated according to the manufacturer's guidelines. Check the level of fuel, coolant, hydraulic and lubricating oil reservoirs, as well as the condition of filters. On rubber-tired cranes, check the tires for cuts, gouges, and underinflation.

As you walk around the machine, look for any signs of physical dam-

age, such as cracked, bent, or dented components. Carefully inspect painted surfaces for indications of hidden damage. Cracked or flaking paint can indicate more severe structural damage such as a broken weld or a buckled structural member. Keep painted surfaces clean to aid in these inspections.

Look for fluid leaks. If a leak is observed, find its cause and repair it before operating the machine. Check that all window glass on the operator's cab is clean and undamaged so that the operator has an unobstructed view.

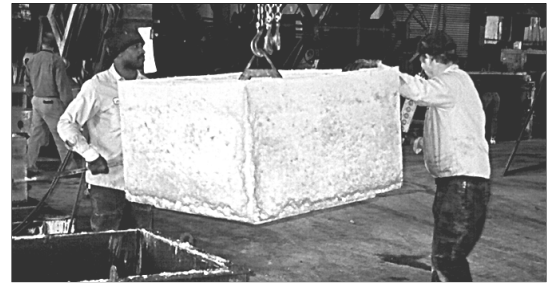
Check the crane's major components, such as outriggers (the condition of pads, cylinders, and arms), wire rope (for kinks, flattening, broken strands, and other damage), boom and sheaves, and hooks (for bending or twisting and inoperative or missing safety latches).

Also check all rigging and other lifting devices. These include slings and chokers (condition of hooks and eyes; worn or damaged links on chain-type slings; kinks, flattening, or broken strands on wire-rope slings; and torn or damaged fibers on synthetic slings).

Inside the cab. Upon entering the cab, check that the soles of your shoes and the machine's foot pedals are clean and dry. Doing so reduces the possibility of your shoes sliding off the pedals during operation. If there's any mud, grease, or other foreign material on your shoes, the foot pedals, or the cab floor, clean it off before proceeding.

Check that the load chart and other instructions and warnings signs are in the cab and visible to the operator (as required by OSHA). Before starting the engine, check that all levers and controls are properly positioned. After starting the engine, check all gauges and other indicators for proper readings. Take a few moments to listen to the engine for any unusual noises.

After the engine has warmed up, check the operation of the hoists, boom upper-angle limit switch, boom-angle indicator, backup alarm, anti two-block warning device, and



Overhead cranes are a mainstay in most precast concrete plants. Knowing how to operate them safely is one of the keys to a safe and productive workplace.

load-moment indicator. Once again, be alert for any unusual noises or vibrations as these tests are undertaken.

Outrigger safety. Check the surface on which outriggers will be set. It must be firm and level. One rule of thumb is that the tonnage of the machine divided by five equals the square feet of blocking surface area required per outrigger. For example, a 50-ton crane requires 10 square feet of blocking area per outrigger. Another rule of thumb is that the blocking should cover a minimum of three times the surface area of the outrigger pad. In addition, the pad should not extend over the edge of any portion of the blocking, and all blocking must be level.

Use and fully extend all outriggers and carefully level the crane. If the crane is not level, stresses develop that can twist or otherwise damage the boom, possibly causing it to fail or the crane to tip. In addition, all outrigger pads must be pinned to the cylinder arms to prevent their coming loose in the event the crane becomes light on one side during a lift. On rubber-tired machines, make sure that all wheels are off the ground and that the weight of the crane is carried by the outriggers.

Once the crane is in position for the lift, barricade any accessible areas within the swing radius of the rear of the rotating superstructure to prevent workers from being crushed or struck (as required by OSHA).

Crane capacity. The operator should have a thorough understanding of the factors that can affect the crane's capacity to lift a load. Questions to be answered include:

- What is the configuration of the

crane? This includes such things as boom extensions, reeving, and type and placement of outriggers.

- Which quadrants will the crane be working in? For example, on some cranes, depending on outrigger placement and other factors affecting machine balance, lifting of any type is not recommended over the front of the crane; on other cranes, capacities are greatly diminished in some quadrants.

- What is the boom length? Generally, the longer the boom, the less the crane can lift.

- What is the boom angle? Usually, the greater the angle of the boom, the closer the load is to the machine and the more it can lift. The smaller the boom angle, the further the load is from the machine and the less it can lift.

- What is the radius of the load? In general, the greater the radius (measured from the center of the turntable to the vertical lifting line), the lower the lifting capacity.

- How many line parts are being used? In other words, is a two-, four-, or even nine-part line being used? If the same size wire rope is used, increasing the number of line parts generally increases lifting capacity.

- What deductions must be taken? Deductions made from a crane's load ratings include such things as the weights of the block, stowed or erected boom extensions, and rigging. 

REFERENCES

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2. Safe Operating Practices for Mobile Crane Users, PPM Cranes Inc., Technical Publications Dept., P.O. Box 260002, Conway, SC 29526

3. Safety Manual for Crane Users, Operators, and Maintenance Personnel, Construction Industry Manufacturers Association, 111 E. Wisconsin Ave., Milwaukee, WI 53202

PREPLANNING A LIFT

Before beginning any lift—with any type of crane—it is important to plan how the lift will be undertaken. Questions to answer include:

- How many crew members are needed, and what responsibilities will they have?

- What is the weight of the load?

- What is the rated capacity of the crane?

- On rubber-tired and truck-mounted cranes, what is the lift radius and boom angle?

- How will the signalperson communicate with the crane operator?

- Where will the signalperson be positioned?

- Are there any overhead power lines or other obstructions that need to be taken into consideration?

- Are there any buried utilities, such as natural gas lines, that could rupture or be crushed if the crane's outriggers were placed over them?

- For rough-terrain and truck-mounted cranes, is the ground on which the crane will be positioned stable enough to support the crane and keep it level while the load is being lifted?

- How will the load be rigged?

- Is there other work taking place in the area?

- What actions will be taken to ensure the safety of other workers in the area during the lift?

- What weather conditions are expected? (High winds and rain can create many problems.)

- How can the crane be positioned to use the shortest boom length and radius possible?