



## **CRANES**

Integrated Water Services, Inc.  
(the Company)



## **Purpose**

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The purpose of this program is to outline the procedures for safe operations and the training requirements regarding crane and lifting devices, including all rigging design, construction, installation, maintenance, and safely performance.

## **Scope**

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This program applies to all Company employees who operate overhead cranes, hoists, and rigging equipment in the scope of their employment duties and assignments. Third party contractors hired to provide crane services with their own equipment must provide their own policies and procedures. Contractors who are hired to operated a Company owned crane may use this policy.

When work is performed by a subcontractor on a company site, the contractor's written safety program shall take precedence for their employees. However, subcontractors may adopt this procedure for their use.

## **Key Responsibilities**

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### **Managers and Supervisors**

- Ensure only appropriately trained, qualified, and certified operators operate lifting and hoisting equipment.
- Establish and maintain a daily, monthly, and annual inspection program.
- Establish a recordkeeping log for safety checks, maintenance, and repairs.
- Are responsible for ensuring that employees and contractors are trained and qualified on the proper operations of the equipment and have been trained in rigging safety by a competent person.
- Are responsible to see that all provisions of this program are followed and that rigging inspections are performed, and the equipment is in safe operating condition.

### **Riggers & Operators**

- Employees are responsible for inspecting the equipment they are using and reporting any observable wear, needed repairs, or damage to their supervisor.
- Shall report all equipment malfunctions immediately.
- Employees are responsible for following the requirements of this program.

## **Procedure**

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Operating controls shall be plainly marked to indicate the direction of travel.

All manufacturer procedures applicable to the operational function of equipment must be complied with. All manufacturer procedures applicable to the operational functions of equipment, including its use with attachments, must be complied with.

Procedures applicable to the operation of the equipment shall be readily available at all times.



The operator shall have ready access to procedures applicable to the operation of the equipment. Procedures include rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and the operator's manual.

#### **Operator Qualifications and Certifications**

Only those operators qualified by training or experience shall be allowed to operate equipment and machinery. Operators shall be qualified and certified by one of the following methods:

- Certification by an accredited crane operator testing organization.
- Qualification by an audited employer program.
- Qualification by the U.S. military.
- Licensing by a government entity.

#### **Exemptions:**

- Operators of derricks (see §1926.1436), sideboom cranes (see §1926.1440), or equipment with a maximum manufacturer-rated hoisting/lifting capacity of 2,000 pounds or less (see §1926.1441) are not required to comply with §1926.1427 operator certification requirements.
- An operator in training may operate a crane only under the direct supervision of a trained and certified operator.

#### **Load Chart**

Each hoist shall have a legible load chart showing the rated capacity in all permitted working positions and configurations of use, manufacturer's name, model, serial number and year of manufacture or shipment date permanently marked or noted clearly, permanently posted on the equipment, weatherproofed and conspicuous on the equipment and shall be kept legible at all times.

#### **Modifying Equipment**

Modifications or additions that may affect the capacity or safe operation of the equipment must not be made without written approval from the manufacturer or approval from a registered professional engineer. The manufacturer must approve all modifications/additions in writing. A registered professional engineer must be qualified with respect to the equipment involved and must ensure the original safety factor of the equipment is not reduced.

#### **Prior to Lifting**

- Cranes must not be used unless ground conditions are able to support the equipment and any supporting materials per the manufacturer's specifications.
- Equipment must not be assembled or used unless ground conditions are firm, drained, and graded to a sufficient extent so that the equipment manufacturer's specifications are met.
- All loads shall be hooked or slung under the direction of a competent rigger.
- Prior to operating any equipment, the operator must be familiar with all recent entries in the equipment log book.
- The operator must carry proof of training.
- Before the start of each shift, the operator must inspect the crane or hoist and ensure the control functions and safety devices are tested.



- Safety devices are required to be on all equipment and must be in proper working order before operations begin. If any of the devices are not in proper working order the equipment must be taken out of service and operations must not resume until the device is working properly again. Examples of safety devices may include crane level indicator, boom stops, jib stops, foot pedal brake locks, horns, etc.
- A fire extinguisher must be immediately available in the cab of each crane or other hoisting equipment.
- Whenever there is a safety concern, the operator must have the authority to stop and refuse to handle loads until a qualified person has determined that safety has been assured as safe.
- When the operator of a crane or hoist does not have a clear and unobstructed view of the boom, jib, load line, load hook and load throughout the whole range of the hoisting operation, the operator must act only on the directions of a qualified, designated signaler who has a clear view of the things the operator cannot see.
- The operator of the crane or hoist must stop the operation of the equipment on receiving a stop signal from any person.
- Operators of hoisting equipment shall disregard signals from anyone except designated signal persons except in an emergency or when somebody or anybody gives a stop signal.
- Where the design of a crane is such that the boom may fall over backward, positive boom stops shall be installed in accordance with the manufacturer's instructions.
- No employee shall ride or be permitted to ride on loads, hooks or similar equipment unless specifically authorized by his or her supervisor and a specific Job Hazard Assessment has been performed.

#### Marking Boundaries

The operator must address safety measures to be used when the equipment has the potential to strike and injure an employee or pinch/crush an employee against any other object. The operator will identify hazard areas by marking the boundaries of the crane swing radius with warning lines, railings or similar barriers. Employees or other persons are not allowed within the barrier when operations are taking place. The crane will immediately be required to stop movement if someone enters the swing radius area.

#### Overhead Power Lines

A pre-operation hazard assessment will be performed to identify the work zone and determine if any part of the equipment could reach closer than 20 feet to a power line. The work zone shall be identified by demarcating boundaries such as flag and range limiting devices or defining the work zone as 360 degrees around the equipment up to the maximum working radius.

The operator will ensure measures have been taken if determined that no part of the equipment, load line or load could get closer than 20 feet to a power line. If it is determined that any part of the equipment, load line or load could get closer than 20 feet to a power line then at least one of the following measures must be taken:

- Ensure the power lines have been deenergized, visibly grounded, and induction from nearby live lines is not a potential.
- Determine the line's voltage and minimum approach distance permitted in Table A below.



**TABLE A—MINIMUM CLEARANCE DISTANCES**

<b>Voltage</b> (nominal, kV, alternating current)	<b>Minimum Clearance Distance</b> (feet)
up to 50	10
over 50 to 200	15
over 200 to 350	20
over 350 to 500	25
over 500 to 750	35
over 750 to 1,000	45
over 1,000	(as established by the utility owner/operator or registered professional engineer who is a qualified person with respect to electrical power transmission and distribution).

Note: The value that follows "to" is up to and includes that value. For example, over 50 to 200 means up to and including 200kV.

#### Assembling/Disassembling Equipment

The manufacturer procedures, instructions, and prohibitions must be followed when assembling and/or disassembling equipment.

A competent and qualified person must direct the assembly/disassembly of equipment.

#### **Handling the Load**

##### Size of Load

The rated capacity of a crane or hoist must not be exceeded, except for rated load test. The working load shall not be exceeded and shall be determined by the original manufacturer of the equipment, a registered professional engineer, or other persons whose qualifications are acceptable to local regulatory requirements.

##### Attaching the Load

- The load shall be attached to the hook by means of slings or other suitable and effective means which shall be properly rigged to ensure the safe handling of the load.
- Chain and rope slings shall be free of kinks or twists before use.
- Baskets, tubs, skips or similar containers used for hoisting bulk materials shall be loaded so as not to exceed their safe carrying capacity.
- The hoist rope shall not be wrapped around the load.
- The load shall not be moved without checking the balance and the brakes.
- Brakes shall be checked in compliance with manufacturers written procedures.

#### **Safe Lifting**

- If the operator of a lifting device has any doubts as to the safety of employees in the vicinity of the lift, the operator must not move any equipment or load until the operator is assured that the working conditions are safe. He or she shall report the circumstances to his or her supervisor who then shall be responsible for determining the action to be taken.
- Loads will be carried as close to the grade as possible and tag lines shall be rigged as necessary to control swinging of the load.



- Prior to moving a load the operator and signaler shall ensure that the travel path of the load is free and clear of any undesirable obstructions.
- A suspended load shall not be left unattended by the operator.
- Ensure all employees who may be affected by the lift are aware of the hazards and are adequately protected.
- The operator must ensure that lifting and hoisting work is arranged so that a load does not pass over workers.
- The operator of a lifting device that is travelling with a load must ensure that the load is positioned as close to the ground or grade as possible.
- No worker shall for any reason stand or pass beneath a suspended load.
- Release the load only after the stability of the load has been verified and loads shall be safely landed and supported before unhooking.

If a hoist or crane is designed to be operated with outriggers or other stabilizing devices, the operator shall ensure:

- The outriggers or other stabilizing devices are used in accordance with the manufactures instructions.
- Are set on a solid footing or pad.
- Have their controls readily accessible to the operator and in a suitable position for safe operation.
- The area around the outriggers or other stabilizing devices is kept free of obstruction.
- There is a proper minimum clearance between any moving part of the crane and any obstacle near the base of the hoist or crane.
- Where there is a danger of an employee being trapped or crushed by any moving part of the crane when the crane swings, the area around the base of the crane is barricaded to restrict the entry of employees.

#### **Log Book Procedure**

- The log book will be readily available at all times to the site supervisor, safety steward, managers, customer, regulatory officials, or any other Company employee concerned with the maintenance and safe operation of the equipment. The operator shall be responsible for recording defects, operating difficulties, the need for maintenance and all maintenance and alteration work performed.
- The log book for the equipment at a project shall include the greater of the immediately preceding twelve months or the period the crane or similar hoisting device is on the project.
- All log book entries shall, on a regular basis, be signed by the person who performs the inspection, maintenance or calibration and review.
- The log book will include the following information:
  - The date and time any work was performed on the hoist.
  - Length of time in lifting service including hours of service.
  - All defects and deficiencies and when they were detected.
  - Details on all inspections, examinations, calibrations, checks and tests.
  - Repairs or modifications performed or maintenance history.
  - The record of certification.
  - Details on any incident that may affect the safe operation of the equipment.

#### **Inspections**

Each crane and hoist must be inspected and maintained at a frequency and to the extent required to ensure that every component is capable of carrying out its original design function with an adequate margin of safety and is



maintained in good working order. Inspections shall also be conducted at regular intervals as recommended by the manufacturer and by law.

Records of inspection and maintenance must be kept by the equipment operator and other persons inspecting and maintaining the equipment, for the following types of lifting equipment:

- A crane or hoist with a rated capacity of 900kg (2200 lbs.) or more
- A crane or hoist used to support an employee
- A tower crane
- A mobile crane, boom truck or sign truck
- A side boom tractor or pipe layer
- A construction material hoist
- A chimney hoist

The following inspections shall occur at the indicated frequency:

#### New Equipment

Before being placed in service, new hoisting equipment, or hoisting equipment which has had modifications in the design or has undergone major repairs, shall be inspected and proof tested under the direction of a competent person who shall give the written warranty of the safe capacity of the equipment.

#### Daily

A visual inspection of the equipment will be conducted by a competent person prior to each shift that the equipment is used. The inspection must consist of observation for apparent deficiencies. Some inspection items shall include control mechanisms, pressurized lines, hooks and latches, wire rope, electrical apparatus, tires and tracks, and ground conditions. The manufacturer's guidelines shall be followed in the inspection process.

The following will be tested at the beginning of each shift by the competent operator:

- Limit switches
- Brakes
- Circuit breakers
- Other safety devices

Any defects found during inspection or during the use of a crane or hoist must be recorded in the inspection and maintenance record system and be reported immediately to the supervisor, who must determine the course of action to be taken. If a defect affects the safe operation of the crane or hoist, the equipment must not be used until the defect has been remedied.

#### Monthly

The crane manager will ensure monthly inspections of equipment by a competent person are documented. The manufacturer's guidelines shall be followed. The inspection must be documented. Documentation must include the following:

- items checked,
- results of inspection,
- name and signature of the inspector.



Documentation must be retained for 12 months. (Documented monthly inspection is not required if the daily inspection is documented and records are retained for 12 months).

Any defects must be corrected before the crane is used. The report must be dated and signed by the person performing the inspection.

#### Yearly

Once each year a more detailed inspection must be made of all hoisting equipment at each facility. After completing the annual inspection, a report must be completed and signed by the person performing the inspection and the report will be returned promptly to the Safety Director.

### **Rigging**

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All rigging work shall be assembled, used, maintained, and dismantled under the direct supervision of a competent and qualified rigger trained in safe rigging practices, in accordance with manufacturer's specifications and with the code of signals authorized by local regulatory guidelines for controlling hoisting operations.

#### **Rigging Breaking Strength and Load Rating**

The safe working-load on ropes, chains, slings, and fittings shall not exceed the safe working-load recommended by the manufacturer.

Rigging fittings must be marked with the manufacturer's identification, product identifier, and the working load limit (WLL) or sufficient information to readily determine the WLL.

Rigging shall not be subjected to a load of more than 10 percent of the breaking strength of the weakest part of the rigging, if an employee is being raised or lowered 20 percent of the ultimate breaking strength of the weakest part of the rigging, and if the rigging is fatigue rated and an employee is not being raised or lowered the maximum load must not exceed 25 percent of the ultimate breaking strength.

The operator may use a dedicated rigging assembly designed and certified for a particular lift or project by a professional engineer but the dedicated rigging assembly must be re-rated before it is used for another lift or project.

The maximum load rating of the rigging, as determined by the rigging manufacturer or a professional engineer must be legibly and conspicuously marked on the rigging.

#### **Rigging Inspection and Rejection Criteria**

All rigging and equipment to be used during a work shift is to be inspected thoroughly prior to each period of continuous use during the shift to ensure the rigging is functional and safe by a competent person. All deteriorated or defective equipment shall be immediately removed from service if it doesn't meet the below inspection requirements or rejection criteria.

#### Slings

- A wire rope sling with a swaged or poured socket or a pressed fitting must be permanently identified with its working load limit, the angle upon which the WLL is based and the name or mark of the sling manufacturer.





- An alloy steel chain sling must be permanently identified with the size, the manufacturer's grade and the WLL, the length and number of legs, and the name or mark of the sling manufacturer.
- Synthetic fiber web slings must be permanently identified with the manufacturer's name or mark, manufacturer's code or stock number, working load limits for the types of hitches permitted, and type of synthetic web material or be removed from service if any of these requirements are not met.
- A sling shall be permanently removed from service if it is damaged or worn.
- All slings are to be clearly labeled to indicate the slings maximum load or the slings maximum load is made readily available to employees.
- A sling must be stored to prevent damage when not in use.
- When a sling is applied to a sharp edge of a load, the edge or the sling must be protected to prevent damage to the sling.

#### Hooks

- A worn or damaged hook must be permanently removed from service and the operator shall not use a hook that is worn, damaged, deformed, cracked or otherwise defective or where the throat opening has been increased or the tip has been bent more than 10% out of plane from the hook body, or any dimension of the hook has been decreased by 10% or any damage exceeds any criteria specified by the manufacturer.
- All hooks shall be clearly labeled with the maximum load of the hook in a location where an rigger using the hook can easily see the rating or the hook's maximum load is made readily available to the rigger.
- All hooks shall have a safety latch, mousing or shackle if the hook could cause injury if it is dislodged while in use.

All devices shall be visually inspected prior to use and removed from service for any of the following conditions:

- Nylon slings with:
  - Abnormal wear.
  - Torn stitching.
  - Broken or cut fibers.
  - Discoloration or deterioration.
- Wire rope slings with:
  - Kinking, crushing, bird caging, or other distortions.
  - Evidence of heat damage.
  - Cracks, deformation, or worn end attachments.
  - Hooks opened more than 10% at the throat.
  - Hooks twisted sideways more than 10 degrees from the plane of the unbent hook.
- Alloy steel chain slings with:
  - Cracked, bent, or elongated links or components.
  - Cracked hooks.
  - Shackles, eye bolts, turnbuckles, or other components that are damaged or deformed.

#### **Operational Procedures**

- Rigging shall not be subjected to loads more than outlined in legislative requirements. The operator will ensure the maximum load rating of the rigging is available to the employees at the work site.



- Wire rope, alloy steel chain, synthetic fiber rope, metal mesh slings, and synthetic fiber slings shall meet the requirements of ASME Standard B30.9-2006, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks and Slings (or current version). Below-the-hook lifting devices, other than slings, shall meet the requirements of ASME Standard B30.20-2006, Below the Hook Lifting Devices (or current version).
- Loads to be unhooked by a rigger must be safely landed and supported before the rigging is detached.
- The determination of the working load limit (WLL) of a sling assembly must ensure that the WLL of any individual component of the assembly is not exceeded.
- All slings used to hoist a load and the slings fittings and attachments must be in compliance with legislated standards and capable of supporting at least 10 times the load to which the slings fittings, and attachments may be subjected where they are used to support an employee, and at least five times the maximum load to which they may be subjected in any other case.
- No shackles shall be subjected to a load greater than the maximum load indicated on the shackle, and all shackle pins are installed to prevent accidental withdrawal, and a bolt is never used in the place of a properly fitted shackle pin.
- All hooks shall have a safety latch, mousing, or shackle if the hook could cause injury if it is dislodged while in use.
- Where an employee or surrounding property may be endangered by the rotation or motion of a load during hoisting one or more tag lines must be used to control the rotation or motion of the load and the tag lines will be of sufficient length to protect the employees and surrounding property from any overhead hazard and the tag lines are not removed from the load until the load is securely landed.

### **Rigging a Load**

- Determine the weight of the load - do not guess.
- Determine the proper size for slings and components.
- Do not use manila rope for rigging.
- Ensure that shackle pins and shouldered eyebolts are installed in accordance with the manufacturer's recommendations.
- Ensure that ordinary (shoulderless) eyebolts are threaded to at least 1.5 times the bolt diameter.
- Use safety hoist rings (swivel eyes) as a preferred substitute for eye bolts wherever possible.
- Pad sharp edges to protect slings.
- Remember that machinery foundations or angle-iron edges may not feel sharp to the touch but could cut into rigging when under several tons of load.
- Wood, tire rubber, or other pliable materials may be suitable for padding.
- Do not use slings, eyebolts, shackles, or hooks that have been cut, welded, or brazed.
- Install wire-rope clips with the base only on the live end and the U-bolt only on the dead end.
- Follow the manufacturer's recommendations for the spacing for each specific wire size.
- Determine the center of gravity and balance the load before moving it.
- Initially lift the load only a few inches to test the rigging and balance.

### **Signaling**

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A signal person must be provided for any and all overhead lifting and crane work.

Signals to the operator shall be in accordance with industry standards unless a different signal requirement has been established for the specific project or lift. Specific requirements include:



- Each movement of equipment shall be preceded by distinctive signals clearly discernible to all employees endangered by the movement and clearly distinguishable by the operator of the equipment controlled, and a signal which is not understood clearly by the operator of equipment shall be acted upon by the operator as though it were a stop signal.
- A signal person shall not cause a signal to be given for the movement of equipment unless he or she has ensured that he or she and all employees within the area for which he or she is responsible are not endangered by the movement.
- Only a designated signaler shall cause a signal to be given for the movement of equipment, but employees may cause a stop signal to be given and this signal shall be obeyed promptly and without question.
- An employee designated to direct the movement of equipment shall not be otherwise occupied while the equipment is in motion and he or she shall be prepared to signal to stop during the motion.
- A signaling device that functions unreliably or in a way that might constitute a hazard to an employee shall be removed from service immediately.
- Signals shall be discernible or audible at all times.
- Some special operations may require addition to or modification of the basic signals.
- For all such cases, these special signals shall be agreed upon and thoroughly understood by both the person giving the signals and the operator, and shall not be in conflict with the standard signals.

### **Training:**

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Training shall include:

- Documentation of employee, date of training and subject matter, including method used to test knowledge of material.
- No employee shall operate cranes or equipment covered by this program until training has been complete and management has approved and designated that person as a qualified operator. The Safety Director must be included in the decision to make an employee an authorized operator.

### **Lift Equipment Inspections:**

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The Lift Equipment Inspection Form is located at the safety support center in the form tab: [Lift Equipment Form](#)