



Delaware County Regional Sewer District Standard Operating Procedure

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	1	16

1.0 Purpose

- 1.1 The program provides necessary information on Overhead Cranes & Hoists. This program has been prepared in accordance with the OSHA Standard 1910.179 as adopted by Ohio Public Employment Risk Reduction Program (PERRP) and other best practice standards.

2.0 Scope

- 2.1 The guideline applies to all Delaware County Regional Sewer District (DCRSD) employees and/or 3rd parties when any work and task activities may require the use of Overhead Cranes, Hoists, and any other form of lifting device.

3.0 Definitions

ANSI - The American National Standards Institute.

Brake – A device used for retarding or stopping motion by friction or power means.

Bridge - The parts of a crane consisting of girders, trucks, end ties, foot walks, and drive mechanism which carries the trolley or trolleys.

Bridge Conductors - The electrical conductors located along the bridge structure of a crane to provide power to the trolley.

Bridge travel - The crane movement in a direction parallel to the crane runway.

Bumper - [buffer] An energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel; or when two moving cranes or trolleys come in contact.

Cantilever Gantry- a hoisting crane with a bridge like spanning structure mounted on two high supports that move along tracks on the ground.

Clearance - The distance from any part of the crane to a point of the nearest obstruction.

Collectors - Contacting devices for collecting current from runway or bridge conductors.

Control braking - A method of controlling crane motor speed when in an overhauling condition.

Counter torque - A method of control by which the power to the motor is reversed to develop torque in the opposite direction.

Crane - A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine.

Davit-a small crane made for lifting and lowering equipment.

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	2	16

Designated - Selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

Drift point - A point on a travel motion controller which releases the brake while the motor is not energized. This allows for coasting before the brake is set.

Drum – The cylindrical member around which the ropes are wound for raising or lowering the load.

Dynamic - A method of controlling crane motor speeds when in the overhauling condition to provide a retarding force.

Emergency stop switch - A manually or automatically operated electric switch to cut off electric power independently of the regular operating controls.

Equalizer - A device which compensates for unequal length or stretch of a rope.

Exposed - Capable of being contacted inadvertently. Applied to hazardous objects not adequately guarded or isolated.

Fail-safe - A provision designed to automatically stop or safely control any motion in which a malfunction occurs.

Floor-operated crane - A crane which is pendant or nonconductive rope controlled by an operator on the floor or an independent platform.

Frequent Inspection- Daily to Monthly intervals.

Gantry crane - A crane similar to an overhead crane except that the bridge for carrying the trolley or trolleys is rigidly supported on two or more legs running on fixed rails or other runway.

Hoist - An apparatus which may be a part of a crane, exerting a force for lifting or lowering.

Hoist chain - The load bearing chain in a hoist. NOTE: Chain properties do not conform to those shown in ANSI B30.9-1971, Safety Code for Slings.

Hoist motion - That motion of a crane which raises and lowers a load.

Holding brake – A brake that automatically prevents motion when power is off.

Jib- the projection arm of a crane.

Limit switch - A switch which is operated by some part or motion of a power driven machine or equipment to alter the electric circuit associated with the machine or equipment.

Load block - The assembly of hook or shackle, swivel, bearing, sheaves, pins, and frame suspended by the hoisting rope.

Load- The total superimposed weight on the load block or hook.

Main switch - A switch controlling the entire power supply to the crane.

Master switch - A switch that dominates the operation of contactors, relays, or other remotely operated devices.

Mechanical - A method of control by friction.

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	3	16

Overhead crane - A crane with a movable bridge carrying a movable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

Periodic Inspection- 1 to 12 month intervals.

Power-operated crane - A crane whose mechanism is driven by electric, air, hydraulic, or internal combustion means.

Qualified Person- A person who, by possession of a recognized degree or certificate of professional standing in an applicable field, or who, by extensive knowledge, training, and experience. Has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

Rated load - The maximum load for which a crane or individual hoist is designed and built by the manufacturer and shown on the equipment nameplate(s).

Regenerative - A form of dynamic braking in which the electrical energy generated is fed back into the power system.

Rope - Wire rope, unless otherwise specified.

Running sheave - A sheave which rotates as the load block is raised or lowered.

Runway - An assembly of rails, beams, girders, brackets, and framework on which the crane or trolley travels.

Runway Conductors - The electrical conductors located along a crane runway to provide power to the crane.

Semi Gantry- is A-type double girder or single girder gantry crane which only have one unilateral leg, one side of it is the leg traveling on the ground track, the other side is the end of the bridge girder institution traveling on the bracket track.

Side pull - That portion of the hoist pull acting horizontally when the hoist lines are not operated vertically.

Span - The horizontal distance center to center of runway rails.

Spring Return Controller - A controller which when released will return automatically to a neutral position.

Standby crane - A crane which is not in regular service but which is used occasionally or intermittently as required.

Stop - A device to limit travel of a trolley or crane bridge. This device normally is attached to a fixed structure and normally does not have energy absorbing ability.

Switch - A device for making, breaking, or for changing the connections in an electric circuit.

Trolley - The unit which travels on the bridge rails and carries the hoisting mechanism.

Trolley travel - The trolley movement at right angles to the crane runway.

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	4	16

Truck - The unit consisting of a frame, wheels, bearings, and axles which supports the bridge girders or trolleys.

Wall Crane- a crane having a jib with or without trolley and supported from a side wall or line of columns of a building.

4.0 Responsibilities

4.1 Operations Superintendent- shall have the responsibility to:

- Ensure that all employees have received the required training and are certified to operate the cranes and hoists throughout the DCRSD;
- Ensure that hoisting equipment is inspected on a frequent and periodic basis and rigging equipment is inspected pre-use and annually in accordance with this standard operating procedure; Maintain written and/or electronic records of inspections and tests, and providing access to the DCRSD managers for their respective department equipment;

4.2 DCRSD Manager-shall have the responsibility to:

- Ensure that all employees are following the procedures as written in this standard operating procedure;
- Ensure that frequent inspections are being completed;
- Ensure that all rigging equipment is inspected on a periodic basis;

4.3 Crane and Hoist Operators are responsible for:

- Operating hoisting equipment safely;
- Conducting functional test prior to using and frequent inspections of the equipment;
- Selecting and inspecting rigging equipment appropriately;

4.4 Joint Health and Safety Committee (JHSC) - shall have the responsibility to:

- Conduct training for all crane and hoist operators as required;
- Interpreting crane and hoist safety rules and standards;
- Maintain employee-training records;

5.0 Crane Operator Training

Prior to operation of any cranes or hoists all personnel must go through crane operator training. The training must include both a written and practical exam and a certificate be issued upon completion of course.

5.1 Crane Operator Training course. The Crane Operator training course must include the following:

- How to identify and explain the function of all major crane components and assemblies;
- How to define the minimum qualification and requirements of a crane operator;
- How to perform and document the crane inspection procedure required by OSHA;
- Understand the rules of safe and efficient crane operation;
- How to perform precise spotting of loads and make precision lifts;
- How to become familiar with the proper techniques to minimize load swing;
- How to explain and practice all recommended hand signals;

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	5	16

- An understanding of basic rigging procedures to attach a load to the hook;
- An understanding of the requirements of crane operators per OSHA 1910.179;

5.2 Refresher training may be required every three years at a minimum.

5.3 When the *DCRSD* has reason to believe that there are deviations from the crane and hoist procedures as listed in this Standard Operating Procedure, or that there are inadequacies in the *employee's* knowledge or use of these procedures, refresher training may be required.

6.0 Personal Protective Equipment

6.1 Personal Protective Equipment (PPE) is intended to protect employees from specific hazards that may be created during the use of a crane and hoist. Employees shall be required to wear PPE including, but not limited to, hard hats, face shields, goggles, gloves, safety toe boots, and hearing protection when necessary.

7.0 Inspection.

7.1 Prior to each initial use, all cranes shall be inspected by a designated person to insure compliance with the provisions of this procedure.

7.2 Inspection procedure for cranes in regular service are divided into two general classifications based upon the intervals at which inspection should be performed. The intervals in turn are dependent upon the nature of the critical components of the crane and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are herein designated as “frequent” and “periodic” with respective intervals between inspections as defined below:

Frequent inspection – Daily to monthly intervals.

- Delaware County Regional Sewer District shall perform inspection prior to each time the crane is operated. The frequent inspections will be performed only by designated operators. The frequent inspection will be performed using the “Crane Frequent Inspection Form” included in this standard operating procedure. If the crane is classified as a “Standby Crane”, it shall be given a frequent level inspection no less than every 6 months.

Periodic inspection – 1 to 12-month intervals.

- Delaware County Regional Sewer District shall perform inspection at 12 month intervals. The periodic inspections will be performed only by qualified crane technicians who meet CMAA Inspector requirements. This inspection shall be arranged by the organization with administrative control of the crane

7.3 Frequent inspection

The following items shall be inspected for defects at intervals as defined in this section or as specifically indicated, including observation during operation for any defects which might appear between regular inspections. All deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

- All functional operating mechanisms for maladjustment interfering with proper operation;

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	6	16

- Hooks with deformation or cracks, having more than 5 percent not to exceed ¼ inch in excess of normal throat opening, no more than 10 degree twist from the plane of the unbent hook and any wear exceeding 10 percent of the original section dimension of saddle;
- Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations;
- All functional operating mechanisms for excessive wear of components;
- Rope reeving for noncompliance with manufacturer's recommendations;

7.4 **Periodic inspection-** Complete inspections of the crane shall be performed at intervals as generally defined in this section, depending upon its activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of the frequent level inspection of this section and in addition, the following items. Any deficiencies such as listed shall be carefully examined and determination made as to whether they constitute a safety hazard:

- Deformed, cracked, or corroded members;
- Loose bolts or rivets;
- Cracked or worn sheaves and drums;
- Worn, cracked or distorted parts such as pins, bearings, shafts, gears, rollers, locking and clamping devices;
- Excessive wear on brake system parts, linings, pawls, and ratchets;
- Load, wind, and other indicators over their full range, for any significant inaccuracies;
- Gasoline, diesel, electric, or other power plants for improper performance or noncompliance with applicable safety requirements;
- Excessive wear of chain drive sprockets and excessive chain stretch;
- Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations;

7.5 **Standby Cranes-** A crane which has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming to requirements of frequent inspection no less than every 6 month (*Crane Classifications from CMAA Specifications #70 1994*).

A crane, which has been idle for a period of over 6 months, shall be given a complete inspection conforming to requirements of a periodic inspection as described in section 7.4.

Standby cranes shall be inspected at least semi-annually in accordance with requirements of frequent inspection described above. They shall be given a periodic level inspection at minimum of once per year.

7.6 **Rated load test-**Test loads shall not be more than 125 percent of the rated load unless otherwise recommended by the manufacturer. The test reports shall be placed on file where readily available to appointed personnel.

7.7 **Operational tests-**Prior to initial use all new and altered cranes shall be tested to insure compliance with this section including the following functions:

- Hoisting and lowering;
- Trolley travel;
- Bridge travel;
- Limit switches, locking and safety devices;

7.8 **Limit Switches.** The trip setting of hoist limit switches shall be determined by tests with an empty hook traveling in increasing speeds up to the maximum speed. The actuating mechanism of the limit

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	7	16

switch shall be located so that it will trip the switch, under all conditions, in sufficient time to prevent contact of the hook or hook block with any part of the trolley.

7.9 **Running ropes.** A thorough inspection of all ropes shall be made on a frequent basis and a certification record which includes the date of inspection, the signature of the person who performed the inspection. Any deterioration, resulting in appreciable loss of original strength, shall be carefully observed and determination made as to whether further use of the rope would constitute a safety hazard. Some of the conditions that could result in an appreciable loss of strength are the following:

- Reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires;
- 12 randomly distributed broken wires in one lay or 4 broken wires in one strand in one lay.
- Corroded or broken wires at end connections;
- Corroded, cracked, bent, worn, or improperly applied end connections;
- Severe kinking, crushing, cutting, or separation;

7.10 **Other ropes** All rope which has been idle for a period of a month or more due to shut down or storage of a crane on which it is installed shall be given a thorough inspection before it is used. This inspection shall be for all types of deterioration and shall be performed by a designated person whose approval shall be required for further use of the rope. A certification record shall be available for inspection which includes the date of inspection, the signature of the person who performed the inspection.

7.11 **Hooks** Inspections by operators or other designated personnel shall visually inspect hooks for deficiencies such as the following prior to use and during a frequent inspection. Hooks having any of the following conditions shall be removed from service until repaired or replaced:

- Cracks, nicks, and gouges;
- Deformation- any visibly apparent bend or twist more than 10 degrees from the plane of the unbent hook;
- Throat opening-any distortion causing an increase in the throat opening exceeding 5 percent, not to exceed ¼ inch (or as recommended by the manufacturer);
- Wear exceeding 10 percent of the original dimensions of the saddle.
- Damage from chemicals;
- Latch engagement, damage to or malfunction of latch (if provided);
- Evidence of heat damage;

8.0 Slings Safety and Inspection Criteria

8.1 The safe operating practices shall be followed as outlined in OSHA 1910.184 when using slings:

- Slings that are damaged or defective shall not be used;
- Slings shall not be shortened with knots or bolts or other makeshift devices;
- Slings legs shall not be kinked;
- Slings shall not be loaded in excess of their rated capacity;
- Slings used in a basket hitch shall have the loads balanced to prevent slippage;
- Slings shall be securely attached to their loads;
- Slings shall be padded or protected from the sharp edges of their loads;
- Suspended loads shall be kept clear of all obstructions;
- All employees shall keep clear of loads about to be lifted and of suspended loads;

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	8	16

- Hands and fingers shall not be placed between the sling and its load while the sling is being tightened around the load;
- Shock loading is prohibited;
- A sling shall not be pulled from under a load when the load is resting on the sling;
- Employers must not load a sling in excess of its recommended safe working load as prescribed by the sling manufacturer on the identification markings permanently affixed to the sling;
- Employers must not use slings without the affixed and legible identification markings.

8.2 Removal from service criteria;

Wire Rope Slings (ASME B30.9) - A wire rope sling shall be removed from service if conditions such as the following are present:

- Kinking, crushing, bird-caging or other distortions
- Evidence of heat damage
- Cracks, deformation, or worn end attachments
- Six randomly broken wires in a single rope lay
- Three broken wires in one strand of rope
- No affixed and legible identification markings

Nylon Web Slings (ASME B30.9) - A synthetic webbing sling shall be removed from service if conditions such as the following are present:

- Acid or caustic burns
- Melting or charring of any part of the sling
- Knots in any part of the sling
- Abnormal or excessive wear
- Torn stitching
- Broken or cut fibers
- Discoloration or deterioration
- No affixed and legible identification markings

Polyester Round Slings (ASME B30.9)-A synthetic round sling shall be removed from service if conditions such as the following are present:

- Acid or caustic burns
- Evidence of heat damage
- Holes, tears, cuts, abrasive wear, or snags that expose the core yarns
- Broken or damaged core yarns
- Knots in the rounding's, except for core yarns inside the cover
- No affixed and legible identification markings

Alloy Steel Chain Slings (ASME B30.9) - An alloy steel chain sling shall be removed from service if conditions such as the following are present:

- Cracks or breaks
- Evidence of heat damage
- Excessive wear, nicks, or gouges
- Stretched chain links or components

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	9	16

- Bent, twisted, or deformed chain links
- Lack of ability of chain or components to hinge (articulate) freely
- No affixed and legible identification markings

Wire Mesh Slings (ASME B30.9) - A metal mesh sling shall be removed from service if conditions such as the following are present:

- Broken weld or a broken brazed joint along the sling
- Broken wire in any part of the mesh
- Reduction in wire diameter of 25% due to abrasion or 15% due to corrosion
- Lack of flexibility due to distortion of the mesh
- Distortion of the choker fitting so the depth of the slot is increased by more than 10%
- Distortion of either end fitting so the width of the eye opening is decreased by more than 10%
- Visible distortion of either end fitting
- No affixed and legible identification markings

Hooks

- Cracks
- Opened more than 5% at the throat
- Twisted sideways more than 10 degree angle from the plane of the unbent hook
- Wear exceeding 10 percent of the original dimensions of the saddle.

End attachments

- Shackles, eyebolts, turnbuckles, or other components that are damaged or deformed.

8.3 Sling Inspections

- **Frequent inspections** (prior to use) an inspection shall be completed by a designated person (*DCRSD employee*) on the sling and all fasteners and attachments for damage or defects. Additional inspections shall be performed during sling use where service conditions warrant. Damaged or defective slings shall be immediately removed for service.
- **Periodic inspections** shall be completed by a designated person (*DCRSD employee*) on all slings on an annual basis, at intervals no greater than 12 months. A written record including the condition of the sling and manufacturer design criteria shall be maintained for alloy steel chains and wire mesh slings.

9.0 Handling the load

- 9.1 Size of load. The crane shall not be loaded beyond its rated load except for test purposes.
- 9.2 Attaching the load. The hoist chain or hoist rope shall be free from kinks or twists and shall not be wrapped around the load. The load shall be attached to the load block hook by means of slings or other approved devices. Care shall be taken to make certain that the sling clears all obstacles.

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	10	16

9.3 Moving the load. The load shall be well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches. Before starting to hoist the following conditions shall be noted:

- Hoist rope shall not be kinked.
- Multiple part lines shall not be twisted around each other.
- The hook shall be brought over the load in such a manner as to prevent swinging.
- During hoisting care shall be taken that:
 - There is no sudden acceleration or deceleration of the moving load.
 - The load does not contact any obstructions.

9.4 Cranes shall not be used for side pulls except when specifically authorized by a responsible person who has determined that the stability of the crane is not thereby endangered and that various parts of the crane will not be overstressed. While any employee is on the load or hook, there shall be no hoisting, lowering, or traveling. The employer shall require that the operator avoid carrying loads over people. The operator shall test the brakes each time a load approaching the rated load is handled. The brakes shall be tested by raising the load a few inches and applying the brakes. The load shall not be lowered below the point where less than two full wraps of rope remain on the hoisting drum.

9.5 When two or more cranes are used to lift a load one qualified responsible person shall be in charge of the operation. He shall analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made. The employer shall insure that the operator does not leave his position at the controls while the load is suspended. When starting the bridge and when the load or hook approaches near or over personnel, the warning signal shall be sounded.

9.6 Hoist limit switch. The upper limit switch of each hoist shall be tried out under no load. Extreme care shall be exercised; the block shall be "inched" into the limit or run in at slow speed. If the switch does not operate properly, the appointed person shall be immediately notified. The hoist limit switch, which controls the upper limit of travel of the load block, shall never be used as an operating control.

10.0 Hand Signals

10.1 Signals to the operator shall be in accordance with the standard hand signals unless voice communications equipment (telephone, radio, or equivalent) is used. Signals shall be discernable 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 thoroughly and understood by both the person giving the signals and the operator, and shall not be in conflict with the standard signals.

11.0 Maintenance.

11.1 Preventive maintenance. A preventive maintenance program based on the crane manufacturer's recommendations shall be established.

11.2 Maintenance procedure. Before adjustments and repairs are started on a crane the following precautions shall be taken:

- The crane to be repaired shall be run to a location where it will cause the least interference with other operations in the area.
- All controllers shall be at the off position.
- The main or emergency switch shall be open and locked in the open position.

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	11	16

- Any equipment removed from service by an *Affected Employee/Manager* shall be tagged as “Danger. Do Not Operate”. Only tags as specified in 29 CFR 1910.147 (c) (5) (ii) and (iii) shall be used. The tag shall identify the person applying the tag, the date, and the reason the tag has been applied.
- After adjustments and repairs have been made the crane shall not be operated until all guards have been reinstalled, safety devices reactivated and maintenance equipment removed.

11.3 Adjustments and repairs. Any unsafe conditions disclosed by the inspection requirements shall be corrected before operation of the crane is resumed. Adjustments and repairs shall be done only by qualified personnel. Adjustments shall be maintained to assure correct functioning of components. The following are examples:

- All functional operating mechanisms
- Limit switches
- Control systems
- Brakes

11.4 Repairs or replacements shall be provided promptly as needed for safe operation. The following are examples:

- Crane hooks showing defects shall be discarded. Repairs by welding or reshaping are not generally recommended. If such repairs are attempted they shall only be done under competent supervision and the hook shall be tested to the load requirements.
- Load attachment chains and rope slings showing defects.
- All critical parts which are cracked, broken, bent, or excessively worn.
- Pendant control stations shall be kept clean and function labels kept legible.

12.0 Crane Operating Safety Rules.

12.1 The OSHA rules governing mechanical lifting equipment are very detailed. But as is usually the case, they represent what should be common sense guidelines for preventing tragedy. In addition to the training and inspection requirements, here are some other basic prescriptions for safe operation of lifting equipment:

- The following operating rules for crane operators are from the Crane Manufacturers Association of America, Inc.: (CMAA)
- Use lifting equipment only for its intended purpose.
- Cranes and lifts are rated for the maximum loads they can carry safely, and these ratings should be posted on the equipment where they can be seen.
- Lifting equipment should never be overloaded, because doing so can either directly cause an accident or damage the equipment so that it is no longer safe. If there is a doubt about whether a load is too heavy, do not lift it until you are absolutely sure it is within the rated capacity of the equipment.
- Keep work spaces clear. The work space should be clear of items that could accidentally be struck and knocked over.
- Similarly, workers should stay out of the area where cranes or lifts are operating unless they are directly involved in the work being performed.
- Crane controls should be moved smoothly and gradually to avoid abrupt, jerky movements of the load. Slack must be removed from the sling and hoisting ropes before the load is lifted.
- Center the crane over the load before starting the hoist to avoid swinging the load as the lift is started. Loads should not be swung by the crane to reach areas not under the crane.
- Crane hoisting ropes should be kept vertical. Cranes shall not be used for side pulls.

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	12	16

- Be sure everyone in the immediate area is clear of the load and aware that a load is being moved.
- Do not make lifts beyond the rated load capacity of the crane, sling chains, rope slings, etc.
- Do not operate the crane if limit switches are out of order or if chains show defects or wear.
- Make certain that before moving the load, load slings, load chains, or other load lifting devices are fully seated in the saddle of the hook.
- On all capacity or near capacity loads, the hoist brakes should be tested by returning the master switch or push button to the OFF position after raising the load a few inches off the floor. If the hoist brakes do not hold, set the load on the floor and do not operate the crane. Report the defect immediately to the supervisor.
- Check to be sure that the load is lifted high enough to clear all obstructions and personnel when moving bridge or trolley.
- At no time should a load be left suspended from the crane unless the operator is at the master switches or push button with the power on, and under this condition keep the load as close as possible to the floor to minimize the possibility of an injury if the load should drop. When the crane is holding a load, the crane operator should remain at the master switch or push button.
- Do not lift loads with any sling hooks hanging loose. (If all sling hooks are not needed, they should be properly stored or a different sling should be used.)
- All slings or cables should be removed from the crane hooks when not in use. (Dangling cables or hooks hung in sling rings can inadvertently snag other objects when the crane is moving.)
- Crane operators should not use limit switches to stop the hoist under normal operating conditions. (These are emergency devices and are not to be used as operating controls.)
- Do not block, adjust or disconnect limit switches in order to go higher than the switch will allow.
- Upper limit switches (and lower limit switches, when provided) should be tested in stopping the hoist at the beginning of each shift, or as frequently as otherwise directed.
- No loads should be moved or suspended over people regardless of the attachment.
- If plugging protection is not provided, always stop the controllers momentarily in the OFF position before reversing - except to avoid accidents. (The slight pause is necessary to give the braking mechanism time to operate.)

13.0 General requirements.

13.1 These procedures applies to overhead and gantry cranes, including semi gantry, cantilever gantry, wall cranes, storage bridge cranes, and others having the same fundamental characteristics. These cranes are grouped because they all have trolleys and similar travel characteristics.

- New and existing equipment. All new overhead and gantry cranes constructed and installed on or after August 31, 1971, shall meet the design specifications of the American National Standard Safety Code for Overhead and Gantry Cranes, ANSI B30.2.0-1967.
- Modifications. Cranes may be modified and rerated provided such modifications and the supporting structure are checked thoroughly for the new rated load by a qualified engineer or the equipment manufacturer. The crane shall be tested in accordance with Section XI.
- Wind indicators and rail clamps. Outdoor storage bridges shall be provided with automatic rail clamps. A wind-indicating device shall be provided which will give a visible or audible alarm to the bridge operator at a predetermined wind velocity. If the clamps act on the rail heads, any beads or weld flash on the rail heads shall be ground off.
- Rated load marking. The rated load of the crane shall be plainly marked on each side of the crane, and if the crane has more than one hoisting unit, each hoist shall have its rated load marked on it or its load block and this marking shall be clearly legible from the ground or floor.
- Clearance from obstruction. Minimum clearance of 3 inches overhead and 2 inches laterally shall be provided and maintained between crane and obstructions in conformity with Crane Manufacturers Association of America, Inc.; Specification No. 61. Where passageways or

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	13	16

walkways are provided obstructions shall not be placed so that safety of personnel will be jeopardized by movements of the crane.

- Designated personnel. Only designated personnel shall be permitted to operate a crane covered by this section. Designated personnel must go through training for a crane initially, and refresher training every three years, per industry consensus.
- Fire extinguishers. The DCRSD shall insure that operators are familiar with the operation and care of fire extinguishers provided.

14.0 Stops, bumpers, rail sweeps, and guards.

- Trolley stops. Stops shall be provided at the limits of travel of the trolley. Stops shall be fastened to resist forces applied when contacted. A stop engaging the tread of the wheel shall be of a height at least equal to the radius of the wheel.
- Bridge bumpers. A crane shall be provided with bumpers or other automatic means providing equivalent effect, unless the crane travels at a slow rate of speed and has a faster deceleration rate due to the use of sleeve bearings, or is not operated near the ends of bridge and trolley travel, or is restricted to a limited distance by the nature of the crane operation and there is no hazard of striking any object in this limited distance, or is used in similar operating conditions. The bumpers shall be capable of stopping the crane (not including the lifted load) at an average rate of deceleration not to exceed 3 ft/s/s when traveling in either direction at 20 percent of the rated load speed.
- The bumpers shall have sufficient energy absorbing capacity to stop the crane when traveling at a speed of at least 40 percent of rated load speed. The bumper shall be so mounted that there is no direct shear on bolts. Bumpers shall be so designed and installed as to minimize parts falling from the crane in case of breakage.
- Trolley bumpers. A trolley shall be provided with bumpers or other automatic means of equivalent effect, unless the trolley travels at a slow rate of speed, or is not operated near the ends of bridge and trolley travel, or is restricted to a limited distance of the runway and there is no hazard of striking any object in this limited distance, or is used in similar operating conditions. The bumpers shall be capable of stopping the trolley (not including the lifted load) at an average rate of deceleration not to exceed 4.7 ft/s/s when traveling in either direction at one-third of the rated load speed.
- When more than one trolley is operated on the same bridge, each shall be equipped with bumpers or equivalent on their adjacent ends. Bumpers or equivalent shall be designed and installed to minimize parts falling from the trolley in case of age.
- Rail sweeps. Bridge trucks shall be equipped with sweeps which extend below the top of the rail and project in front of the truck wheels.

15.0 Brakes.

- Brakes for hoists. Each independent hoisting unit of a crane shall be equipped with at least one self-setting brake, hereafter referred to as a holding brake, applied directly to the motor shaft or some part of the gear train.
- Each independent hoisting unit of a crane, except worm-gear hoists, the angle of whose worm is such as to prevent the load from accelerating in the lowering direction shall, in addition to a holding brake, be equipped with control braking means to prevent over speeding.
- Holding brakes. Holding brakes for hoist motors shall have not less than the following percentage of the full load hoisting torque at the point where the brake is applied. 125 percent when used with a control braking means other than mechanical. 100 percent when used in conjunction with a mechanical control braking means. 100 percent each if two holding brakes are provided. Holding brakes on hoists shall have ample thermal capacity for the frequency of operation required by the service. Holding brakes on hoists shall be applied automatically when power is

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	14	16

removed. Where necessary holding brakes shall be provided with adjustment means to compensate for wear. The wearing surface of all holding-brake drums or discs shall be smooth. Each independent hoisting unit of a crane handling hot metal and having power control braking means shall be equipped with at least two holding brakes.

- Control braking means. A power control braking means such as regenerative, dynamic or counter torque braking, or a mechanically controlled braking means shall be capable of maintaining safe lowering speeds of rated loads. The control braking means shall have ample thermal capacity for the frequency of operation required by service.
- Brakes for trolleys and bridges. Foot-operated brakes shall not require an applied force of more than 70 pounds to develop manufacturer's rated brake torque. Brakes may be applied by mechanical, electrical, pneumatic, hydraulic, or gravity means. Where necessary brakes shall be provided with adjustment means to compensate for wear. The wearing surface of all brake drums or discs shall be smooth. All foot-brake pedals shall be constructed so that the operator's foot will not easily slip off the pedal. Foot-operated brakes shall be equipped with automatic means for positive release when pressure is released from the pedal. Brakes for stopping the motion of the trolley or bridge shall be of sufficient size to stop the trolley or bridge within a distance in feet equal to 10 percent of full load speed in feet per minute when traveling at full speed with full load. If holding brakes are provided on the bridge or trolleys, they shall not prohibit the use of a drift point in the control circuit. Brakes on trolleys and bridges shall have ample thermal capacity for the frequency of operation required by the service to prevent impairment of functions from overheating.
- Application of trolley brakes. A drag brake may be applied to hold the trolley in a desired position on the bridge and to eliminate creep with the power off.
- Application of bridge brakes. On all floor, remote and pulpit-operated crane bridge drives, a brake of no coasting mechanical drive shall be provided.

16.0 Electric equipment.

- General. The control circuit voltage shall not exceed 600 volts for AC or DC current. The voltage at pendant push-buttons shall not exceed 150 volts for AC and 300 volts for DC. Where multiple conductor cable is used with a suspended pushbutton station, the station must be supported in some satisfactory manner that will protect the electrical conductors against strain. Pendant control boxes shall be constructed to prevent electrical shock and shall be clearly marked for identification of functions.
- Equipment. Electrical equipment shall be so located or enclosed that live parts will not be exposed to accidental contact under normal operating conditions. Electric equipment shall be protected from dirt, grease, oil, and moisture. Guards for live parts shall be substantial and so located that they cannot be accidentally deformed so as to make contact with the live parts.
- Controllers. Cranes not equipped with spring-return controllers or momentary contact pushbuttons shall be provided with a device which will disconnect all motors from the line on failure of power and will not permit any motor to be restarted until the controller handle is brought to the "off" position, or a reset switch or button is operated. Lever operated controllers shall be provided with a notch or latch which in the "off" position prevents the handle from being inadvertently moved to the "on" position. An "off" detent or spring return arrangement is acceptable. The controller operating handle shall be located within convenient reach of the operator. As far as practicable, the movement of each controller handle shall be in the same general directions as the resultant movements of the load. The control for the bridge and trolley travel shall be so located that the operator can readily face the direction of travel. For floor-operated cranes, the controller or controllers if rope operated, shall automatically return to the "off" position when released by the operator. Pushbuttons in pendant stations shall return to the

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	15	16

“off” position when pressure is released by the crane operator. Automatic cranes shall be so designed that all motions shall fail-safe if any malfunction of operation occurs.

- Remote-operated cranes shall function so that if the control signal for any crane motion becomes ineffective the crane motion shall stop.
- Resistors. Enclosures for resistors shall have openings to provide adequate ventilation, and shall be installed to prevent the accumulation of combustible matter too near to hot parts. Resistor units shall be supported so as to be as free as possible from vibration.
- Provision shall be made to prevent broken parts or molten metal falling upon the operator or from the crane.
- Switches. The power supply to the runway conductors shall be controlled by a switch or circuit breaker located on a fixed structure, accessible from the floor, and arranged to be locked in the open position. On cab-operated cranes a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. A means of opening this switch or circuit breaker shall be located within easy reach of the operator. On floor-operated cranes, a switch or circuit breaker of the enclosed type, with provision for locking in the open position, shall be provided in the leads from the runway conductors. This disconnect shall be mounted on the bridge or foot walk near the runway collectors. One of the following types of floor-operated disconnects shall be provided:
 - Nonconductive rope attached to the main disconnect switch.
 - An under voltage trip for the main circuit breaker operated by an emergency stop button in the pendant pushbutton in the pendant pushbutton station.
 - A main line contactor operated by a switch or pushbutton in the pendant pushbutton station.
 - The hoisting motion of all electric traveling cranes shall be provided with an over travel limit switch in the hoisting direction.

17.0 Hoisting equipment.

- Sheaves. Sheave grooves shall be smooth and free from surface defects which could cause rope damage. Sheaves carrying ropes which can be momentarily unloaded shall be provided with close-fitting guards or other suitable devices to guide the rope back into the groove when the load is applied again. The sheaves in the bottom block shall be equipped with close-fitting guards that will prevent ropes from becoming fouled when the block is lying on the ground with ropes loose. Pockets and flanges of sheaves used with hoist chains shall be of such dimensions that the chain does not catch or bind during operation. All running sheaves shall be equipped with means for lubrication. Permanently lubricated, sealed and/or shielded bearings meet this requirement.
- Ropes. In using hoisting ropes, the crane manufacturer’s recommendation shall be followed. The rated load divided by the number of parts of rope shall not exceed 20 percent of the nominal breaking strength of the rope. Socketing shall be done in the manner specified by the manufacturer of the assembly. Rope shall be secured to the drum as follows:
 - No less than two wraps of rope shall remain on the drum when the hook is in its extreme low position.
 - Rope end shall be anchored by a clamp securely attached to the drum, or by a socket arrangement approved by the crane or rope manufacturer.
 - Rope clips attached with U-bolts shall have the U-bolts on the dead or short end of the rope. Spacing and number of all types of clips shall be in accordance with the clip manufacturer’s recommendation. Clips shall be drop-forged steel in all sizes manufactured commercially. When a newly installed rope has been in operation for an hour, all nuts on the clip bolts shall be retightened.
 - Swaged or compressed fittings shall be applied as recommended by the rope or crane manufacturer.
 - Wherever exposed to temperatures, at which fiber cores would be damaged, rope having an independent wire rope or wire-strand core, or other temperature-damage resistant core shall be used.

Subject	Effective	Supersedes	This Sheet	Total
Crane & Hoist Program	July 20 th 2016	May 5 th 2016	16	16

- Replacement rope shall be the same size, grade, and construction as the original rope furnished by the crane manufacturer, unless otherwise recommended by a wire rope manufacturer due to actual working condition requirements.

17.1 Equalizers. If a load is supported by more than one part of rope, the tension in the parts shall be equalized.

17.2 Hooks. Hooks shall meet the manufacturer's recommendations and shall not be overloaded.



Crane Frequent Inspection Form

Delaware County Regional Sewer District
OSHA 29 CFR 1910.179 (j)

Equipment Number _____ Date _____ Time _____

To be performed prior to each use
Standby Cranes must be inspected no less than every 6 months

Items to be Inspected	Acceptable	Repair Needed	Repair Reported
Perform a <i>visual inspection</i> of all crane components for wear, distorted parts including trolley wheels and stops, sprockets, pins and other mechanical parts. <i>Report obvious abnormalities.</i>			
Check lifting hooks for cracks, deformation and proper operating latch. <i>Report obvious abnormalities -Review SOP section 7</i>			
Check rope for condition that could result in appreciable loss of strength. <i>Report obvious abnormalities-Review SOP section 7</i>			
Check pendant control for automatic shut-off when up or down button is released, damaged controls, frayed wires.			
Check electrical devices, cords, push buttons, switches for proper operation, deterioration.			
Check hoist braking system for proper operation.			
Test upper switch for proper operation.			
Check hoist or load attachment chains for wear, distorted links or stretched links. <i>Report obvious abnormalities-Review SOP section 8</i>			
Check slings for wear, stretch, cuts, kinks or twists. <i>Report obvious abnormalities-Review SOP section 8</i>			

Comments _____

Employee Name (Print) _____



Non-Electrical Crane Frequent Inspection Form

Delaware County Regional Sewer District
OSHA 29 CFR 1910.179 (j)

Equipment Number (s)	1 _____	Date _____	Time _____
	2 _____		
	3 _____		
	4 _____		
	5 _____		
	6 _____		
	7 _____		

	A- Acceptable		R-Repair Needed			RP-Repair Reported	
Items to be Inspected	1	2	3	4	5	6	7
Perform a <u>visual inspection</u> of all crane components for wear, distorted parts including sprockets, crank handles, pins and other mechanical parts. <u>Report obvious abnormalities.</u>							
Check lifting hooks for cracks, deformation and proper operating latch. <u>Report obvious abnormalities -Review SOP section 7</u>							
Check rope for condition that could result in appreciable loss of strength. <u>Report obvious abnormalities-Review SOP section 7</u>							
Check hoist or load attachment chains for wear, distorted links or stretched links. <u>Report obvious abnormalities-Review SOP section 8</u>							

Comments _____

Employee Name (Print) _____