TITLE:

EHS-324 OVERHEAD AND GANTRY CRANES

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1.0 Introduction

1.1 Purpose

The purpose of these guidelines is to establish safe work practices to protect all Emory employees, students, visitors, and contractors from workplace hazards associated with the use of overhead and gantry cranes as prescribed in the Occupational Safety and Health Administration (OSHA) Standard - 29 CFR 1910.179 Overhead and Gantry Cranes. While some entities and/or divisions of Emory may have additional or more stringent guidelines, the guidelines outlined in this document shall serve as the minimum requirements for all.

1.2 Scope

These guidelines are inclusive of Emory employees, including Emory Healthcare (EHC), faculty, staff, students, contractors, and other people who work with or in close proximity to overhead and gantry cranes.

1.3 Definitions

Bridge. Part of a crane consisting of girders, trucks, end ties, footwalks and drive mechanism which carries the trolley or trolleys.

Bumper. An energy absorbing device for reducing impact when a moving crane or trolley reaches the end of its permitted travel.

Footwalk. The walkway with a handrails attached to the bride or trolley for access purposes.

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

Hoist. An apparatus exerting a force for lifting or lowering.

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

Overhead crane. An overhead crane is a crane with a moveable bridge carrying a movable fixed hoisting mechanism and traveling on an overhead fixed runway structure.

Rated load. The maximum load for which a crane or hoist is designed and built. The rated load is provided on the equipment nameplate.

Stop. A device to limit the travel of a trolley or crane bridge.

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

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

1.4 Training Requirements

Only designated and properly trained personnel are permitted to operate overhead and gantry cranes. Training includes a review of the following information as well as any manufacturer information or required training related to the equipment being used.

2.0 General Requirements

- Personnel operating cranes must wear the appropriate personal protective equipment, including:
  - Head protection – hard hats
  - Foot protection – safety shoes with metatarsal protection
  - Hand protection – work gloves
  - Eye protection – safety glasses
  - Any other PPE deemed necessary for the area and work conditions.
- Any modification or rerating for a new load must be certified by a qualified engineer or the equipment manufacturer.
- Outdoor storage bridges must be provided with automatic rail clamps.
- Ensure that the rated load of the crane is clearly marked on each side of the crane. The marking must be clearly legible from the ground or floor.
- Maintain a minimum of three inches overhead and two inches laterally between the cranes and obstructions.
- Ensure that each crane is equipped with a power traveling mechanism is equipped with an effective warning signal.

3.0 Inspection

- Prior to initial use of a new or altered crane, conduct an inspection to ensure compliance with this document.
- Prior to each use of a crane, conduct a visual inspection to ensure proper functionality of the crane and all operating mechanisms. The visual inspection checks for signs of excessive wear of all components, such as cracks, leaks, deformation, twist distortion or other damage that could interfere with proper operation.
- Perform a monthly inspection and maintain documentation. Documentation must include the date of the inspection, name of inspector, equipment inspected and noted deficiencies. Items to be inspected include:
- Deformed, cracked or corroded components.
- Loose bolts or rivets.
- Cracked or worn sheaves and drums.
- Any worn, cracked, corroded or distorted parts such as clips, hooks, snaps, bearings, gears, shafts, rollers, sprockets, etc.
- Brakes: operational and in good condition; and for excessive wear.
- Load rating signage is present.
- Electrical apparatus in good condition.
- Ropes and/or chains in good condition with no excessive wear, stretch, twist, distortion, kinking, cuts, corrosion etc.
- All guards securely fastened.
- Clearance from obstruction.
- Remote control operational.

- Control box labeled.
- Free from excessive dirt, grime, grease, oil and moisture.
- Accuracy of load, wind and other indicators.
- Gasoline, diesel, electric or other power sources for improper performance or noncompliance with safety requirements.
- Inspect cranes that are not in regular use at least semi-annually. Perform a full monthly inspection prior to use on any crane left idle for longer than six months.

4.0 Testing

- Prior to initial use and in addition to inspection, perform operational testing on new and altered cranes to ensure compliance with the above section as well as the following functions.
    - Hoisting and lowering.
    - Trolley travel.
    - Bridge travel.
    - Locking and braking mechanisms.
    - Safety device functions.
- Determine the trip setting of hoist limit switches by testing with an empty hook traveling in increasing speeds up to the maximum speed. Locate the actuating mechanism of the limit switch 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.
- Perform a rated load with a test load no more than 125 percent of the rated load unless otherwise recommended by the manufacturer.
- Keep testing documentation readily available.

5.0 Maintenance

- Establish a preventative maintenance program for each piece of equipment based on the manufacturer's recommendation.
- Only designated personnel can perform maintenance, adjustments or repairs on cranes.
- Correct any unsafe condition or deficiency before operating the crane.
- Promptly repair or replace components as needed for safe operation.
- Make adjustments as needed to ensure correct functioning of components.
- Prior to any maintenance, ensure the following precautions are taken:
    - Move the crane that is to be repaired to a location where it will cause the lease interference with other operations.
    - Place all controllers in the "off" position.
    - De-energize all electrical and mechanical energy sources in accordance with required lockout/tagout procedures and equipment-specific procedures.
    - Place "Warning" and "Out of Order" signs on the crane and on the floor beneath or on the hook where it is visible from the floor.
    - Ensure that rail stops or other suitable means are provided where other cranes are in operation to prevent interference with the idle crane.
    - Before resuming operation of the crane, reinstall all guards, reactivate safety devices and remove tools and equipment.

6.0 Load Handling

- Do not load the crane beyond its rated capacity except for test purposes.
- When attaching a load:
  - Ensure the ropes or chains used to attach the load are free of kinks or twists and are not wrapped around the load.
  - Attach the load to the load block hood using slings or other approved devices.
  - Handle the sling carefully to clear all obstacles.
  - Properly secure and balance the load prior to lifting more than a few inches.
  - Do not kink the hoist rope and do not twist multiple lines around each other.
  - Attach the load in a manner that prevents swinging.
- When moving a load:
  - Ensure there is no sudden acceleration or deceleration of a moving load.
  - Never hoist, lower or travel while any employee is on the load or hook.
  - Do not carry loads over people.
  - Do not leave the controls while a load is suspended.

7.0 Brakes

- Ensure that brakes have ample thermal capacity for the frequency of operation.
- When necessary, provide holding brakes with an adjustment methods to compensate for wear.
- Ensure that the wearing surface of holding brake drums and discs is smooth.
- Brakes for hoists:
  - Ensure that each independent hoisting unit of the crane is equipped with at least one self-setting brake, called a holding brake, as well as a control braking method to prevent over speeding.
  - Apply holding brakes automatically when power is removed.
  - Ensure that the power control braking method is capable of maintaining safe lowering speeds of rated loads.
- Brakes for trolleys and bridges
  - Ensure that foot operated brakes do not require more than 70 pounds of force to develop the manufacturer's rated brake torque.
  - Apply brakes by mechanical, electrical, pneumatic and hydraulic or gravity means.
  - Ensure the foot brake pedals have a non-slip surface.
  - Ensure the brakes are sufficient size to stop the trolley or bridge within a distance in feet equal to ten percent of full load speed in feet per minute when traveling at full speed with a full load.

8.0 Electrical equipment

- Ensure that the control circuit voltage does not exceed 600 volts AC or DC.
- Enclose equipment in such a way as to protect live parts from accidental contact under normal operating conditions as well as to protect from oil, grease and moisture.
- Keep guards in place to prevent contact with live electrical parts.

- Locate controls so that the operator can face the direction of travel.
- Controls must automatically return to “off” when released by the operator.
- Provide adequate ventilation in enclosures for resistors and means to prevent accumulation of combustible matter near hot parts.
- Ensure that the power supply to the runway conductors is controlled by a switch or circuit breaker located on a fixed structure accessible from the floor.
- Provide the hoisting motion of all electrical traveling cranes with an over travel limit switch in the hoisting direction.
- Pendant push stations must meet the following requirements:
    - The station must be supported in such a way as to protect the wiring from strain.
    - The voltage must not exceed 150 volts for AC and 300 volts for DC.
    - Control boxes must be signed to prevent electrical shock and clearly marked for identification of functions.
    - Pushbuttons must return to the “off” position when pressure is release by the operator.

9.0 Hoisting Equipment

9.1 Sheaves

- Ensure that sheave grooves are smooth and free from surface defects that could cause rope damage.
- Install guards on sheaves carrying ropes to guide the rope back into the groove when the load is applies.
- Equip all running sheaves with means for lubrication.
- Ensure that mechanisms are in place to prevent ropes from being soiled and to prevent the chain from binding or catching during operation.

9.2 Ropes

- Follow the manufacturer’s recommendations for sue of hoisting ropes, socketing, spacing and number of rope clips, hooks and compressed fittings.
- The rated load divided by the number of parts or rope shall not exceed 20 percent of the nominal breaking strength of the rope.
- Leave no less than two wraps of rope on the drum when the hook is in its extreme low position. Securely attach rope ends to the drum or use a manufacturer approved socket arrangement.
- Use replacement rope that is the same size, grade and construction of the original rope supplied by the manufacturer.
- If a load is supported by more than one part of a rope, equalize the tension in the parts.

10.0 Footwalks and Ladders

- If sufficient headroom is available on cranes with a trolley running on top of the girders, provide a footwalk along the entire length of the bridge.
- Provide no less than 48 inches of headroom.
- Ensure that footwalks can sustain a distributed load of at least 50 pounds per square foot and have an anti-slip walking surface.

- Equip gantry cranes with fixed ladders or stairways extending from the ground to the footwalk or cab platform.
- Ensure that stairways have rigid and substantial metal handrails and anti-slip walking surfaces.

11.0 Stops, Bumpers, Rail Sweeps and Guards

- Provide stops at the limits of travel of the trolley that are fastened to resist applied force.
- On each crane bridge, ensure that bumpers or other automatic means are capable of stopping the crane at an average rate of deceleration not to exceed 3ft/s/s when traveling in either direction at 20 percent of the rated load speed.
- On each crane trolley, ensure that bumpers or other automatic means are capable of stopping the trolley 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.
- Equip bridge trucks with rail sweeps extending below the top of the rails and in front of the truck wheels.
- Install guards to prevent ropes from chafing or fouling if the run close to other parts.
- Guard exposed moving parts should be securely fastened. Ensure they are capable of supporting the weight of a 200 pound person.

12.0 References

- Occupational Health and Safety Administration (OSHA) Overhead and Gantry Cranes - 29 CFR 1910.179
- OSHA Personal Protective Equipment - 29 CFR 1910.132-138
- American National Standard for Occupational and Educational Personal Eye and Face Protection Devices ANSI Z87.1 (current)
- Standard Specification for Performance Requirements for Foot Protection ASTM F2413-05 (current)
- American National Standard for Industrial Head Protection ANSI/ISEA Z89.1 (current)