



## **CONSTRUCTION ENVIRONMENTAL HEALTH & SAFETY EXHIBIT**

# **CRANES AND HOISTING EQUIPMENT**

### **I. Definitions**

- A. **Critical Lift:** Any hoisting operation where the load weight exceeds 75% of the lifting device's net capacity, where hoisting over an occupied structure, where two lifting devices are used in tandem to hoist a load, where non-standard rigging practices are employed, or is in the presence of special hazards.
- B. **Gross Capacity:** The capacity of a lifting device, **excluding** the weights of the main hook block, auxiliary hook/block, slings and rigging, main/auxiliary wire rope from boom tip to block, the stored jib weight, and the auxiliary boom head.
- C. **Net Capacity:** The capacity of a lifting device, **inclusive** of the weights of the main hook block, auxiliary hook/block, slings and rigging, main/auxiliary wire rope from boom tip to block, the stored jib weight, and the auxiliary boom head.
- D. **Operator:** The person(s) whose position/title/task assignment requires that he/she operate or control a piece of equipment or tool.
- E. **Rigger:** The person responsible for configuring and rigging a load to be hoisted, as listed in Section VIII below.
- F. **Signal (Tag)-Person:** The person responsible for handling a hoisted load, whether through physical contact, or communication with an equipment operator, as listed in Section IX below.

### **II. General Requirements**

- A. At a minimum, the use, inspection, set-up, and maintenance of cranes and hoisting equipment shall comply with 29 CFR 1926 Subpart CC, ANSI B30.5-2018, and the manufacturer's recommendations and requirements.
- B. All cranes as part of the submitted pre-lift documents must submit a copy of the most recent annual crane inspection.
- C. The hoist path for all hoisting operations shall be pre-determined and coordinated with the project Contractors to ensure that adequate clearance is given around hoisting operations. This is the responsibility of the General Contractor, in coordination with the Contractor performing the hoisting operation. The presence or non-presence of overhead power lines shall be identified at the time the hoist path is determined. This shall be included in the Crane Hoist Plan
- D. No load shall be hoisted above any site personnel or critical equipment (e.g. storage tanks, emergency generators, etc.). Where loads must be hoisted over occupied structures a qualified person shall determine whether portions of the building should be evacuated, the safety factor for rigging equipment should be increased, or any other additional procedures are required to perform the lift. Any additional safety measures shall be identified as part of the critical lift plan.
- E. All crane lines, including main and auxiliary lines, shall have an anti-two block device attached. Pile-driving and clam-shelling rigs are excluded from this requirement.
- F. All safety devices (anti-two blocks, limits, etc.) shall be tested prior to each shift, as part of the equipment inspection.
- G. All loads shall have tag lines attached to control the load, unless it is determined that tag lines pose a greater risk to the safety of the load (i.e. entanglement of the tag line). **NOTE:** It is assumed that tag lines are feasible, and that entanglement hazards can be minimized through coordination of the hoisting path.



## **CONSTRUCTION ENVIRONMENTAL HEALTH & SAFETY EXHIBIT**

### **CRANES AND HOISTING EQUIPMENT**

- H. Tag lines shall consist of a minimum 5/8” rope and shall be free of knots. Tag lines shall be of sufficient length to maintain control of the load where there is any potential for striking either the boom or a fixed object.
- I. Suspended loads shall not be left unattended, nor shall loads be suspended overnight.
- J. Clear communication between the operator and the signal person shall always be maintained during hoisting operations. The method(s) of communication shall be pre-determined and agreed upon by the operator and signal-person. Only one signal person shall signal a crane at a time.
- K. The erection, jumping, and dismantling of tower and gantry cranes of all types requires a written procedure, compliant with the manufacturer’s recommendations and requirements. This procedure must be submitted to the General Contractor and Project Safety Manager for review and approval prior to commencement of activities.
- L. As part of the crane set-up procedure to determine crane placement, specifically on Harvard property, the Harvard Engineering and Utilities department and/or other school department with knowledge of utilities in the area should be contacted to determine if the proposed crane placement impacts existing underground utilities. Above ground utilities including nearby electrical, should also be considered.

### **III. Pre-Lift Considerations**

- A. Operators of cranes and motorized hoisting equipment shall possess a Commonwealth of Massachusetts – Department of Public Safety Hoisting License, for the type of equipment that they operate, a certification from the National Commission for Certification of Crane Operators for the type of equipment they operate, a valid driver’s license, and a current DOT medical examination card. These operator documents (as well as a copy of the crane’s most recent annual crane inspection) should be submitted to the General Contractor, Project Manager, Project Safety Manager and HUEHS as part of the crane hoisting plan. Operators of electric cable tuggers/pullers/winches used for hoisting materials shall possess the appropriate class Commonwealth of Massachusetts Department of Public Safety Hoisting License.
- B. All hoisting activities, other than critical lifts, require the completion of a Crane Hoist Plan. The Crane Hoist Plan shall be submitted to the Project Safety Manager as part of the hazard analysis for the operation at least one week prior to the planned lift. At a minimum, the items listed in the Crane Hoist Plan Form, shall be addressed.
- C. All hoisting activities that meet the definition of a Critical Lift require the completion of a Critical Lift Plan. The Critical Lift Plan shall be submitted to the Project Safety Manager as part of the hazard analysis for the operation. At a minimum, the Critical Lift Plan shall address the items listed in the Critical Lift Plan Form.
- D. Where excavators are used to hoist materials below the lifting eye, the Contractor or operator shall perform a documented review confirming that the lift is being performed within the capacity of the machine based on configuration (i.e. over blade/blade down), lift point height and maximum radius, and that proper rigging equipment is used, rigging is in good condition, and a signal person is identified. Site conditions, including inspection for the presence of overhead power lines, shall be included in the review.
- E. No hoisting operation shall be permitted when wind gusts or sustained winds are greater than twenty-five (25) MPH, or when they exceed the manufacturer’s recommendations, load chart, or Critical Lift Plan, whichever is more stringent.



## **CONSTRUCTION ENVIRONMENTAL HEALTH & SAFETY EXHIBIT**

### **CRANES AND HOISTING EQUIPMENT**

- F. A copy of the Crane Hoist Plan must be reviewed by the crew and placed in the cab of the crane before the lifting operation begins.

#### **IV. Set-Up**

- A. Cranes and hoisting equipment shall be set up on a firm, supporting surface. This surface shall be in compliance with the manufacturer's recommendations for the type of equipment and configuration used. Sub-surface conditions (i.e. presence of ductbanks, tanks, tunnels, etc.) must be assessed as part of the hazard analysis.
- B. Cribbing shall be placed beneath the outriggers of all cranes. Cribbing shall be at least three (3) times the size of the outrigger pad and shall consist of solid members. No voids shall be present beneath or between the cribbing.
- C. The crane or hoisting equipment shall be level within one (1) degree, or within the manufacturer's specifications, whichever is more stringent. The levelness shall be rechecked at least three (3) times during the work shift. If during any of the levelness inspections, the crane or hoisting equipment is out of level greater than one (1) degree, the hoisting operation shall immediately halt, and the cause shall be determined and rectified. Re-leveling the outriggers alone is not considered an appropriate response.
- D. The swing radius shall be free and clear of obstructions and shall be cordoned off using either danger tape or high-visibility flagging and signs.

#### **V. Inspection**

- A. Each crane, including pile driving rigs, shall have been inspected within the last year by an independent, 3<sup>rd</sup>-party inspection agency. The agency may not be under the control or ownership of the crane owner and shall not be involved in the repair, servicing, or sales of cranes and hoisting equipment. The 3<sup>rd</sup>-party inspection agency must be accredited through a nationally recognized organization such as the OSHA Maritime Crane Accreditation and Certification Program, National Commission for the Certification of Crane Operators (NCCCO), by a Certified Crane Surveyor as certified through the Crane Certification Association of America or approved by HUEHS.
- B. The inspection shall be submitted to the Project Safety Manager prior to its use on site. For lattice-boom or tower cranes, this inspection shall be completed after the crane's set-up on the project. NOTE: Accommodations shall be made so that all crane parts/pieces (e.g. boom sections) can be inspected by the 3<sup>rd</sup>-party inspection agency while at ground level.
- C. Each crane or hoisting equipment shall be inspected by the operator after set-up and prior to its initial lift, before each shift, and after any malfunction. This inspection shall, at a minimum, comply with the manufacturer's inspection guidelines, and shall be documented. All inspection documentation shall be maintained on the project.
- D. If a near miss, incident, or unplanned event occurs at any time during work, the hoisting operation shall halt, and the crane or hoisting shall be re-inspected. If crane tipping, shock-loading, side-loading, boom contact with any object, or drum/sheave binding occurs, the crane shall be taken out of service, and re-inspected by a certified, independent testing agency.



## **CONSTRUCTION ENVIRONMENTAL HEALTH & SAFETY EXHIBIT**

### **CRANES AND HOISTING EQUIPMENT**

#### **VI. Load Rating and Capacity**

- A. The load weight shall not exceed seventy-five percent (75%) of the crane's net capacity, considering the boom length, angle, and load radius. For hoisting operations that will exceed this capacity, a Critical Lift Plan must be completed.
- B. Computerized or electronic capacity-indicating or load-indicating devices, whether integral to the crane or not, shall not be used to determine the capacity of the crane. These instruments shall only be used to verify and confirm the capacities listed on the load chart.
- C. The crane's capacity shall be determined using the shortest tipping access (e.g. over the side) that will be encountered during the hoisting operation. The Crane Hoist Plan shall reflect this.
- D. The use of any outrigger configuration other than fully-extended is not allowed unless the manufacturer specifically allows otherwise, and a load chart is supplied for the configuration. Where outriggers are used in other than the fully-extended position, and where the manufacturer does not recognize its use, capacities shall be based on the 'on-rubber' load rating.
- E. Where actual boom length falls between lengths shown on load chart, the Crane Hoist Plan shall be based on the next **longer** boom length.
- F. Where actual boom angle falls between angles shown on the load chart, the Crane Hoist Plan shall be based on the next **shorter** boom angle.
- G. Where the actual load radius falls between the radii shown on the load chart, the Crane Hoist Plan shall be based on the next **longer** load radius.

#### **VII. Operator Responsibilities (minimum)**

- A. The operator is responsible for proper crane mobilization, set-up, inspection, use, and ensuring that the crane's capacity is within the tolerances prescribed above.
- B. The operator must be involved in the pre-planning effort, including information required to complete the Crane Hoist Plan/Critical Lift Plan. The operator shares in the responsibility to ensure that the load(s) are properly rigged, the hoisting path is clear, and the communication from/to the tag person is clear and understood.
- C. The operator must not engage in any activity that may divert his/her attention from the hoisting operation (e.g. talking on a cellular phone, etc.).
- D. The operator is responsible to immediately halt the hoisting operation if any condition or circumstance presents itself that may jeopardize the safety of personnel or property, or the integrity of the crane or hoisting equipment.

#### **VIII. Rigger Responsibilities (minimum)**

- A. All rigging must be performed by qualified riggers as defined by 29CFR Part 1926.1401. Documentation of qualifications for riggers shall be provided to the General Contractor with the Crane Hoist Plan/Critical Lift Plan.
- B. The rigger is responsible for the daily inspection of rigging equipment, and for the proper configuration/use of rigging equipment for hoisting operations.
- C. The rigger is responsible for knowing and identifying the weight of items to be hoisted, and for ensuring that the rigging used is of sufficient capacity.



## **CONSTRUCTION ENVIRONMENTAL HEALTH & SAFETY EXHIBIT**

### **CRANES AND HOISTING EQUIPMENT**

- D. If defects/damages are observed in any of the rigging equipment used, the rigger is responsible for removing this equipment from service.
- E. The rigger is responsible for immediately halting the hoisting operation if any condition or circumstance presents itself that may jeopardize the safety of personnel or property, or the integrity of the crane or hoisting equipment.

#### **IX. Signal-Person (Tag-Person) Responsibilities (minimum)**

- A. All signal-persons must be qualified in accordance with 29CFR Part 1926.1428. Documentation of qualifications for signalpersons shall be provided to the General Contractor with the Crane Hoist Plan/Critical Lift Plan.
- B. The signal-person is responsible for ensuring that the hoist path remains free and clear of obstructions and that no personnel are allowed to walk or work under a hoisted load.
- C. The signal-person is responsible for ensuring that the signaling method used between him/herself and the operator is appropriate and agreed upon, and for maintaining constant communication with the operator.
- D. The signal-person is responsible for immediately halting the hoisting operation if any condition or circumstance presents itself that may jeopardize the safety of personnel or property, or the integrity of the crane or hoisting equipment.
- E. The signal-person must not engage in any activity that may divert his/her attention from the hoisting operation (e.g. talking on a cellular phone, etc.).

#### **X. Rigging Equipment**

- A. At a minimum, the use and inspection of rigging equipment shall comply with 29CFR Part 1926.251, applicable ANSI standards, and the manufacturer's recommendations and requirements.
- B. The hazards and hazard controls associated with the use of rigging equipment, specific to the operation at hand, shall be documented as part of the hazard analysis, and shall be reviewed with the workforce prior to commencement of activities along with the crane hoist plan.
- C. All rigging equipment shall be visually inspected prior to its use by a Competent Person designated by the employer. Defective and/or worn equipment shall be removed from service.
- D. A formal, documented rigging inspection and inventory shall be conducted at least weekly by the Competent Person. This documentation shall be retained on the project by the Contractor and shall be produced upon request.
- E. Custom-designed or shop-fabricated lifting devices or rigging equipment, including scale pans and hoisting buckets, shall be designed by a Massachusetts-registered Professional Engineer and shall be proof-tested to at least one-hundred and fifty percent (150%) of its rated capacity. The proof test shall be documented, including the test date, the name of the person overseeing the test, the configuration of the rigging during the test, a description of the load lifted and its weight, and the amount of time the device/equipment was subjected to the test weight. The proof test shall have been conducted within the last year.
- F. The rated capacity shall be permanently affixed to the custom-designed or shop-fabricated lifting devices or rigging equipment.



## **CONSTRUCTION ENVIRONMENTAL HEALTH & SAFETY EXHIBIT** **CRANES AND HOISTING EQUIPMENT**

- G. Where lifting eyes or loops are provided on the equipment or material to be hoisted, slings shall not be choked directly to the lifting eye or loop. Shackles or hooks shall be used.
- H. All hooks shall have a self-closing safety latch which prevents attached slings from becoming inadvertently freed.

### **XI. Reference**

ASME/ANSI B30, Parts 1-29  
1926.1400, Cranes and Derricks in Construction  
NFPA 70, Article 610, Cranes and Hoists