

Hoist and Rigging Program–6HR00-3.0

Associated OHS General Industry & Process: Construction Safety

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Gantry Crane 	Bridge Crane 
Electric-Powered Hoists 	Manual Hoist (chain fall, come along) 
Chain Sling 	Wire-rope slings 
Synthetic Web Sling 	Rigging Hooks 

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1. Summary

1.1 Objective

The purpose of this Hoist and Rigging Program is to provide safety procedures for those University of Virginia Facilities Management (FM) employees that may work with, or in the vicinity of cranes, hoists, and other mechanical lifting and pulling devices while on University of Virginia property or leased spaces. In addition, this Program addresses the care, maintenance, and best work practices of wire ropes, slings, and related rigging devices that may be used in conjunction with cranes, hoists, and other mechanical lifting and pulling devices.

1.2 Scope

This Program applies to all University of Virginia employees and contractors involved in moving material that involves the use of cranes, hoists, and/or rigging on University of Virginia property or leased space.

2. Regulations & Other Requirements Occupational Safety & Health Administration (OSHA)

The Occupational Health and Safety Administration (OSHA) has developed regulations and guidelines for the protection of workers and facilities related to cranes and rigging. Specifically, this information can be found in 29 CFR 1910 Subpart N, Materials Handling and Storage. Additional guidance for the design of commercial cranes can be found in ASME/ANSI B30 and Crane Manufacturer's Association of America standards, CMAA-70 and CMAA-74. Information specific to personnel baskets and platforms suspended from any crane can be found in 29 CFR 1926.550(g).

2.2 University of Virginia

This Hoist and Rigging Program complies with UVA-FM requirements.

3. Roles and Responsibilities Facilities Management Occupational Health & Safety

It is the responsibility of UVA FM-OHS to:

- a) Develop, administer, and annually review this Hoist and Rigging Program.
- b) Provide observational safety checks of work operations and enforcement of safety policies and procedures as needed.
- c) Coordinate training as required by this program.
- d) Assist with inspection of jobsite when requested.
- e) Assist supervisors with periodic assessments if needed.

3.2 Facilities Management Supervisors

It is the responsibility of UVA FM Supervisors to:

- a) Be familiar with the contents of the Hoist and Rigging Program and how to apply.
- b) Maintain a list of Competent Employees under their supervision.
- c) Ensure required Hoist and Rigging training is provided to employees within the work area(s)
- d) Complete periodic inspections in accordance with Hoist and Rigging Program
- e) Take prompt corrective action when unsafe conditions or practices are observed.

3.3 Facilities Management Employees

It is the responsibility of UVA FM Employees to:

- a) Attend required training.
- b) Follow policies outlined in this Program.
- c) Notify Supervisor and/or FM-OHS of any unsafe act or condition before proceeding with assigned work.

3.4 Project Managers

It is the responsibility of UVA Project Management to:

- a) UVA Project Managers (PM), Construction Project Coordinators, Construction Superintendents, and Contract Administration Managers (CAM) are responsible for ensuring that contractors comply with Hoist and Rigging regulations while working on UVA property.

3.5 Contractors

It is the responsibility of Contractors working on UVA Grounds to:

- a) Contractors are responsible for ensuring that their personnel understand and comply with the requirements of OSHA standards 29 CFR 1926 Subpart H & 1910 Subpart N.

4. Hoist and Rigging Program

4.1 Training

Only those individuals authorized by way of formal and hands-on education and testing are to use cranes and hoists on University of Virginia property or leased spaces. Training is typically provided by the manufacturer or is facilitated by FM-OHS through an alternative Authorized Trainer. Training should include, at a minimum, the following:

- a) Classroom Informational Training
 - General crane/ hoist safety
 - Crane inspections
 - Attaching, raising, lowering, and moving loads
 - Hand signals
- b) Hands-On Training
 - Specific controls for the crane/hoist
 - Specific slings used with loads
 - Specific handling instructions as provided by the manufacturer

A written examination on both classroom and hands-on training should be provided for all prospective crane/hoist operators.

4.2 Competent and Authorized Person

A person who, by reason of training and/or experience, capable of identifying existing and predictable hazards, has the authorization to take prompt corrective measures, and has demonstrated the ability to safely perform all assigned duties may be considered 'Competent'.

An Authorized Person is a person who is approved or assigned by the employer to perform a specific type of duty or duties or to be at a specific location or locations at the job site.

4.3 Operator

A person who has NCCCO Certification, and who has demonstrated the ability to safely perform all assigned duties may be considered to be an 'Operator'. These persons may be authorized to operate all, or only specific, cranes and hoists.

Certification is valid for 5 years. In order to be recertified the operator must pass a written exam and meet medical qualifications.

4.4 Load Testing

Load Testing will be required for cranes that have been altered, repaired, or had parts replaced by a qualified company.

4.5 Inspections

Hazards identified during a frequent inspection shall be reported to a Supervisor and FM-OHS immediately. Slings, wire ropes and alloy chains, as components of a hoist, shall be visually inspected daily and before each use. Inspections shall occur during sling use where service conditions are warranted. All inspections must be conducted by a competent person. Pre-operational inspections should be documented and maintained.

a) Crane and Hoist Inspections

Cranes, hoists, and rigging must be regularly inspected to ensure that accidents do not occur. Therefore, inspections at different intervals of equipment operation are required to ensure the mechanical integrity of all equipment as well as the health and safety of equipment users

b) Initial Inspection

All cranes and hoists that are new, reinstalled, altered, repaired, modified or overloaded shall be inspected by a qualified person prior to initial use. Slings, wire ropes and alloy chains, as components of a hoist, shall be inspected according to the manufacturer's requirements. Inspection of altered, repaired, modified, or overloaded cranes may be limited to those components affected by the alteration, repair, or modification, as determined by a qualified person.

c) Pre-Operation Inspection

A pre-operation inspection shall be conducted daily and before each instance the crane or hoist placed into service by a competent person. The pre-operation inspection should occur at the start of the work shift on a day when the equipment will be used. Operators should complete the following steps to ensure the crane is working properly, including, but not limited to:

- Test the upper limit switch by raising the unloaded hook block until the limit switch trips
- Visually inspect as much of the hook, load lines, trolley (if applicable), and bridge (if applicable) as much as possible from the operator's normal location
- Test the lower limit switch, if possible
- Test all direction and speed controls
- Test the hoist brake, if applicable
- Inspect all control mechanisms for maladjustments
- Inspect all safety devices
- Inspect all air, hydraulic, and other pressurized lines for deterioration or leakage
- Inspect hooks and latches for deformation, chemical damage, cracks, or wear
- Inspect wire rope reeving for compliance with hoisting equipment manufacturer's specifications

- Inspect electrical apparatus for malfunctioning, signs of excessive deterioration, dirt or moisture accumulation
- Inspect hydraulic system for proper fluid level
- Inspect tires for proper inflation and condition
- Inspect ground conditions around the equipment for proper support
- Inspect the hoisting equipment for level position, including after each move and set up
- Inspect operator cab windows for significant cracks, breaks, or other deficiencies that would hamper the operator's view
- Inspect rails, rail stops, rail clamps and supporting surfaces when equipment has rail traveling

d) Periodic Inspection

Periodic inspections are documented inspections that include observations of crane and hoist operations. Wire ropes and alloy chains, as components of a crane or hoist, are also inspected. Periodic inspection intervals are based off of the manufacturer's recommendations. As such, depending on the type of equipment, it may be necessary for periodic inspections to be performed by a representative from the manufacturer or a manufacturer-trained qualified person.

4.6 General Design and Safety Requirements

The design of all cranes and hoists constructed after 1971 must comply with the requirements of ASME/ANSI B30.2.0-1967 standards for crane construction as well as the CMAA-70-2010 and CMAA-74-2010. These documents contain information that helps crane purchasers and users make optimum equipment selections based on their desired specifications as well provides information on structural design, mechanical design, and electrical equipment, among others. Specific crane and hoist safety design requirements are indicated below:

- a) The rated load of each crane and hoist must be plainly marked on each side of the individual piece of equipment in a visible & legible location from the ground or floor. If a crane has more than one hoisting unit, each hoist shall have its rated load marked on it or on its block, clearly legible from the ground or floor.
- b) All crane and hoist hooks shall have safety self-closing latches
- c) Hooks shall not be painted if the paint previously applied by the manufacturer has worn, and shall meet the manufacturers' recommendations and shall not be overloaded.
- d) Guards shall be in place for all moving parts where there is the potential for exposure to hazardous energy or moving mechanical parts, and shall be substantial and positioned to prevent accidental contact.
- e) Cranes and hoists shall have a main electrical disconnect switch in a separate box that is capable of being locked and tagged out of service
- f) Crane bridges and hoist monorails shall be labeled on both sides with the maximum capacity
- g) All newly installed cranes and hoists, as well as those that have been extensively repaired or rebuilt structurally, shall be load tested at 125% of their rated capacity prior to being placed in service
- h) Personnel baskets and platforms suspended from any crane shall be designed in accordance with the specifications in 29 CFR 1926.550(g)
- i) All cranes used for personnel lifting shall have anti-two blocking devices installed and operations.
- j) Cranes taken out of service for extended periods shall be clearly tagged "Out of Service" with the tag or label being signed and dated and these cranes should be physically disconnected from power.

4.7 General Rigging Safety Requirements

Use only rigging that is in satisfactory condition based on a pre-operation inspection. Defective equipment shall be immediately tagged out of service. The load capacity limits should be stamped or affixed to all rigging components with permanent and legible manufacturer markings. Best practices for wire rope slings require a safety factor of five to be maintained.

4.7.1 Types of Defective Slings

The following types of slings should be placed out of service and destroyed if any of the following exist:

a) Nylon slings:

- Abnormal wear;
- Torn stitching;
- Broken or cut fibers;
- Discoloration or deterioration.

b) Wire rope slings:

- 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;
- Hooks opened more than 15% at the throat;
- Hooks twisted sideways more than 10 degrees from the plane of the unbent hook.
-

c) Alloy steel chain slings:

- Cracked, bent, or elongated links or components;
- Cracked hooks.

4.8 Rigging a Load

Rigging a load for transport or hoisting is one of the most important components of a successful lift. A successful lift is contingent on proper planning, communication, and rigging. Operators shall do the following when rigging a load:

- a) Determine the weight of the load and do not guess;
- b) Determine the proper size for slings and components;
- c) Do not use manila rope, or similar, for rigging;
- d) Make sure that shackle pins and eye bolts are installed in accordance with the manufacturer's recommendations;
- e) Pad sharp edges to protect slings
- f) Remember that machinery foundations or angle-iron edges may not feel sharp to the touch but will cut into rigging under several tons of load. Wood, tire rubber, or other pliable materials may be suitable for padding

- g) Do not use slings, eye bolts, shackles, or hooks that have been cut, welded, brazed, or otherwise altered;
- h) Install wire rope clips with the base only on the live end and the U-bolt only on the dead end and follow manufacturer's recommendations for spacing for each specific wire size;
- i) Determine the center of gravity and balance the load before moving it;
- j) Initially lift the load only a few inches to test the rigging and balance;
- k) Use a tag line.

4.9 Restricted Areas

Pre-planning shall be conducted to verify no personnel are under suspended loads. Set up "Restricted Areas" that indicate the locations of the lift/travel path. Make sure that orange cones, yellow tape, or other means to alert persons in the area of the lift mark the lift/travel path of the load.

4.10 Lifting, Moving and Lowering a Load

During equipment lifting, moving, and lowering operations, the following applies:

- a) Only authorized personnel may operate any crane or hoist and only those so authorized may place rigging on any material to be moved;
- b) Ensure proper clearance in all areas of crane use;
- c) Ensure at least one spotter is on scene;
- d) If voice or radio communication between crane operator is not possible, hand signals should be utilized;
- e) Each load should be moved so as to minimize shock on the crane and the crane's components;
- f) Lift loads only high enough to clear the tallest obstruction in the travel path;
- g) Land the load when the move is finished and choose a safe landing;
- h) Never leave suspended loads unattended;
- i) In the event of an emergency, if a load must remain suspended, ensure the area is clearly marked with signage and blocked on all four sides to prevent unauthorized access.
- j) Use a tag line.

4.11 Parking a Crane / Hoist

Whenever a crane or hoist is to be placed out of service at the end of a shift or similar cessation of work, the following applies:

- a) Remove all slings and accessories from the hook and return the rigging device to the designated storage racks;
- b) Raise the hook at least 7 feet above the floor;
- c) Place the emergency stop switch (or push button) in the OFF position.

4.12 Hand Signals

When there is a large volume of traffic at a worksite, it is essential for workers to be able to use hand signals. Figure 1 indicates standard hand signals for crane operation. A signal person must be provided in each of the following situations:

- a) The point of operation, or the area near or at the load placement, is not in full view of the operator;
- b) When the equipment is travelling, the view in the direction of travel is obstructed;

- c) Due to site-specific safety concerns, either the operator or the person handling the load determines that it is necessary.

During operations requiring signals, the ability to transmit signals between the operator and signal person must be maintained. If that ability is interrupted at any time, the operator must safely stop operations requiring signals until it is established, and a proper signal is given and understood. Designate one competent person to be the signal person.

If the operator becomes aware of a safety problem and needs to communicate with the signal person, the operator must safely stop operations and those operations must not resume until the operator and signal person agree that the problem has been resolved.

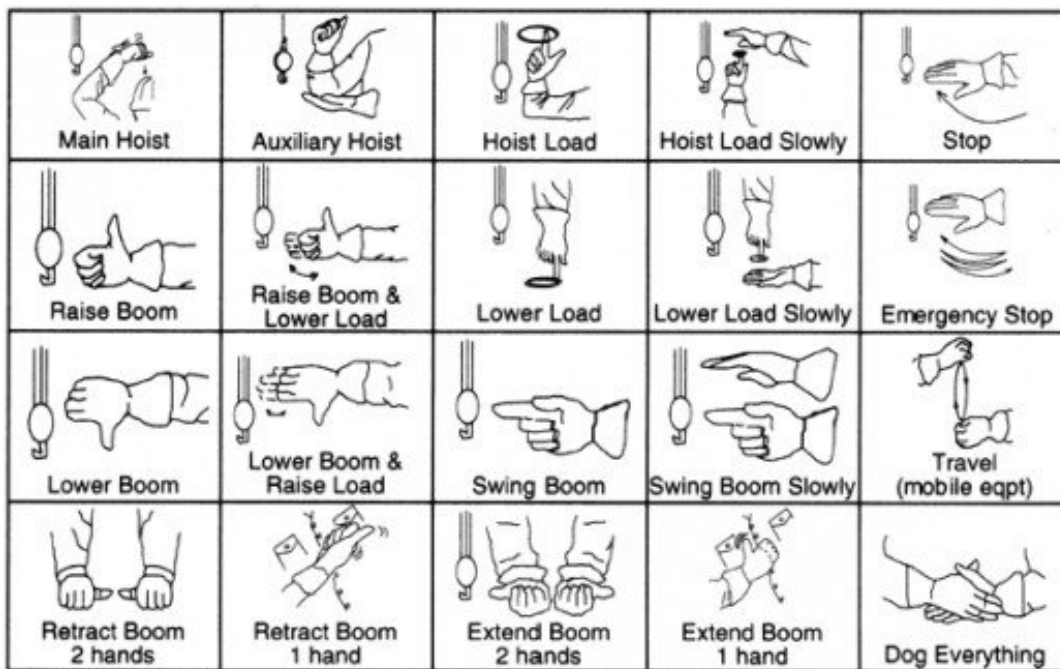


Figure 1. OSHA Hand Signals, 29 CFR 1926. Subpart CC, Appendix A

4.12.1 Non-Standard Hand Signals

When using non-standard hand signals, the signal person, operator, and lift director (when there is one) must contact each other prior to the operation and agree on the non-standard hand signals that will be used. Signals other than hand, voice, or audible signals may be used where the employer demonstrates that the new signals provide at least equally effective communication as voice, audible, or Standard Method hand signals.

4.13 Working at Heights on Hoists

Most cranes and hoists are by nature elevated above the surrounding work area. As such, anyone conducting maintenance or repair on cranes or hoists at heights greater than four feet shall use fall protection. Fall protection includes safety harnesses that are fitted with a lifeline, lanyard, and are securely attached to a

structural member of the crane or a suitable anchor point of a building. Safety belts are not permitted for fall protection.

Use of crane as a work platform should only be considered when conventional means of reaching an elevated worksite are hazardous or not possible.

4.14 Overloading

Cranes or hoists shall not be overloaded beyond their rated load for normal operations. Any crane or hoist suspected of having been overloaded shall be removed from service. Additionally, overloaded cranes shall be inspected, repaired, load tested, and approved for use before being returned to service.

4.15 Typical Cranes and Rigging at UVA

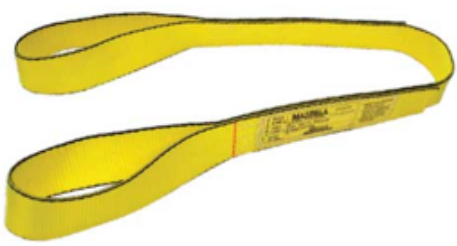
Gantry Crane 	Bridge Crane 
Electric-Powered Hoists 	Manual Hoist (chain fall, come along) 
Chain Sling 	Wire-rope slings 
Synthetic Web Sling 	Rigging Hooks 

Figure 2. Samples of Typical Cranes and Rigging at UVA

5. Program Review and Record Keeping

5.1 This Hoist and Rigging Program shall be reviewed and updated at least annually and whenever necessary to reflect changes in UVA FM policies or procedures, industry standards, or government regulations.

Appendix A: Definitions

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

Bridge crane – Crane with bridge mounted on tracks, which enables three-dimensional handling.

Competent – A person who has demonstrated the ability to safely perform all assigned duties may be considered “Competent”.

Crane – A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism as an essential component of the machine.

Designated / Authorized Person – Person selected by department supervisor as being qualified to operate or work around specialized equipment.

Drum – Cylindrical member around which rope/chains are wound for raising and lowering loads.

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

Overhead crane – Crane with a moveable bridge carrying a moveable or fixed hoisting mechanism and traveling on an overhead fixed runway structure.

Rated Load - The maximum load for which a crane or individual hoist is designed and built.

Sling - Lifting devices such as chain, wire rope, metal mesh, fiber rope, and synthetic web utilized to secure a load to be moved.

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

Appendix B: Acronyms

ANSI: American National Standards Institute

ASME: American Society of Mechanical Engineers

CMAA: Construction Management Association of America

FM: Facilities Management

JHA: Job Hazards Analysis

LOTO: Lockout/Tagout

NCCCO: National Commission for the Certification of Crane Operators

NFPA: National Fire Protection Association

OHS: Occupational Health and Safety

OSHA: Occupational Safety & Health Administration

PPE: Personal Protective Equipment

UVA: University of Virginia