THE OHIO STATE UNIVERSITY

Crane, Hoist and Sling Safety Program

May 2014

Prepared by:
The Ohio State University
Environmental Health and Safety
Occupational Safety & Industrial Hygiene

1314 Kinnear Road
Columbus, OH 43212-1168

614-292-1284 Phone
614-292-6404 Fax

www.ehs.osu.edu

Table of Contents

1.0 Introduction

1.1 The Ohio State University Crane, Hoist and Sling Safety Program applies to all OSU staff members who operate and/or are responsible for cranes, hoists and slings. Moving large, heavy loads may involve the use of specialized lifting devices such as cranes, hoists and slings. There are significant safety issues to be considered, both for the operators and for workers in proximity to them. The Occupational Safety and Health Administration (OSHA) have established regulations and guidelines for the protection of workers and facilities relating to crane, hoist and slings in 29 CFR 1910 Subpart N *Materials Handling and Storage.* The OSU Crane, Hoist and Sling Safety Program outline departmental responsibilities and provide important safety information regarding the use of these specialized lifting devices.

2.0 Responsibilities

2.1 OSU Environmental Health & Safety - The Ohio State University Office of Environmental Health & Safety (EHS) is responsible for the following:

2.1.1 Updates and revisions to the written Crane, Hoist and Sling Safety Program;

2.1.2 Ensure crane, hoist and sling training programs meet applicable requirements;

2.1.3 Provide program oversight.

2.2 Department Supervisors – Supervisors or department heads of areas where cranes, hoists and/or slings are operated are responsible for the following:

2.2.1 Designating and identifying personnel authorized to operate cranes, hoists and slings;

2.2.2 Ensuring authorized operators have received proper training;

2.2.3 Ensure cranes, hoists and slings are maintained in proper working order and repaired when necessary.

2.2.4 Ensure scheduled inspections and testing is conducted as required by the equipment being utilized

2.3 Authorized crane, hoist and sling operators – Operators of cranes are responsible for the following:

2.3.1 Attending and passing training and evaluation of competence prior to operating a crane, hoist or sling;

2.3.2 Performing and documenting pre-use inspections;

2.3.3 Reporting all maintenance/repair issues to his/her supervisor and removing the equipment from service if necessary;

2.3.4 Operating and maintaining equipment in a safe manner at all times.

3.0 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.

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

Crane – a machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an essential part of the machine. Cranes whether fixed or mobile are driven manually or by power.

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/lowering loads.

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

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.

Hand-held hoist – lever operated roller chain hoist

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

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

Pawl – device used to hold machinery against undesired rotation by engaging a ratchet.

Pendant – controls suspended from an electric hoist.

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

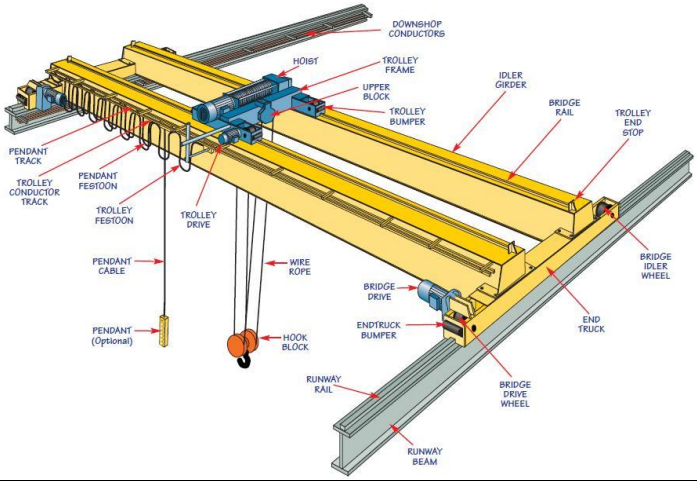
Rated load – the maximum load for which a crane or individual hoist is designed and built by the manufacturer and shown on the equipment nameplate(s).

Semi-gantry crane – a gantry crane with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by a truck running on an elevated rail or runway.

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.

Gantry Crane	Semi-Gantry Crane
	

Floor-Operated Crane	Bridge Crane
	

Electric Powered Hoist	Manual Hoist (Lever, chain fall, come along)
	

Pneumatic Powered Hoist	Chain Sling
	

Metal Mesh Sling	Wire Rope Sling
	

Synthetic Web Sling	Fiber Rope Sling
	

4.0 Design & Safety Requirements

4.1 The design of all cranes and hoists constructed after 1971 must comply with the requirements of the American Society of Mechanical Engineers and American National Standards Institute's (ASME/ANSI) B30.2.0-1967 standards for crane construction; and the Crane Manufacturer's Association of America standards CMAA-70-2010 and CMAA-74-2010.

4.2 The rated load of the crane must 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, which must be clearly visible from the floor.

4.3 Only designated/authorized personnel who have been properly trained may operate cranes, hoists and slings.

4.4 Clearance from obstructions:

4.4.1 A minimum clearance of 3 inches overhead and 2 inches laterally must be provided and maintained between the crane and any obstruction.

4.4.2 Where passageways, foot walks, or walkways exist, their placement must not present a hazard to employees when cranes are in use.

4.4.2.1 Foot walks shall be of rigid construction and designed to sustain a distributed load of at least 50 pounds per square foot and shall be slip resistant.

4.4.2.2 Elevated walkways must provide adequate fall protection through the installation of appropriate guardrail systems.

4.5 Cranes with parallel runways must always maintain clear path of travel for the crane.

4.6 Trolley stops and/or bumpers should be provided to limit the travel of the trolley along the runway and be capable of sufficiently stopping the trolley.

4.7 Guards shall be in place for all moving parts where there is potential for hazardous contact or wearing could occur.

4.8 Crane electronic controllers should be equipped to shut the crane to the "off" position as a fail-safe.

4.9 Hooks used as part of crane operation must be equipped with a safety latch to prevent loads from bouncing off the hook.

5.0 Crane Operation Requirements

5.1 Pre-operational test – At the start of each work shift (on a day when the crane will be used), operators should complete the following steps to ensure the crane is operating properly.

5.1.1 Test the upper limit switch – raise the unloaded hook block until the limit switch trips.

5.1.2 Visually inspect the hook, load lines, trolley, and bridge as much as possible from the operator station (typically this is at floor level)

5.1.3 If provided, test the lower limit switch.

5.1.4 Test all direction and speed controls for both bridge and trolley travel

5.1.5 If equipped, test bridge and trolley limit switches when crane use will come close the tripping these switches.

5.1.6 Test the hoist brake.

5.1.7 If any of the above items does not pass the pre-operational inspection, the crane must be locked out and removed from service immediately.

5.1.8 Appendix A provides an example of a pre-operational checklist.

5.1.9 Pre-operational inspections should be documented.

5.2 Rigging a load – when attaching a load to a crane, the following safety requirements should be followed

5.2.1 Determine the accurate weight of the load and ensure crane weight limitations are not exceeded.

5.2.2 Determine the appropriate size and number of slings and associated components.

5.2.3 Sharp edges on loads being lifted/lowered should be padded to prevent wear on slings.

5.2.4 Ensure slings and hooks are in proper working condition with no excessive wear.

5.2.5 Determine the center of gravity of the load and ensure rigging maintains the load level during movement.

5.2.6 Once slings are in place, lift the load only slightly off the ground to test the rigging and balance, re-work the rigging if necessary.

5.2.7 Use a tag line when loads must traverse long distance or be otherwise controlled.

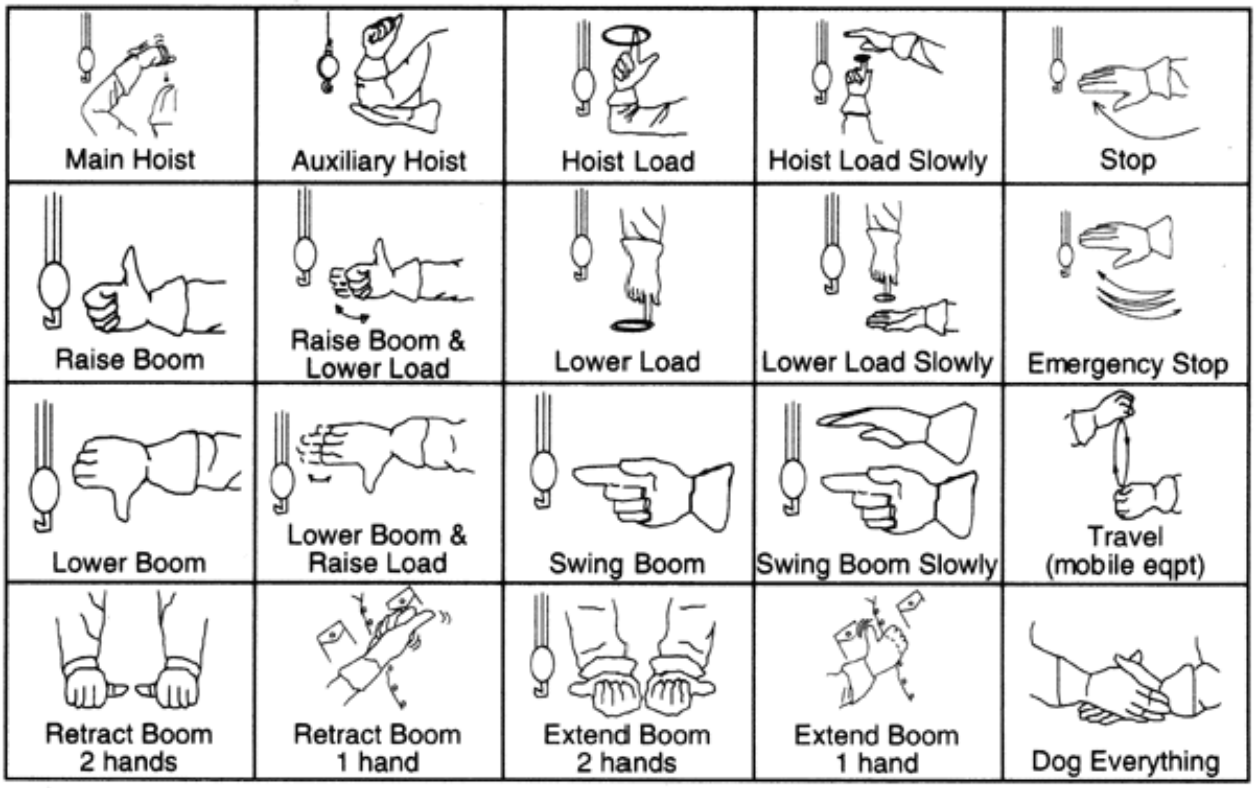
5.3 Lifting and lowering a load – during equipment moving operations the following safety requirements should be followed.

5.3.1 Only authorized personnel may operate a crane.

5.3.2 Ensure proper clearance in all areas of crane use and unauthorized entry will not occur.

5.3.3 Cranes should only be operated with an authorized operator and at least one spotter.

5.3.4 If audio (voice/radio) communication between crane operator and spotter is not possible, hand signals should be utilized. Signals must be discernible or audible at all times by both the crane operator and spotter.



5.3.5 Ease the load up/down to prevent shock load on the crane. Shock load can occur when a suspended load is accelerated/decelerated quickly.

5.3.6 Lift loads only high enough to clear the tallest obstruction in the travel path.

5.3.7 Never leave suspended loads unattended. In 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.

5.4 Parking a crane/hoist – once loads are moved and the crane is out of operation for the shift, it should be properly parked.

5.4.1 Remove all slings and accessories from the hook and return rigging devices to designated storage locations.

5.4.2 Raise the hook at least 7 feet above the floor.

5.4.3 Store the pendant away from aisles and work areas, or raise it at least 7 feet above the floor.

5.4.4 Place the emergency stop switch in the off position and place controller in designated storage location to prevent unauthorized use.

6.0 Inspection, Maintenance and Testing

6.1 Cranes must be continuously inspected to ensure accidents do not occur. The pre-operational inspection must be conducted before each use as outlined in section 5.0 of this program.

6.2 Monthly inspections:

6.2.1 Cranes should be inspected monthly regardless of use.

6.2.2 Monthly inspections should be conducted by someone familiar with the crane and its operation, and should be documented.

6.2.3 Defective cranes must be removed from service and locked out of service until defects are corrected.

6.2.4 Appendix B provides an example monthly crane inspection checklist. Checklists used in the field should be specific to the crane being inspected. Consult the manufacturer's specifications to develop or obtain a monthly checklist.

6.3 Annual preventative maintenance

6.3.1 Cranes should be inspected annually for preventative maintenance.

6.3.2 Cranes, which sit idle for periods longer than 12 months or are unused, should be inspected prior to anticipated use.

6.3.3 A properly trained crane specialist designated by the supervisor, or third party company should perform and document the annual PM service.

6.3.4 A sample annual checklist can be found in Appendix C. The annual inspection should address, at a minimum, the following items.

6.3.4.1 Hoisting and lowering mechanisms

6.3.4.2 Trolley and bridge travel

6.3.4.3 Limit switches and safety devices

6.3.4.4 Structural members

6.3.4.5 Bolts or vivets

6.3.4.6 Sheaves and drums

6.3.4.7 Moving parts such as bearings, shafts, gears, rollers locking and clamping devices

6.3.4.8 Fuel, electric or other power plants

6.3.4.9 Chain-drive sprockets

6.3.4.10 Crane and hoist hooks

6.3.4.11 Electrical controllers, limit switches and push button stations

6.3.4.12 Slings (wire, metal mesh, fiber mesh, rope, etc.)

6.3.5 Specific inspection items may vary depending on the type of crane being inspected. It is the responsibility of the supervisor to ensure the manufacturer's specified inspection checkpoints are covered during the annual PM service.

6.4 Load testing on newly installed or recently repaired cranes

6.4.1 Newly installed cranes and hoists, and those which have undergone sufficient repairs or have been rerated, should be load tested at 125% of the rated load

6.4.2 Slings should be accompanied by load test data upon purchase

6.4.3 Any time a crane is overloaded during use, it shall be inspected before returning to use.

7.0 Training

7.1 Only designated trained persons are permitted to operate a crane.

7.2 Training should include, at a minimum, the following:

7.2.1 Classroom/online informational training, which should include the following:

7.2.1.1 General crane safety

7.2.1.2 Crane inspections

7.2.1.3 Attaching, raising, lowering, and moving loads

7.2.1.4 Hand signals

7.2.2 Hands-on training with the specific equipment to be used as part of their job duties, to include the following:

7.2.2.1 Specific controls for the crane

7.2.2.2 Specific slings used with loads

7.2.2.3 Specific handling instructions as provided by the manufacture

7.2.2.4 Specific hand signals developed for use with the individuals using the crane

7.2.3 Written examination: both the classroom and hand-on training should be documented through an examination process.

8.0 Recordkeeping

8.1 Each department is responsible for maintaining records relating to cranes in use throughout OSU.

8.2 Records to be maintained include the following:

8.2.1 A list and specifications/operator manuals for all cranes and hoists

8.2.2 Training records to include name of trainer and employee, date of training and type of training.

8.2.3 Pre-use, monthly and annual inspection reports

8.2.4 Maintenance and repair records

9.0 Non-Standard Crane-like Lifting Devices

9.1 Non-standard devices and equipment used for lifting people or equipment should be used as designed and engineered; and should be maintained as required by the manufacturer.

9.2 Each such device can be evaluated by OSU EHS for suitability and safety of personnel.

10.0 Contractors

10.1 Contractors are required to have their own specific crane, hoist and sling safety programs and allow only fully trained crane operators.

10.2 Contractors using non-OSU cranes must ensure cranes are properly maintained and have been recently inspected to ensure safe operation.

10.3 Contractors are permitted to use OSU-owned cranes with authorization from the department claiming ownership of the crane. All applicable standards, regulations and OSU Written Programs must be followed.

Appendix A – Sample pre-operational crane inspection form

CRANE OPERATOR DAILY INSPECTION CHECKLIST							
Crane name/number	Crane type:			Crane capacity		Date of inspection:	
Location:	Hour Meter: Start:_____ Stop:_____			Total hours operated:			
Operator's name:				Oiler's name:			
INSTRUCTIONS: *Check all items indicated. Inspect and indicate as satisfactory = S, Unsatisfactory = U, or not applicable = N/A*							
Walk around inspection	**U**	**S**	**N/A**	**Operator Cab Inspection**	**U**	**S**	**N/A**
Safety guards and plates				Gauges			
Carrier frame, rotate base				Warning & indicator lights			
General hardware				Control/brakes			
Wire rope				Visibility			
Reeving				Load rating charts			
Block				Safety devices			
Hook				Emergency stops			
Sheeves				List/trim indicators			
Boom/Jib				Boom Angle/Radius Indicator			
Gantry, pendants, boom stops				**Machinery House Inspection**	**U**	**S**	**N/A**
Walks, ladders, handrails				Housekeeping			
Wind locks, chocks, stops				Engine/Compressor			
Tires, wheels, tracks				Leaks - Fuel, lube, Oil, Water			
Leaks-Fuel, oil, lube, water				Lubrication			
Radius indicator				Battery			
Outrigger/locking device				Lights			
Operation Inspection	**U**	**S**	**N/A**	Glass			
Area safety				Clutch/Brake linings			
Unusual noises				Electric motors			
Control Action				Warning tags			
Brakes/boom/load/ rotate				Fire extinguisher			
Crane stability				Comments:			
No load test							
Fleeting sheeve							
Limit switches							
Operator's signature:				Supervisor's signature:			

Crane Inspection &
Certification Bureau
P.O. Box 621388
Orlando, FL 32862-1388
(800) 327-1386 * (407) 277-0884
www.cicb.com

CICB Overhead Crane/Hoist Monthly Checklist

Crane ID #:	Capacity:

Mark the appropriate boxes **S** - Satisfactory **U** - Unsatisfactory **N** - Not Applicable	Reference Standard	Machine Description & Number											
		Month											
		Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Controls													
Support Against Strain	B30.2-1.13.1 (d)												
Identification/labels	B30.2-1.13.1 (e)												
Warning Labels/decals	B30.2-1.1.5 (a)												
General Condition	B30.2-1.1.2 (c)												
Hook													
Safety Latch	1910.179 (j)(2)(iii)												
Deformation	B30.10-1.2.1.2 (c)(1)												
Wear	B30.10-1.2.1.2 (c)(2)												
Cracks, Nicks, Gouges	B30.10-1.2.1.2 (c)(3)												
Attachment Points	B30.10-1.2.1.2 (c)(6)												
Self-Locking Operation	B30.10-1.2.1.2 (c)(7)												
Chain													
Operation	B30.16-2.5.1 (a)												
Lubrication	B30.16-2.5.1 (b)												
Defects/wear	B30.16-2.5.1 (c)												
WireRope													
Distortion	B30.2-2.4.1 (a)(1)(a)												
Corrosion	B30.2-2.4.1 (a)(1)(b)												
Broken Wires/cuts	B30.2-2.4.1 (a)(1)(c)												
Reeving	B30.2-2.1.1 (c)(6) & 1910.179 (j)(2)(vii)												
Structure													
Load Rating Marked	B30.2-1.1.1												
Defects, Cracks, Welds	B30.2-2.1.3 (b)(1)												
Air System	B30.2-2.1.2 (c)(3) & 1910.179 (j)(2)(ii)												
Hydraulic System	B30.2-2.1.2 (c)(3) & 1910.179 (j)(2)(ii)												
Bridge													
Wear/defects	B30.2-2.1.2 (c)(1) & 1910.179 (j)(2)(vi)												
Trolley													
Wear/defects	B30.2-2.1.2 (c)(1) & 1910.179 (j)(2)(vi)												
Hoist													
Wear/defects	B30.2-2.1.2 (c)(1) & 1910.179 (j)(2)(vi)												

Appendix C – Sample annual crane safety inspection checklist

IT MUST INSPECTED YEARLY BY A CERTIFIED PERSON		PAGE 1 OF 1
SAFETY, AND HEALTH PROGRAM	ATTACHMENT:	NA

HOIST ANNUAL INSPECTION CHECKLIST

Hoist ID: _____ Date: _____

Inspector: _____

No.	Inspection Point	Pass	Fail	Comments
	HOIST			
	Drum wear, cracks (un-spool all rope)			
	Rope anchorage			
	Worn or cracked pins, bearings, shafts, gears, rollers, locking or clamping devices			
	Excessive wear of brake and clutch system, pawls, ratchets			
	Excessive wear of drive mechanism, chain, chain sprockets.			
	Electrical system for evidence of contact pitting or deterioration of controller, limit switches, pushbuttons.			
	Fire extinguisher charge			
	Power plant performance			
	Load control mechanisms for maladjustments, wear			
	Limit switches or devices			
	Deterioration or leakage of hydraulic systems			
	Fuel system leakage or deterioration			
	Electrical and control system malfunction or deterioration			
	Engine oil level			
	Hydraulic oil level			
	Fuel level			
	Other lubrication			
	Mounting/anchorage system for continued ability to sustain imposed loads.			
	WIRE ROPE			
	Inspect entire length of wire rope.			
	Obvious visible damage, kinking, crushing, deterioration, wear, distortion, broken wires.			
	Reduction of rope diameter, loss of core support, corrosion.			
	Broken wires or corrosion at end connections			
	End connections and fittings, corrosion			

Comments:

IF THE UNIT DOES NOT PASS FULLY IT MUST BE TAGGED OUT OF SERVICE