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Crane and Hoist Program

1. Purpose / Background

The many crane and hoist systems spread across MIT range from fractional ton chain-falls, to multi-ton overhead cranes. These crane and hoist systems are valuable assets to assist with work that needs to be done, such as, lifting heavy items and for positioning items into areas that are not easily reached by hand.

In late 2016, both OSHA 29 CFR 1910.179 and MA Regulations 520 CMR 6.00 were amended to increase requirements for operation and inspection of cranes and hoists. This Program assures a shift towards full compliance with both OSHA and Massachusetts State regulations for crane safety.

The purpose of this SOP is to detail the steps required to install and safely operate an overhead crane or hoist within your DLC.

2. Scope

The scope of this program includes any overhead crane system (jib, gantry, underhung, etc.) and the included (or stand-alone) hoisting mechanism that is attached to any building, research facility or equipment owned or operated by MIT.

Although OSHA does require general oversight of the use of all crane and hoist systems, Massachusetts regulations have more detailed requirements on specifically listed systems. Those systems specifically covered under MA Regulations are;

Any hoisting equipment when the motive power to operate such machinery is mechanical and other than steam, that has the capability of hoisting the load higher than ten feet, and is rated to lift loads greater than 500 pounds.

The program encompasses company-owned equipment being used on company-owned or leased property, which does include Remote Facilities.

NOTE: The in-house training and licensure portion of this program applies to main campus only and does *not* apply to Lincoln Laboratory, Haystack Observatory, Bates Accelerator and Wallace Observatory.

This program applies to MIT employees, students and temporary workers that operate and use overhead cranes, hoists and associated (or stand-alone) lifting equipment.

3. Prerequisites

An EHS professional with adequate experience at MIT EHS who has demonstrated knowledge of relevant regulatory standards, industry standards, and hoisting/rigging practices may implement and monitor the requirements set forth in this SOP.

NOTE: The in-house training and licensure portion of this program can only be managed by personnel carrying the state provided MA 3A license.

The MIT EHS-MS includes the use of an on-line Training Needs Identification process via the Atlas Learning Center. Completion of this assessment with respect to the relevant questions on hoisting of materials is required of all MIT members. In turn, completion of the training indicated in the Training Needs Assessment is necessary to work with crane and hoisting systems as described in the Scope above.

4. Roles & Responsibilities

DLC Staff/Operators

- Update your Training Needs Identification (TNI) to reflect that you 'Operate cranes or hoists'.
- Only use equipment for which you have received training.
- Carry appropriate hoist operator's license at all times during crane and hoist operation.
- Follow all crane operating procedures.
- Conduct the appropriate inspections when they are required and complete the required documentation when necessary.
- Notify the supervisor of any deficiencies identified during inspections.
- Report all incidents involving cranes and hoists to supervisor immediately.

DLC Supervisors

- Designate personnel who are qualified to operate cranes and hoists within your area of responsibility.
- Ensure that crane and hoist operators receive proper training.
- Ensure that the requirements of the program are observed, particularly with respect to inspections.
- Ensure scheduled inspections and testing is conducted as required.
- Maintain all necessary documentation involving inspection, testing and maintenance activities of cranes and hoists.
- Ensure cranes, hoists and rigging are maintained in proper working order and repaired or replaced when necessary.
- Notify EHS when new crane and hoisting systems are added within your location or when they are removed from service.

EHS Office

- Review the Crane and Hoist Safety Program on a periodic basis and revise as necessary
- Provide technical assistance regarding regulatory requirements

- Provide in-house training and MIT specific hoist operator's licenses to those meeting requirements
- Establish and maintain an inspection record keeping system
- Conduct periodic audits of Crane/Hoist Program compliance.

EHS Coordinator

- Ensure any listed crane and hoisting systems within your area of responsibility are inspected by a qualified third-party contractor annually.
- Verify that crane and hoist operators have completed training and have an appropriate hoisting license on their person during all witnessed crane and hoist operations.
- Maintain an accurate and up to date inventory of active crane and hoist systems within your DLC.

5. Program Guidelines

Since MA Regulations are more comprehensive but for only a subset of the crane and hoisting systems that are used at MIT; as necessary, these guidelines will be broken down into two parts. **Part A** will be for MA listed crane and hoisting systems as described in the Scope above. **Part B** will apply to the remainder of the crane and hoisting systems that will fall solely under the OSHA Regulations.

Inventory

It is a requirement that MIT maintain an inventory of all active crane and hoisting systems. As such, it is essential that each DLC keeps an accurate and up-to-date inventory of all crane and hoisting systems used on MIT owned or leased property.

In order to maintain accuracy, whenever hoists or related equipment are purchased or installed as part of a project, this must be reflected in the inventory to ensure addition to the annual inspection program. For MA listed crane and hoist systems including; hoisting machinery, overhead hoists (underhung), overhead cranes, underhung cranes, monorail cranes, overhead bridge cranes, electric or air driven hoists, pendant controlled hoists, lifting devices, and any other equipment that has the minimum capability of hoisting the load higher than 10 feet and is rated to lift loads greater than 500 pounds, the following criteria must be included:

Requirements:

- Stamped drawing of installation by Engineer of Record.
- Pre-Inspection by 3rd party vendor experienced in the installation, maintenance and repair of cranes and hoists.
- Results from load testing for installed crane and hoist systems.

Additionally, starting at the inception of this program, the inventory shall also be updated whenever a crane and hoisting system is decommissioned or locked out so that accurate historical data can still be retained.

Licensure

Part A

MA Regulations require that anyone operating a listed crane and hoisting system must be trained and duly licensed. Hoisting licenses shall be carried on the operator's person at all times during hoisting equipment use. There are currently two options to become a licensed crane and hoist operator at MIT and that is by, obtaining a license directly through the state by applying for a Class 3A hoisting license, or by taking the MIT sponsored State approved training and obtaining an MIT specific hoist operator's license. Below are the MIT Program expectations and the requirements for obtaining licenses.

NOTE: If your manager has previously decided that a MA 3A hoisting license is required to operate specific cranes and hoists within your DLC's, then it is expected that you will maintain this license. MIT campus is required to have an adequate number of State licensed operators to maintain our State approved program.

- **Massachusetts 3A License**

Obtaining a license, by applying directly through the state for a Class 3A hoisting license, will allow the operator, after equipment specific hands on training, to operate any hoist listed within the Class throughout the state.

Below is a summary of requirements. Go to <https://www.mass.gov/hoisting>, for complete information on how to obtain a MA 3A hoisting license.

All Operators must:

- Be 18 years or older with a valid MA driver's license, learner's permit or Massachusetts ID issued by the MA RMV.
- Possess a MA DOT Medical Certificate.
 - All license applications (initial and renewal) must be accompanied by a valid DOT Medical Certificate.
- Apply for testing date.
 - Testing only occurs the last week of every month at designated locations throughout the state. A test date will usually be scheduled for the month following the date the application was received.
- Go through the renewal process every two (2) years.
 - Four (4) hours of Continuing Education Credits
 - New MA DOT Physical if needed
 - In the event your DOT Medical Certificate has expired, or is about to expire, you will need to have another physical and send a copy of the DOT Medical Certificate with your application.

NOTE: If your MA 3A hoisting license has expired, you have a year grace period in which you may renew your license without penalty. In this time, your license is considered expired and cannot be used until renewed. After the year grace period, you will need to retake the state exam to get your license back.

NOTE: If you have the MA 3A hoisting license and you utilize the MIT Campus Training Needs Identification (TNI) checklist, scan a copy of your license and email

to environment@mit.edu to get credit for course EHS00706 which will satisfy your training need.

- **MIT Specific License**

MIT has an In-Service Training Program that has been approved by the state for Cambridge Campus only. The license obtained through this program will only allow holders to operate specific MIT owned hoists used on MIT owned or leased property.

- Register for course EHS00707, MIT 3A Hoist/Crane Safety Trng & License, within the ATLAS Learning Center Course Catalog.
- After completing the course and validation exam, there will be a hands-on practical component utilizing the crane and hoist system you intend to use.
- You will be asked to provide some additional information and a head shot for your MIT specific operator's license. This license will not expire.
- There is no renewal process for this license but additional training may be required if program components are updated in the future, if they are not being followed or if unsafe operating conditions are witnessed.

Part B

Currently, there is no requirement set forth by OSHA that an operator of a non-listed crane and hoisting system requires a license. As long as the operator is trained on safe operation and has been designated by their supervisor, they can operate these systems.

It is recommended that operators of non-listed crane and hoisting systems also complete the in-service training program.

Inspection

Part A

The expectation is that daily use and annual inspections are completed for all Crane and Hoist systems.

- Daily Use – conducted by the licensed operator.
The following checklist (**see also Appendix D**) should be completed prior to use each day of operation. The checklist should be stored near the hoist operating controls and readily available if audited.

Inspection Item	Description of Inspection Check Points (Pass; Fail; N/A)	Date of Inspection and Use												
1 Control Devices	Test run controls to ensure they match device markings													
2 Brakes	Check that all motions do not have excessive drift and that stopping distances are normal													
3 Hook	Check for damage, cracks, gouges, twisting, deformations of the throat opening, wear on the saddle or load bearing point													
4 Hook Latch	If a hook latch is required, check for proper operation and damage													
5 Wire Rope/Chain	Check for broken wires, strands, kinks, or other deformation or damage to the rope structure													
6 Reeving	Check that wire rope or chain is properly reeved and that rope or chain parts are not twisted about each other													
7 Limit Switches	Check that the upper limit device stops lifting motion before striking any part of the hoist													
8 Oil Leakage	Check for sign of oil leakage on crane and on the floor area beneath the crane													
9 Unusual Sounds	Check for any unusual sounds from the crane or hoist mechanism while in operation													
10 Warning and Safety Labels	Check that warning and other safety labels e.g.load capacity, are not missing and that they are legible													
11 Housekeeping and Lighting	Check area for accumulated materials, slip/trip hazards and poor lighting													
12 Attachments and Rigging	Check for damage or defects (see attached)													
Crane and Hoist Inspection/Operator Initials														

- Periodic (Annual)** – conducted by a competent 3rd party inspector. OSHA and MA regulations require that cranes and hoists are inspected annually to look for defects, general wear and compliance issues. This type of inspection must be conducted by a 3rd party vendor experienced in the installation, maintenance and repair of cranes and hoists. These reports must be retained for future inspections. MIT currently has three approved vendors that can be used to conduct these annual inspections.

Part B

The Daily Use checklist should be used for non-listed crane and hoisting systems. OSHA requires periodic inspection requirements for non-listed crane and hoisting systems, although, at this time, MIT does not require that a 3rd party vendor accomplish this.

Incident Response

Any hoisting incident which results in serious injury, property damage, or any condition that is necessary for the preservation of the public health or safety, must be reported to EHS immediately. EHS needs to contact the Mass Department of Public Safety within 1 hour from the time that the incident occurred or was discovered. The licensee operating the equipment at the time of the incident shall work with EHS to develop a written report to submit to the Mass Department of Public Safety within 48 hours.

MA Regulation defines the term serious injury as any personal injury that results in death, dismemberment, significant disfigurement, permanent loss of the use of a body organ, member, function, or system, a compound fracture, or other significant injury. Property damage is defined as damage to private or public property that exceeds \$5000 per incident.

After an incident, the hoisting machinery shall not be moved or dismantled until an inspector has completed the investigation. There shall be no alteration of the scene. The only exception of this requirement is for preservation of life, the removal of injured persons or to permit the flow of emergency vehicles.

6. Training

Anyone who operates a crane or hoisting system shall receive training on safe operation of the equipment prior to use. This training can be offered through MIT or external programs. In addition, all operators must receive hands-on training utilizing the crane and hoisting system of intended use. Consult the EHS Crane and Hoist Program Manager if you have questions as to which training would be appropriate.

Contact your EHS Coordinator if you need to use a crane and hoisting system within your DLC, and they will make sure that you receive training by the appropriate competent operator.

7. Monitoring Requirements

The MIT EHS-MS provides for routine and regular evaluation of training requirements and status, and gaps in completion. The EHS-MS uses a database-driven training needs that requires new staff to register and complete training requirements, as determined through the assessment. EHS will periodically monitor overall compliance with the requirements for Training and report those to EHS Coordinators.

EHS Coordinators are expected to regularly monitor their DLC training databases to identify new or changed status conditions regarding affected staff. Wherever a DLC identifies significant issues related to incomplete training, they should make reasonable efforts to solicit completion of training. The EHS-MS provides for consequences in circumstances of extended non-compliance with training requirements.

In addition to training, EHS Coordinators are also expected to monitor the status of the crane and hoist inventory within their DLCs. During Level II Inspections, Coordinators should note the condition and status of each crane and hoist and update their inventory accordingly. This includes adding any that are not already accounted for and denoting those that have been removed, relocated or locked out.

8. Record Management

This section incorporates record management practices defined by the EHS Office or DLCs. These would include this SOP, the MIT Learning Center, training completion records and sign-in sheets, Level II EHS-MS Inspection sheets, correspondence to affected or potentially affected or supervisors.

9. References

9.1 Standards

- [MA 520 CMR 6.00](#): Hoisting Machinery
- [OSHA 1910.179](#): Overhead and Gantry Cranes

9.2 Other SOP/SOGs

To view the SOPs/SOGs go to <https://ehs.mit.edu/sops/> and search for the SOP/SOG listed. MIT Certificates are required to view SOPs/SOGs.





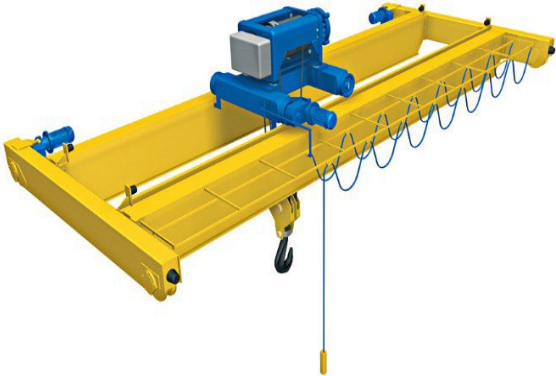

- EHS-0092: Hoist Operations (Fact Sheet)

10. Definitions

- **Qualified Operators**: A person designated by the DLC who, by way of training and experience, may operate cranes, hoists and related rigging equipment. This person is capable of identifying existing and potential hazards associated with the movement of stated equipment and material. Such persons may be deemed “qualified” to operate all or only specific cranes / hoists within a DLC.
- **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.
- **Hoist**: Apparatus, which may be part of a crane, exerting a force for lifting or lowering
- **Rigging**: Collectively referred to as “below the hook” devices, are also called ‘lift gear’. May be any device used to carry, position, and secure a load while it is being hoisted or craned.
- **Listed Crane and Hoisting System**: Derricks, cableways, machinery used for discharging cargoes, and temporary elevator cars used on excavation work or used for hoisting building material, when the motive power to operate such machinery is mechanical and other than steam, including but not limited to excavators, backhoes, front end loaders, uni-loaders, skid loader, skid steer loaders, compact loaders or similar devices, lattice cranes, derricks, cranes with or without wire rope; all fork lifts, powered industrial lift trucks, overhead hoists (underhung), overhead cranes, underhung cranes, monorail cranes, lifting devices, cableways, powered platforms and any other equipment that has the minimum capability of hoisting the load higher than ten feet, and either the capability of lifting loads greater than 500 pounds or the capacity of the bucket exceeds ¼ cubic yards; overhead bridge cranes, electric or air driven hoists, pendant controlled hoists, specialty equipment as categorized by license grade in 520 CMR 6.00.
- **In-service Training**: A company program that has been approved by the Department and is required for issuance of a company license by those companies that have been exempted from hoisting licensing requirements, pursuant to M.G.L. c. 146, § 53.
- **License**: A document issued to an individual to operate a certain type and class of hoisting machinery.


APPENDIX A: Types of Listed Crane and Hoisting Systems

Appendices Image Source: Cornell University Crane and Hoist Safety Program Document, 2017

<p style="text-align: center;">Gantry Cranes</p> 	<p style="text-align: center;">Semi-Gantry Crane</p> 
<p style="text-align: center;">JIB Crane</p> 	<p style="text-align: center;">Wall Crane</p> 
<p style="text-align: center;">Bridge Crane</p> 	<p style="text-align: center;">Monorail</p> 

Pneumatic Powered Hoist	Electric Overhead Hoist
	

APPENDIX B: Other (Non-Listed) Types of Crane and Hoisting Systems

Manual Hoist	Floor-Operated Crane
	

APPENDIX C: Types of Rigging

<p>Chain Slings</p> 	<p>Metal Mesh Sling</p> 
<p>Wire Rope Sling</p> 	<p>Fiber Rope Slings</p> 
<p>Synthetic Web Slings</p> 	<p>Different Types of Shackles</p> 

APPENDIX D: Daily Use Inspection Checklist

Inspection Item	Description of Inspection Check Points (Pass; Fail; N/A)	Date of Inspection and Use							
1 Control Devices	Test run controls to ensure they match device markings								
2 Brakes	Check that all motions do not have excessive drift and that stopping distances are normal								
3 Hook	Check for damage, cracks, gouges, twisting, deformations of the throat opening, wear on the saddle or load bearing point								
4 Hook Latch	If a hook latch is required, check for proper operation and damage								
5 Wire Rope/Chain	Check for broken wires, strands, kinks, or other deformation or damage to the rope structure								
6 Reeving	Check that wire rope or chain is properly reeved and that rope or chain parts are not twisted about each other								
7 Limit Switches	Check that the upper limit device stops lifting motion before striking any part of the hoist								
8 Oil Leakage	Check for sign of oil leakage on crane and on the floor area beneath the crane								
9 Unusual Sounds	Check for any unusual sounds from the crane or hoist mechanism while in operation								
10 Warning and Safety Labels	Check that warning and other safety labels e.g. load capacity, are not missing and that they are legible								
11 Housekeeping and Lighting	Check area for accumulated materials, slip/trip hazards and poor lighting								
12 Attachments and Rigging	Check for damage or defects (see attached)								
Crane and Hoist Inspection/Operator Initials									

APPENDIX E: General Reference

General Safe Work Practices:

- All hoisting machinery shall be operated in accordance with the manufacturer's specifications.
- Rated load capacities shall be conspicuously posted on all equipment and shall be visible to operators while they are at their control stations.
- Do not exceed the rated load capacity of the crane, or rigging. (Keep in mind that the hoist may be higher rated than the rail/beam or vice versa).
- Persons operating the crane, hoist or rigging shall inspect all machinery and equipment prior to each use to make sure it is in safe operating condition.
- Belts, gears, shafts, pulleys, sprockets, spindles, drums, fly wheels, chains, or other reciprocating, rotating, or other moving parts or equipment shall be guarded if such parts are exposed to contact by employees, or otherwise create a hazard.
- No modifications or additions which affect the capacity or safe operation of the equipment shall be made without the manufacturer's written approval. If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals, shall be changed accordingly. In no case shall the original safety factor of the equipment be reduced.
- Disconnect power to a hoist or crane that is unsafe or in need of repair. Arrange to have the equipment locked out and tagged out.
- Never operate a hoist or crane that in your opinion is UNSAFE TO OPERATE.

Engaging the Load:

- The rigging shall be properly seated and secured in the base of the hook.
- The load shall not be applied to the point of the hook or the hook latch.
- Before moving the load, the operator shall be sure chains and wire rope are not kinked or twisted and that multiple part chains or ropes are not twisted about each other.
- The rope or chain must be properly seated on the drum, sheaves, or sprockets before the lift takes place.
- Remove slack from the sling, chain, or cable before lifting a load.
- The hoist must be centered over the load.
- The operator shall not pick up a load in excess of the rated load of the hoist or crane.
- Specific attention should be given to balancing of the load to prevent slipping.

Moving the Load:

- The operator shall not engage in any activity that will divert his/her attention from the task.
- The operator shall respond to signals from a designated person only. However, the operator shall obey an emergency stop signal at all times, no matter who gives it.
- The operator shall make sure the load and hoist will clear all obstacles before moving or rotating the load.
- A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.
- The operator shall inch powered hoists and cranes slowly in engagement with a load, but should avoid quick stops and sudden reversals of direction.
- A load shall not be lifted more than a few inches until it is well balanced in the sling or lifting device.

- When lifting loads at or near capacity, brake action shall be tested by lifting the load a few inches off the surface to verify that the brakes are holding.
- On rope hoists, the load shall not be lowered below the point where less than two wraps of rope remain on each anchorage of the hoist drum, unless a lower limit device is provided. In this case no less than one wrap may remain on each anchorage of the hoist drum.
- Loads shall not be suspended over personnel.
- All employees shall be kept clear of loads about to be lifted and of suspended loads.
- Under no circumstances may anyone ride the hook or load.
- Directional movement should be made smoothly and deliberately to avoid swing.
- Never pull a hoist by the controller cable.
- Contact between trolleys (on two trolley cranes) or between trolleys and stops should be avoided.
- The operator shall not use the upper (or lower, if provided) limit device(s) as a normal means of stopping the hoist. These are emergency devices only.

Placing the Load:

- Never leave the controls unattended while a load is suspended. If it becomes necessary to leave the controls, lower the load to the floor.
- The load block should be positioned above head level when the hoist is not in use.
- Care shall be exercised when removing a sling from under a landed and blocked load.