

# M\_003 Overhead Hoist Safety Lecture



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# Safety is everyone's business and compliance with safety procedures is **MANDATORY**



- If an activity or practice seems unsafe, “Stop Work” and take the time to address concerns
- Only designated and qualified personnel may operate an overhead hoist
- No suspended load is ever to be left unattended by the hoist operator
- Operators are required to visually examine hoist equipment before using it
- No LLE personnel are permitted to repair a hoist
- Only approved rigging gear shall be attached to a load hook
- All engineered lifts must be coordinated through ME
- LLE hoist operators shall not carry loads over people
- Any hoist found to have a deficiency shall be de-energized and tagged out in accordance with LLE procedure

# Within LLE there is often a need to move sizeable pieces of equipment or materials

- Rigging/Material Handling is accomplished using jib, gantry, bridge cranes, and other specially designed equipment using overhead hoists



- Overhead bridge cranes in the OMEGA facilities can lift up to 10 tons
- Personnel must be trained and become qualified in the use of overhead bridge cranes before being permitted to lift any loads

**Personnel must stay clear of overhead crane operations**

# There are two specific roles in moving materials overhead, hoist operators and riggers

- The definitions for hoist operators and riggers are as follows;
  - ***hoist operator:*** an employee who generally uses an overhead hoist as a tool to assist in the performance of their regular job
  - ***rigger:*** At LLE a rigger is responsible for safely attaching payloads to the load hook of a hoist.



# For hoist operators and riggers there are multiple classes of qualification

- There are 2 classes of training for Hoist operators



- Hoist operator (M\_003) – for overhead vertical lifting with unpowered horizontal motion
- Overhead Crane operator (M\_009) – for overhead vertical lifting with powered horizontal motion

- There are 3 classes of training for riggers

- No training is required for payloads <120 lbs
- Basic rigger (M\_004) – for personnel attaching any loads from 120-500 lbs to any hoist
- Advanced rigger (M\_005) – for personnel attaching any load >500 lbs to any hoist

**Overhead rigging of material or equipment must be performed only by designated personnel**

# OSHA Department of Labor (DOL) establishes the rules for overhead hoists



- **The rules for Overhead Hoists are established in 29 CFR 1910.179 Overhead and gantry cranes**
- **The DOL incorporates additional rules by reference by citing additional standards within the regulations**
- **ASME B30 pertains to lifting and material-handling related equipment**
  - **There are 28 subparts to ASME B30**
  - **For Overhead Underhung Hoists ASME B30.16 is specified**

# Purpose and Scope of the ASME B30 standard



- **The purpose B30 Standard is intended to**
  - (a) prevent or minimize injury to workers, and otherwise provide for the protection of life, limb, and property by prescribing safety requirements**
  - (b) provide direction to manufacturers, owners, employers, users, and others concerned with, or responsible for, its application**
  - (c) guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives**
  
- **Scope**
  - **Volume B30.16 includes provisions that apply to the construction, installation, operation, inspection, testing, and maintenance of hand chain-operated chain hoists and electric and air-powered chain and wire rope hoists used for, but not limited to, vertical lifting and lowering of freely suspended, unguided loads which consist of equipment and materials.**

# Definitions

- ***designated person***: a person selected or assigned by the employer or the employer's representative as being competent to perform specific duties

**Only designated personnel may operate an overhead hoist**

- ***qualified person***: a person who, by possession of a recognized degree in an applicable field, or certificate of professional standing, or who, by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.
- ***unattended***: a condition in which the operator of a hoist is not at the operating control devices (pendant station or hand chain). If, however, the control devices are within an unobstructed distance of 26 ft (8.0 m) and within sight of the operator, the hoist should be considered attended.

**No suspended load is ever to be left unattended by the hoist operator**

# Overhead hoists can only be attached to engineered and load rated support structures

- All support structures must display a load rating
- All hoists must display a load rating
- When a hoist is suspended from a trolley, a trolley and monorail, or a trolley and crane, and the rated load of each of these pieces of equipment is different, the rated load for the system utilizing this combination of equipment shall be based on the lowest maximum rated load of any individual piece of equipment or structure within the system



# Multiple hoists with independent payloads are permitted on a single support structure if the following conditions are met

- The combined rated load of the hoists shall not exceed the rated load of the support structure
- Example: 1 ton + 600 lbs is less than the 2 ton limit of the structure



# Multiple (usually no more than two) hoists can be attached to a single payload if the following conditions are met



- The combined rated load of the hoists shall not exceed the rated load of the support structure. Example: 1 ton + 600 lbs is less than the 2 ton rating of the support structure
- The maximum permitted load is determined by the hoist with the lowest rating.

**Example:**  
1 ton and 600 lb hoists are connected to the same payload. The maximum hook capacity for the payload is 600 lbs.



1 Ton

600 lbs

# Inspection of overhead hoists is crucial to personnel and equipment safety



- **There are three inspection classifications;**
  - **“Initial inspection” is performed upon initial installation**
  - **“Frequent inspection” shall performed on a monthly basis**
  - **“Periodic inspection” shall be performed on a yearly basis**
- **LLE policy is to have all formal inspections and all maintenance performed by external Certified Crane Inspectors and mechanics, monthly and yearly**

**In addition to the ASME B30.16 requirements, operators are required to visually examine hoist equipment before using it**

# Inspection Records

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- **Dated inspection reports or comparable records shall be made on critical items such as hoisting machinery, sheaves, hooks, chains, ropes, and other lifting devices as covered under Periodic Inspection. Records shall be placed on file.**

**Records for overhead crane inspections are maintained by the O&M group and are available for review by crane operators.**

# Operators of Overhead Hoists

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- **Hoists shall be operated only by the following qualified personnel:**
  - (a) designated persons**
  - (b) trainees under the direct supervision of a designated person**
  - (c) maintenance and test personnel, when it is necessary in the performance of their duties**
  - (d) inspectors (crane)**

# Hoisting practices for operators



- **Operation of an overhead hoist involves more than pulling the hand chain of a hand chain-operated hoist or depressing the "UP" or "DOWN" control of a powered hoist.**
- **The equipment covered by the B30 Standard is subject to hazards that cannot be abated by mechanical means, but only by the exercise of intelligence, care, and common sense. It is therefore essential to have personnel involved in the use and operation of equipment who are competent, careful, physically and mentally qualified, and trained in the proper operation of the equipment and the handling of loads.**
- **Serious hazards include, but are not limited to, improper or inadequate maintenance, overloading, dropping or slipping of the load, obstructing the free passage of the load, and using equipment for a purpose for which it was not intended or designed.**

**Hoist operators are pivotal to ensuring that hoists are used correctly and loads moved safely**

# Before operating the hoist



- (a) The operator shall be familiar with all operating controls of the hoist, and be instructed in the operation(s) to be performed. Instructions shall include, as applicable, the warnings on the hoist, the hoisting practices listed in this presentation, and the operation instructions portion of the hoist manufacturer's manual**
- (b) If adjustments or repairs are necessary, or any defects are known, the operator shall report this promptly to a designated person**

**Any hoist found exhibiting these conditions shall be tagged out and not operated**

- (c) LLE policy forbids operating any equipment that is tagged out**
- (d) No LLE personnel are qualified or permitted to repair a hoist**

# Before operating the hoist

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- (e) The chain or rope shall not be used as a ground for welding**
- (f) A welding electrode shall not be touched to the chain or rope**
- (g) Hand chain-operated hoists shall only be operated with hand power**

# Applying the load

- (a) The hoist rope or chain shall not be wrapped around the load**
- (b) The load shall be attached to the load hook by suitable means**

**Only approved and rated rigging gear shall be attached to a load hook**

- (c) The sling or other device shall be properly seated in the base (bowl or saddle) of the hook. The hook latch shall not be allowed to support any part of the load**

- (d) The load shall not be applied to the point of the hook**

**Load hooks are only rated in the “bowl”, not at the tip**



- (e) Before moving the load, the operator shall be sure chains or wire rope are not kinked or twisted or that multiple part chains or ropes are not twisted about each other**
- (f) The hoist shall not be operated unless the rope or chain is seated properly on the drum, sheaves, or sprockets**

# Applying the load – continued



- (g) Hoists shall not be operated unless the hoist unit is centered over the load, except when authorized by a qualified person who has determined that the components of the hoist and its mounting will not be overstressed. Should it be necessary to pick a load that is not centered under the hoist unit, precautions shall be taken to control the swing of the load when it is picked clear of its support**

**This type of lift is only permitted by a qualified rigger**

- (h) The operator shall not pick up a load in excess of the rated load appearing on the hoist or load block, except during properly authorized tests or properly authorized planned engineered lifts in accordance with paragraph ASME B30.16-3.2.2. A hoist overload limiting device shall not be used to measure the maximum load to be lifted**

**All engineered lifts must be coordinated through ME**

- (i) Specific attention should be given to balancing of the load and hitching or slinging to prevent slipping of the load**

# Moving the load

- (a) The operator shall not engage in any activity that will divert the operator's attention while operating the hoist**
- (b) The operator shall respond to signals from a designated person only. However, the operator shall obey a stop signal at all times, no matter who gives it**
- (c) The operator shall not lift or lower a load with the hoist until the operator and all other personnel are clear of the load**
- (d) The operator shall make sure the load and hoist will clear all obstacles before moving or rotating the load**
- (e) The operator shall inch powered hoists slowly into engagement with a load, but should avoid unnecessary inching and quick reversals of direction**
- (f) A load shall not be lifted more than a few inches until it is well balanced in the sling or lifting device**

# Moving the load – continued

- (g) Each time a load approaching rated capacity is handled, the operator shall check hoist brake action by lifting the load just clear of supports and continuing only after verifying that the brake system is operating properly**
- (h) 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**
- (i) LLE hoist operators shall not carry loads over people**
- (j) Personnel shall not be carried on the hook or the load**
- (k) The operator shall avoid swinging the load or load hook when traveling the hoist**

# Moving the load – continued

**(l) On trolley-mounted hoists, contact between trolleys or between trolleys and stops should be avoided**



**(m) 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**

# Parking the load

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- (a) No suspended load is ever to be left unattended by the hoist operator**
- (b) The load block should be positioned above head level for storage when the hoist is not in use**
- (c) Care shall be exercised when removing a sling from under a landed and blocked load**

# Hoist-Limit Devices (Switches)

- (a) Prior to the initial use of any hoist during each shift, the operator shall verify operation of the upperlimit device under no-load conditions. If more than one upper-limit device is present, only the operation of the primary upper-limit device need be verified. Care shall be exercised; the block shall be inched into the limit or run in at slow speed. If the device does not operate properly, the operator shall immediately notify the appointed person.**
- (b) The hoist-limit device that controls the upper limit of travel of the load block shall not be used as an operating control in normal operation unless additional means are provided to prevent damage from overtravel.**

**Prior to the initial use of any hoist during each shift, the operator shall verify operation of the upperlimit device under no-load conditions**

# Handling The Load



- **Load Weight**
  - **The hoist shall not be loaded in excess of its rated load except for test purposes, as provided in Load Testing procedures, or for planned engineered lifts.**
  
- **Planned Engineered Lifts**
  - **Lifts in excess of the rated load may be required from time to time on a limited basis for specific purposes such as new construction or major repairs. Every planned engineered lift exceeding the rated load shall be treated as a special and separate event.**

**All engineered lifts must be coordinated through ME**

# Hoist Lockout/Tagout

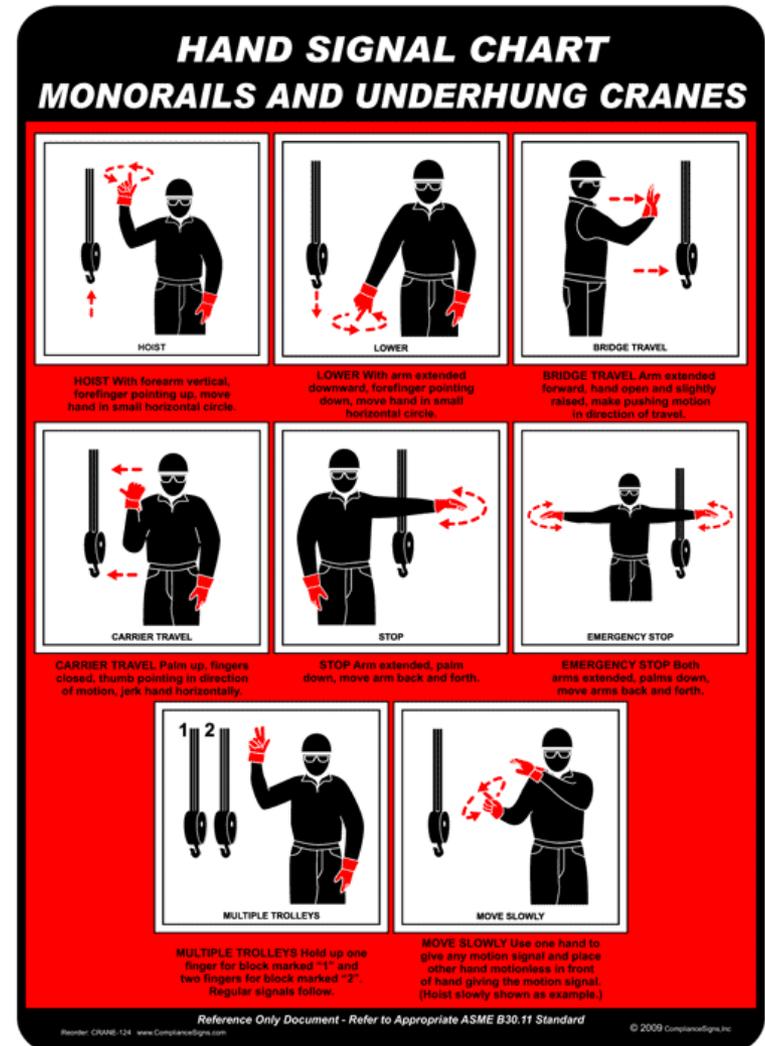
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- **Any hoist found to have a deficiency shall be de-energized and tagged out in accordance with LLE lockout/tagout procedures**

# Hand signals

- Posters containing complete hand signal information for Monorails and Underhung Cranes are posted near the overhead bridge cranes
- Complete knowledge of the hand signals is required for operation of the overhead cranes
- Complete knowledge of the hand signals is required for all riggers



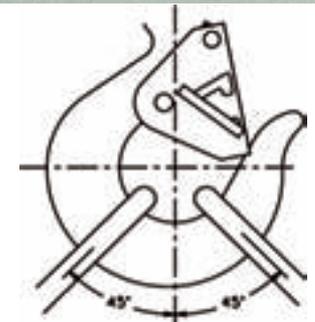
# Hand signals

- Hand signals are not likely to be needed in most laboratory spaces because of close proximity
- However, all operators must know Stop and Emergency Stop
- The hoist operator will only follow hand signals from a designated signalman
- Anyone may call for a stop or an emergency stop and it must be obeyed by the hoist operator

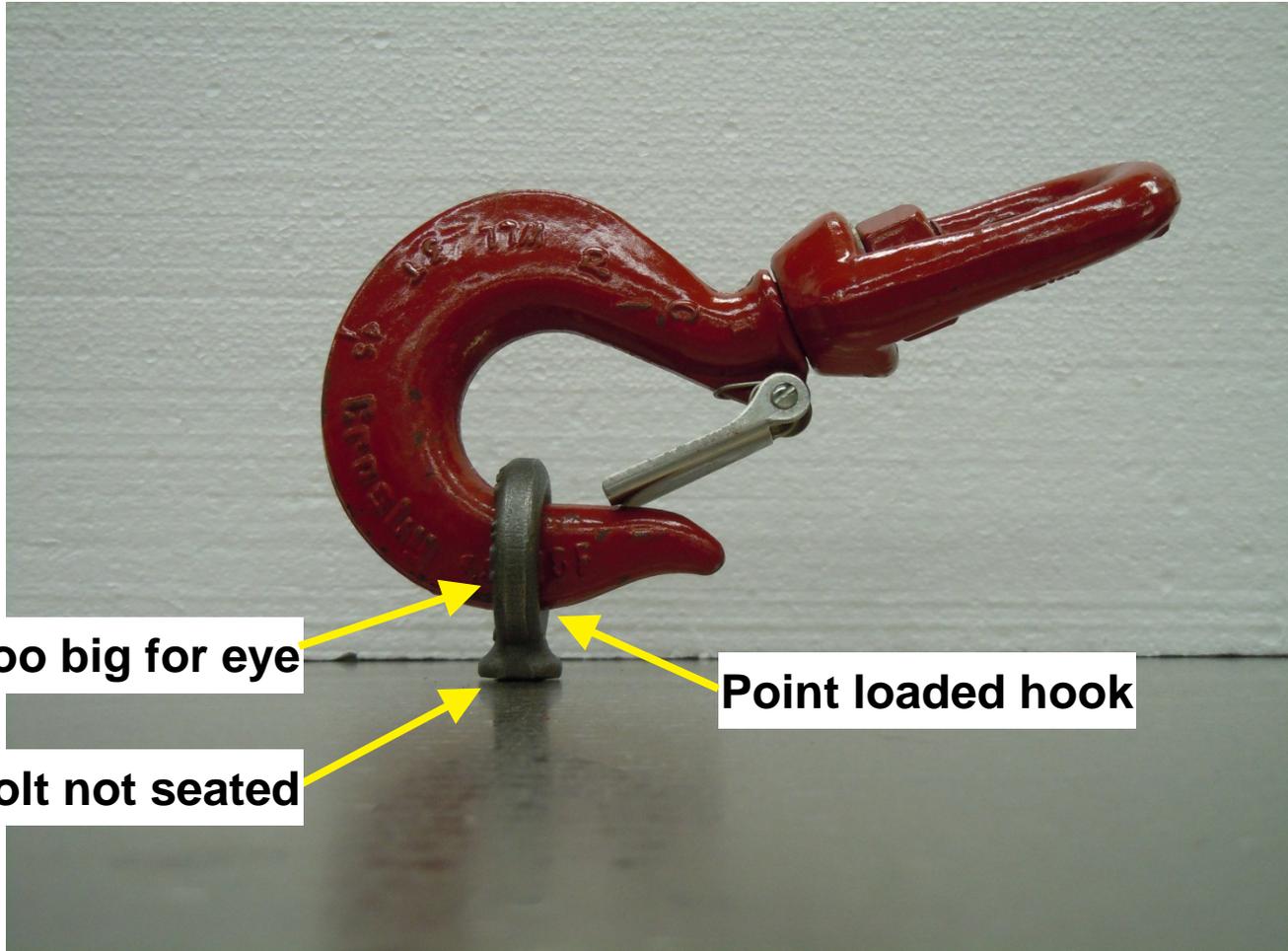


# The load hook

- Always inspect the hook and latch before use
- Insure there is no excessive wear in the saddle of the hook
- Never use a latch that is distorted or bent
- Always make sure spring will force the latch against the tip of the hook
- Always make sure the hook supports the load. The latch must never support the load
- Latches are intended to retain loose sling or devices under slack conditions
- Latches are not intended to be an anti-fouling device
- Only load the hook in the “saddle” or “bowl” within  $\pm 45^\circ$  of vertical
- Hooks are only to be loaded In-line



# What is wrong with this picture?



Hook too big for eye

Point loaded hook

Eye bolt not seated

# Loading the load hook

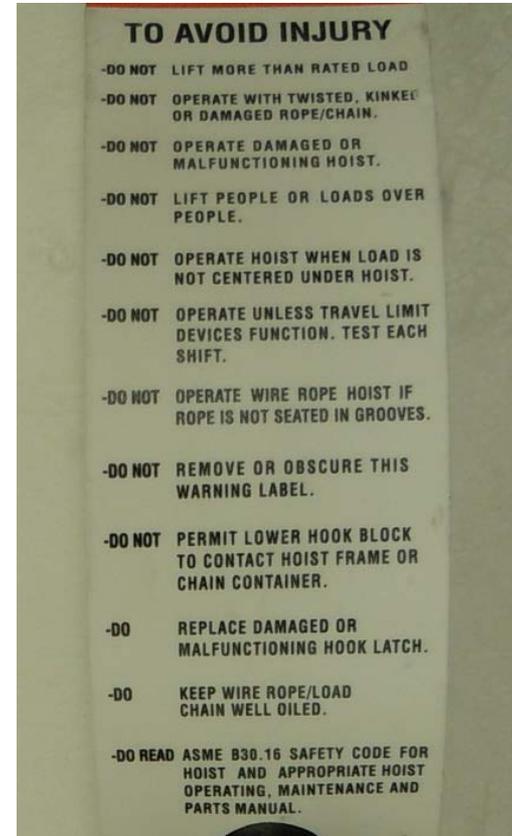
- When placing two sling legs in a hook, make sure the angle between the legs is less than 90° and if the hook or load is tilted, nothing bears against the bottom of this latch
- For two legged slings with angles greater than 90°, use an intermediate link such as a master link or bolt type shackle to collect the legs of the slings. The intermediate link can be placed over the hook to provide an in-line load on the hook. This approach must also be used when using slings with three or more legs.
- Make sure all rigging materials are secured inside the latch area and the latch closes
- **Never** point load a load hook



# Hook latches must be closed and in contact with the hook tip (unlike the examples below which are wrong)



# Examples of overhead hoist controls and manufacturers warnings



**Overhead hoists are to be used in accordance with manufacturers recommendations**

# Manufacturers manuals are an excellent source of general and product specific information



## SAFETY PRECAUTIONS

Each Shopstar Electric Chain Hoist is built in accordance with the specifications contained herein and at the time of manufacture complies with our interpretation of applicable sections of \*American Society of Mechanical Engineers Code (ASME) B30.16 "Overhead Hoists," the National Electrical Code (ANSI/NFPA 70) and the Occupational Safety and Health Act (OSHA). Since OSHA states the National Electrical Code applies to all electric hoists, installers are required to provide current overload protection and grounding on the branch circuit section in keeping with the code. Check each installation for compliance with the application, operation and maintenance sections of these articles.

\*Copies of this Standard can be obtained from ASME Order Department, 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300, U.S.A.

### ⚠ WARNING

Improper operation of a hoist can create a potentially hazardous situation which, if not avoided, could result in death or serious injury. To avoid such a potentially hazardous situation, THE OPERATOR SHALL:

1. **NOT** operate a damaged, malfunctioning or unusually performing hoist.
2. **NOT** operate the hoist until you have thoroughly read and understood this Operating, Maintenance and Parts Manual.
3. **NOT** operate a hoist which has been modified without the manufacturer's approval or without certification that it is in conformity with ANSI/AMSE B30 volumes.
4. **NOT** lift more than rated load for the hoist.
5. **NOT** use hoist with twisted, kinked, damaged, or worn load chain.
6. **NOT** use the hoist to lift, support, or transport people.
7. **NOT** lift loads over people.
8. **NOT** operate a hoist unless all persons are and remain clear of the supported load.
9. **NOT** operate unless load is centered under hoist.
10. **NOT** attempt to lengthen the load chain or repair damaged load chain.
11. Protect the hoist's load chain from weld spatter or other damaging contaminants.
12. **NOT** operate hoist when it is restricted from forming a straight line from hook to hook in the direction of loading.
13. **NOT** use load chain as a sling, or wrap chain around load.
14. **NOT** apply the load to the tip of the hook or to the hook latch.
15. **NOT** apply load unless load chain is properly seated in the chain sprocket(s).
16. **NOT** apply load if bearing prevents equal loading on all load supporting chains.
17. **NOT** operate beyond the limits of the load chain travel.
18. **NOT** leave load supported by the hoist unattended unless specific precautions have been taken.
19. **NOT** allow the load chain or hook to be used as an electrical or welding ground.
20. **NOT** allow the load chain or hook to be touched by a live welding electrode.
21. **NOT** remove or obscure the warnings on the hoist.

### ⚠ WARNING

Improper operation of a hoist can create a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. To avoid such a potentially hazardous situation, THE OPERATOR SHALL:

1. Maintain firm footing or be otherwise secured when operating the hoist.
2. Check brake function by tensioning the hoist prior to each lift operation.
3. Use hook latches. Latches are to retain slings, chains, etc. under slack conditions only.
4. Make sure the hook latches are closed and not supporting any parts of the load.
5. Make sure the load is free to move and will clear all obstructions.
6. Avoid swinging the load or hook.
7. Make sure hook travel is in the same direction as shown on the controls.



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# LLE overhead hoist operator policies



- **Operators shall not exceed the capacity of the overhead hoist**
- **All engineered lifts must be coordinated through ME**
- **Only approved and rated rigging gear shall be attached to a load hook by a qualified rigger**
- **Side pulls are not permitted at LLE**
- **LLE overhead hoist operators shall not carry loads over people**
- **No suspended load is ever to be left unattended by the hoist operator**
- **Prior to the initial use of any hoist during each shift, the operator shall verify operation of the upper limit device under no-load conditions**
- **Complete knowledge of the hand signals is required for operation of the overhead hoist**
- **Any overhead crane found to have a deficiency shall be de-energized and tagged out in accordance with LLE lockout/tagout procedures**

# Overhead hoist Do's



- **Read and follow the manufacturer's instructions**
- **Visually inspect the hoist and support structure for any damage and remove from service if necessary**
- **Check the brake for excessive drift**
- **Check the operation of the limit switches**
- **Check for damaged wire rope, chain, or hooks**
- **Check the wire rope or chain for improper seating, twisting, kinking, wear, or other defects before operating the hoist**
- **Make sure the hook latch is closed before operating**
- **Center the hook over the load before operating**
- **Be sure the load attachment is properly seated in the bowl of the hook**

# Overhead hoist Don'ts



- **Never lift a load until all personnel are clear**
- **Do not let any unqualified personnel operate a hoist**
- **Never carry personnel on a load hook**
- **Do not operate a hoist if you are physically unfit**
- **Do not operate a hoist to the extreme limits of the wire rope or chain**
- **Avoid sharp contact between multiple hoists or the end stops**
- **Never use the wire rope or chain as a sling**
- **Do not point load the hook**
- **Do not avert attention from the load during a lift**
- **Never leave a suspended load unattended**
- **Never attempt to repair a hoist**
- **Never exceed the load rating of the hoist or support structure**

# The overhead hoist process

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1. Energize the hoist (if powered)
2. Inspect the hoist
3. Test the controls
4. Test the upper limit switch
5. Inspect the load block, hook, and wire rope
6. Designate a signalman
7. Review the lift path
8. Attach the payload
9. Test lift the payload and adjust the rigging as necessary
10. Lower the payload and test the load brake
12. Move the payload
13. Lower the payload
14. Secure the payload
15. Detach the payload
16. Park the hoist
17. Deenergize the hoist (if powered)

# Safety is everyone's business and compliance with safety procedures is **MANDATORY**



- If an activity or practice seems unsafe, “Stop Work” and take the time to address concerns
- Only designated and qualified personnel may operate an overhead hoist
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