M_009 Overhead Crane Safety Training

Mechanical Safety Office
University of Rochester
Laboratory for Laser Energetics

Qualification for the use of overhead cranes requires completion of the following

- Take the online Overhead Crane Safety Training and pass the associated test with a minimum score of 80%
- Learn the use of an overhead crane under the supervision of an LLE overhead crane instructor and complete a performance evaluation test that demonstrates proficiency and safe operation of an overhead crane
  - Use involves operating the crane under supervision of LLE competent person
  - Please reference the LLE crane instructors competent persons list provided on the LLE Safety page

Key to understanding the material in this presentation

- **This training addresses the safe operation of LLE's overhead cranes in the Omega and the Omega EP facility**

- **ASME rules in this presentation are direct quotes and are shown for reference and completeness**

LLE policies and important notes are shown in a yellow box like this to highlight their importance.

Summary

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 crane
- No load is to be left attached to the hook; suspended or unattended
- Operators are required to complete pre-operational checklist before use
- The operator shall maintain possession of the remote pendant at all times from startup to securing of the crane
- No LLE personnel are permitted to make any repairs on an overhead crane
- Only approved rigging gear shall be attached to a load hook
- All engineered lifts must be coordinated through Mechanical Engineering (ME) or the Mechanical Safety office
- Crane operators are never to carry loads over people
- Any overhead crane found to have a deficiency shall be de-energized and tagged out in accordance with LLE lock out/tag out procedure

Outline

- The Overhead crane safety course consists of six sections
  I. Introduction
  II. Overhead crane types
  III. Overhead bridge crane
  IV. Testing and maintenance
  V. Operation
  VI. Site specific procedures

Section I

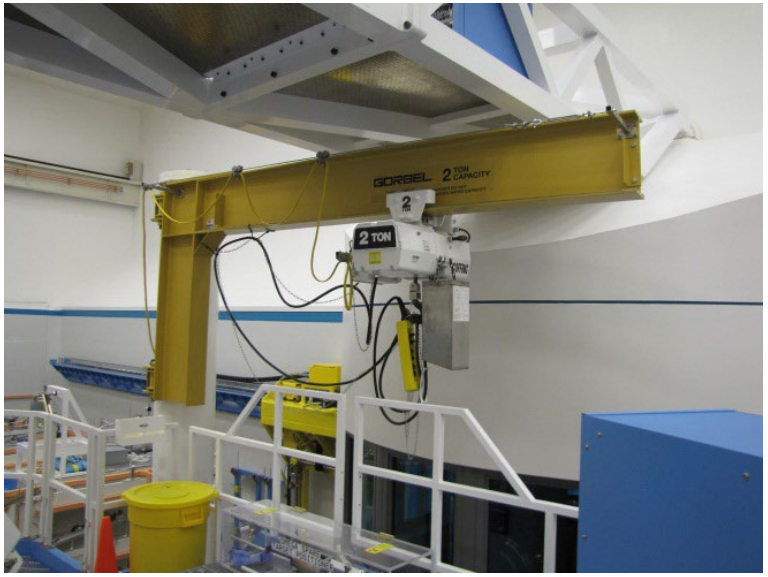
Introduction

Overhead Crane – Definition and Locations

Per the training definitions at LLE, overhead crane training is needed for any crane with powered motion in one axis. This includes:

- **Two (2) overhead bridge cranes in Omega EP and Omega Target Bay**
- **Two (2) jib type cranes in Omega**

Omega EP Bridge Crane



Omega Jib Crane

The focus of this training will be on the overhead bridge cranes.

Training Classifications and definitions

- There are multiple classifications for handling materials within LLE
  - Material Handling (M_012) – for the movement of materials <400 lbs utilizing carts, hoists, lifts, and basic rigging materials
  - Overhead Crane (M_009) – for use of overhead cranes with powered horizontal motion
  - Advanced Rigger (M_005) – for personnel moving and handling any load >400 lbs. (administered by Crane Tech)

Overhead Crane training is not required for the use of local gantry's that have unpowered motion along the axis of trolley travel. This training is covered in M_012.

Governing bodies for the rules for overhead hoists and cranes (reference material)

- Rules established by the Occupational Safety and Health Administration (OSHA) are defined in 29 CFR 1910.179 Overhead and gantry cranes
- The Department of Labor (DOL) incorporates additional rules by reference by citing additional standards within the regulations
- American Society of Mechanical Engineers (ASME)
  - ASME B30 Standard pertains to lifting and material-handling related equipment
  - There are 28 subparts to ASME B30
  - For Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist) ASME B30.2 is specified
  - The B30 Standard is intended to:
    - prevent or minimize injury to workers, and otherwise provide for the protection of life, limb, and property by prescribing safety requirements
    - provide direction to manufacturers, owners, employers, users, and others concerned with, or responsible for, its application
    - guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives

Section II

Overhead Crane Types

This section covers the commonly used overhead cranes at LLE and describes their basic parts

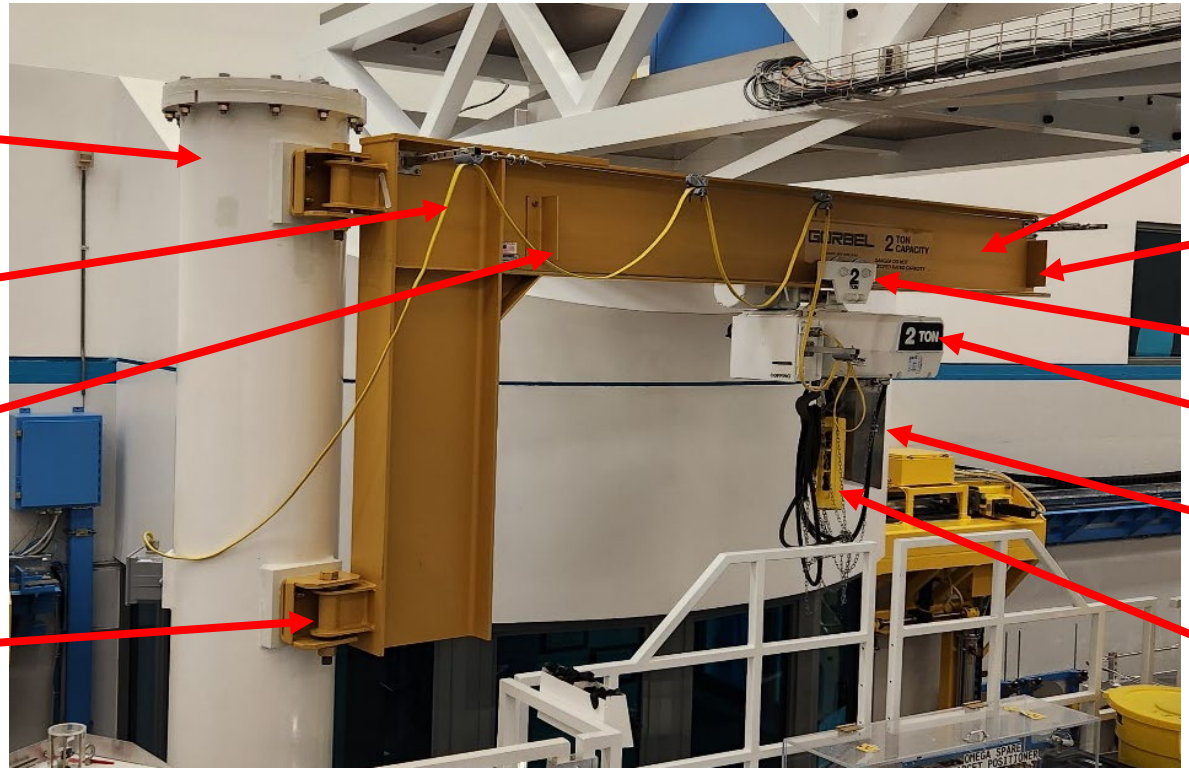
Overhead Crane Types – Jib Crane

- **Jib Crane:** a crane having a cantilever frame that incorporates several design features, that vary between the different types of jib cranes. The basic parts are the boom, mast, trolley, and the hoist.
  - *Boom:* the horizontal beam that extends from the support and holds the load.
  - *Mast:* the vertical beam or pipe steel that supports the boom and allows the system to rotate.
  - Trolley: the powered or unpowered mechanism the moves along the length of the boom to which the hoist is attached to.
  - *Hoist:* used to lift, position, and lower a load.

Wall Mounted Jib Crane (East side, Omega)

Mast Mounted Jib Crane (West side, Omega)

Jib Crane - overview



Mast (column)

Festoon

Travel Stop

Boom Hinge (pivot)

Boom

Travel Stop

Trolley

Hoist

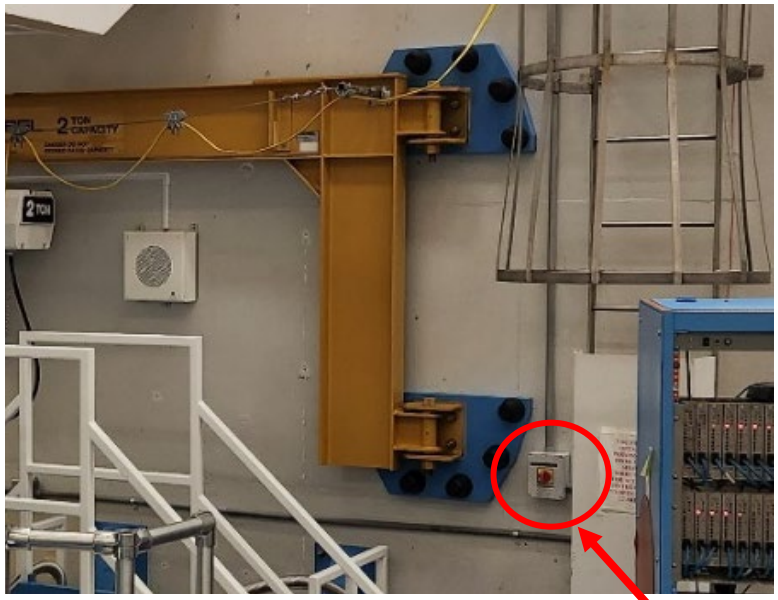
Chain Bucket

Pendant

The jib cranes in the Omega target bay have powered travel along the length of the boom, and therefore they are covered in this training module.

Omega Jib Cranes – Main Power Switch Locations

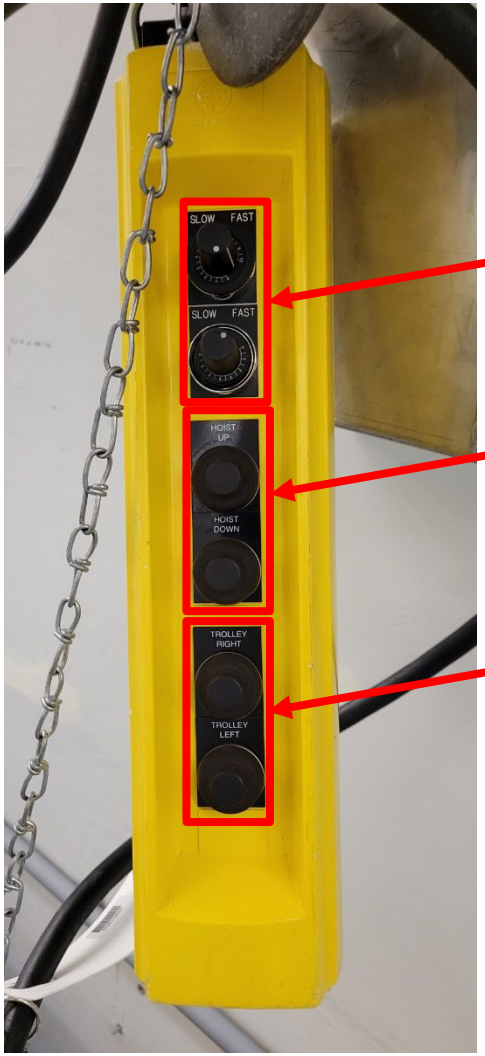
Wall Mounted Jib Crane (East side, Omega)



Mast Mounted Jib Crane (West side, Omega)

Main Power Switch Locations

Omega Jib Cranes - Pendant



Speed Control (Hoist and Trolley)

Hoist Up/Hoist Down

Trolley Right/Trolley Left

<u>Always</u> start with the adjustments for the speed controls in the "slow" position then adjust accordingly

Overhead Crane Types – Gantry Crane

Gantry Crane: This type of overhead crane is a freestanding structure where the bridge for carrying the trolley or trolleys, is rigidly supported on two or more legs running on fixed rails, wheels, or casters.

This gantry does not utilize powered motion in one axis, and therefore use is not covered under this training module. Training required would be M_003 Overhead Hoist.

ME Assembly Lab Gantry Crane

Overhead Crane Types – Overhead Bridge Crane

Overhead Bridge Crane: is a type of overhead crane with a single or multiple girder movable bridge, carrying a movable or fixed hoisting mechanism that travels on an overhead fixed runway structure

The overhead bridge crane shown here (Omega EP), is specifically a *"Double Girder, Overhead, Underhung Bridge Crane".* (Underhung meaning the trolley rides below the top of the bridge.)

LLE has three (3) bridge cranes and is therefore covered in this training module

Section III

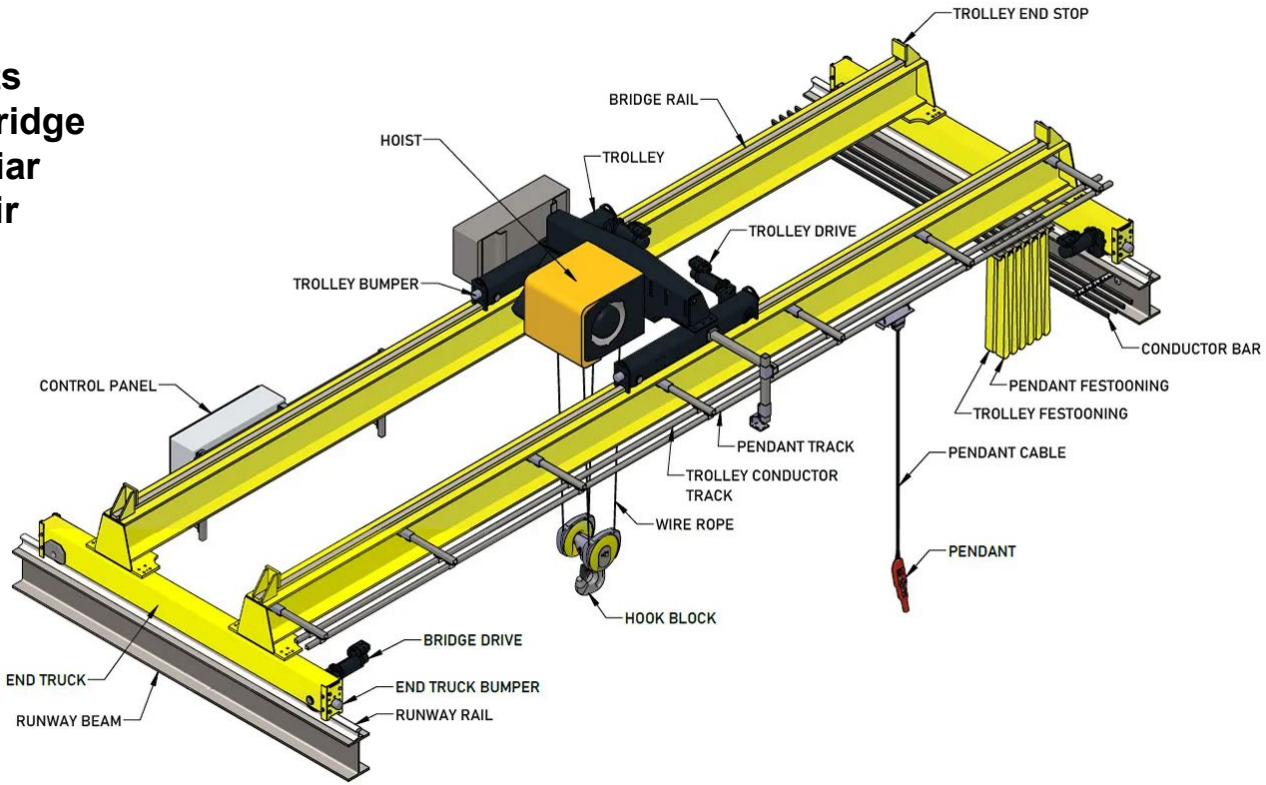
Overhead Bridge Crane - Description

This section covers the component make-up of the overhead bridge cranes at LLE and describes their basic function

Overhead Bridge Crane – Component Overview

Pictorial Diagram of Crane Components

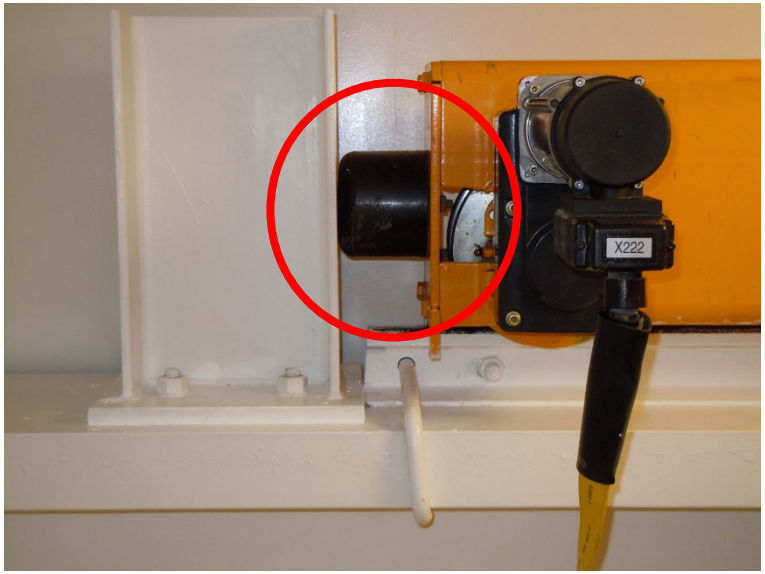
There are many components that make up an overhead bridge crane. It is good to be familiar with these components; their function and where they are located



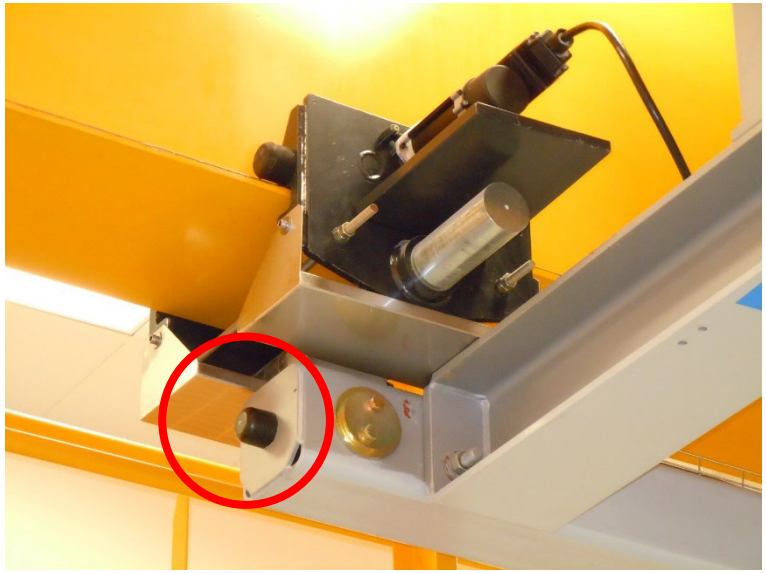
Although this is a picture of a top running bridge crane, many of the component terms are the same

Overhead Bridge Crane – Component Overview

<u>Bridge and Trolley Bumpers</u>: These are used as end stops to limit the physical travel of the bridge or trolley in either direction.



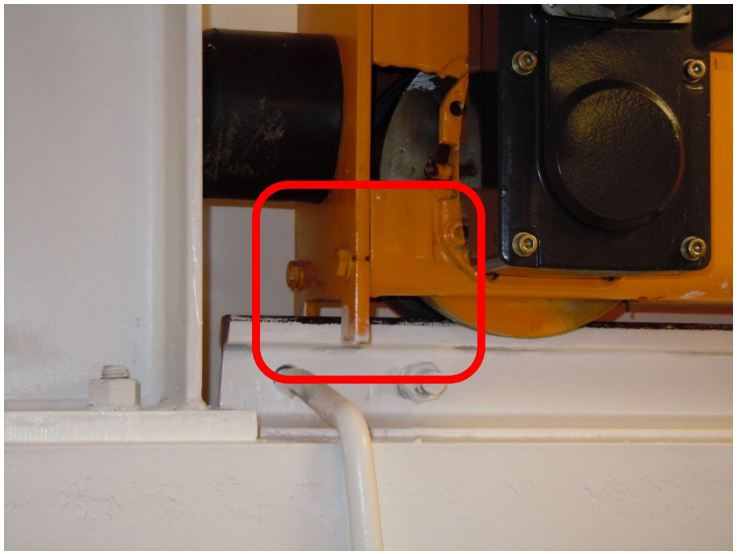
Bridge Bumper



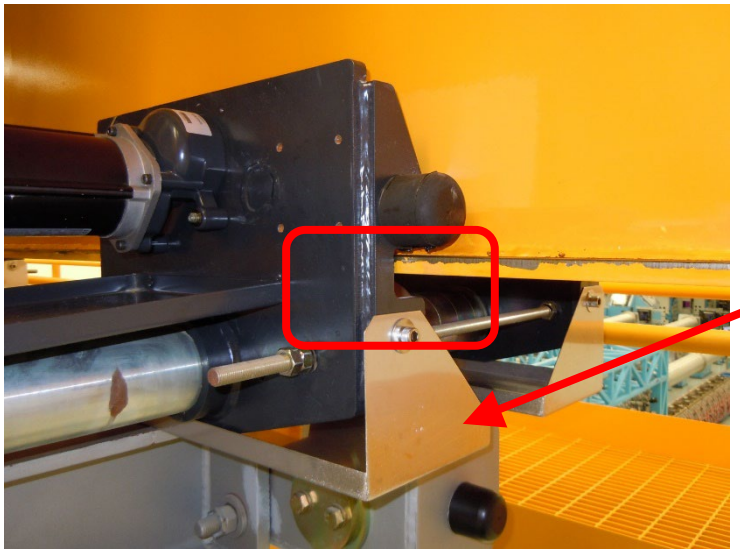
Trolley Bumper

Overhead Bridge Crane – Component Overview

Rail Sweeps: Located on the leading edge of the wheels of both the bridge and the trolley, they are designed to clear the rail of objects on the runway which could cause damage to the wheel or derail the wheel



Bridge Sweep

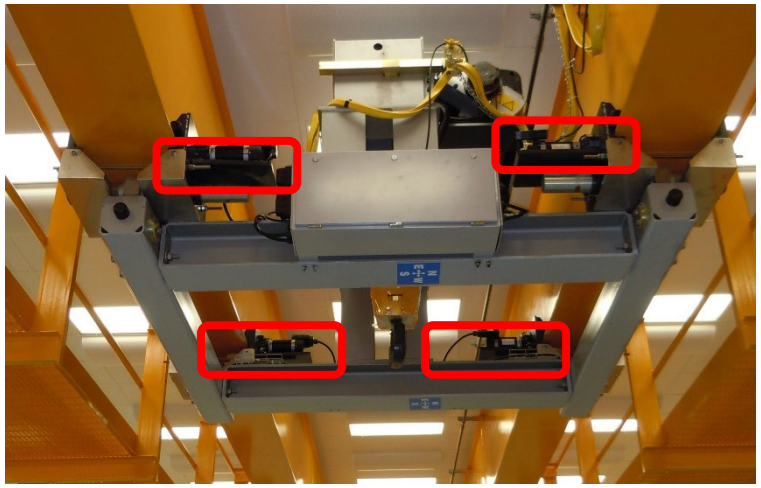


Rail Sweep

Overhead Bridge Crane – Component Overview

<u>Bridge and Trolley Brakes</u>: On both the bridge and the trolley, there are four (4) sets of brakes; one for each drive motor/wheel. These brakes are activated upon release of the control button commanding the direction of travel.

Bridge Brake

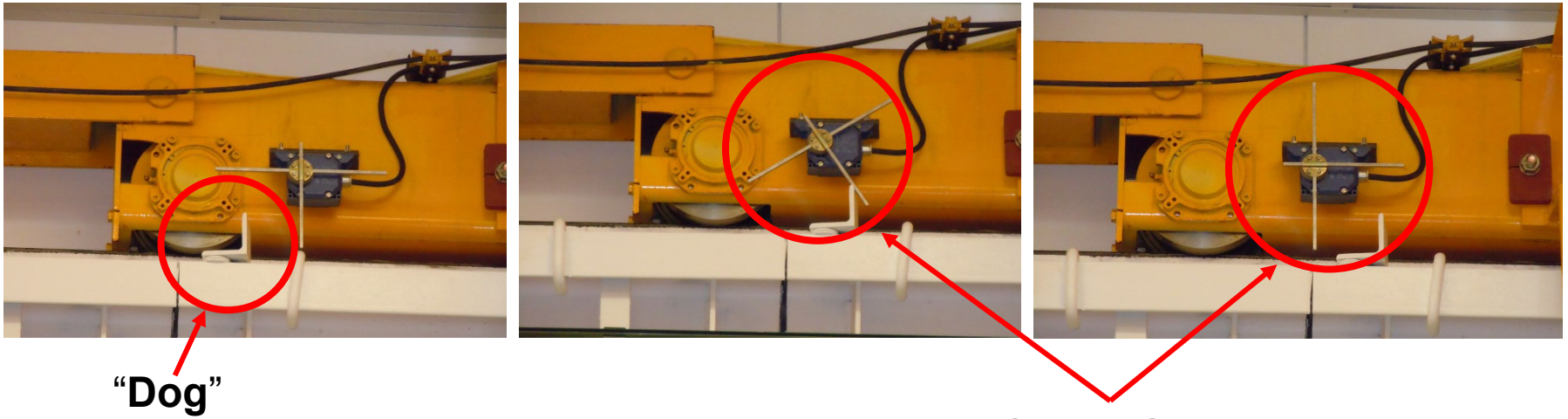


Trolley Brakes

Overhead Bridge Crane – End of Travel Speed Reduction

Near the ends of all runways is a bracket or "dog" that trips a switch on the end truck which reduces the maximum speed that the crane can travel

Bridge Travel



"Dog"

Travel Speed Switch

Operators must be aware of where they are relative to the switch and not be surprised by a change in speed near the end of travel

Overhead Bridge Crane - Electrical Equipment

- **The power supply to the runway conductors are controlled by a switch or circuit breaker located on the walls of both Omega and EP bays.**
- **The electrical disconnects for all LLE bridge cranes are clearly labeled on the cover.**

Omega Overhead Crane Disconnect

South Wall Between South EMS and Cluster 6 FASP

Omega EP Overhead Crane Disconnects

High Bay Crane East Wall (Target Area)

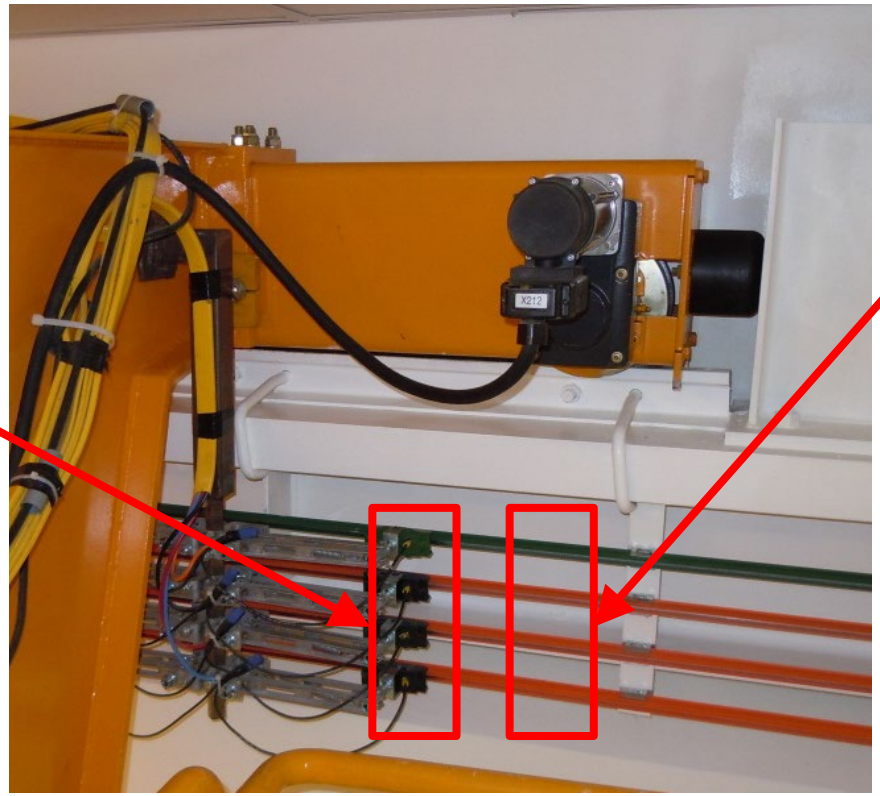
Low Bay Crane East Wall (Near Garage Door)

Overhead Bridge Crane - Runway Conductors and Collectors

- **There are two basic parts to the electrical system that powers the crane overhead**
  - **Conductors: These are the series of bars mounted on a fixed portion of the building that run along the length of the bridge supplying power the crane**
  - **Collectors: These are the contacting devices located on the bridge of the crane used for collecting current (power) from the runway conductors**

Open type conductors, mounted on the crane runway beams, are located and guarded such that persons cannot inadvertently come into contact with them under normal operating conditions

Runway Conductors and Collectors - Overview



Collectors (shoes)

Conductors (with orange and green outer insulation)

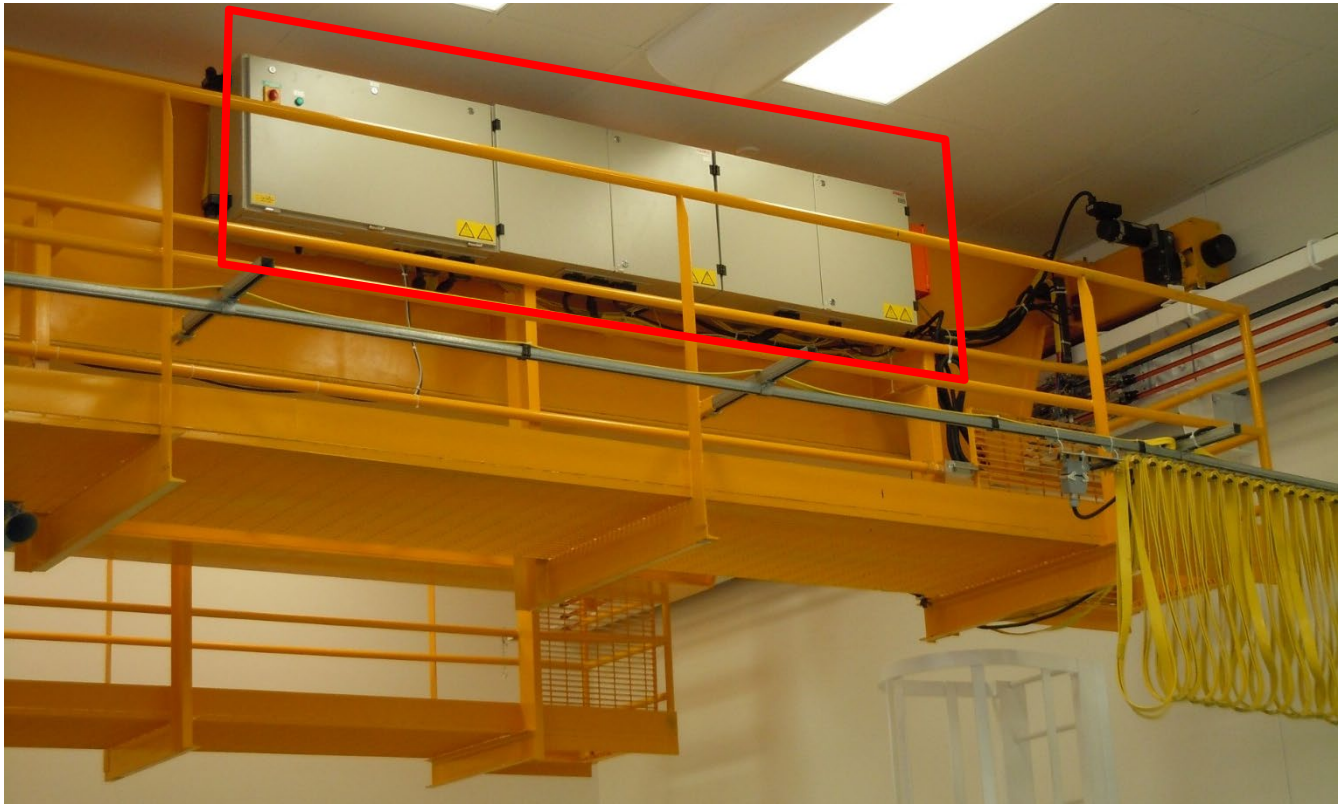
Danger!!!

The conductors should always be considered live or "HOT"

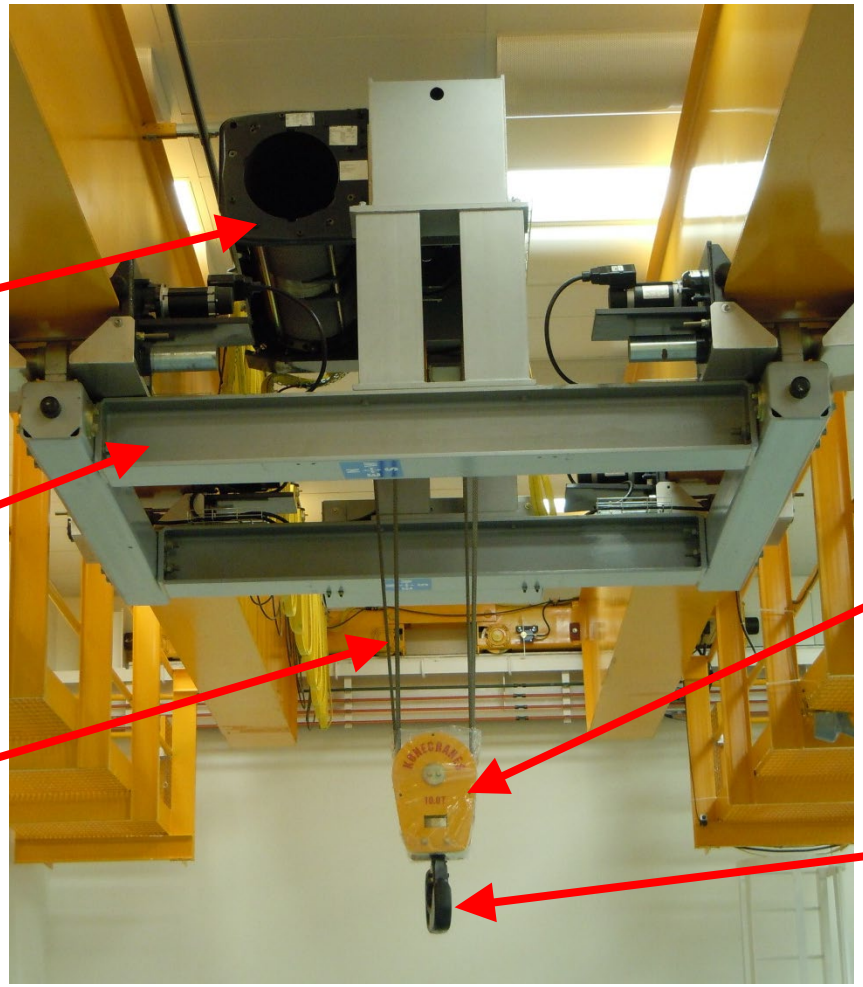
DO NOT TOUCH!

Overhead Bridge Crane - Electrical Equipment Controls

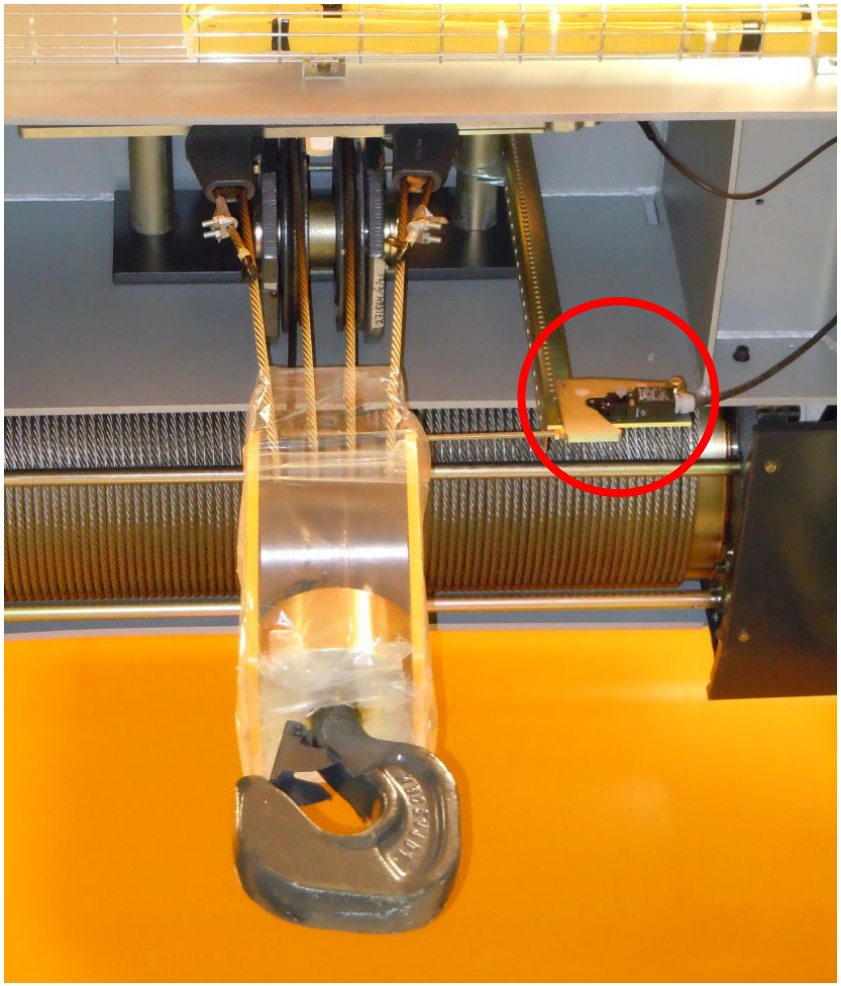
Control boxes are located on the bridge of the crane



Hoisting Equipment - Overview



Hoisting Equipment - Upper Limit Switch

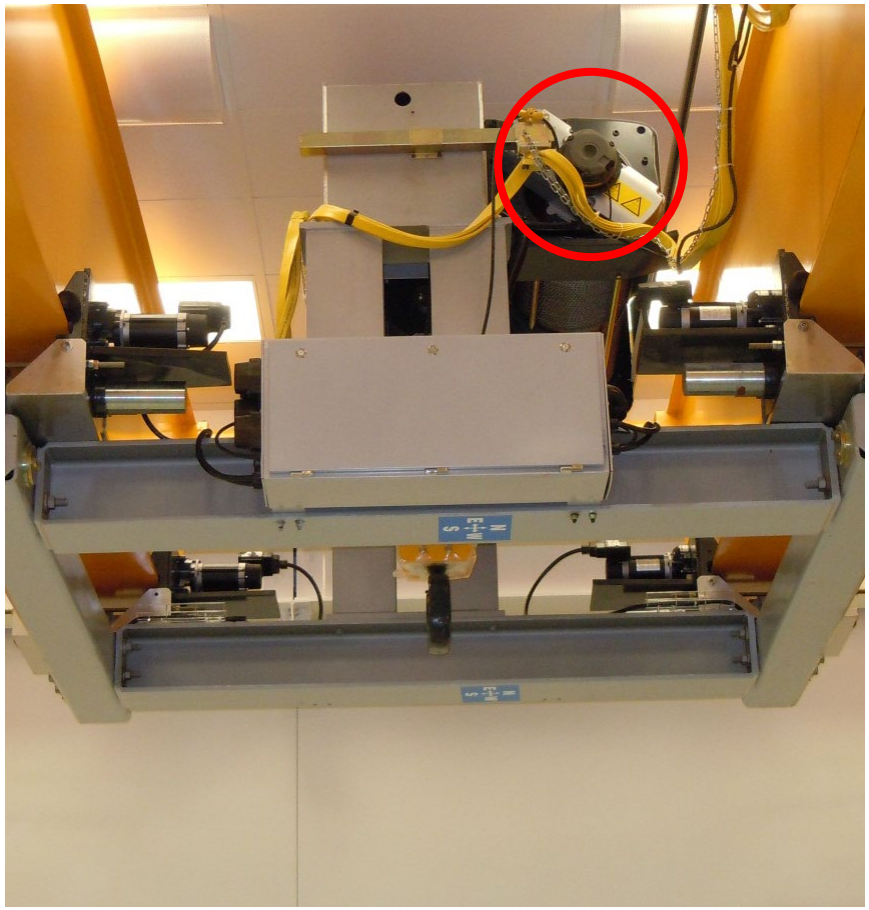


The upper limit switch prevents the load block from approaching too close to the hoist reeving. It is actuated when it comes in contact with the top of the load block.

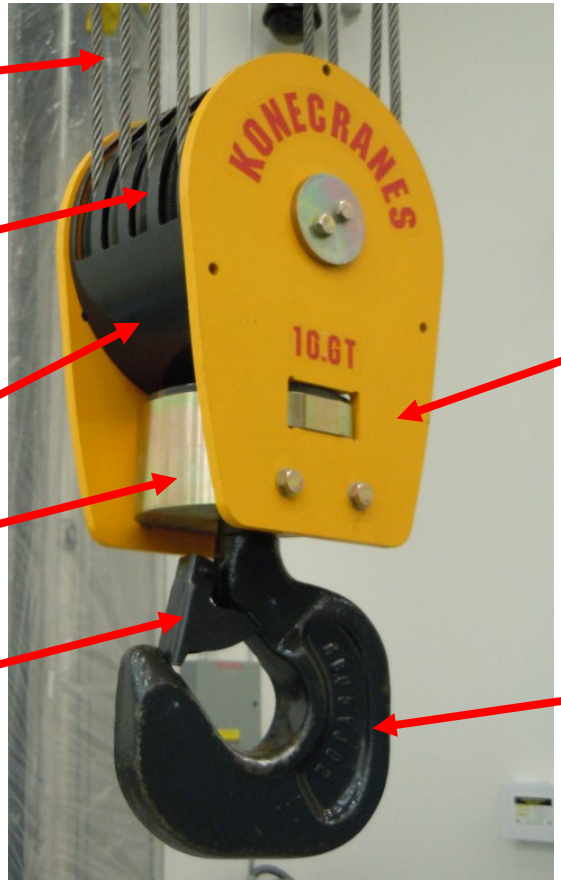
Hoisting Equipment - Integrated Hoist Brake

- The hoist drum has a motor with an integrated brake.

- Power must be applied to the brake to “disengage” the brake and allow drive to rotate. In other words, “spring set/power released.”
  - In the event of a power failure or fault, the brake is automatically engaged mechanically. This feature makes the drive fail-safe.



Hoisting Equipment – Hooks and Sheaves



Wire Rope

Sheaves (integrated with load block 4X)

Sheave Guard

Hook Swivel

Hook Latch

Load Block

Load Hook

All crane operations require that all rigging gear must be captured inside of the latch with latch closed.

Overhead Bridge Crane – Remote Crane Pendant

- **Remote control pendants are used in both facilities to control all crane motions. All buttons are labeled with their appropriate function.**

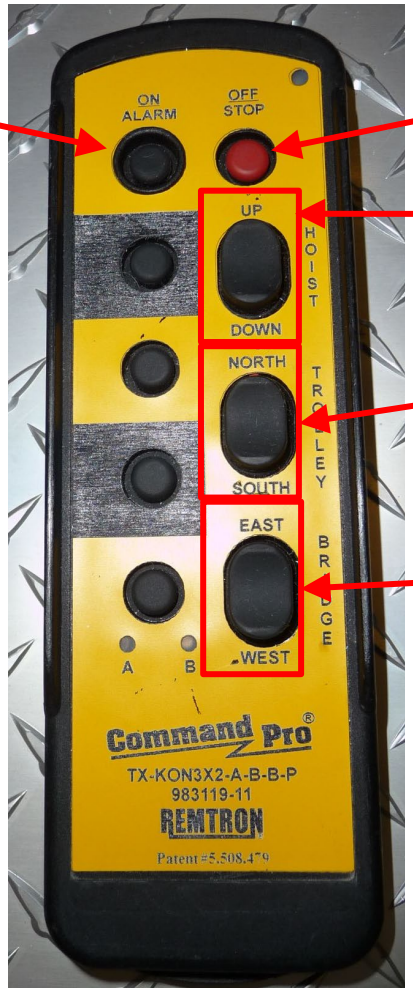
- **A safety feature of the crane is that all motion is locked out until the horn/alarm button has been pressed. After a period of inactivity, the pendant functions will "time-out" and the crane functions will deactivate. Depressing the horn/alarm button is needed to re-activate the crane.**

- **The remote-operated cranes function so that if the control signal for any crane motion becomes ineffective, the crane motion will stop. Signals received from any source other than the operating station (transmitter) will not result in operation of any motion of the crane.**

Overhead Bridge Crane – Remote Crane Pendant

Omega Bridge Crane Pendant

Remote Power On/Off Alarm



Stop

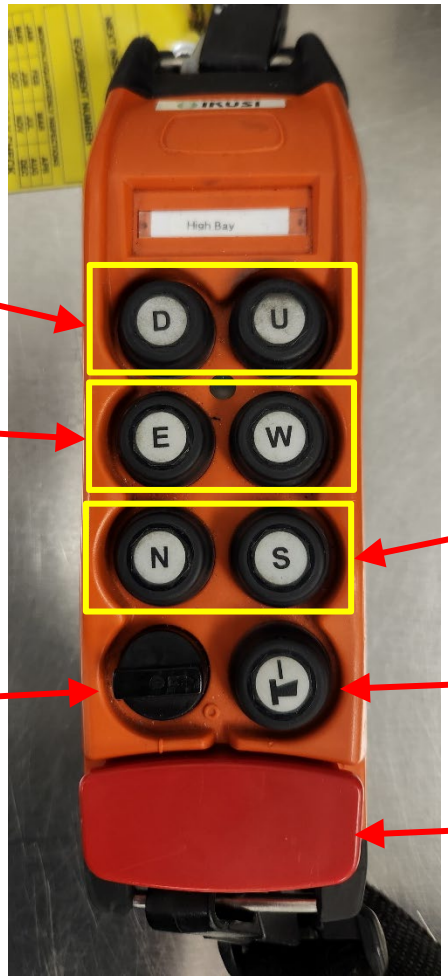
Hoist Down/Up

Bridge North/South

Trolley East/West

Overhead Bridge Crane – Remote Crane Pendant

EP Bridge Crane Pendant



Hoist Down/Up

Trolley East/West

Bridge North/South

Remote Power On/Off

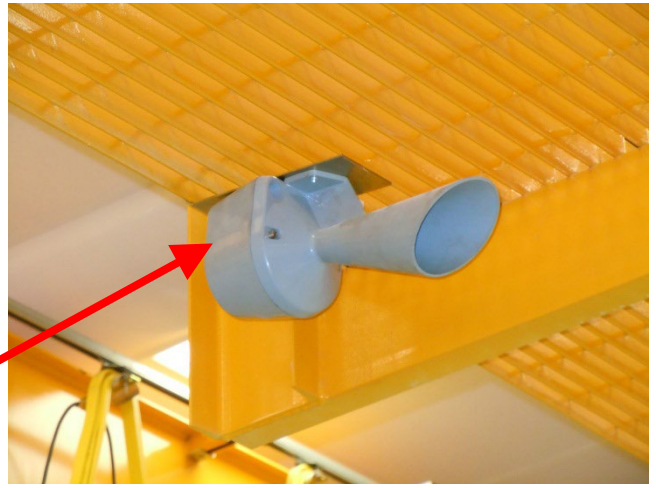
Horn

Emergency Stop

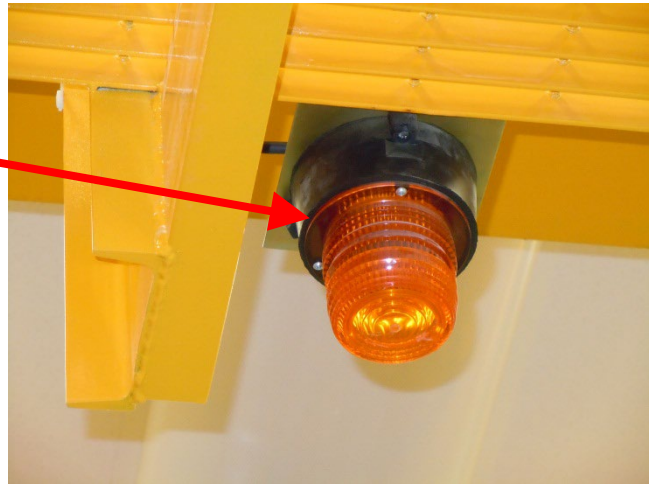
Warning Devices – Crane Travel

- **The following warning devices are provided on the overhead bridge cranes in Omega EP.**
  - **These devices provide an alert during travel of the bridge or the trolley; not for hoist operation**

<u>Horn</u> - This is commanded by the operator before any movement of the crane is to take place



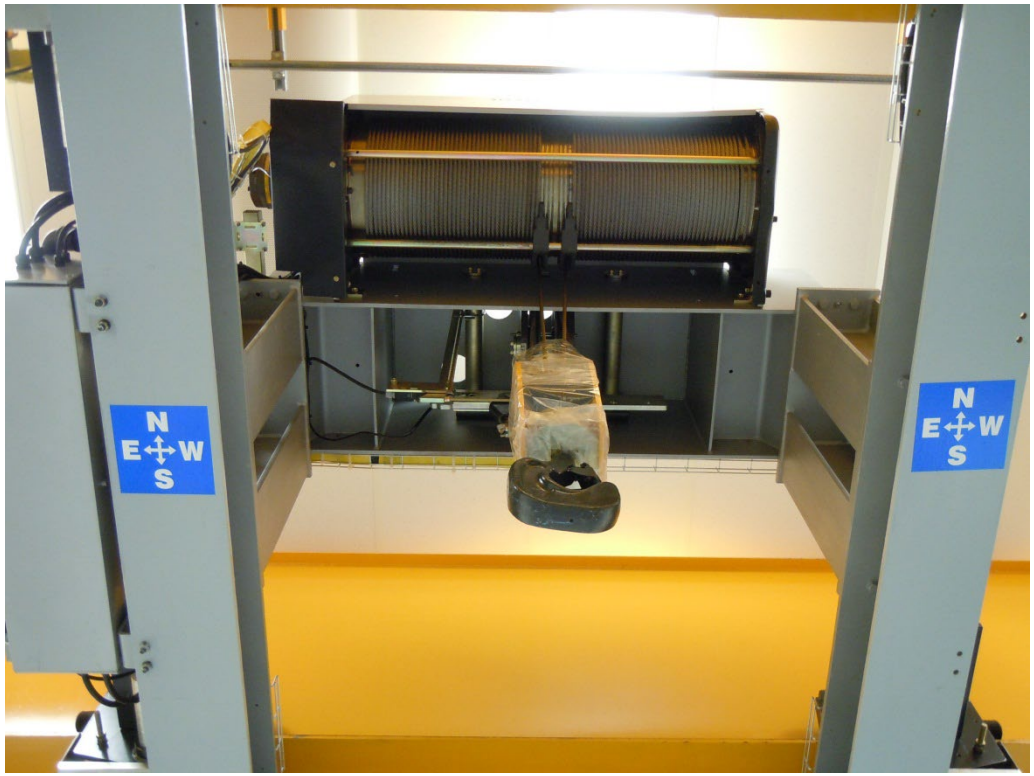
<u>Beacon</u> – The flashing light alerts the operator and bystanders of movement of the bridge and trolley *not the hoist*

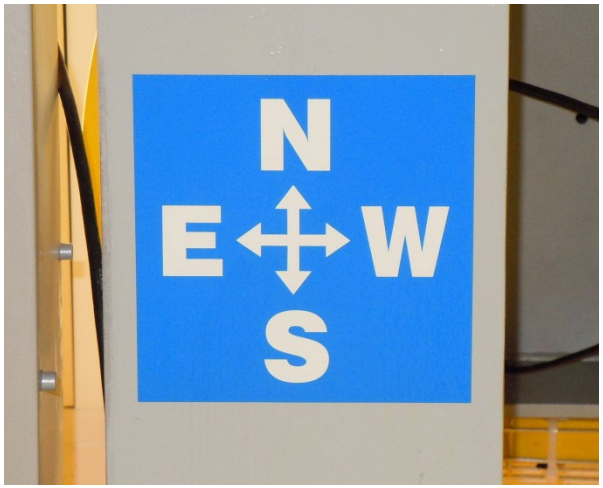


The Omega Target bay bridge crane does not have a beacon provided

Overhead Bridge Crane – Directions of Travel

- The bottom of the trolley is labeled with the compass points denoting travel directions
- In both Omega and EP facilities, the travel direction of the bridge runs East and West, and the trolley runs North and South



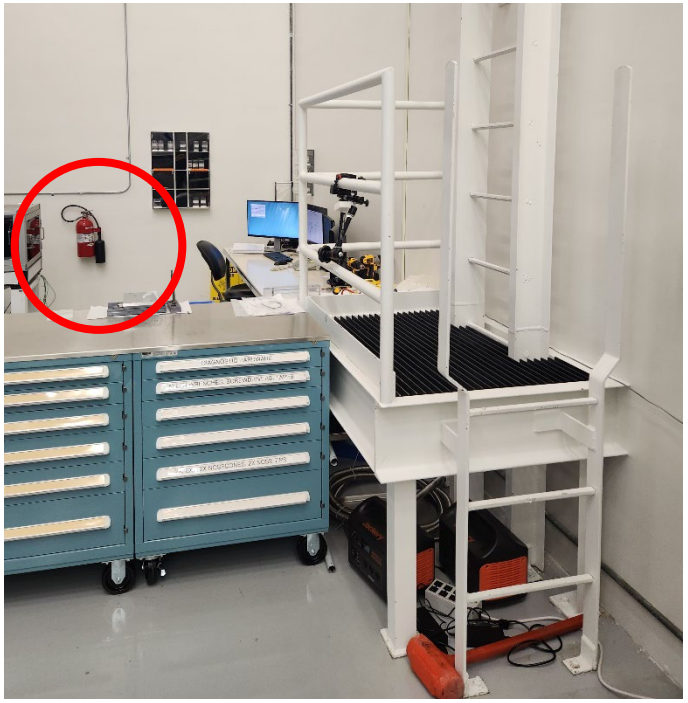


Overhead Bridge Crane - Markings

- All load blocks display a load rating
- All support structures (the bridge) display a load rating

Overhead Bridge Crane – Fire Extinguishers

- **Fire extinguishers for the cranes are located near the base of the access ladders**



EP HIGH BAY

EP LOW BAY

OMEGA TARGET BAY

The Overhead Crane Manual

- **The crane manufacturer furnishes a copy of the manual with the crane. The manual includes general information applicable to the following:**
  - ***(a)*** **installation**
  - ***(b)*** **operation**
  - ***(c)*** **inspection**
  - ***(d)*** **testing**
  - ***(e)*** **lubrication**
  - ***(f)*** **maintenance**
  - ***(g)*** **parts**
  - ***(h)*** **wiring diagram (may be supplied separately)**

Personnel responsible for the inspection or maintenance of the crane shall be familiar with the applicable contents of the manual furnished with the crane. Operators may reference this document through the O&M department.

Section IV

Inspection and Maintenance

This covers the LLE policies for Inspection, Testing, and Maintenance of the overhead bridge cranes

Inspection Classifications at LLE

UR LLE

(1) Daily Inspection. Pre-operational checklist that includes visual examination of the equipment including verification of functions and hoist limits. A log is filled out before use once a day as needed.

(a) Frequency interval – Daily as used

(2) Frequent Inspection. **Visual examinations by an external service that inspects for wear or damage of components, and proper functionality of safety devices with records kept by the O&M group.**

(a) Frequency interval **- monthly**

(3) Periodic Inspection. A more in-depth inspection **of the equipment in place by a external service that looks for deterioration or wear and making sure all aspects of the equipment are in good working order. Records are again kept and maintained by the O&M group.**

(a) **Frequency interval - yearly**

LLE Overhead Crane Inspection and Maintenance Policies

- **LLE policy is to have all periodic inspections performed by an external Certified Crane Inspector; monthly and yearly.**

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

- **All operational and load testing must be performed by a Certified Crane Inspector.**

- **All preventive maintenance and repairs are performed by a certified external vendor.**

No LLE personnel are qualified or permitted to perform preventive maintenance or repairs on overhead cranes.

Section V

Operation

This section covers the ASME requirements and the conforming LLE policies for the operation of overhead cranes

Crane Operator - Prerequisites

- Personnel are required to pass a practical operating examination.
- Qualifications shall be limited to the specific type of equipment for which the operator is being examined.
- Cranes can only be operated by the following personnel:
  - qualified operators
  - designated persons
  - trainees under the direct supervision of a designated person
  - maintenance and test personnel, when it is necessary in the performance of their duties
  - inspectors (crane)

Overhead Crane Pre-operational checklist

- A pre-ops checklist is to be performed before the 1st use of the crane for the day
- Subsequent operators need only verify the checklist has been performed
- Checklists will be located at the pendant stations for the respective cranes
- Once the checklist is complete, the operator will sign and date in the appropriate space

Pre-ops checklist is as follows:

- Make sure no functions will work with E-stop activated
- Check pendant control functions - Move crane N/S, E/W, down/up
- Check upper limit switch
- Visual check of crane hook, latch, sheeves, and wire rope
- Verify no drift of crane hook
- If any malfunctions or unusual noises are observed, the crane should be tagged out according to LLE lockout/tagout policy. Notify the ME safety office such that a certified crane company can perform service.

Detailed Instructions for the Overhead Crane Pre-operational Checklist

- Use the Crane Main Disconnect Switch to turn on power
- Activate the radio pendant controls by pressing the start button
- Confirm the bridge moves East and West, and the trolley moves North and South
- Test the Hoist Upper Limit Switch using the following steps;
  a) Position the hook in an area where it is safe and lower the hook 4-5 feet
  b) In *Creep Mode,* slowly raise the hook. The upper limit switch should STOP the hoist before the hook block comes in contact with the sheeves or drum
- Position the hook over the location where you are performing the lift
- Lower the hook to eye level and check the following;
  a) The hook swivels freely
  b) The latch closes against the inside of the hook
  c) Inspect the hook for signs of damage
  d) Examine the wire rope looking for broken strands or kinks
  e) If there are any issues, Stop and notify your supervisor, if not continue
- Test the Hoist Load Brake using the following steps;
  a) In *Creep Mode,* slowly raise the hoist until the load is about two inches above the floor or cart, and STOP
  b) Verify the Hoist Brake holds and the load hook does not drift down
  c) If no issues were found continue, otherwise STOP and notify your supervisor
- Set the load down, or have someone attend the load, and sign and date the checklist located at the Crane Main Disconnect Switch

Hoist-Limit Devices (Switches)

- The testing of the upper limit switch device is done carefully such that the block is be inched or run into the limit at slow speed. If the device does not operate properly, the operator shall immediately tag out the crane per LLE procedure.
- The overhead cranes in OMEGA and OMEGA EP use an encoder as the primary upper limit device. The secondary upper limit switches are mechanical and stop the hoist when a rod contacts the hook block.
- 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 over-travel.

Order of Operations

1. Review the hoisting operation and lift path with all involved personnel
2. Designate ancillary personnel as required
3. Attach the payload
4. Test lift the payload and adjust the rigging as necessary
5. Raise the payload
6. Move the payload
7. Lower the payload
8. Secure the payload
9. Detach the payload
10. Park the crane
11. Deenergize the crane
12. Put the remote control away

No load is to be left attached to the hook; suspended or unattended

Hoisting Practices for Operators – ASME B30.2

- **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 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.**

Overhead crane operators are pivotal to ensuring that hoists are used correctly and loads moved safely

Conduct of Operators as derived from ASME B30.2 Section 2-3.1.7

(1) **The operator shall not engage in any practice that will divert attention while engaged in operating the crane.**

(2) **If unfit in any way physically or otherwise, an operator shall not engage in the operation of the equipment.**

(3) **The crane operator shall**

(a) be familiar with and understand all hand signals

(b) use and respond to any hand signals from the person who is directing the lift or an appointed signal person

(c) use clear and concise verbal communication with all involved in a lift

(d) be responsible for the lifts when a signal person or spotter is not required as part of the crane operation

(e) obey a stop signal at all times, no matter who gives it

Conduct of Operators (cont.)

(4) Each operator shall be responsible for those operations under the operator's direct control. *Whenever there is doubt as to safety, the operator shall consult with the appropriate individuals and rectify any concerns before handling the loads*.

(5) The operator shall activate the warning device (horn), before starting the bridge or trolley motion of the crane

(6) The operator shall not close the main switch (crane disconnect) until certain that no worker is on or adjacent to the crane. Before closing the main switch, the operator shall be sure that all controllers are in the off position

Note: Remote crane controls on Omega and Omega EP are designed to "time out" after a period of no use. Activating the horn is needed to re-activate the crane functions

Conduct of Operators (cont.)

(7) **If there is a warning sign or lock on the main electrical disconnect, it shall not be energized until the sign or lock is removed by the person who placed it there, or by an authorized person. (reference LLE lock out/tag out procedure)**

(8) If power goes off during operation, the operator shall immediately place all controllers in the off position. Prior to reuse of the crane, operating motions shall be checked for proper function.

(9) **The operator shall be familiar with the equipment and its proper care. If any errant conditions exist or defects are found during pre-inspection, operation, or otherwise, the operator shall promptly put the crane in a safe state, de-energized, and proceed with lockout/tagout of the crane. The ME safety office should be notified such as to facilitate the O&M group to contact a certified crane company.**

Conduct of Operators (cont.)

(10) **Contact with runway stops or with other cranes shall be made with extreme caution. The operator shall do so with particular care for the safety of persons on or below the crane, and only after making certain that any persons on the other cranes are aware of what is being done.**

(11) **Before any maintenance work is performed on a crane, a qualified operator shall lock and tag the main switch (crane disconnect) (see para. 2-2.3.2 in ASME B30.2) in the de-energized position.**

(12) All controls shall be tested by the operator before beginning a new shift. If any of the controls do not operate properly, the crane should be homed or placed or put in a safe condition. The crane should be immediately be placed in lockout/tagout log of the appropriate facility.

(13) **Persons boarding or leaving overhead cranes should do so only at authorized locations and designated boarding entrances (this is covered later in the presentation)**

Attaching the Load

- An important aspect of maintaining safety of crane and rigging operations is knowing the weight of the load.
- Bring the hook to the load in such a manner as to minimize swinging and position it directly over the CG (center of gravity) of the load
- Verify the hoist rope in the block is not kinked, damaged, or otherwise compromised and seated in the drum grooves and sheaves. Verify there is a “no slack” condition in the wire rope.
- The load shall be attached to the load block hook by means of slings or other approved and load rated rigging gear and must be seated in the bowl of the hook.
- Care shall be taken to make certain that the sling length will allow the load to clears all obstacles.

Moving the Load

- **Before lifting the load, verify that it is secured, balanced, and positioned properly in the hook, sling, or lifting device**
- **During lifting, care shall be taken that there is no sudden acceleration or deceleration of the moving load and that the load will not contact any obstructions**
- **The load should be moved in such a manner as to not induce excessive swinging**
- **The operator shall NEVER carry loads over people**
- **No load attached to the hook, suspended or otherwise, is ever to be left unattended by the crane operator**
- **The crane operator should always be in sight of the hook/block during operation**

Moving the Load (cont.)

- In the event that two or more cranes are used to lift a load, one qualified person shall be in charge of the operation. This person shall analyze the operation and instruct other personnel involved in the proper positioning, rigging, and movements of the load.

- When landing a load, operators must be certain the floor or cart can support the weight of the payload

- The load shall not be lowered below the point where two wraps of rope remain on each anchorage of the hoisting drum unless a lower-limit device is provided, in which case, no less than one wrap shall remain

Moving the Load (cont.) – Side Pulls

- Cranes should not be used for side pulls, except when specifically authorized by a qualified person who has determined that
  - the various parts of the crane will not be overstressed
  - the hoist rope will not rub against other members of the crane, such as the girders or trolley frame, except members specifically designed for such contact
  - such side pulls will not cause the hoist rope to be pulled out of the sheaves or across drum grooves
  - such side pulls will not result in excessive swinging of the load block or load

All side pulls must be coordinated through the ME safety department and qualified rigging personnel such as an LLE advanced rigger

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.**

- **The crane 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.**

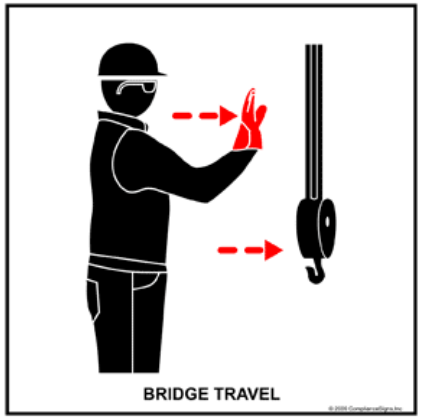
LLE does not routinely engage in Engineered lifts
All engineered lifts must be coordinated through Mechanical Engineering and the Safety office

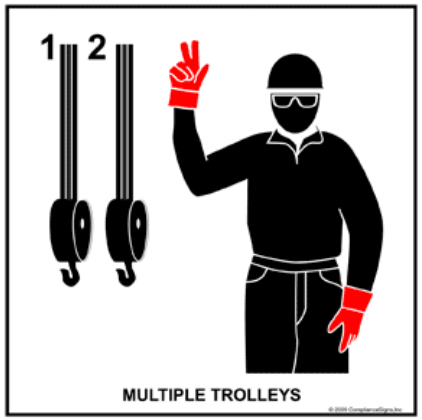
Communication - Hand Signals and Verbal

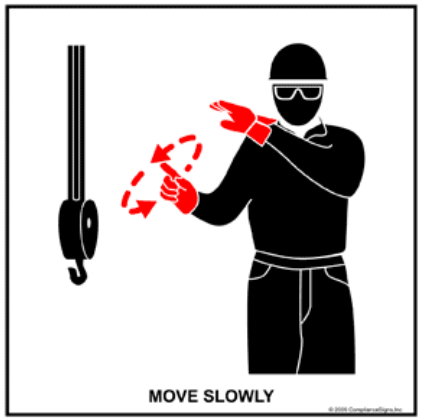
- **All crane operators and riggers must know all of the listed/posted hand signals (next slide)**
- **Although hand signals are not likely to be needed in most cases because of the close proximity of the crane operator to the riggers or other assigned personnel. *Clear concise verbal communication is paramount in the safe operation of the crane. (see below)***
- **Radios and/or cell phones may be used in lieu of face to face communication as necessary**
- **Anyone may call for a stop or an emergency stop and it must be obeyed by the hoist operator**

Suggested communication
Crane operator: *"moving crane North"*
Assigned personnel: *"moving crane North, aye"*

Knowledge of These Eight Hand Signals is Required







Posters containing complete hand single information are posted near the overhead bridge crane disconnects

Overhead Crane Lockout/Tagout

- **Any overhead crane found to have a deficiency shall be de-energized and put in a safe state.**

- **This may include but is not limited to raising the crane block to a safe height above personnel, removing any necessary rigging, and homing the crane.**

- **Notify the Facility Shot Director and the ME Safety Office**

- **The deficiency shall be logged in the appropriate facility's Material Deficiency Log (MDL) then tagged out in accordance with LLE lockout/tagout procedures**

LLE Overhead Crane Operator Policies

- 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
- Operators must adhere to the rules as derived from OSHA “Conduct of Operators”
- Operators shall not exceed the capacity of the overhead crane
- Only approved and rated rigging gear shall be attached to a load hook by a qualified rigger
- Side pulls are only permitted when coordinated through Advanced riggers and the Mechanical safety office
- Crane operators shall not carry loads over people
- No attached load, suspended or otherwise, is ever to be left unattended by the crane operator
- Complete knowledge of the hand signals is required for operation of the overhead cranes
- Any overhead crane found to have a deficiency shall be de-energized and tagged out in accordance with LLE lockout/tagout procedures
- All engineered lifts must be coordinated through ME

Section VI

Site Specific Procedures

This section will cover the parking and access procedures for both Omega and EP facilities

Crane Remote Control Locations

OMEGA

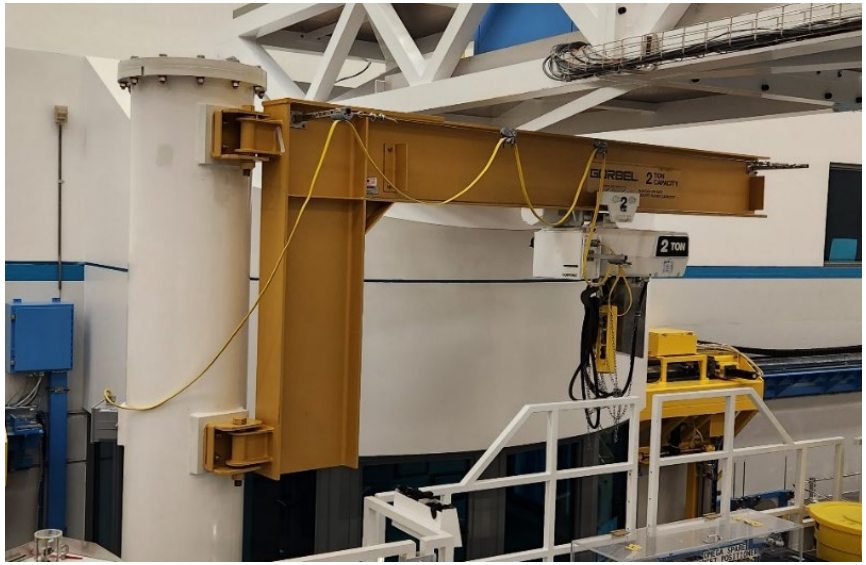
- South wall between South end mirror structure and cluster 6 FASP

OMEGA EP

- Cabinet on wall in anteroom near entrance door

Parking the Overhead Cranes

- **OMEGA Jib Cranes**
  - **Both jib cranes are shown in their parked position**
  - **Load hook is raised to upper limit**
  - **Pendant control and associated line should be stowed on the hook in a neat and orderly fashion**

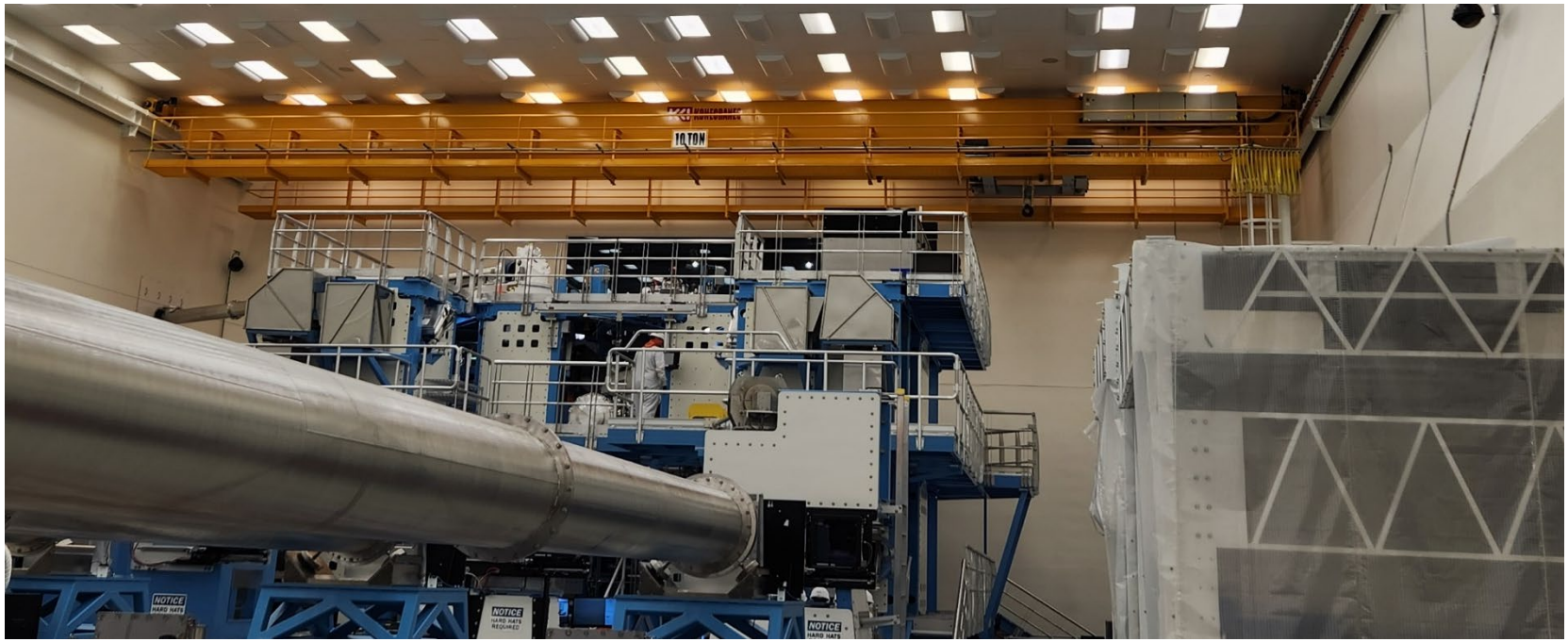


Parking the Overhead Cranes

- **OMEGA EP**
  - — **<u>Low Bay Crane</u> (shown below looking South)**
    - – **Load block is to be raised to upper limit**
    - – **Bridge is driven to southern most position where the catwalk and the cage ladder are aligned. Trolley is driven to eastern most position.**

Parking the Overhead Cranes

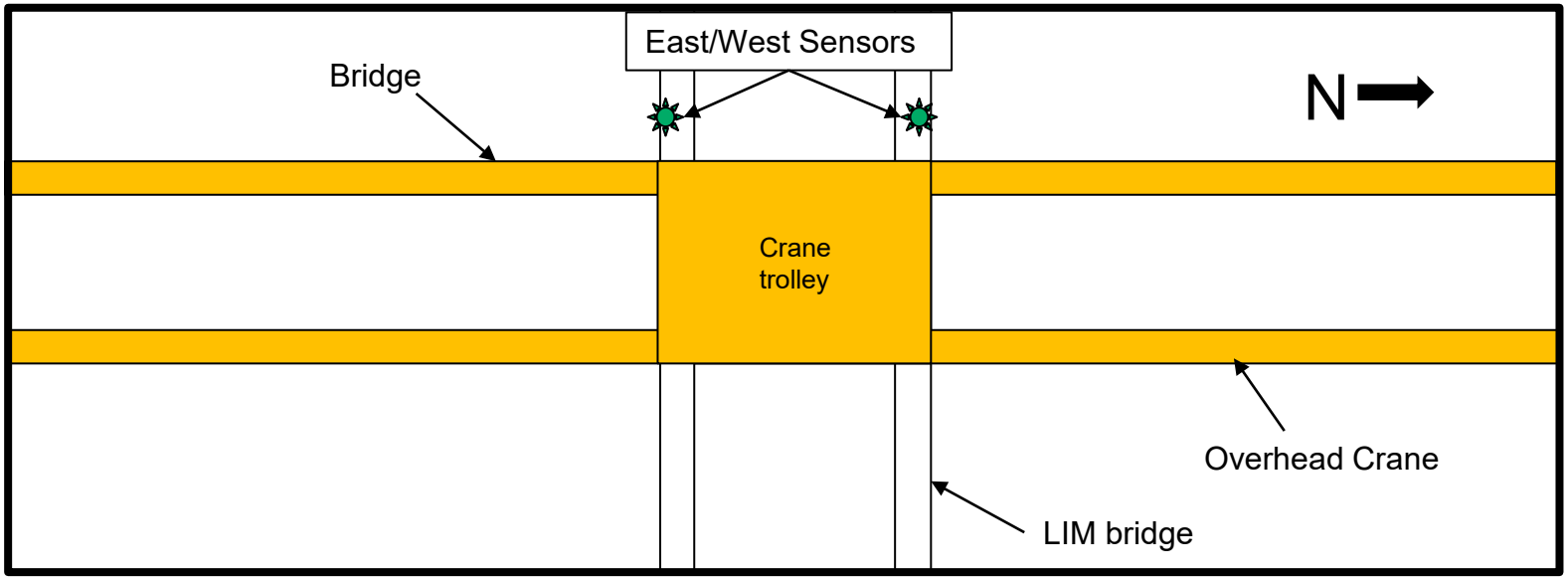
- **OMEGA EP (cont.)**
  - **<u>High Bay Crane</u> (shown below looking North)**
    - **Load block is to be raised to upper limit**
    - **Bridge is driven to Northern most position where the catwalk of the crane and the cage ladder are aligned to each other. Trolley is driven to eastern position as shown.**



Parking the overhead cranes

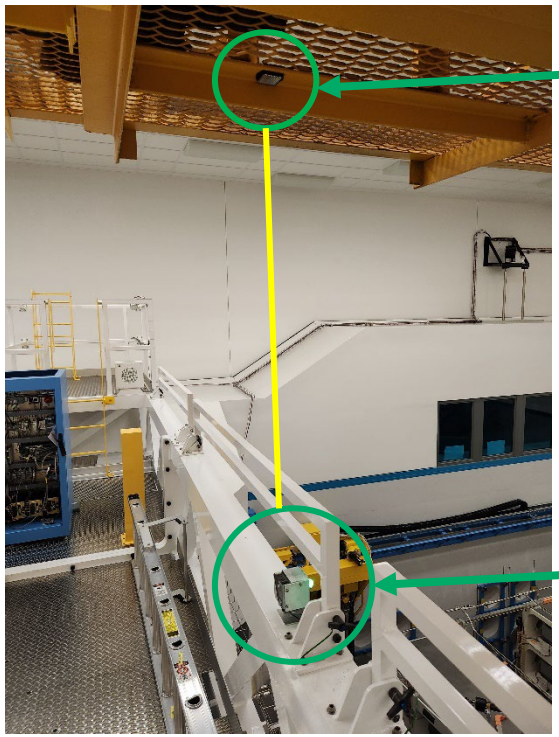
- **OMEGA**
  - **Crane block (hook) is raised to upper limit**
  - **Crane trolley is driven to midpoint of travel over LIM bridge**
  - **Bridge of crane is driven into proper alignment when sensors (located on LIM bridge) are aligned with the reflector (located on crane)**

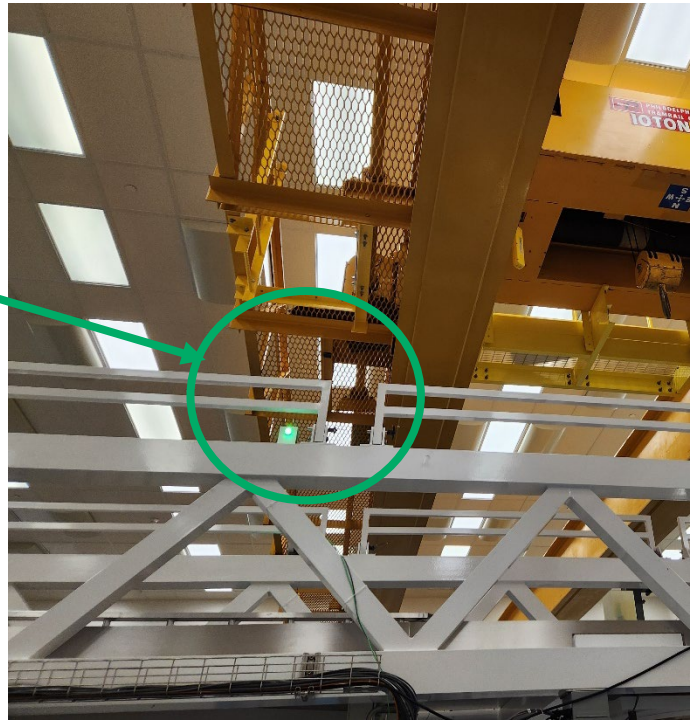
Overhead View of Bridge Crane in Omega Target Bay



Parking the Overhead Cranes

- **OMEGA (cont.)**
  - **There is an alignment reflector located on underside of crane that should be lined up with sensors mounted on the LIM bridge**
  - **When properly aligned, green lights will be illuminated (one on the North and one on the South side of the LIM Bridge**





Accessing the Crane Bridge

- **Access to all crane ladders requires key access. Keys are controlled by the Shot Directors for OMEGA and OMEGA EP and must be signed out.**

- **There are different procedures in gaining access to the bridge of the cranes in either facilities**

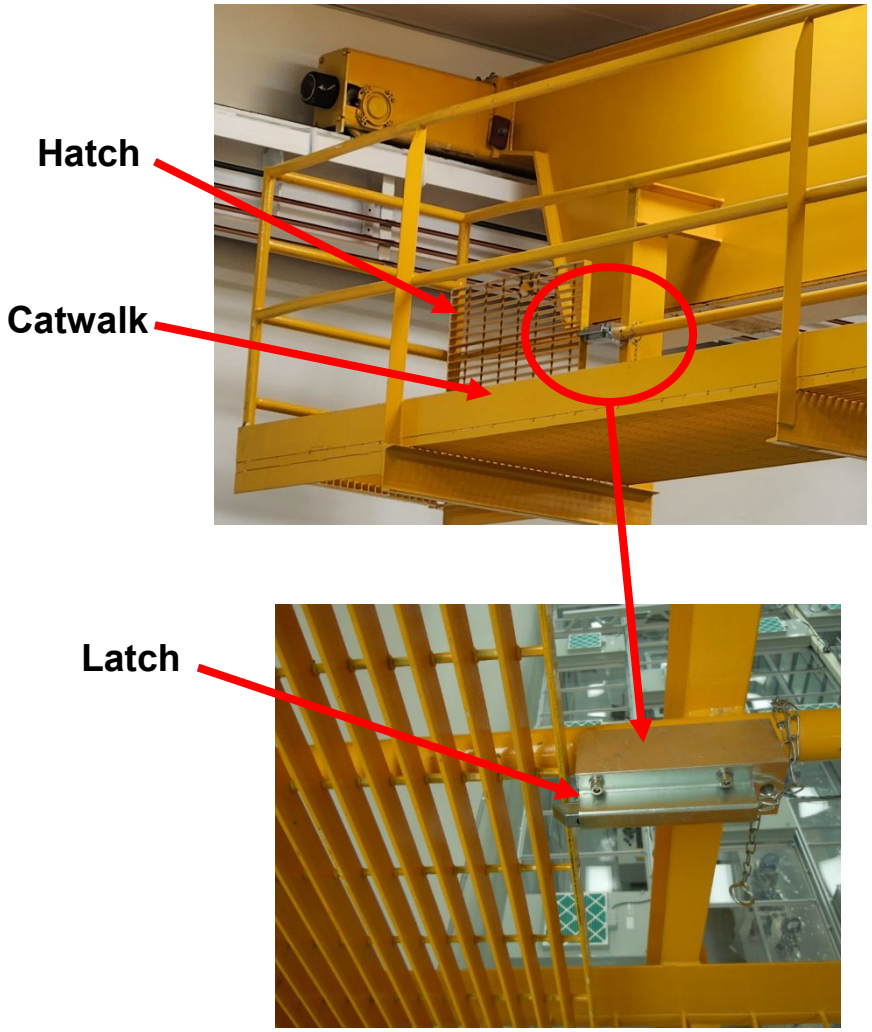
Obtain Shot Directors permission before accessing the bridge

Accessing the Crane Bridge

- **Omega EP (High and Low Bay Cranes)**
  - **From the base of the ladder, verify that the access hatch and cage ladder are aligned**
  - **Unlock cage ladder access leaving the key in the lock as shown**

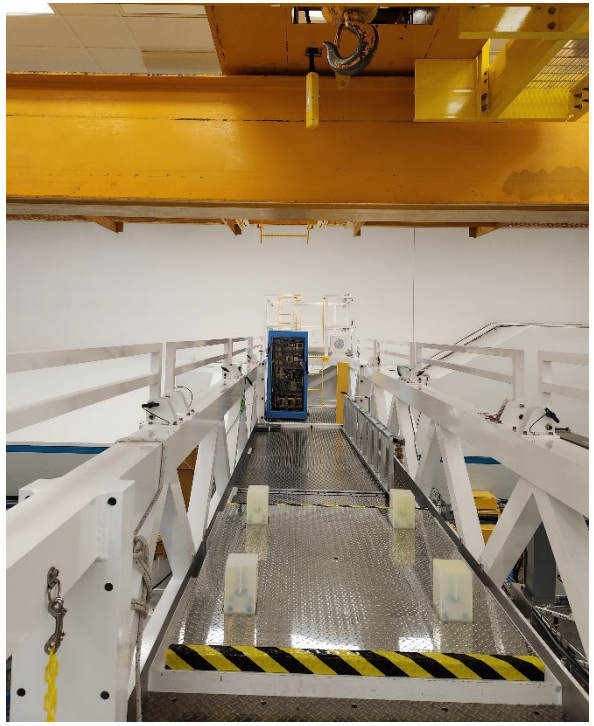
Accessing the Crane Bridge

- **Omega EP** (High and Low Bay Cranes (cont.)
  - Climb cage ladder to access crane catwalk
  - **Danger! access hatch must be closed by releasing the latch before traversing the platform due to fall hazard!**
  - Make sure the access hatch is securely latched in the up position before attempting to mount the cage ladder and descend
  - Exit the bridge in reverse order
  - Remember to lock the crane ladder access and return the key to the Shot Director



Accessing the Crane Bridge

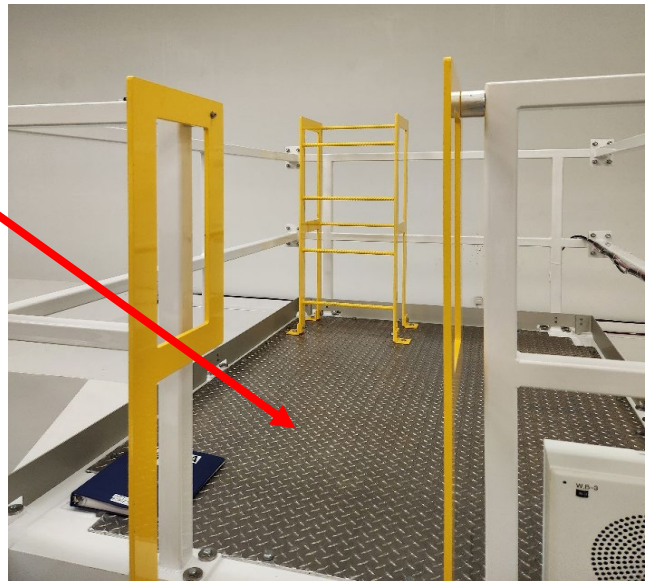
- **Omega**
  - After obtaining key from the Shot Director, unlock the cage ladder guard and open fully to the left
  - Climb cage ladder to the top of the East shield wall to access the Cryo LIM Bridge



Accessing the Crane Bridge

- **Omega (cont.)**
  - **Once on the LIM bridge, drive crane towards the West such that the ladder from the access platform on the LIM bridge lines up with the access ladder on the crane**

DANGER* - Crane should never be driven from access platform due to impact or crushing hazard.



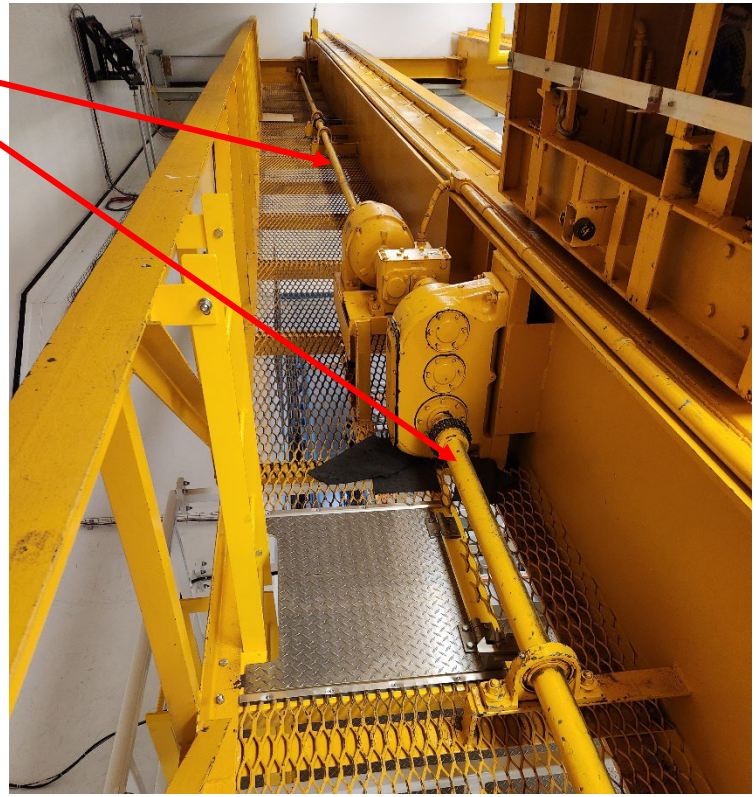
Accessing the Crane Bridge

- **Omega** (cont.)
  - Once aligned, access the platform and climb the ladder onto the crane cat walk

  - Close the access hatch once on the catwalk

Accessing the Crane Bridge

- **<u>Omega</u> (cont.)**
  - **If operating/moving the crane from the catwalk, EXTREME CARE must be taken to avoid interaction with any of the moving parts (driveshaft) of the crane. Care also must be taken to avoid any objects overhead.**

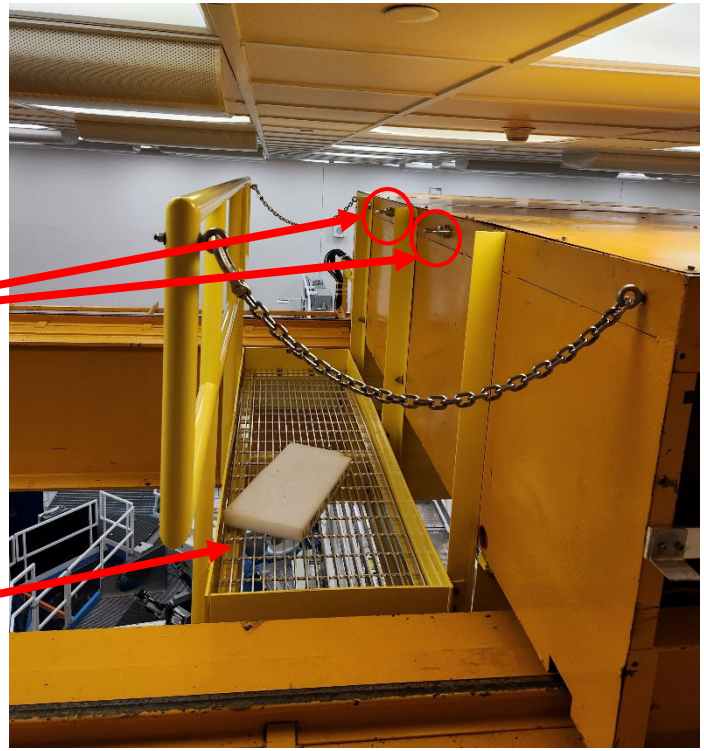


Accessing the Crane Bridge

- **Omega** (cont.)
  - If accessing the trolley platform, Fall Protection **IS REQUIRED** be worn. Harness lanyard **MUST** be attached to one of the (2) installed "D" rings

"D" ring anchors

Trolley platform



Fall protection training (M_006) is required for using harnesses

All crane deficiencies must be logged in the appropriate Material Deficiency Log (MDL)

- During crane inspections and service calls, an LLE Overhead Crane qualified escort must accompany the crane service worker. The escort is responsible for:
  - Reviewing all crane entries listed in the MDL with the Shot Director (SD) and service worker
  - Updating the status of existing deficiencies and enter any new deficiencies in the MDL
- If the service worker identifies a safety deficiency, the escort must:
  - Tag out the crane if recommended by the service worker
  - Have the service worker explain the deficiency and recommended corrective actions to the Operations and Maintenance Manager and Mechanical Safety Officer

If an operator identifies a crane deficiency, it must be entered into the MDL and the crane must be locked out until the deficiency has been resolved

Overhead Crane Summary (1)

- Verify condition of pre-ops check list and complete if necessary
- Never exceed the load rating of the hoist or support structure
- Inspect the wire rope for any defects before operating the hoist
- Be sure the load attachment is properly seated in the bowl of the hook and all rigging materials and latch is closed
- Center the hook over the load before operating
- Check the brake for excessive drift under load
- Do not operate a hoist to the extreme limits of the wire rope
- Verify load path and that landing area can support the load

Overhead Crane Summary (2)

- Never lift a load until all personnel are clear
- Do not let any unqualified personnel operate the overhead crane
- Never carry personnel on a load hook
- Do not operate a hoist if you are physically unfit
- Do not avert attention from the load during a lift
- Never leave a load attached to the hook; suspended or unattended
- Never carry loads over people
- Once a rigging operation is complete, remove all materials from the hook, park the crane, and return the pendant to stored location

Summary

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 crane
- No load is to be left attached to the hook; suspended or unattended
- Operators are required to complete pre-operational checklist before use
- The operator shall maintain possession of the remote pendant at all times from startup to securing of the crane
- No LLE personnel are permitted to make any repairs on an overhead crane
- Only approved rigging gear shall be attached to a load hook
- All engineered lifts must be coordinated through Mechanical Engineering (ME) or the Mechanical Safety office
- Crane operators are never to carry loads over people
- Any overhead crane found to have a deficiency shall be de-energized and tagged out in accordance with LLE lock out/tag out procedure