

## FESHM 10140: MOBILE CRANES

### Revision History

<b>Author</b>	<b>Description of Change</b>	<b>Revision Date</b>
Roza Doubnik	<ul style="list-style-type: none"><li>• Updated link to the Prime Contract No. DE-AC02-07CH11359 with the conformed, contract through Modification No. 302 from June 10, 2022.</li></ul>	July 2022
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Angela Aparicio Marcel Borcean	<ul style="list-style-type: none"><li>• Added references to new FESHM 10200 – Lift Plans</li><li>• Included OSHA training/certification requirements</li><li>• Included ASME medical requirements</li><li>• Updated crane inspection requirements</li><li>• Added utility locate requirements</li></ul>	June 2020
John P. Cassidy	<ul style="list-style-type: none"><li>• Chapter renumbering.</li><li>• Clarified the training requirements for mobile crane operators to include formal classroom training and retraining.</li><li>• Added the physical examination requirements of ASME B30.5</li><li>• Added the requirements for monthly and annual inspections to be conducted by a qualified crane service contractor.</li></ul>	January 2015
Thomas Page	Five-year review of chapter 5025. Added Chapter 5025 using the new FESHM template.	November 2013

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## 1.0 INTRODUCTION AND SCOPE

Mobile cranes pose unique hazards to the crane and hoisting industry. Improper use of material handling equipment creates a significant potential for property loss and serious injury. This chapter outlines the requirements for operating, testing, inspecting, maintenance, and documenting of mobile cranes in use at Fermilab and in support of DOE-sponsored work managed by Fermi Research Alliance (FRA).

It is the intent and purpose of this chapter to provide a means for governing the safety of Fermilab personnel and equipment. Mobile crane subcontractors who move materials and or equipment at Fermi National Accelerator Laboratory are governed by FESHM Chapters 7010 and 7020. The Lift Director (Person-in-Charge) is responsible for verifying that all inspections of the crane are up to date.

## 2.0 POLICY

Hoisting and rigging equipment and all design, installation, inspection, testing, and operations activities shall be in accordance with Fermilab [Prime Contract](#) No. DE-AC02-07CH11359 with the conformed contract through Modification No. 302 from June 10, 2022. Attachment J.9 Appendix I DOE Directives. For mobile cranes these regulations (available in the library) are:

- 29 CFR 1910, Subpart N, OSHA General Industry Standards, Materials Handling and Storage.
- 29 CFR 1926, Subpart CC, OSHA Construction Standards, Cranes and Derricks in Construction
- ASME B30.5 (Mobile Cranes)
- ASME B30 Series

## 3.0 DEFINITIONS

**Critical Lift** - A lift that meets any of the following:

- Loss of control of the item being lifted would likely result in the declaration of an emergency.
- The load or item is unique and, if damaged, would be irreplaceable or not repairable and is vital to a system, facility or project operation.
- The cost to replace or repair the load item damaged would have a negative impact on facility, organizational, or DOE budgets to the extent that it would affect program commitments.
- Lifts made with more than one crane.
- Lifts made in close proximity to utilities, such as gas lines, water lines, electrical lines or overhead utilities.
- Lift involves non-routine or technically difficult rigging arrangement.
- Lifts over items that are considered critical to the lab.
- For steel erection, a lift shall be designated as a critical lift if:
  - The lift exceeds 75% of the rated capacity of the crane, or
  - The lift requires the use of more than one crane.

See [FESHM 10200, \*Lift Plans\*](#) for the requirements regarding critical lifts.

**Load** - The total weight superimposed on the load block or hook. This includes not only the material being lifted but also all the rigging equipment necessary to attach the load to the load block: lines, shackles, rigging, etc.

**Mobile Cranes** - Crawler cranes, locomotive cranes, wheel-mounted cranes, and any variation thereof that retain the same fundamental characteristics. This scope only includes the type of cranes listed that are powered by internal combustion engines or electric motors.

**Mobile Crane Contractor** – A mobile crane contractor is a contractor through ownership or rental operates a business that provides mobile crane services to others.

**Modified** - A variation or alteration that changes the original configuration of the crane or adds other features not originally installed with the crane and impacts the crane's lifting capacity or load bearing components.

**Lift Director**– A Qualified Person appointed to be responsible for the safe execution of a Critical Lift.

**Ordinary Lift** – a standard lift that does not meet the requirements of a Critical Lift.

**Personnel Lift** – raising, lowering or transporting personnel using hoisting equipment covered by the ASME B30 Standard. Requirements regarding personnel lifts using cranes are covered in FESHM 10190, *Crane Personnel Lifting Platforms*.

**Qualified Person** - a person who, by possession of a recognized degree in an applicable field or a 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.

**Qualified Operator** - A person who has successfully completed the training requirements outlined in this chapter and has been so designated by the division/section/project head.

**Rated Load (Capacity)** - The posted maximum load designated by the manufacturer.

## 4.0 ROLES AND RESPONSIBILITIES

### 4.1 Division/Section/Project Head

The Division/Section/Project Head is responsible for implementing this program. Specifically, they are responsible for:

- Assuring, through the line management, that employees assigned to perform rigging or crane operation duties are qualified to perform the work assigned. Successful completion

- of crane training is necessary, but not necessarily sufficient, to deem a person qualified to perform all rigging and crane operation tasks.
- Ensuring that documentation on mobile cranes is maintained.
  - Ensuring that all cranes within their areas of responsibility are inspected, tested, maintained, and repaired as required in this document.
  - Assuring that service subcontractors who perform inspection, testing, maintenance and repair of cranes have adequate oversight, usually provided by Facilities Engineering Services Section.

#### **4.2 Facilities Engineering Services Section (FESS)**

The Facilities Engineering Services Section (FESS) is responsible for:

- Maintaining manuals and manufacturer information and records related to testing, inspection, and repair of mobile cranes owned or managed by Fermi Research Alliance.
- Arranging contracts with qualified subcontractors to perform annual inspection, testing, maintenance and repair of cranes.
- At the request of divisions/sections, arranging for qualified subcontractors to perform annual inspection, testing, maintenance and repair of cranes. FESS will provide oversight of the subcontractor.

#### **4.3 ES&H Section**

The ES&H Section is responsible for:

- Providing consultation services to D/S/P heads regarding safety of operations and training opportunities.

#### **4.4 Fermilab Medical Office**

The Fermilab Medical Office is responsible for:

- Maintaining the operator fit-for-duty exam parameters per ASME requirements and conducting the fit-for-duty exam.

#### **4.5 WDRS Professional Development and Learning**

The WDRS Professional Development and Learning is responsible for:

- Coordinating and scheduling training opportunities for newly selected and qualified operators.
- Maintaining training records of operators in the TRAIN database.

#### **4.6 Lift Director**

The Lift Director is responsible for:

- Ensuring a utility locate (e.g. [eJULIE](#) and/or GIS) has been completed prior to setting up the crane(s). Refer to [FESHM 7030](#) for more details about utility locate services.
- Reviewing the hazard analysis (see [FESHM 2060](#)) and lift plan for ordinary, critical or personnel lifts with all involved or affected by the lift before the lift is initiated.
- Being present at the jobsite during lifting operations.
- Stopping crane operations if alerted to an unsafe condition affecting those operations.

- Directing the operation of assigned lift in accordance with the hazard analysis, lift plan, and all appropriate rigging and lifting best practices.
- Identification of appropriately trained individuals participating in the lift. Skill level of each participant in the lift shall be commensurate with the assigned duty.

#### 4.7 Qualified Operator

The Qualified Operator is responsible for:

- Obtaining mobile crane operator certification.
- Recognizing if a lift or rigging task is within their capability based on previous experience or training. If level of training or experience is insufficient to assure a safe lift, operator must state this to their supervisor or the Lift Director and not proceed with the task.
- Following best practices in rigging and hoisting to assure a safe lift.
- Identify hazards and mitigations associated with the hazard, including appropriate personal protective equipment (PPE).
- Identifying appropriately trained individuals, if required, to participate in the lift. Skill level of each participant in the lift shall be commensurate with the assigned duty.
- Performing a pre-lift inspection of lift site location. If a problem or situation appears to not be safe, notify the lift director to determine next steps.
- Conducting daily crane inspection and checks prior to use. If the crane is not operating properly, notify lift director and contact FESS Crane Office to have a pre-lift inspection/repair completed by a subcontractor.
- Inspecting slings, fastenings and attachments for damage or defects prior to each use and remove from service if damaged or defective (See [FESHM Chapter 10130](#)).
- Ensuring the sling identification is legible and shows the rated capacities for each type of hitch: vertical, basket and choke (See [FESHM Chapter 10130](#)).
- Performing lift in accordance with any formal hazard analysis (HA) or lift plan, if one exists.
- Before leaving the crane unattended,
  - Land any load suspended below the hook
  - Disengage the master clutch
  - Set travel, swing, boom brakes, and other locking devices
  - Put controls in the off or neutral position
  - Stop the engine.

#### 4.8 Mechanical Safety Subcommittee (MSS)

Mechanical Safety Subcommittee is responsible for:

- Serving the Divisions/Sections/Projects in a consulting capacity on all Mobile Crane matters.

#### 4.9 Task Manager/Construction Coordinator (TM/CC)

Task Manager/Construction Coordinator is responsible for:

- Acquiring Advanced Rigging Training (designed for these mobile crane tasks).
- Being able to use and demonstrate knowledge of the “Standard Hand Signals for Controlling Crane Operations.”

- Ensuring subcontractors utilizing mobile cranes meet the requirements outlined in [FESHM 7010](#), and Appendix 3 of FESHM 7010.
- Verifying a utility locate (e.g. eJULIE or GIS) has been completed prior to setting up the crane(s).

## 5.0 OPERATIONS

### 5.1 Qualification for Operators

Operators shall be required to successfully meet the qualifications for the specific type crane that they are operating. Operators shall be required to meet the qualifications requirements listed in ASME B30.5 Section 5-3.1.2 and OSHA 29 CFR 1926.1427.

Operators will receive certification from an accredited crane operator testing organization.

### 5.2 Physical Qualifications

The Fermilab Medical Office with the aid of ASME B30.5 standard, Section 5-3.1.2(a) shall determine if the operator or operator trainees meet the physical qualifications to operate a mobile crane, unless it can be shown that failure to meet the qualifications will not affect the operation of the crane.

These qualifications include a physical exam that will check for the following:

- Vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses.
- Ability to distinguish colors, regardless of position, if color differentiation is required.
- Adequate hearing to meet operational demands, with or without hearing aid.
- Sufficient strength, endurance, agility, coordination, and speed of reaction to meet the operation demands.
- Normal depth perception, field of vision, reaction time, manual dexterity, coordination, and no tendencies to dizziness or similar undesirable characteristics.
- A negative result for a substance abuse test.
- No evidence of having physical defects or emotional instability that could render a hazard to the operator or others, or that in the opinion of the examiner could interfere with the operator's performance. If evidence of this nature is found, it may be sufficient cause for disqualification.
- No evidence of being subject to seizures or loss of physical control; such evidence

### 5.3 Training/Certification for Operators

#### 5.3.1. Mobile Crane Operator Certification

- Operators are required to be licensed and certified by an accredited crane operator testing organization (accredited by a nationally recognized accrediting agency).
  - Testing includes written and practical tests.
  - Certification requires successfully passing the physical examination, as described above.
- The certification is valid for 5 years.
- As part of the certification process, the operator in training will be evaluated by the crane operator testing organization. During the certification process, the operator will be evaluated by the certification vendor using the Fermilab mobile crane.

- If warranted, at their discretion, supervisors may require re-evaluation of already qualified operators.

### 5.3.2. Recertification

- a. Mobile Crane Operator Certification expires after five (5) years. Mobile crane operators must be re-certified every five years.

## 5.4 Conduct of Operators

The operator shall not engage in any practice that will divert their attention while actually engaged in operating the crane.

The operator shall respond to signals from the person who is directing the lift or an appointed signal person. The standard hand signals shall be as specified in the ASME B30-5 standards. When a signal person or a crane follower is not part of the crane operation, the operator is then responsible for the lifts.

Before leaving the crane unattended, except as permitted in ASME B30-5.3.1.3.e.7, the operator shall:

- land any load, bucket, lifting magnet, or other device;
- disengage the clutch;
- set travel, swing, boom brakes, and other locking devices;
- put controls in the off or neutral position;
- secure the crane against accidental travel;
- stop the engine

## 5.5 Operating Practices

Know the rated capacity of the crane and the weight of the load. A safe lift depends on many factors including boom length, boom angle, and load radius. At no time shall the operating capacity of the crane be overloaded.

A durable load-rating chart with legible letters and figures shall be provided with each crane and attached in a location accessible to the operator while at the controls. The load rating chart shall provide a full and complete range of manufacturer's crane load ratings at all stated operating radii, boom angles, work areas, and all stated boom lengths and configurations, jib lengths and angles (or offset), as well as alternate ratings for use and nonuse of optional equipment on the crane, such as outriggers and extra counterweights, that affect ratings.

A 10BC or larger fire extinguisher shall be installed at all operator stations. Fire extinguishers shall be maintained in a serviceable condition.

Always position the crane on a solid and level footing. It may be necessary in certain situations to use heavy timber mats to build a good working foundation. Utilize Fermilab GIS or an eJULIE to confirm location of underground utilities.

When moving a crane:



- Secure the boom and hook block.
- Check clearances under overpasses, overhead lines, or any overhead obstruction; when side clearances are tight, install a barrier or post a lookout, and make certain there is sufficient clearance for tail swing.
- When traveling with a load, snub the load to prevent swaying if possible; never travel with near-capacity loads.
- Never travel a rubber-tired unit with a load over the side.

To minimize the hazard of electrocution or serious injury as a result of contact between the energized power lines and the crane, load line, or load, observe the safe working distances listed in the table below:

Normal voltage (phase to phase)	Minimum required clearance
to 50 kV	10 ft (3.1 m)
Over 50 to 200 kV	15 ft (4.6 m)
Over 200 to 350 kV	20 ft (6.1 m)
Over 350 to 500 kV	25 ft (7.6 m)
Over 500 to 750 kV	35 ft (10.7 m)
Over 750 to 1000 kV	45 ft (13.7m)

See [FESHM Chapter 10200](#), “Lift Plans,” for critical lift requirements.

## 6.0 TESTING

All Mobile Cranes are subject to the test requirements of ASME B30.5, the manufacturer, and this chapter. Operational and Load tests shall be performed using hoisting equipment of the proper size and capacity for the mobile crane being tested. Operational tests do not require that written records be kept.

Rated load tests are required prior to initial use after any load-sustaining parts have been altered, repaired, or replaced (rope replacement is specifically excluded from this requirement). The test loads shall not exceed 110% of the mobile crane's rated capacity. This test shall be conducted, and a record signed and dated with the signature of the qualified person.

## 7.0 INSPECTIONS

All mobile cranes shall be inspected in accordance with ASME B30.5 and the manufacturer's recommendations. Each mobile crane shall be inspected and documented on a monthly and annual basis by a qualified crane service contractor. Minimum inspection criteria shall incorporate the items as noted in this chapter and ASME B30.5.

Frequent inspection:

- All running ropes in service should be visually inspected once each working day. A visual inspection shall consist of observation of all rope that can reasonably be expected to be in use

during the day's operations. These visual observations should be concerned with discovering gross damage that may be an immediate hazard, including:

- Distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion. Loss of rope diameter in a short rope length or unevenness of outer strands should provide evidence that the rope or ropes must be replaced.
- General corrosion.
- Broken or cut strands.
- Number, distribution and type of visible broken wires.
- Core failure in rotation-resistant ropes.
- When such damage is discovered, the rope shall be either removed from service or given a periodic inspection.

A rope that has been idle for a period of a month or more due to storage or the crane on which it is installed shall be given a recorded inspection before it is placed in service.

The FESS Crane Office will maintain records of all monthly and annual inspections on units requiring compliance to this Chapter.

## **8.0 MAINTENANCE**

### **8.1 Seasonal**

Seasonal maintenance will be done to verify that the mobile cranes covered by this chapter are well lubricated, tires are in good condition and all fluids are at appropriate levels. An inspection of the unit for any other functional issues or problems will be completed to prepare the unit for summer or winter operations.

### **8.2 Regular**

Operators are responsible for reporting regular maintenance items to the FESS Crane Office. They will make arrangements for personnel trained to maintain these units to repair or perform maintenance tasks.

All units should be kept indoors through inclement and/or winter weather. This type of weather ages the units quickly and it is best to avoid extended exposure.

## **9.0 REFERENCES**

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conformed contract through Modification No. 302 from June 10, 2022. Attachment J.9 Appendix I DOE Directives. For mobile cranes these regulations (available in the library) are:

29 CFR 1910.180, Subpart N, OSHA General Industry Standards, Materials Handling and Storage, Crawler locomotive and truck cranes

29 CFR 1926, Subpart CC, OSHA Construction Standards, Cranes and Derricks in Construction

29 CFR 1926.1427, Subpart CC, OSHA Construction Standards, Cranes and Derricks in Construction, Operator training, certification, and evaluation

ASME B30.5, Mobile and Locomotive Cranes

ASME B30 Safety Standard Series, Cranes and Related Equipment – Cableways, Derricks, Hoists, Hooks, Jacks, and Slings

DOE Hoisting and Rigging Manual