

## FESHM 10110: BELOW-THE-HOOK LIFTING DEVICES

### Revision History

<b>Author</b>	<b>Description of Change</b>	<b>Revision Date</b>
Angela Aparicio Giuseppe Gallo Charles Orozco Paul Satti Shishir Shetty	Added reference to the new Below-the-Hook Lifting Device Load Test Checklist. Added reference to BTH lifting device inventory in TeamCenter.	April 2022
Mike Bonkalski	Added the responsibilities for oversight of the Below the Hook Lifting Device inspections and repairs program to the FESS/FM CRANES organization.	October 2018
Thomas Page	Release Chapter 10110 using new FESHM template. Updated lifting device groups per ASME B30.20.	November 2012

**TABLE OF CONTENTS**

1.0	INTRODUCTION AND SCOPE .....	3
2.0	DEFINITIONS.....	3
3.0	RESPONSIBILITIES .....	3
3.1	Division/Section/Projects:.....	3
3.2	Chief Safety Officer:.....	4
3.3	Facilities Engineering Services Section (FESS/FM CRANES): .....	4
3.4	The Mechanical Safety Subcommittee: .....	4
4.0	PROGRAM DESCRIPTION .....	4
4.1	Engineering Note Procedure .....	4
4.2	Manufacture .....	6
4.3	Operation.....	6
4.4	Testing.....	7
4.5	Inspections .....	7
5.0	FORMS .....	9

## 1.0 INTRODUCTION AND SCOPE

This chapter outlines the requirements for designing, fabricating, operating, testing, inspecting and documenting of Below-the-Hook lifting devices fabricated in-house or purchased for a specific specialty use. All other devices such as standard lifting devices, slings and rigging hardware are addressed in [FESHM Chapter 10130](#).

This chapter applies to all Below-the-Hook lifting devices used at Fermilab, as well to any work and individuals at FERMILAB involved with hoisting and rigging activities.

## 2.0 DEFINITIONS

Additional definitions and terminology are contained in the standards and/or manuals listed below:

- ASME B30.20 – Below-the-Hook Lifting Devices
- ASME BTH-1 – Design of Below-the-Hook Lifting Devices
- 29 CFR 1910 and 1926
- Fermilab ES&H Manual

**Below-the-Hook Lifting Device-** Equipment (other than slings or rigging accessories) for attaching loads to hoists. These devices are arranged in the following five (5) groups per ASME B30.20.

- |                  |   |
|------------------|---|
| 1. Chapter 20-1: | Structural and Mechanical Lifting Devices |
| 2. Chapter 20-2: | Vacuum Lifting Devices                    |
| 3. Chapter 20-3: | Close Proximity Operated Lifting Magnets  |
| 4. Chapter 20-4: | Remotely Operated Lifting Magnets         |
| 5. Chapter 20-5: | Scrap and Material Handling Grapples      |

**Qualified Person-** a person who, by possession of a recognized degree 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 (ASME B30.20)

## 3.0 RESPONSIBILITIES

### 3.1 Division/Section/Projects:

The Division/Section Head or Project Manager (where applicable) 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.
  - Ensuring that successful completion of all necessary training and only assigning to those employees tasks for which they are qualified to perform. NOTE: A person deemed qualified to perform a particular crane or rigging activity may not mean they are qualified to perform other types of work.

- Provide an inventory and locations list to FESS/FM Crane Office of all the active and inactive Below-the-Hook devices. Inventories can be uploaded to TeamCenter ED0018854 – FNAL Lifting Devices list.
- Ensuring that all Below-the-Hook devices within their areas of responsibility are available for inspection, testing, maintenance, and repairs as required in this document.

### **3.2 Chief Safety Officer:**

- Providing consultation services to division/section heads regarding safety of operations and training opportunities.
- Coordinating and scheduling training opportunities for newly selected and qualified operators.
- Maintaining training records of operators in the TRAIN database.
- Auditing the Division/Section for compliance with this chapter. This may be accomplished through the Tripartite ESH&Q Assessment process.

### **3.3 Facilities Engineering Services Section (FESS/FM CRANES):**

- Maintaining a Below-the-Hook inspection service and associated records related to testing, inspection, and repair of the Below-the Hook devices. This includes the distribution of related reports to the landlord division/section head or their designee as needed.
- Arranging for qualified contractor or subcontractors to perform annual inspections, testing, maintenance and repair of the Below-the Hook devices. FESS will provide oversight of the contractor or subcontractor.

### **3.4 The Mechanical Safety Subcommittee:**

- Serving in a consulting capacity on all Below-the-Hook lifting device matters.

## **4.0 PROGRAM DESCRIPTION**

### **4.1 Engineering Note Procedure**

1. All Below-the-Hook lifting devices shall meet the requirements of this chapter.
2. Lifting Fixtures provided and used by outside contractors in execution of their contract work are outside the scope of this engineering note procedure but must adhere to the balance of this FESHM Chapter.
3. Engineering Notes: An Engineering Note shall be prepared by a qualified person for all Below the-Hook lifting devices owned by Fermilab or collaborating institutions used at Fermilab whether purchased or fabricated at Fermilab or a collaborating institution. The minimum format for the Engineering Note is shown in the appendix of this chapter. The purpose of the Engineering Note is to allow a reviewer to check the design and to inform future users of the lifting device's limitations.

- a. Engineering Notes are required for fixtures designed at Fermilab or other non-commercial institutions such as Universities or other Laboratories. The Engineering Note shall include design compliance calculations to verify that the lifting fixture meets, at a minimum, the requirements of ASME B30.20, ASME BTH-1, and 29 CFR 1910 and/or 1926.
  - b. Engineering Notes for specialized fixtures purchased from a commercial source engaged in the manufacturing of lifting fixtures shall include the manufacturer's Certificate of Test, copies of the Operator's Manual and Inspections and Maintenance Instructions.
  - c. Modifications to Below-The-Hook Lifting Devices (whether designed at Fermilab or other non-commercial institutions such as Universities or other Laboratories or purchased from a commercial source engaged in the manufacturing of lifting fixtures) shall be documented in the revised Engineering Note and rechecked and reapproved.
  - d. All Engineering Note Packages shall include all safety precautions, operating, and maintenance procedures, service or duty cycle rating (if applicable), recommended inspection frequency and complete nameplate data required for the lifting device. See section 20-1.3: Inspection, Testing, and Maintenance in ASME B30.20 for guidance.
  - e. Where any fixture lifts a load at a point other than the center of gravity, the engineering note must explicitly address the issue of the stability of the load and fixture combination.
  - f. All Below-the-Hook lifting devices are subject to the test requirements of ASME B30.20, the manufacturer, and this chapter. Operational and Load tests shall be performed using hoisting equipment of the proper size and capacity for the device being tested. Load tests shall be documented in the engineering note package.
  - g. Initial Inspection (per Inspection section of this chapter) shall be performed and documented in the note.
4. Review of Engineering Notes: All lifting device Engineering Notes shall be reviewed by a qualified person for compliance with the requirements of this chapter.
  5. Amendment of Engineering Notes: All subsequent changes in usage that could affect the safety of personnel or the capability of performance of the lifting device shall require an amendment to the original engineering note. This amendment shall be reviewed in the same manner as the original note.
  6. Similar Lifting Devices: Lifting devices that are manufactured or fabricated to meet previously engineered, fabricated and reviewed lifting devices need not have the full engineering analysis repeated. Documentation shall be provided by reference to an existing approved Engineering Note and the detailing of all differences. A "Rated Load" test shall be required.

7. Director's Exception: A written exception, signed by the Laboratory Director or their designee, allowing for the use of a lifting device is required for use of a lifting device which does not meet the requirements of this chapter.
  - a. The Division/Section/Project Head or their designee shall provide a statement showing the necessity for a Director's Exception.
  - b. The engineer or designer shall provide a stress analysis of the lifting device.
  - c. The lifting device must be tested per the Testing Section of this chapter.
  - d. The engineer shall provide a fabrication procedure, a list of planned and/or completed record of inspections and any other quality control procedures used.
  - e. The engineer shall provide a description of personnel and equipment hazards associated with operation of this lifting device. The hazard analysis shall address the lifting device application, operating limits controls, and inherent safeguards provided.
  - f. The Chief Safety Officer must concur on such exception.
8. Engineering Note for Existing Lifting Devices: Lifting devices currently in use at Fermilab shall be inspected and reviewed with an Engineering Note prepared. Lifting devices without an Engineering Note shall not be used.

## 4.2 Manufacture

1. Below-the-Hook lifting devices shall be manufactured to comply with this chapter and ASME B30.20.
2. Identification shall be a part of the manufacturing process. Each device in service at Fermilab shall be permanently labeled with the Fermilab lifting device number Engineering Note Package Number and other nameplate data. The manufacturer of purchased devices shall affix its nameplate data and label the device with the Fermilab device number. (All documentation shall reference the Fermilab device number.)

## 4.3 Operation

All Below-the-Hook lifting devices shall be operated in accordance with the latest edition of ASME B30.20, OSHA and the Fermilab ES&H Manual. Refer to ASME B30.20 for training, operator qualifications, conduct of operations, and operating practices of Below-the-Hook lifting devices.

#### 4.4 Testing

1. Load testing shall conform to the specific requirements of ASME B30.20, section 1.3 Load Test and shall be documented in the Engineering Note. This test shall be conducted, and a record signed and dated with the signature of the qualified person. The test documentation shall be included in the Engineering Note.
  - a. A load test checklist is available with guidance for conducting the load test. See [FESHM 10110 Form 2, Below-the-Hook Lifting Device Load Test Checklist](#). The completed checklist may be attached to the engineering note.
2. Specialized commercially manufactured lifting devices which have certificates of test or existing devices which have documented evidence of having successfully passed a load test meeting ASME B30.20 requirements do not need to be re-load tested. The only deviation to this occurs when the lifting device had been altered, repaired, or modified. In this case a qualified person must be consulted; as the device may require further testing.

#### 4.5 Inspections

Inspections, inventory and maintenance of Below-the-Hook devices are the responsibility of the division/section/sling owner. There are four types of inspections; Initial inspection (documentation required), Pre-use inspection (not required to be documented), Monthly inspection for devices with daily use (not required to be documented), and the annual inspection (**documentation required**). The division/section shall provide the FESS/FM Crane Office an inventory of Below the Hook device in order for the FESS/FM Crane Office to provide the annual inspections. The D/S/P will make the Below-the-Hook devices available to the inspector on the agreed upon date.

1. All Below-the-Hook lifting devices shall be inspected in accordance with this chapter, ASME B30.20, and the manufacturer's recommendations.
2. *Initial Inspection* - An initial inspection by a qualified person of all new and reinstalled devices is required for commissioning to verify that unit is built and operates to specifications. The inspection documentation will be maintained by the FESS Crane Office.
3. *Per Use Inspection* - All devices shall be visually inspected by the operator per B30.20 prior to each use. This is not a documented inspection but will cover the following:
  - a. Verification of nameplate, load rating, and validation date of previous annual inspection. The device shall not be used if the nameplate is missing, rated load is insufficient for the lift, or annual inspection is older than one year.
  - b. Surface of the load for debris
  - c. Condition and operation of controls
  - d. Condition and operation of the indicators and meters when installed

- e. Should any anomalies arise during operation, operation shall be paused. The owner of the device and FESS Crane Office must be contacted to review the issue.
4. *Monthly Inspection* – A monthly inspection is required for devices with daily use. It is a visual, non-documented inspection by a qualified person inspecting the following:
    - a. Structural members for deformation, cracks or excessive wear on any part of the lifter
    - b. Loose or missing guards, fasteners, covers, stops, or nameplates
    - c. All functional operating mechanisms and automatic hold-and-release mechanisms for maladjustments interfering with operation.
  5. *Annual Inspection* - An annual inspection arranged by the FESS/FM Crane Office must be completed for all devices in use and those to be used that may have been in storage for longer than a 12-month period. The inspection must be documented and records kept by the FESS/FM CRANE office and available for review by operators and others requiring access to inspection data and information. The date of the last annual inspection shall be recorded on the lifting fixture. The inspection shall consist of items listed in *Monthly Inspection* and the following:
    - a. Loose bolts or fasteners
    - b. Cracked or worn gears, pulleys, sheaves, sprockets, bearings, chains, and belts
    - c. Excessive wear of friction pads, linkages, and other mechanical parts
    - d. Excessive wear at hoist hooking points and load support clevises or pins
  6. Infrequently Used Devices
    - a. Stored devices do not require Monthly and Annual Inspections until the device is returned to service.
    - b. An Annual Inspection must be completed prior to use if such an inspection has not been done in the previous 12-month period. If an inspection is required it must be documented, and records kept by FESS/FM CRANE office and available for review by operators and others requiring access to inspection data and information.
    - c. If a device has been inspected in the previous 12-month period, a Per Use Inspection is required prior to use.



## 5.0 FORMS

There is an Engineering Note Cover Page form to be included in the Below-the Hook Lifting Device Engineering Note. This cover page should be sent to the FESS/FM Crane Office to be kept with the Device records.

- [Below-the-Hook Lifting Device Engineering Note Cover Page](#)

A load test checklist is available with guidance for conducting the load test. See [FESHM 10110 Form 2](#). The completed checklist may be attached to the engineering note.

Both forms can be found on the ES&H website or the ES&H document management database under FESHM Chapter 10110.