Fermilab

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Memorandum

March 13, 2008

To: Bruce Chrisman

From: William Griffing Mary Coyle for

Subject: Revised FESHM Chapter 5022 – Below the Hook Lifting Devices

FESHM Chapter 5022, "Below the Hook Lifting Devices" has been revised to require that Special Lifting Devices receive a visual pre-use inspection or a documented periodic one. It has also been updated to reflect requirements in current ANSI/ASME standards.

After final approval, please return this approval page to Elizabeth Bancroft at MS119 for posting on the web.

Encl.

Recommended for Approval:

Bruce Chrisman 3/17/08
Bruce Chrisman Date

Approved:

Piermaria Oddone 3/26/08
Piermaria Oddone Date

BELOW-THE-HOOK LIFTING DEVICES

INTRODUCTION

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 5024.

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
- 10 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 four (4) groups per ASME B30.20.

a. Group I Structural and Mechanical Lifting Devices
b. Group II Vacuum Lifting Devices
c. Group III Magnets, Close Proximity Operated
d. Group IV Magnets, Remote Operated

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)

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SPECIAL RESPONSIBILITIES

The Division/Section Head is responsible for

- appointing a qualified person(s) for review and maintenance of the documentation for all Below-the-Hook lifting devices within the division/section control in accordance with the chapter.

The ESH Section Head is responsible for

- auditing the Division/Section for compliance with this chapter. This may be accomplished through the Tri[artite ES&H Assessment process.

The Mechanical Safety Subcommittee is responsible for

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

PROGRAM DESCRIPTION

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 for fixtures designed at Fermilab or other non-commercial institutions such as Universities or other Laboratories shall include design compliance calculations to verify that the lifting fixture meets as a minimum the requirements of ASME B30.20 and 10 CFR 1920 and 1926.

   b. Engineering Notes for specialized fixtures purchased from a commercial source engaged in the manufacturing of lifting fixtures shall include the

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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 Engineering Note.

d. All Engineering Notes 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.

e. Where any fixture lifts a load at a point below 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.

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.

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7. Director's Exception: A written exception, signed by the Laboratory Director or his 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 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 ESH Director 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.

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 a Fermilab lifting device 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.)

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.

Testing

1. The load rating should not be more than 80% of the maximum load utilized during the test. The tests details shall conform to the specific requirements for the device Group within ASME B30.20 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.

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 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; they may require further testing.

Inspections

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. This inspection shall be documented in the engineering note.
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

4. *Monthly Inspection* – A monthly inspection is required for devices with frequent/regular 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 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 Division/Section 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 the Division/Section 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 then a Per Use Inspection is required prior to use.

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BELOW-THE-HOOK LIFTING DEVICE
Engineering Note Cover Page

Lifting Device Numbers:

FNAL Site No/ _____ Div. Specific No. _____ Asset No. _____

If applicable If applicable If applicable

ASME B30.20 Group: (check one)
- [ ] Group I Structural and Mechanical Lifting Devices
- [ ] Group II Vacuum Lifting Devices
- [ ] Group III Magnets, Close Proximity Operated
- [ ] Group IV Magnets, Remote Operated

Device Name or Description _____

Device was (check all applicable)
- [ ] Purchased from a Commercial Lifting Device Manufacturer. Mfg Name _____
- [ ] Designed and Built at Fermilab
- [ ] Designed by Fermilab and Built by a Vendor. Assy drawing number _____
- [ ] Provided by a User or other Laboratory
- [ ] Other: Describe _____

Engineering Note Prepared by _____ Date _____

Engineering Note Reviewed by _____ Date _____

Lifting Device Data:

Capacity _____

Fixture Weight _____

Service: [ ] normal [ ] heavy [ ] severe
(refer to B30.20 for definitions)

Duty Cycle _____ 8, 16 or 24 hour rating (applicable to groups III, and IV)

Inspections Frequency _____

Rated Load Test by FNAL (if applicable) Date _____ Load _____

[ ] Check if Load Test was by Vendor and attach the certificate

Satisfactory Load Test Witnessed by: _____

Signature (of Load Test Witness) _____

Notes or Special Information:

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