



SANFORD UNDERGROUND RESEARCH FACILITY

SOUTH DAKOTA SCIENCE AND TECHNOLOGY AUTHORITY

Below the Hook Lifting Devices and Slings/Rigging Hardware Standard

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Revision History

Rev	Date	Section	Paragraph	Summary of Change	Authorized by
03	2/26/2026	1 & 6	6.1 & 6.2	Updated document due to change to the document numbering of controlled documents due to the change from DocuShare system to SharePoint system	CCR 1227
05	3/6/2026	1, 2, 3, 4, 5 & 6	4.2.3-4.2.5, 4.3.1-4.3.7, 4.4.1-4.4.5, 4.5.7, 4.5.8, 4.7.4, 4.10, 5.1, 4.3, 5.5, 5.6, 5.9 & 6.1-6.3	Changes throughout document to align with DOE 1090	CCR 1234

1.0 Purpose

The purpose of this standard is to establish requirements for Hoisting and Rigging, to ensure that all Below-the-Hook (BTH) devices, slings, and rigging are designed, fabricated, tested, inspected, maintained, and used to protect workers, the public, the environment, and property from hoisting and rigging hazards.

SDSTA references the following to fulfill this standard:

- OSHA 1910.184
- OSHA 1926.753
- ASME B.30.20
- ASME BTH-1
- DOE O 1090, Hoisting and Rigging
- ASME B30.9, Slings

2.0 Scope

This standard applies to all SDSTA personnel, contractors, subcontractors, and visiting collaborators and activities using BTH devices and rigging equipment at SDSTA-controlled facilities.

3.0 Definitions

Below-the-Hook (BTH) Lifting Device – a device, other than a load block, used for attaching a load to a hoist. The lifting device may be reeved directly into the hoist. The lifting device may contain components such as slings, hooks, and rigging hardware addressed by other ASMEB30 volumes or other standards.

Below the Hook Slings/Rigging Equipment – An assembly to be used for lifting when connected to a lifting mechanism. The upper portion of the sling is connected to the lifting mechanism, and the lower portion supports the load. Types of slings and rigging equipment:

- Synthetic Slings
- Steel/Wire Rope Slings
- Chain Slings
- Clevises/Shackles
- Blocks and Pulleys

Competent Person – A competent person is someone capable of identifying existing and predictable hazards in the workplace and who has the authority to take prompt corrective measures to eliminate them.

Critical Lift – A hoisting or lifting operation that has been determined to present an increased level of risk beyond normal lifting activities. (for specific classification, see DOE 1090)

- High value or potential impact of a high-value item.
- Significant impact to operations (budget, program commitments, schedule, etc.).
- Load out of view of the crane operator.

- Potential release of hazardous or radioactive material into the environment.
- Slung Loads
- Hoisting of personnel from an overhead crane.
- Single lift involving more than one crane.
- Weight that exceeds 75% of the rated load.

Customized lifting devices – Custom-fabricated lifting devices utilized between the hook and the load to handle unique or complicated lifting and rigging applications. May be commercially manufactured, designed, and fabricated externally or in-house. Design, testing, certification, and rated capacity/load shall be aligned with the requirements of this document.

Engineering Notes – Documentation of the professional evaluation performed on structural design specifications.

Proof load Test- A non-destructive, controlled, and temporary application of a load exceeding the maximum working load to lifting equipment, rigging, or components. It verifies structural integrity, functionality, and ensures no permanent deformation, typically performed before initial use, after repairs, or at intervals to confirm safety and compliance.

Qualified Person -A person who, by possession of a recognized degree, certificate, or 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, the work, or the project.

Qualified Rigger – An individual responsible for rigging activities associated with a critical lift. One who has extensive experience, knowledge, or possesses a recognized degree or certificate.

Rated Capacity – Maximum working load (100%) permitted by the manufacturer under specified working conditions. This is indicated on the tag or on the lifting equipment.

Rated Load / Marking – The maximum load identifier for which a crane, hoist, or lifting device is designed and built by the manufacturer. The load shall not exceed 80% of the rated load test or specification.

Rated Load Test – A formal process utilizing a known weight to evaluate both the hoisting device and supporting structure’s capability to safely establish the rated load.

Rigging Supervisor – A person, who, by possession of a recognized degree or certificate of professional standing in the applicable field, or who, by extensive knowledge, rigging training, and experience, has successfully demonstrated the ability to solve or resolve problems related to rigging and associated rigging work.

Slung load- A load suspended under the conveyance in the shaft.

Qualified Person -A person who, by possession of a recognized degree, certificate or 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, the work, or the project.

Qualified Rigger — An individual responsible for rigging activities associated with a critical lift. One who has extensive experience, knowledge, or possesses a recognized degree or certificate.

4.0 Responsibilities

4.1. SDSTA Executive Director

- 4.1.1. Ensures accountability for the requirements of this standard with direct reports.

4.2. SDSTA Department Directors

- 4.2.1. Ensure that direct reports are trained to perform the assigned work.
- 4.2.2. Ensure accountability of the requirements of this document with direct reports.
- 4.2.3. Seek advice from the ESH Department, as appropriate.
- 4.2.4. Ensure personnel are qualified, trained, and authorized.
- 4.2.5. Ensures sufficient resources are provided to support compliant hoisting and rigging operations.

4.3. Surface Operations and Utilities Department

- 4.3.1. Appoints Certified Riggers and Subject Matter Experts for hoisting and rigging.
- 4.3.2. Appoints a qualified person(s), a rigging qualified person(s) and a “Subject Matter Expert” with respect to hoisting and rigging.
- 4.3.3. Maintains a hoisting and rigging training program and establishes training requirements for SURF personnel involved in BTH use.
- 4.3.4. Conducts a biennial review, in conjunction with the ESH Department, of the Hoisting and Rigging Program, including a review of this standard to ensure it still meets SDSTA needs.
- 4.3.5. Selects a qualified contractor to perform annual inspection, testing, maintenance, and repair of BTH devices as needed.
- 4.3.6. Conducts an annual review of this standard.
- 4.3.7. Ensures proof testing is completed for all rigging used in critical lifts.

4.4. Engineering Department

- 4.4.1. Appoints a qualified engineer(s) to assist the Surface Operations & Utilities Department, who provides engineering support with respect to the certification and load rating of all customized BTH lifting devices.
- 4.4.2. Approves all qualified persons as it relates to the development of third-party custom lifting devices and engineered plans for critical lifts.
- 4.4.3. Creates and maintains a record of all engineering notes.
- 4.4.4. Approves all lifting device engineering notes.
- 4.4.5. Ensure customized lifting devices meet requirements

4.5. Environment, Safety, and Health Department

- 4.5.1. Maintains training documentation as required per this standard.
- 4.5.2. Conducts a biennial review, in conjunction with the Surface Operations & Utilities Department, of the Hoisting and Rigging Program, including a review of this standard to ensure it still meets SDSTA needs.
- 4.5.3. Provides consultation services regarding the safety of operations.
- 4.5.4. Coordinates and schedules training.
- 4.5.5. Maintains training records.
- 4.5.6. Assists Surface Operations & Utilities Department with the development and implementation of training needs.
- 4.5.7. Approves deviations and equivalencies from the requirements of this standard.

4.5.8. Conduct a review for DOE O 1090 compliance.

4.6. Project Managers

4.6.1. Ensure accountability of the requirements of this document with contractors/subcontractors.

4.6.2. Ensure that contractors/subcontractors are trained to perform the assigned work, including all equipment and tools.

4.6.3. Identify work activities that require WPC documents.

4.7. Supervisors

4.7.1. Ensure that direct reports are trained to perform the assigned work, including all equipment and tools involving hoisting and rigging activities.

4.7.2. Identify work activities that require WPC documents.

4.7.3. Ensure accountability for the requirements of this document with direct reports.

4.7.4. Assist the Rigging Supervisor in the administration of inspections and documentation activities for slings, rigging hardware, and BTH lifting devices located in the area under their supervision.

4.8. Certified Rigger

4.8.1. Ensures all BTH equipment shall be inspected before a critical lift.

4.8.2. Conducts initial inspections of all new, modified, or repaired devices before use.

4.8.3. Supervises all rigging activities.

4.9. Workers and Users

4.9.1. Participate in the development of the WPC documents.

4.9.2. Complete pre-shift/pre-use inspections as required.

4.9.3. Participate in a pre-job briefing with co-workers who share in the work performance before work begins.

4.9.4. Ensure training on applicable equipment and tools is complete and current prior to performing work.

4.9.5. Ensures that all rigging activities are performed under the supervision of a certified rigger.

4.10. Rigging Specialist

4.10.1. Maintains an inventory and inspection program for slings, rigging hardware, and BTH rigging devices, including documentation. Appoints and utilizes supervisors and foremen to administer this program.

4.10.2. Conducts a yearly audit of the slings, rigging, and BTH device records.

4.10.3. Maintains manuals and manufacturer information and records related to testing, lifting capacity, inspection, and repair of all BTH devices.

5.0 Instructions

The use of below-the-hook lifting devices, slings, and rigging equipment requires special considerations due to their inherent hazards. The following sections shall be adhered to as required when using any of this equipment.

5.1. Manufacturer

- Non-Commercial:

- BTH lifting devices shall be manufactured to comply with this standard and ASME BTH-1 and ASME B30.20.

- Identification shall be a part of the manufacturing process. Each device in service at SDSTA shall be permanently labeled with a SDSTA unique identifier, and other nameplate data.

- Commercial:

- The manufacturer of purchased devices shall affix its nameplate data and label the device.

5.2. Commissioning:

- An initial inspection by a certified rigger of all new, modified, or repaired devices is required for commissioning to verify that the:
 - Unit is built and operates to specifications.
 - Device is assigned an SDSTA identification number and affixed to the device.
 - SDSTA identification number is documented in a computerized maintenance management system (CMMS). Rated load/markings shall be affixed to the device.
 - Information is documented in the engineering notes for customized devices.

5.3. Load Testing:

- The test must be performed when a BTH lifting device is modified, or repaired.
- The load test results shall be documented and maintained within the CMMS.
- Manufacture certificate of test may be equivalent if available.

5.4. Rated Load/Marking:

- Commercial BTH Devices: Rated capacity equals rated load.
- Customized Lifting Devices require a load test used in the determination of the rated load.
 - The rated load shall not be more than 75% of the confirmed load test or specifications, whichever is less.
 - Example: BTH device specification is 2 tons. The load test was done to 90% of the specification (3600 lbs.). The rated load would be $75\% \times 3600 \text{ lbs.} = 2700 \text{ lbs.}$ 2700 lbs. would be the value on the marking. The rated load shall be plainly identified on the BTH device.
 - The rated load shall be documented and maintained within the engineering notes.

5.5. Engineering Notes for Customized BTH Devices

- Customized BTH lifting devices shall only be used after an engineering analysis has been performed on the modified BTH and this analysis documented with an engineering note.
 - Engineering notes shall be prepared by a qualified person for:
 - ◆ All customized BTH lifting devices owned by SDSTA or;
 - ◆ Research collaborators' equipment used at SDSTA, whether purchased or fabricated at SDSTA or a collaborating institution.
 - ◇ All subsequent changes in BTH usage that could affect the safety of personnel, or the capability of performance shall require an amendment to the original engineering note.
 - ◆ Modifications to BTH lifting devices or custom devices shall be documented before use.
 - ◆ 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 for an existing approved engineering note and the detailing of all differences.
- Contractors may utilize an equivalent documented process, such as a commercial source engaged in the manufacturing of lifting devices.
- ◆ An engineering note equivalency may include:
 - ◇ Commercial BTH devices:
 - ❖ Manufacturer's certificate of test.
 - ❖ Copies of the operator's manual and inspections (if applicable).
 - ◇ Non-Commercial BTH devices:
 - ❖ Device designed by a qualified person as determined by the Director of Engineering.
- 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.
- ◆ 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.
- ◆ Load test results (see below load test requirements).
- ◆ Initial inspection results (see below inspection requirements).

5.6. Proof Load Test:

- All below-the-hook devices used in critical lifts shall be proof-load tested and identified visually and electronically.
 - Documentation of proof load test shall be maintained in the CMMS.
 - The proof load test shall meet the ASME standards.

5.7. Pre-Use Inspection:

- All devices shall be visually inspected by the competent person before each use. This is not a documented inspection, but will cover the following:
 - 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 the annual inspection is older than one year.
 - Structural members for deformation, cracks, or excessive wear on any part of the lifter.
 - Loose or missing guards, fasteners, covers, or stops.
 - All functional operating mechanisms and automatic hold-and-release mechanisms for maladjustments interfering with operation.
 - All lifting devices requiring repair shall be:
 - ◆ Tagged out of service.
 - ◆ Reported to the supervisor.
 - ◆ Documented as per its SURF identification number.
 - ◆ Repair activities are entered into the CMMS.

5.8. Annual Inspection

- An annual inspection performed by a certified rigger must be completed for all BTH devices. The inspection must be documented, and records must be entered in the CMMS and available for review by operators and others requiring access to inspection data and information. The annual inspection date shall be affixed on the lifting devices. The annual inspection at a minimum, shall consider the following information:
 - Verification of nameplate and load rating.
 - Structural members for deformation, cracks, or excessive wear on any part of the lifter.
 - Loose or missing guards, fasteners, covers, or stops.
 - All functional operating mechanisms and automatic hold-and-release mechanisms for maladjustments interfering with operation.
 - Missing hardware.
 - Excessive abrasion, nicks, or discoloration.
 - Unauthorized modifications.
 - All lifting devices requiring repair shall be:
 - ◆ Tagged out of service.
 - ◆ Reported to the supervisor.
 - ◆ Documented as per its manufacturer's identification number.
 - ◆ Repair activities are entered into the CMMS.

5.9. Slings and Rigging Equipment Program Elements

- The slings/equipment shall be marked in such a fashion as to provide the information for the pre-use inspection to determine whether the hardware can sustain the expected load. See the table below for specifics.
- Labels shall meet the identification requirements per ASME B30.9.
- Use:
 - All slings and rigging hardware shall be used in accordance with the manufacturer's recommendations, OSHA, and SDSTA requirements.
 - Damaged slings and rigging equipment are to be destroyed and discarded.
 - Environmental conditions are to be considered in the use of sling or rigging equipment, e.g., UV damage on synthetic, fumes, acids, and corrosives on steel.
- Storage:
 - Specific facilities are to be utilized to organize and store equipment when not in use. Storage facilities shall consider the following:
 - ◆ Clean, dry, and free of chemicals.
 - ◆ Sufficient room to hang and organize.
 - ◆ Good illumination for inspections.
 - ◆ Controlled access.
 - ◆ Strategic location to support work.

6.0 Documented Information/Related Document

- 6.1. ESH-10000-S-001 Cranes and Hoists Standard
- 6.2. SOU-1000-S-001 Inspection Criteria for Basic Rigging Equipment
- 6.3. ESH-2000-S-001 Work Planning and Control Standard