

Chapter 41

Hoisting and Rigging

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1 Overview

Hoisting and rigging (H&R) refers to the lifting and moving of loads using mechanical devices. The objectives of the hoisting and rigging program are to protect personnel from injury, the environment from harm, and equipment and property from damage; specifically, to protect load operators and others in the work area, scientific equipment, other government property, and the hoisting and rigging equipment itself.

Hoisting and rigging is a complicated topic and can have significant safety consequences if not performed correctly. Fundamental to the hoisting and rigging program, and consistent with SLAC's integrated safety and environment management system (ISEMS), is the expectation that organizations involved in hoisting and rigging activities take responsibility to understand the hoisting and rigging requirements and apply them to their operations.

The SLAC hoisting and rigging program follows Department of Energy Standard 1090, "Hoisting and Rigging" ([DOE-STD-1090-2007](#)), which compiles hoisting and rigging codes, standards, and regulations. It is not the intent of this chapter to reiterate what is already well documented in DOE-STD-1090-2007. Instead, this chapter supplements the standard by identifying SLAC-specific implementation requirements as well as deviations from DOE-STD-1090-2007. Further, this chapter provides guidance on areas of the standards that may be ambiguous.

1.1 Hazards / Impacts

Improper design, use, or maintenance of cranes, fixtures, lifting devices, and rigging accessories can cause equipment to fail or a load to drop from the lifting system, resulting in personnel injury, death, damage to the environment or significant property loss.

2 Scope

This chapter applies to all personnel and equipment used to perform any hoisting and rigging activity on the SLAC site. Activities involving the following equipment are included

- Cranes, hoists and miscellaneous lifting devices
- Rigging hardware and accessories
- Powered industrial vehicle (forklift) when used as a hoist

Subcontractor requirements for hoisting and rigging activities are specified in Section 4.1.4 of this chapter. For more general information regarding subcontractor policy, see [Chapter 42, “Subcontractor Construction Safety”](#), and [Chapter 49, “Service Subcontractor Safety”](#).

2.1 Exemptions

Powered industrial vehicles (forklifts) not used as a hoist are exempt from the requirements of this chapter. See [Chapter 48, “Powered Industrial Vehicles”](#).

Any deviation from this chapter requires approval from the [Hoisting and Rigging Citizen Committee](#) chairperson or designee.

3 Implementation

The requirements of this chapter take effect September 15, 2009.

4 Requirements

4.1 General

This chapter will frequently use such terms as *qualified inspector*, *qualified person*, and *qualified engineer*. The first-line supervisor directing hoisting and rigging activities is responsible for ensuring that personnel who they supervise and who perform hoisting and rigging activities such as designing, inspecting, maintaining, and using hoisting and rigging equipment, preparation and approval of lift plans, and review of equipment compliance are qualified to do so. A person may be qualified to perform one of these tasks but not qualified to perform another.

Supervisors must be knowledgeable of the specific types of hoisting and rigging operations under their supervision and the associated hazards. Further, supervisors must be familiar with applicable rules and procedures implemented at the site to ensure that hoisting and rigging work under their control is done efficiently and safely, with safety as top priority. Supervisors must ensure that employees fully understand

the importance of safety and that they recognize their own authority and responsibility to stop activity when safety is questionable.

4.1.1 Equipment

SLAC owns thousands of pieces of hoisting and rigging equipment and routinely purchases and fabricates new equipment. To ensure that equipment meets extensive and frequently complex standards, all equipment (including rigging hooks but excluding other rigging hardware and accessories) must undergo a *review of conformance*. The review of conformance process ensures that the equipment is properly evaluated, tested, and inspected by qualified personnel. The process also ensures that all equipment is registered in the H&R Equipment Database, which tracks the equipment by serial number and owner and maintains its inspection status.

Note The H&R Equipment Database consists of two databases: one for cranes ([Crane Information Database](#)) and one for other equipment, such as lifting devices ([Rigging Equipment Database](#)).

4.1.1.1 Equipment Custodian

All hoisting and rigging equipment, including rigging hardware and accessories, must have a formally designated equipment custodian. The custodian is responsible for ensuring that

- All hoisting and rigging equipment completes a review of conformance prior to being placed into service
- Equipment undergoes all required inspections
- Non-compliant equipment is removed from service

4.1.1.2 Review of Conformance

The review of conformance process ensures that, prior to being placed into service; equipment is evaluated by qualified personnel for compliance with the requirements of [DOE-STD-1090-2007](#) and this chapter. This process verifies that equipment is

- Assigned to a designated equipment custodian
- Uniquely identified and registered in the H&R Equipment Database
- Designed, engineered, manufactured, inspected, and tested to meet applicable requirements
- Approved by the Hoisting and Rigging Citizen Committee
- Given an initial inspection
- Authorized and released for use

For rigging hardware and accessories and synthetic slings (excluding rigging hooks), the review of conformance requirement is satisfied by performing an initial inspection of the equipment prior to being placed into service.

For all other hoisting and rigging equipment, the review of conformance must be documented using the Hoisting and Rigging: Review of Conformance Form ([pdf](#) or [Word](#)).

4.1.1.3 Equipment Procurement and Fabrication

All purchased and SLAC-fabricated hoisting and rigging equipment must meet all applicable standards and regulations, including ASME/ANSI standards, OSHA regulations, and [DOE-STD-1090-2007](#).

It is the responsibility of the requestor to ensure that purchase specifications require that the vendor supply the documentation required for the review of conformance, which includes

- Certificate of compliance with applicable standards
- Load test certification

Procurement and installation of fixed-location hoists and cranes must receive prior approval from the Hoisting and Rigging Citizen Committee.

Note The Hoisting and Rigging Citizen Committee is available to advise on hoisting and rigging purchase requirements.

4.1.1.4 Identification

All hoisting and rigging equipment, including rigging hooks (but excluding other rigging hardware and accessories and synthetic slings), must be marked with a unique identification number.

- For cranes, hoists, and miscellaneous lifting devices, the identification number (referred to as the CRN #) is assigned by the Facilities Department.
- For other hoisting and rigging equipment, the identification number is the equipment serial number provided by the manufacturer, or designated by the design engineer, or assigned by the equipment custodian.

Note Permanent assemblies (such as wire rope bridle with rigging hooks) require only a single identification number.

- The identification label, tag, or marking must be durable and legible

4.1.1.5 Registration

Equipment custodians must register all hoisting and rigging equipment (including rigging hooks but excluding other rigging accessories and hardware) with the H&R inspector for inclusion in the H&R Equipment Database.

- Cranes, hoists, and miscellaneous lifting devices that have a *Facilities* CRN # are already registered in the [Crane Information Database](#).
- All other equipment must be registered through the review of conformance process.

4.1.1.6 Tracking

The Facilities Department maintains the H&R Equipment Database that tracks the inspection, testing, maintenance, and repair of hoisting and rigging equipment (including rigging hooks but excluding other rigging hardware and accessories and synthetic slings). Any items not in the H&R Equipment Database must be tracked by the responsible equipment custodian.

4.1.1.7 Inspections

Initial, pre-use, frequent, and periodic inspections are required for all equipment. Certain types of equipment must also pass third-party inspections, such as the *Plate V*. Requirements and procedures for various inspections vary with the type of equipment and are specified in [DOE-STD-1090-2007](#). Each type of inspection must be conducted and documented in accordance with specified requirements noted below and in [Hoisting and Rigging: Inspection and Maintenance Requirements](#).

- Only equipment bearing a current SLAC H&R inspection tag may be used; equipment without a current tag must not be used until it is inspected and tagged. (This applies to all hoisting and rigging equipment, including rigging hooks but excluding other rigging hardware and accessories and synthetic slings.)
- Inspection tags are only issued to equipment that has undergone a documented review of conformance.
- Inspection tags are dated to expire per the inspection requirements for the equipment.
- Synthetic slings: equipment custodians must establish custodian records for all required inspections.
- Third-party inspectors must submit copies of inspection reports, load tests, compliance certificates, and other supporting data to the H&R inspector for inclusion in the H&R Equipment Database.

Note All initial, periodic, and *Plate V* inspections must be documented, including the inspection of rigging hooks but excluding the inspection of other rigging hardware and accessories and synthetic slings.

Initial Inspection

Prior to initial use, a qualified inspector or person must perform an initial inspection on all hoisting and rigging equipment, as appropriate for the equipment type. Additionally, modified lifting devices, or reinstalled, modified, or repaired cranes or hoists, must pass an initial inspection by a qualified inspector. Inspections of repaired and modified cranes may be limited to the provisions affected by the alteration, repair or modification as determined by a qualified person. Initial inspections

- Must be documented and recorded as described in [Hoisting and Rigging: Inspection and Maintenance Requirements](#)
- Are required as part of the Hoisting and Rigging: Review of Conformance Form ([pdf](#) or [Word](#))

Pre-use Inspection

A pre-use inspection for all types of equipment is performed by the operator before each use. Inspection checklists for many types of equipment are included in Section 6.1, "Program Documents".

- The pre-use inspection of a crane, hoist, or miscellaneous lifting device must be documented and the documentation must be readily available and retained for five years
- The pre-use inspection of other hoisting and rigging equipment must be performed but no documentation is required

Frequent Inspection

A qualified inspector or person must perform and document a monthly inspection of running wire ropes, chains, and hooks for hoists and cranes over one ton, as described in [Hoisting and Rigging: Inspection and](#)

[Maintenance Requirements](#). Monthly inspections are tracked using the [Hoisting and Rigging: Crane and Hoist Monthly Inspection Form](#).

Periodic Inspection

A qualified inspector or person must perform and document an annual periodic inspection on all hoisting and rigging equipment as appropriate for the equipment type, as described in [Hoisting and Rigging: Inspection and Maintenance Requirements](#).

Inspection tags are affixed to equipment, including rigging hooks but excluding other rigging hardware and accessories and synthetic slings, upon successful completion of the periodic inspection. Prior to affixing a current H&R inspection tag on the equipment, the qualified inspector must consult the H&R Equipment Database to ensure that a review of conformance was completed.

Plate V Certification

Cal/OSHA Plate V certification must be performed by a qualified third-party Plate V inspector.

- Plate V certifications must be documented and recorded in the [Crane Information Database](#).
- Cranes, hoists, and miscellaneous lifting devices with a rated capacity greater than three tons: certifications must be performed initially and once every four years thereafter. In addition, a Plate V certification must be performed after relocation of a fixed crane.

4.1.1.8 Testing

Requirements and procedures for testing hoisting and rigging equipment vary with the type of equipment and are specified in [DOE-STD-1090-2007](#). Specifically

- All testing must be performed in accordance with the recommendations of the manufacturer
- Operational tests are required following maintenance or servicing of cranes and hoists
- Documented load tests are required:
 - As part of the initial inspection for all hoisting and rigging equipment, including rigging hooks but excluding other rigging hardware, accessories, and synthetic slings
 - For any hoisting and rigging equipment, including rigging hardware and accessories used in critical lifts
 - All cranes and hoists where load bearing parts have been altered or repaired
 - All below-the-hook lifting devices where load bearing parts have been altered or repaired

4.1.1.9 Rented Equipment

All rented equipment must conform to all Cal/OSHA requirements.

4.1.1.10 Maintenance, Modification, Repair

Note Specific maintenance and repair requirements for various hoisting and rigging equipment are specified in [DOE-STD-1090-2007](#).

All cranes must be maintained according to the schedule in [Hoisting and Rigging: Inspection and Maintenance Requirements](#) for preventative maintenance; operational testing; and load testing after an alteration or repair.

- **Maintenance and repair of cranes, hoists and miscellaneous lifting devices** is the responsibility of Facilities and may only be performed by qualified personnel. Third-party maintenance must be coordinated through Facilities. All maintenance records and documentation will be maintained and entered into the H&R Equipment Database by Facilities.
- **Maintenance and repair of all other hoisting and rigging equipment** is the responsibility of the line organization, and must be performed by qualified personnel only.
- **Altered, repaired or modified equipment** must pass an initial inspection prior to use

4.1.1.11 Approval to Use a Forklift as a Hoist

A forklift may only be used as a hoist with an approved attachment in place. To be approved

- A written procedure for the lift must be developed and approved
- A safety analysis must be performed by a qualified engineer
- A data plate must be affixed to the fork lift specifying load analysis

Note Free rigging, or the direct attachment to or placement of rigging equipment (such as slings, shackles, or rings) onto the tines of a powered industrial truck for a below-the-tines (forks) lift, is prohibited at SLAC. Commercially available attachments can only be used if they have passed the review of conformance and are within the rated capacity as specified on the forklift data plate.

4.1.1.12 Storage

Lifting devices must be stored appropriately to protect the device from damage, preferably in a dry, indoor location.

4.1.2 Loads

The lift planning process (see below) requires that the load be fully characterized. The weight and center of gravity (determined from drawings, calculations, markings or estimates) must be known for all lifts. Describing the load is the responsibility of the load owner, who may enlist the assistance of others to help make determinations.

The load owner will ensure that the stresses and deflections induced on the load and attachment points during normal hoisting and rigging operations are within acceptable limits. Upon request, the load owner must provide written documentation.

4.1.2.1 Manufacturer-provided Lift Points

All lift points designed for and installed on engineered or manufactured equipment are considered part of the equipment and are acceptable for their intended use. Manufacturer-supplied lift points must

- Meet manufacturer's pre-operational inspection, testing, and maintenance criteria
- Be inspected by a qualified person prior to initial use

- Used in accordance with manufacturer's instructions. In the absence of such information, further qualified technical support may be needed.

Note The load owner will be responsible for ensuring that manufacturer-provided lift points on their loads comply with this section.

4.1.3 Lifts

All lifts must be planned and conducted in compliance with [DOE-STD-1090-2007](#), which includes guidance on classifying, planning, and performing lifts.

4.1.3.1 Initiating

Many SLAC organizations have trained and qualified employees who are able to meet the hoisting and rigging needs of their organization. Lifts within the organization are generally initiated as part of the supervisor/employee work assignment process.

If an organization's trained and qualified hoisting and rigging personnel are unavailable to perform the lift, or if the lift is beyond their expertise, another organization may perform the lift. A request for professional riggers is initiated through a [Facilities service request](#).

4.1.3.2 Classifying

At the initial stage of the planning process, an appointed qualified person within the lifting organization, with the approval of line management, must classify each lift into one of the DOE-STD-1090-2007 specified lift categories (*ordinary* or *critical*). Load owners will be consulted as necessary to make this determination.

4.1.3.3 Planning

Once the lift has been classified, requirements appropriate for the designated class according to DOE-STD-1090-2007 are applied in planning, documenting, and performing the lift. Consistent with ISEMS, the level of planning rigor, work controls, and documentation for lifts should be commensurate with the level of risks, work complexity, and coordination requirements.

Ordinary Lifts

The majority of the lifts performed at SLAC are classified as *ordinary*. Ordinary lifts can range from simple to very complex. Ordinary lifts must be planned and can be conveyed verbally or documented in a lift plan.

- Requirements for lift planning are determined by the line first-line supervisor responsible for the lift, in coordination with specific organizational policy; some organizations may require documentation for all lifts.
- The first-line supervisor in charge of the lift must ensure that all elements of work planning and authorization are met.
- For lifts requiring more than one person, the first-line supervisor must assign a *designated leader*. If only one person is required for the lift, that person assumes the role of the designated leader.

Critical Lifts

A written lift plan is required for all critical lifts, and the lift plan must be approved by the Hoisting and Rigging Citizen Committee chairperson or designee before any lifting activity begins.

DOE-STD-1090-2007 provides guidance with regard to

- Lift planning and documentation
- Pre-lift meeting requirements
- Requirements specific to the equipment to be used
- More stringent proof-testing requirements

4.1.3.4 Performing

All Lifts

- Must be performed as planned. Any deviation must be made in accordance with the departmental work authorization protocol.
- Only trained, qualified, and authorized personnel will be allowed to rig loads or operate cranes or hoists. Training for the type of equipment used must be completed to the required level.
- All pre-use inspections for hoists, cranes, and hoisting and rigging hardware and accessories must be performed prior to the lift.
- Personnel must not place any part of their body under a suspended load. However, if no alternative exists and the work must be performed under a suspended load, this may be done but the lift must be performed as a *high hazard lift* (see below).
- Rigging practices and operator conduct provided in DOE-STD-1090-2007 will be followed except where the standard is in conflict with this chapter. In those instances this chapter takes precedence.

Ordinary Lifts

- Must have a designated leader
- Deviations from the established lift planning must be reviewed by the designated leader, and the first-line supervisor may be consulted as necessary.

Critical Lifts

- Requires assignment of a *person-in-charge (PIC)*, other than the operator, to oversee the lift
- Crane operators for critical lifts must be trained to professional rigger level.

High Hazard Lifts

- Any lift that requires a worker to place any part of his or her body under a suspended load requires mitigation measures and management level approval (department head or higher) from that worker's department. Mitigation measures must prevent the body or body parts from being struck against or impacted by the load. For example, a lift plan could incorporate a structure or support that would protect the worker from the suspended load if it were to drop or swing while the worker is under the load. Members of the Hoisting and Rigging Citizen Committee are available to assist with determining mitigation measures.

- The document used to describe the high hazard activity (job safety analysis [JSA], work integration plan [WIP], or lift plan) must clearly describe what parts of the body will be under the load, the mitigation measures used, and management's approval.

4.1.3.5 Lifting of Personnel

All hoisting and rigging activities that involve lifting of personnel must receive prior written approval from the Hoisting and Rigging Citizen Committee chairperson or designee. Requests for approval must include detailed documentation showing how the lift will meet the requirement specified in DOE-STD-1090-2007.

4.1.4 Subcontractors

All subcontractors and subcontractor-owned equipment and the services they perform must conform to all Cal/OSHA requirements.

In addition, subcontractor activities at SLAC are regulated as specified in [Chapter 42, "Subcontractor Construction Safety"](#), and [Chapter 49, "Service Subcontractor Safety"](#), in addition to the hoisting and rigging specific requirements in this section.

Note The relevant section in [DOE-STD-1090-2007](#) can be used by the university technical representative (UTR) for guidance when overseeing hoisting and rigging activities conducted by subcontractors.

4.1.4.1 Subcontractor Personnel

All subcontractor operators must have in their possession a valid certificate of competency by an accredited certifying entity for the type of equipment to be used.

4.1.4.2 Lift Classification and Planning

Lifts performed by subcontractors must be classified as high, medium, or low hazard by the project manager. For associated requirements, see [Chapter 49, "Service Subcontractor Safety"](#).

- Lifts classified as high hazard require that the subcontractor submit a detailed work plan (including a lift plan) as part of the site-specific safety plan.
- Lifts classified as medium, low, and very low hazard require a detailed work plan (including a lift plan) that must be submitted as part of the pre-work hazard analysis.

4.1.4.3 Work Plan Approval

- The ESH Field Safety and Building Inspection Office must review and approve subcontractor work planning documents (including lift plans) and review and approve changes in scope of work.
- The H&R inspector must be included in the ESH Field Safety and Building Inspection Office review process.

4.1.4.4 Performing the Lift

- The UTR must ensure that all preoperational inspections are performed by the subcontractor.
- For mobile cranes, the UTR must ensure that the subcontractor's inspection and maintenance records are current.

- The UTR must be present during the setting up and performance of each unique lift or as specified in the scope of work.
- The H&R inspector is available to the UTR to provide expertise on hoisting and rigging equipment and activities.

4.1.5 Personnel

4.1.5.1 Qualifications

Only *qualified persons* will perform hoisting and rigging activities. (See Section 4.3 “Training”, for training requirements.)

4.1.5.2 Personal Protective Equipment

Hoisting and rigging hazards include

- Being struck by or against the load
- Falling objects from crane, hoist, or load
- Lacerations from rigging or load

To mitigate these hazards, hard hats and safety-toed shoes are required for all lifts and when handling the load. Hard hats are also required for all personnel who may be working under a crane or hoist. Other personal protective equipment (PPE) such as gloves and safety-glasses may be required to mitigate hazards. Any deviation from the mandatory PPE must be authorized by the first-line supervisor.

4.1.5.3 Medical Surveillance

Operators of cab-operated, pulpit-operated, or mobile cranes must successfully complete a medical surveillance program in compliance with an accredited certifying entity. This requirement is documented through ESH Course 280ME, Crane Operator Medical Exam ([ESH Course 280ME](#)).

4.2 Procedures and Specific Requirements

This section lists hoisting and rigging procedures and specific requirements. Details are generally found under the appropriate heading or in [DOE-STD-1090-2007](#), as indicated. For a complete listing of program documents, see Section 6.1.

4.2.1 Equipment

4.2.1.1 Review of Conformance

The review of conformance process ensures that hoisting and rigging equipment is in compliance and is registered in the H&R Equipment Database. For details, see Hoisting and Rigging: Review of Conformance Form ([pdf](#) or [Word](#)).

If a visual weld inspection is required (per the review of conformance), see Hoisting and Rigging: Visual Structural Weld Inspection Criteria and Form ([pdf](#) or [Word](#)).

4.2.1.2 Equipment Procurement and Fabrication

All new and fabricated equipment must comply with manufacturing standards and follow the approval process specified in [Hoisting and Rigging: Purchasing Procedure](#).

4.2.1.3 Inspections

For requirements for initial, frequent, pre-use, periodic, and Plate V inspections, see [Hoisting and Rigging: Inspection and Maintenance Requirements](#).

For detail pertaining to how to conduct initial and periodic inspections, see DOE-STD-1090-2007.

For pre-use inspections, see the appropriate checklist:

- Hoisting and Rigging: Pre-use Inspection Checklist for Floor-operated Cranes ([pdf](#) or [Word](#))
- [Hoisting and Rigging: Mobile Crane Pre-use Inspection Form](#)
- [Hoisting and Rigging: Pre-use Inspection Criteria for Below-the Hook Lifting Devices, Slings, and Rigging Hardware and Accessories](#)
- Hoisting and Rigging: Pre-use Checklist for Hand-operated Hoists ([pdf](#) or [Word](#))
- Hoisting and Rigging: Pre-use Checklist for Electrical or Air Powered Hoists ([pdf](#) or [Word](#))

The required monthly crane and hoist inspection of running wire ropes, chains, and hooks for hoists and cranes with a capacity of one ton or more, must be documented using the [Hoisting and Rigging: Crane and Hoist Monthly Inspection Form](#)

4.2.1.4 Maintenance, Modification, Repair

For crane maintenance requirements, see [Hoisting and Rigging: Inspection and Maintenance Requirements](#).

For using a forklift as a hoist, see [Hoisting and Rigging: Forklift Attachment Approval Procedure](#).

4.2.2 Loads

For guidelines on characterizing a load, see Hoisting and Rigging: Lift Planning and Control for Ordinary Lifts ([pdf](#) or [Word](#)).

4.2.3 Lifts

4.2.3.1 Classifying

Lifts are classified by an appointed qualified person according to requirements in DOE-STD-1090-2007.

4.2.3.2 Planning

Ordinary Lifts

Ordinary lifts must be planned according to the requirements in DOE-STD-1090-2007. See also the lift planning sections in [Hoisting and Rigging: Lift Planning and Control Guidelines](#).

Ordinary lifts may require a documented lift plan, depending both on specific organizational policy and the first-line supervisor's assessment. A lift plan generally includes the elements in Hoisting and Rigging: Lift Planning and Control for Ordinary Lifts.

Critical Lifts

For guidance, see DOE-STD-1090-2007.

Note As required by DOE-STD-1090-2007, written and approved lift plans are required for all critical lifts.

4.2.3.3 Performing

Lifts must be performed in accordance with the lift planning (verbal or written). Good practices for performing a lift are summarized in [Hoisting and Rigging: Lift Planning and Control Guidelines](#).

4.2.3.4 Lifting of Personnel

Lift plans that include the lifting of personnel must be approved by the Hoisting and Rigging Citizen Committee prior to the lift. All lifts must be performed in compliance with DOE-STD-1090-2007, Chapter 4.

- DOE-STD-1090-2007, Chapter 4 specifies the operation, design, testing, and inspection requirements for the use of personnel lift platforms or baskets suspended from mobile or overhead cranes.
- Requires that a designated leader be appointed for the entire lifting operation.

4.2.4 Subcontractors

Subcontractor activities at SLAC are regulated as specified in Chapter 42, "Subcontractor Construction Safety", and Chapter 49, "Service Subcontractor Safety", in addition to the hoisting and rigging-specific requirements in Section 4.1.4.

4.3 Training

Training requirements are listed by role below.

Note The terms qualified inspector and qualified person are used throughout DOE-STD-1090-2007. Line management is responsible for ensuring that personnel who perform hoisting and rigging activities, such as design of lifting fixtures, inspection of equipment, preparation and approval of lift plans, and review of equipment compliance, are qualified to do so. A person may be qualified to inspect one type of equipment but not qualified to inspect another. When designating personnel to perform hoisting and rigging functions, line management must be specific as to the scope and limitations of the designation.

4.3.1 Operators, No-load Operators, and Crane Maintenance Personnel

Operators, no-load operators, and crane maintenance personnel are required to attend initial training and must be re-qualified every three years. The training consists of two modules:

- ESH Course 280, Basic Crane and Rigging ([ESH Course 280](#))
- ESH Course 280PRA, Basic Crane Practical Examination ([ESH Course 280PRA](#))

4.3.2 Mobile Crane Operator

A mobile crane operator must be in continual possession of a valid certificate of competency by an accredited certifying entity for the type of mobile crane to be used. Certificate renewal is in accordance with the certifying entity's renewal schedule.

Mobile crane operators will be current in the following SLAC course requirement

- ESH Course 280ME, Crane Operator Medical Exam ([ESH Course 280ME](#))

Note Qualification supersedes ESH Courses 280, Basic Crane and Rigging and 280PRA, Basic Crane Practical Examination

4.3.3 Professional Rigger

A qualified professional rigger must be in continual possession of a valid certificate of competency by an accredited certifying entity for the type of rigging equipment and crane to be used. Certificate renewal is in accordance with the certifying entity's renewal schedule. Certification is required for overhead cranes.

A qualified professional rigger must, in addition, be current with the requirements of the following SLAC course:

- ESH Course 280ME, Crane Operator Medical Exam ([ESH Course 280ME](#))

Note Qualification supersedes ESH Courses 280, Basic Crane and Rigging and 280PRA, Basic Crane Practical Examination

4.3.4 H&R Inspector

A qualified H&R inspector must have completed, at minimum, a course equivalent to Rigging Inspector Training.¹

4.3.5 Crane and Hoist Inspector

A qualified crane or hoist inspector must have completed, at minimum, a course equivalent to Inspector Training: Overhead Crane Inspector Training and Mobile Crane Inspector Training.²

Note A Cal/OSHA Plate V inspector must be qualified per California regulations.

1 For example, "NACB Group Inc.", <http://www.cranesafe.com/>

2 For example, "NACB Group Inc.", <http://www.cranesafe.com/>

4.4 Roles and Responsibilities

4.4.1 Hoisting and Rigging Program Manager

The hoisting and rigging program manager

- Tracks regulatory changes and informs the Hoisting and Rigging Citizen Committee
- Assists in the interpretation of standards in support of compliance and safety improvement efforts
- Provides subject matter expert (SME) consultation on hoisting and rigging activities to line organizations
- Ensures development and administrative oversight for ESH Courses 280 and 280PRA

4.4.2 Hoisting and Rigging Citizen Committee

The Hoisting and Rigging Citizen Committee

- Reviews and approves critical lifts
- Provides subject matter expert (SME) support for hoisting and rigging activities
- Chairperson or designee approves hoisting and rigging equipment through the review of conformance process
- Upholds the [Hoisting and Rigging Citizen Committee charter](#)
- Together with the Field Safety and Building Inspection Office, reviews proposals for the purchase of fixed location cranes

4.4.3 The Crane Maintenance Group

The Crane Maintenance Group

- Provides maintenance for cranes, hoists, and miscellaneous lifting devices
- Schedules necessary repairs
- Initiates scheduled preventative maintenance and inspections
- Performs inspections of cranes, hoists, and miscellaneous lifting devices with rated capacity of three tons and less
- Schedules Plate V certifications

4.4.4 Facilities Department

The Facilities Department

- Maintains the H&R Equipment Database
- Tracks the compliance status of each piece of equipment, including reviews of conformance, maintenance, repair, inspections

4.4.5 Line Management

Line management ensures that their group or department

- Clearly defines roles and responsibilities for all persons involved in hoisting and rigging activities (including the person-in-charge, first-line supervisor, inspectors, designers, lift plan approvers, and equipment custodians)
- Is in compliance with DOE-STD-1090-2007 and the requirements of this chapter

4.4.6 First-line Supervisors

The first-line supervisors

- Are designated by line management
- Classify lifts
- Designate qualified personnel to perform hoisting and rigging activities
- Assign the designated leader as applicable
- Assign hoisting and rigging activities, such as using hoisting and rigging equipment, inspecting rigging hardware and accessories, and preparing and approving lift plans

4.4.7 Load Owners

Load owners

- Assist in classifying lifts
- Make sure loads are maintained in safe working condition
- Describe loads as required
- Ensure structural integrity of the load, including attachment points

4.4.8 Equipment Custodians

Hoisting and rigging equipment will be assigned to an equipment custodian, who will

- Control the use of the equipment
- Maintain equipment in safe working order
- Make equipment available for inspection and maintenance
- Remove non-compliant equipment from service
- Provide information to Facilities for the H&R Equipment Database
- Maintain documentation as required by DOE-STD-1090-2007 and this chapter, including the review of conformance for their equipment
- Carry out periodic inspections of rigging hardware and accessories and synthetic slings (excluding rigging hooks) and/or ensure that required inspections are performed by the qualified person listed in Hoisting and Rigging: Inspection and Maintenance Requirements

Equipment custodians responsible for cranes, hoists, or miscellaneous lifting devices will, in addition to the above duties,

- Verify that maintenance and periodic required inspections are performed
- Ensure that a current inspection label is posted on the crane, hoist, or miscellaneous lifting device
- Ensure that pre-use inspections are being performed and recorded
- Maintain a record of the pre-use inspection checklist for a minimum of five years
- Verify that cranes are labeled with an identification number

4.4.9 Persons-in-Charge

Persons-in-charge (PIC) will

- Oversee critical lifts (and cannot be the operator)
- Have the necessary knowledge and experience for critical lifts and the type of equipment used
- Verify the qualifications of participating personnel
- Ensure that lift planning is completed and reviews the lift with all participating personnel before the lift begins
- Complete the pre-use inspection checklist (if not already finalized)
- Check the condition of equipment and load
- Verify load description and condition
- Request release of equipment from the custodian
- Be present during the entire lift operation
- Return control of the equipment to the equipment custodian (including the pre-use inspection checklist, if required)

4.4.10 Operators

Operators

- Must have the necessary training, knowledge, and experience for the class of lift and the type of equipment used
- Must perform the lift as planned. Any deviation must be made in accordance with the departmental work authorization protocol.

4.4.11 Designated Leaders

If the lift is being made by only one person, that person assumes all responsibilities of the designated leader

The responsibilities of the designated leader depend on the type of lift and/or lifting activity (ordinary or when lifting personnel) and are defined in DOE-STD-1090-2007.

4.4.12 H&R Inspector

The H&R inspector will

- Perform initial and periodic inspections of hoisting and rigging equipment (except rigging hardware accessories)
- Act as a subject matter expert (SME) to assist SLAC departments with hoisting and rigging activities
- Reviews subcontractor lift plans as part of the ESH Field Safety and Building Inspection Office review process
- Maintain the H&R Equipment Database

4.4.13 Crane and Hoist Inspectors

Crane and hoist inspectors will

- Have the necessary training, knowledge and experience
- Carry out initial and periodic inspections of cranes, hoists, and miscellaneous lifting devices

4.4.14 Cal/OSHA Plate V Inspector

The Plate V inspector

- Must be an agent certified by a licensed certifying entity
- Carries out initial and periodic Plate V inspections/certifications for all cranes, hoists, and miscellaneous lifting devices of more than three tons in capacity

4.4.15 Crane Maintenance Supervisor

The crane maintenance supervisor will

- Coordinate maintenance, repair, inspection, and certification of cranes through the crane maintenance program
- Ensure that a functional test of cranes is completed after maintenance or repairs
- Ensure that documentation is made readily available of any load testing, inspection, preventive maintenance, or certification performed
- Ensure labeling and recordkeeping of periodic inspections as necessary to comply with the requirements of this chapter

4.4.16 Designers

H&R equipment designers will

- Be qualified
- Ensure equipment designs meet applicable standards in addition to the requirements of this chapter

4.4.17 ESH Field Safety and Building Inspection Office

The ESH Field Safety and Building Inspection Office will

- Review and approve subcontractor work planning documents
- Review and approve changes in scope of work by a subcontractor
- Together with the Hoisting and Rigging Citizen Committee, review the proposed purchase of fixed location cranes

4.4.18 University Technical Representatives

University technical representatives (UTRs)

- Must be qualified to oversee the type of hoisting and rigging activities to which they are assigned
- Check that all subcontractor operators have a valid certificate of competency by an accredited certifying entity before they operate any mobile or overhead crane
- Ensure that all preoperational inspections are performed by the subcontractor
- For mobile cranes, ensure that the subcontractor's inspection and maintenance records are current
 - Verify adherence to the scope of work. Deviations from the approved scope of work must be reviewed and approved by ESH Field Safety and Building Inspection Office.
- Be present during the setting up and performance of each unique lift or as specified in the scope of work

5 Definitions

Note For a comprehensive list of hoisting and rigging-related definitions, see DOE-STD-1090-2007, Chapter 1.

Attachment point. Designed lifting point that is part of a load

Below-the-hook lifting device. See *lifting device*

Come-along. See *hoist, lever operated*

Crane. A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine

Custodian, equipment. A person assigned responsibility for a piece of hoisting and rigging equipment

Engineer/engineering organization, qualified. An engineer or engineering organization whose competence in evaluation of the type of equipment in question has been demonstrated to the satisfaction of the responsible line management

Free rigging. The direct attachment to or placement of rigging equipment (such as slings, shackles, or rings) onto the tines (forks) of a powered industrial truck for a below-the-tines lift

Lift, High hazard. Any lift where the personnel involved have a part of or their entire body under the suspended load.

Hoist. A device that applies a force for lifting or lowering

Hoist, lever operated. A lever-operated manual device used to lift, lower, or pull a load and to apply or release tension; commonly referred to as a *come-along*

Hoist, chain operated. A chain operated manual device used to lift or lower a load and to apply or release tension; commonly referred to as a *chain-fall*

Inspector, crane. Inspector qualified to inspect cranes, hoists, and miscellaneous lifting devices

Inspector, Plate V. Inspector qualified to perform Cal/OSHA Plate V certifications

Inspector, qualified. Person recognized for competence and whose qualification to perform specific inspection activities has been determined, verified, and documented

Leader, designated. An individual assigned responsibility for safe handling of ordinary lifts

Lift, critical. A lift for which the application of requirements applicable to ordinary lifts would not adequately eliminate or control the likelihood or severity of the following:

- Personnel injury or significant adverse health impact (on-site or off-site)
- Significant release of radioactivity or other hazardous material or other undesirable conditions
- Undetectable damage that would jeopardize future operations or the safety of a facility
- Damage that would result in delay to schedule or other significant program impact such as loss of vital data

Lift, ordinary. All lifts that do not meet the requirements of a *critical lift*

Lift plan. Pre-job plan or procedure for safely executing a lift

Lifting device. Includes a broad range of equipment used in hoisting and rigging activities:

- *Below-the hook lifting device.* Device that, used singularly or in combination, alters or transfers the direction or sequence of loading from the lifting device to the load, such as spreader bars, structural lifters, vacuum lifters, magnetic lifters
- *Miscellaneous lifting device.* Portable A frames (portable gantries), truck mounted cranes with a capacity of one ton or less not covered by ASME B30.5 and self-contained shop cranes as addressed by ASME Portable Automotive Lifting Devices (PALD-2005)
- *Sling.* Wire rope, chain, synthetic web, and metal mesh made into forms, and with or without fittings, for handling loads
- *Rigging hardware or accessories.* Such items as shackles, eyebolts, rings, links, swivel hoist rings, turnbuckles, wire rope clips, and load-indicating devices
- *Rigging hooks.* A rigging hardware component typically attached to chain, wire rope, or suspension members

Load owner. Person responsible for the load to be lifted including attachment and lift points

Maintenance supervisor, crane. Supervisor in the organization designated to maintain cranes and hoists

Non-destructive examination. The development and application of technical methods to examine materials or components in ways that do not impair future usefulness and serviceability in order to detect, locate, measure, and evaluate discontinuities, defects, and other imperfections; assess integrity, properties, and composition; and measure geometrical characteristics

Non-destructive test. Testing that does not destroy or damage the item. Examples include magnetic particle, ultrasonic, liquid penetration, or radiographic testing.

Operator. Person who operates cranes, hoists, and miscellaneous lifting devices

Operator, no-load. Operators who use hoist bridges and trolleys only as a personal platform to perform maintenance (for example, changing light bulbs)

Person, authorized. A person at SLAC who has completed the required training and is authorized to perform the work

Person, designated. An individual selected or assigned as being qualified to perform specific duties

Person, qualified. A person who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated an ability and competence to solve or resolve problems relating to the subject matter and work

Person-in-charge. A qualified person responsible for the safe planning and performance of a critical lift

Plate V certification. A Cal/OSHA specified safety inspection in accordance with 8 CCR 5022 (a) through (d) performed on mobile cranes and cranes, hoists, and miscellaneous lifting devices exceeding three tons

Review of conformance. A comprehensive review of the equipment for compliance with DOE-STD-1090-2007 and the requirements of this chapter

Rigger, journeyman. In this document, a *journeyman rigger* is referred to as a *professional rigger*

Sling. See *lifting device*

Supervisor, first-line. The qualified person authorizing hoisting and rigging activities

Wire rope, running. Wire rope that “runs” over sheaves, pulleys, and drums used to hoist the load

6 References

6.1 Program Documents

- [Hoisting and Rigging Citizen Committee Charter](#)

- H&R Equipment Database
 - [Crane Information Database](#)
 - [Rigging Equipment Database](#)
- [Hoisting and Rigging: Inspection and Maintenance Requirements](#) (SLAC-I-730-0A21S-035)
- [Hoisting and Rigging: Purchasing Procedure](#) (SLAC-I-730-0A21C-023)
- [Hoisting and Rigging: Lift Planning and Control Guidelines](#) (SLAC-I-730-0A21T-008)
- Hoisting and Rigging: Lift Panning and Control for Ordinary Lifts (SLAC-I-730-0A21J-022) [pdf](#) or [Word](#)
- Hoisting and Rigging: Review of Conformance Form (SLAC-I-730-0A21J-021) [pdf](#) or [Word](#)
- Hoisting and Rigging: Visual Structural Weld Inspection Criteria and Form (SLAC-I-730-0A21J-020) [pdf](#) or [Word](#)
- [Hoisting and Rigging: Forklift Attachment Approval Procedure](#) (SLAC-I-730-0A21C-020)
- Hoisting and Rigging: Pre-use Inspection Checklist for Floor-operated Cranes (SLAC-I-730-0A21J-019) [pdf](#) or [Word](#)
- [Hoisting and Rigging: Pre-use Inspection Criteria for Below-the-Hook Lifting Devices, Slings, and Rigging Hardware and Accessories](#) (SLAC-I-730-0A21S-036)
- Hoisting and Rigging: Pre-use Inspection Checklist for Hand-operated Hoists (SLAC-I-730-0A21J-018) [pdf](#) or [Word](#)
- Hoisting and Rigging: Pre-use Inspection Checklist for Electrical or Air Powered Hoists (SLAC-I-730-0A21J-023) [pdf](#) or [Word](#)
- [Hoisting and Rigging: Crane and Hoist Monthly Inspection Form](#) (SLAC-I-730-0A21J-030)
- [Hoisting and Rigging: Mobile Crane Pre-use Inspection Form](#) (SLAC-I-730-0A21J-031)

6.2 Standards

SLAC adheres to the following standards for its hoisting and rigging program.

- Title 29, *Code of Federal Regulations*, Part 1910, “Occupational Safety and Health Standards”
 - Section 1910.184, “Slings” ([29 CFR 1910.184](#))
 - Section 1910.179, “Overhead and Gantry Cranes” ([29 CFR 1910.179](#))
 - Section 1910.180, “Crawler Locomotive and Truck Cranes” ([29 CFR 1910.180](#))
- Title 29, *Code of Federal Regulations*, Part 1926, “Safety and Health Regulations for Construction”
 - Section 1926.251, “Rigging Equipment for Material Handling” ([29 CFR 1926.251](#))
 - Section 1926.550, “Cranes and Derricks” ([29 CFR 1926.550](#))
 - Section 1926.554, “Overhead Hoists” ([29 CFR 1926.554](#))
- Title 8, *California Code of Regulations*
 - Section 5022, “Proof Load Test and Examination of Cranes and Their Accessory Gear” ([8 CCR 5022](#))

- Cal/OSHA Plate V crane certification for overhead bridge cranes greater than three tons in lifting capacity
- Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090-2007](#)) and third-party standards referenced therein

6.3 Related Documents

[SLAC Environment, Safety, and Health Manual](#) (SLAC-I-720-0A29Z-001)

- [Chapter 42, “Subcontractor Construction Safety”](#)
- [Chapter 45, “Fall Protection”](#)
- [Chapter 47, “Mobile Elevating Work Platforms \(MEWP\)”](#)
- [Chapter 48, “Powered Industrial Vehicles”](#)
- [Chapter 49, “Service Subcontractor Safety”](#)

Other laboratories

- [Hanford Site Hoisting and Rigging Manual](#) (DOE-RL-92-36, January 2006)

7 Document Information

Title: Hoisting and Rigging

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/pdfs/ESHch41.pdf>

Revision Record: <https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=40>

Department: Field Safety and Building Inspection

Program: Hoisting and Rigging

Date Effective: 15 September 2009

Hoisting and Rigging: Inspection and Maintenance Requirements

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingReqInspect.pdf>

Revision Record: [https://www-](https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=435)

[internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=435](https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=435)

Department: Field Safety and Building Inspection

Program: Hoisting and Rigging

Authority: [ESH Manual, Chapter 41, Hoisting and Rigging](#)

Date Effective: 15 September 2009

1 Purpose

The purpose of these requirements is to ensure that hoisting and rigging (H&R) equipment is safe to operate.

2 Scope

These requirements cover inspections and maintenance over the life of H&R equipment.

Requirements are listed in terms of

- Types of inspection (initial, pre-use, frequent, periodic, and third party) and maintenance (preventative, operational testing, and load testing)
- Responsibilities (person who ensures that the inspection was performed and person performing the inspection)
- Documentation requirements
 - *HRED* refers to the H&R Equipment Database, which is maintained by the H&R inspector. Submit inspection and maintenance data to this inspector to stay in compliance.
 - *CR* refers to custodian records, which are maintained by the equipment custodian.

Details on what to look for and how to conduct the inspection are listed in Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090-2007](#)).

3 Applicability

These requirements apply to all classes of employees and non-employees and to all H&R equipment.

4 Prerequisites

Inspectors and custodians must be current in training as specified in [Chapter 41, “Hoisting and Rigging”](#).

5 Requirements

Requirements are listed in the table below.

6 References

- *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), [Chapter 41, “Hoisting and Rigging”](#)
- H&R Equipment Database
 - [Crane Information Database](#)
 - [Rigging Equipment Database](#)
- Hoisting and Rigging: Review of Conformance Form (SLAC-I-730-0A21J-021) [pdf](#) or [Word](#)
- Hoisting and Rigging: Visual Structural Weld Inspection Criteria and Form (SLAC-I-730-0A21J-020) [pdf](#) or [Word](#)
- Hoisting and Rigging: Pre-use Inspection Checklist for Floor-operated Cranes (SLAC-I-730-0A21J-019) [pdf](#) or [Word](#)
- [Hoisting and Rigging: Pre-use Inspection Criteria for Below-the-Hook Lifting Devices, Slings, and Rigging Hardware and Accessories](#) (SLAC-I-730-0A21S-036)
- Hoisting and Rigging: Pre-use Inspection Checklist for Hand-operated Hoists (SLAC-I-730-0A21J-018) [pdf](#) or [Word](#)
- Hoisting and Rigging: Pre-use Inspection Checklist for Electrical or Air Powered Hoists (SLAC-I-730-0A21J-023) [pdf](#) or [Word](#)
- [Hoisting and Rigging: Mobile Crane Pre-use Inspection Form](#) (SLAC-I-730-0A21J-030)
- [Hoisting and Rigging: Crane and Hoist Monthly Inspection Form](#) (SLAC-I-730-0A21J-031)
- Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090-2007](#)) and third-party standards referenced therein
- Title 8, *California Code of Regulations*, Section 5022, “Proof Load Test and Examination of Cranes and Their Accessory Gear” ([8 CCR 5022](#))

Hoisting and Rigging: Inspection and Maintenance Requirements

Type	Equipment	Frequency	Person Responsible for Ensuring Inspection is Performed and Documented	Person Qualified to Perform the Inspection	Documentation Requirements
Initial Inspections¹					
	Cranes, hoists, and miscellaneous lifting devices	Initial	Equipment custodian	Crane inspector	HRED
	Miscellaneous lifting devices (such as portable A-frames)	After disassembly and reassembly	Equipment custodian	Qualified person	CR
	Below-the-hook lifting devices	Initial	Equipment custodian	H&R inspector or designee	HRED
	Wire rope and chain slings	Initial	Equipment custodian	H&R inspector or designee	HRED
	Synthetic slings	Initial	Equipment custodian	Qualified person	CR
	Rigging hardware and accessories for critical lifts	Initial	Equipment custodian	H&R inspector or designee	HRED
	Rigging hardware and accessories excluding rigging hooks	Initial	Equipment custodian	Qualified person	None
	Rigging hooks	Initial	Equipment custodian	H&R inspector or designee	HRED
Pre-use Inspections					
	Cranes, mobile cranes, hoists, and miscellaneous lifting devices ²	Each shift used	Operator	Operator	CR
	Below-the-hook lifting devices	Before each use	Operator	Operator	None
	All slings	Before each use	Operator	Operator	None
	Rigging hardware and accessories for critical lifts	Before each use	Operator	Operator	None
	Rigging hardware and accessories excluding rigging hooks	Before each use	Operator	Operator	None
	Rigging hooks	Before each use	Operator	Operator	None

Frequent Inspections of cranes and hoists over one ton³

- 1 The initial inspection is documented in the HRED as part of the H&R review of conformance. See Hoisting and Rigging: Review of Conformance Form [pdf](#) | [Word](#)
- 2 Use the appropriate pre-use checklist.
- 3 Use the [Hoisting and Rigging: Crane and Hoist Monthly Inspection Form](#)

Hoisting and Rigging: Inspection and Maintenance Requirements

Type	Equipment	Frequency	Person Responsible for Ensuring Inspection is Performed and Documented	Person Qualified to Perform the Inspection	Documentation Requirements
	Wire rope, running	Monthly	Equipment custodian	Crane and hoist inspector	CR
	Chains	Monthly	Equipment custodian	Crane and hoist inspector	CR
	Hooks	Monthly	Equipment custodian	Crane and hoist inspector	CR
Periodic Inspections					
	Cranes, hoists, and miscellaneous lifting devices	Annually	Equipment custodian	Crane inspector	HRED
	Below-the-hook lifting devices	Annually	Equipment custodian	H & R inspector or designee	HRED
	Wire rope and chain slings	Annually	Equipment custodian	H & R inspector or designee	HRED
	Synthetic slings	Annually	Equipment custodian	Equipment custodian or designee	CR
	Rigging hardware and accessories for critical lifts	Annually	Equipment custodian	H & R inspector or designee	HRED
	Rigging hardware and accessories excluding rigging hooks	Annually	Equipment custodian	Qualified person	None
	Rigging hooks	Annually	Equipment custodian	H & R inspector	HRED
	All cranes that are idle more than 6 months	Prior to startup	Equipment custodian	Crane inspector	HRED
Third-party Inspections					
	Plate V certification for cranes with a rated capacity greater than 3 tons (see 8 CCR 5022)	Initially and then every four years Fixed cranes: after relocation	Crane inspector	Third-party Plate V inspector	HRED
	Plate V certification for mobile cranes	Initially and then annually	Crane inspector	Third-party Plate V inspector	HRED
Maintenance					
Preventive maintenance	All cranes, hoists, and miscellaneous lifting devices	In most cases every 6-12 months	Facilities crane maintenance supervisor	Facilities crane maintenance personnel	HRED
Operational testing	All cranes, hoists, and miscellaneous lifting devices	After maintenance or repair	Facilities crane maintenance personnel	Facilities crane maintenance personnel	HRED
Load test	All cranes, hoists, and miscellaneous lifting devices for which a load bearing part has been altered or repaired	After alteration or repair	Facilities crane maintenance personnel	Crane inspector	HRED

Hoisting and Rigging: Purchasing Procedure

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingProcedPurchase.pdf>

Revision Record: [https://www-](https://www-internal.slac.stanford.edu/esh/doctest/reports/revisions.asp?ProductID=462)

[internal.slac.stanford.edu/esh/doctest/reports/revisions.asp?ProductID=462](https://www-internal.slac.stanford.edu/esh/doctest/reports/revisions.asp?ProductID=462)

Department: Field Safety and Building Inspection Office

Program: Hoisting and Rigging

Authority: [ESH Manual, Chapter 41, "Hoisting and Rigging"](#)

Date Effective: 15 September 2009

1 Purpose

The purpose of this procedure is to ensure that all new hoisting and rigging (H&R) equipment and accessories purchased or manufactured for SLAC meet specified standards and regulations for the equipment type.¹

Note Counterfeit equipment is considered non-conforming and cannot be used at SLAC.

2 Scope

This procedure covers the SLAC purchase approval process and points to requirements for most types of H&R equipment.

3 Applicability

This procedure applies to all authorized purchasers of H&R equipment and to all H&R equipment purchases.

4 Prerequisites

Not applicable

5 Procedures

Step	Person(s)	Action
1.	Line management	<ul style="list-style-type: none">Designates person who is qualified to select and purchase H&R equipment
2.	Requester	<ul style="list-style-type: none">Determines equipment needConsults with Hoisting and Rigging Citizen Committee and the H&R rigging inspector as needed and for assistanceConsults regulations for equipment specific requirements (for instance OSHA, ANSI/ASME standards, and Department of Energy Standard 1090, "Hoisting

1 Manufacturing standards include ASME, ASTM, ANSI, AWS, SAE

Step	Person(s)	Action
		<p>DOE-STD-1090-2007), Appendix A “Procurement Guidelines”)</p> <ul style="list-style-type: none"> ▪ Defines purchase specifications, including requirement for vendor to supply any documentation needed for the Hoisting and Rigging: Review of Conformance Form (pdf or Word) <p>Fixed location cranes: Must be authorized by the Building Inspection Office and the Hoisting and Rigging Citizen Committee prior to purchase and installation</p>
3.	Requestor or Purchasing Department	<ul style="list-style-type: none"> ▪ Selects vendor ▪ Places order and specifies documentation that vendor must supply in order to meet SLAC technical standards listed above
4.	Requestor	<ul style="list-style-type: none"> ▪ Receives equipment and documentation
5.	Line management	<ul style="list-style-type: none"> ▪ Designates equipment custodian
6.	Equipment custodian	<ul style="list-style-type: none"> ▪ Initiates review of conformance (as required)
7.	Equipment custodian	<ul style="list-style-type: none"> ▪ After successful completion of review of conformance, places equipment into service

6 References

- *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), [Chapter 41, “Hoisting and Rigging”](#)
- Hoisting and Rigging: Review of Conformance Form (SLAC-I-730-0A21J-021), [pdf](#) or [Word](#)
- [Hoisting and Rigging Citizen Committee Charter](#)
- Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090-2007](#))

Hoisting and Rigging: Lift Planning and Control Guidelines

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingGuideLiftPlan.pdf>

Revision Record: [https://www-](https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=437)

[internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=437](https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=437)

Department: Field Safety and Building Inspection Office

Program: Hoisting and Rigging

Authority: [ESH Manual, Chapter 41, "Hoisting and Rigging"](#)

Date Effective: 15 September 2009

1 Purpose

The following guidelines are to help plan lifts so that potential hazards can be identified and controlled.

2 Scope

Basic planning and lift control elements are outlined below; more complex lifts may require planning and control beyond the scope of this guideline. For detailed guidance on developing a lift plan, see Hoisting and Rigging: Lift Planning and Control for Ordinary Lifts ([pdf](#) or [Word](#)).

3 Applicability

These guidelines apply to all lifts performed at SLAC.

4 Guidelines

4.1 Planning

- Characterize the load in terms of dimensions, weight, and center of gravity
- Characterize the task in terms of lifting, rotation, speeds, and travel directions
- Evaluate hazards to determine consequences resulting from collision, upset, or dropping the load
- Determine how to rig the load using good rigging practices.¹ Consult rigging handbooks as necessary to ensure proper rigging techniques are used for the lift.
- Ensure that the attachment points and load can withstand the forces created by the rigging gear attachment
- Select equipment and rigging based on: the type, category of lift, and minimum capacity of lifting equipment (hoist, crane, slings, lifting fixture, etc); and on the identified load, task, and hazards. Ensure that sling angles are considered when determining forces on rigging equipment and the load.

1 See [DOE-STD-1090-2007](#), 12.1.3, 11.3, 11.1

4.1.1 Ordinary Lifts

Ordinary lifts can range from simple to very complex and can be planned and communicated verbally or documented as a written lift plan or procedure.

Note Certain organizations require documented lift plans for ordinary lifts.

- **Verbal planning** can be adequate for some ordinary lifts provided that appropriate controls are established to ensure that the lift requirements are determined, communicated, understood, and carried out. Examples include such controls as
 - Holding pre-lift meetings to discuss the rigging and lift requirements
 - Providing continuous qualified supervisor, engineering, or experienced operator supervision during the setup and/or during lift
 - Limiting equipment use to operators who are specifically qualified
- **Documented lift plans/procedures** provide a record of the planning process an effective communication tool to convey lift requirements and work authorization to workers. For an example, see Hoisting and Rigging: Lift Planning and Control for Ordinary Lifts ([pdf](#) or [Word](#)).
- **A combination** of minimal documentation, such as a rigging sketch (diagram showing rigging details), and verbal instructions to convey lift requirements, may be sufficient to plan, convey, and control certain lifts.

4.1.2 Critical Lifts

For all critical lifts, a written pre-job plan or procedure (lift plan) must be prepared by the lifting organization and approved by the Hoisting and Rigging Citizen Committee. Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090-2007](#)), Chapter 2, specifies the required content and approval for the pre-job plan or procedure.

4.2 Preparing and Testing

- For ordinary lifts, assign a designated leader; for critical lifts, assign a person-in-charge (PIC)
- Verify that all equipment, fixtures, and accessories are operative, up-to-date on required periodic inspections, and in good condition before the operation begins
- Perform all equipment pre-use inspections
- Perform a test lift using similar or dummy loads (optional)
- Prepare the area where the load is being moved to (for example, clear the area, ensure that dunnage is in place)
- Survey the lift site for hazardous or unsafe conditions; clear lift path of obstructions

4.3 Personnel

- Ensure that all personnel are trained on the types of equipment they will be using
- Ensure that all personnel fully understand the requirements of the lift and their role in the operation

4.4 Performing the Lift

- Keep a copy of the plan or procedure (if documented) at the work site and follow the plan

- Ensure all personnel involved in the lift understand the plan
- Provide the task qualified supervision specified in the planning process
- Vacate all non-essential personnel from the building or adjacent area (optional)
- Ensure a signaler is assigned, if required
- Identify the crane operator
- Follow specific instructions/procedures for attachment of the rigging gear to the load. Use proper rigging techniques. Examples include padding sharp corners, orientation of chocker hitches for “rolls”, orientation of hooks, no binding of hoist rings, etc.
- Slowly raise the crane to take the slack out of the rigging without actually lifting the item. Allow the rigging gear to settle into place, checking for twists and binding. Make sure that padding has remained in place and all slings are protected from sharp edges. Begin to raise the item to verify balance and check the braking system by watching that the load does not sink. If load is not balanced, lower the load and adjust. Repeat as necessary until the load is evenly balanced.
- Operators must follow “Conduct of Operator” requirements established in [DOE-STD-1090-2007](#), 7.5, 8.5, 9.5, 10.5, 16.5.
- Stop the job when any potentially unsafe condition is recognized

5 References

- *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), [Chapter 41, “Hoisting and Rigging”](#)
- Hoisting and Rigging: Lift Planning and Control for Ordinary Lifts (SLAC-I-730-0A21J-022) [pdf](#) or [Word](#)
- Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090-2007](#)), “DOE-STD-1090-2007; Hoisting and Rigging Standard (Formerly Hoisting and Rigging Manual)”

Plan #

Department or Group

Hoisting and Rigging: Lift Planning and Control for Ordinary Lifts

Plan Preparer(s)

Signature	Printed name	Date

Approvals

Signature	Printed name	Date

Authorized Personnel

Authorized employee	Signature	Date	Authorizing supervisor	Signature	Date

Note This form includes basic lift planning and control elements for ordinary lifts. For additional lift plan examples, or to compare an ordinary lift planning to planning considerations for critical or production lifts see DOE-STD-1090-2007.

Performing the Lift: Checklist

See also: Hoisting and Rigging: Lift Planning and Control Guidelines¹

- ✓ Keep a copy of this plan at the work site and follow the plan
- ✓ Assign a designated leader
- ✓ Ensure all personnel involved in the lift understand the plan
- ✓ Provide the task-qualified supervision specified in the planning process
- ✓ Vacate all non-essential personnel from the building or adjacent area
- ✓ Ensure a signaler is assigned, if required
- ✓ Identify the crane operator
- ✓ Follow specific instructions/procedures for attachment of the rigging gear to the load.
- ✓ Use proper rigging techniques. Examples include padding sharp corners, orientation of chocker hitches for “rolls”, orientation of hooks, no binding of hoist rings, etc.
- ✓ Test and balance the load. Slowly raise the crane to take the slack out of the rigging without actually lifting the item. Allow the rigging gear to settle into place, checking for twists and binding. Make sure that padding has remained in place and all slings are protected from sharp edges. Begin to raise the item to verify balance and check the braking system by watching that the load does not sink. If load is not balanced, lower the load and adjust. Repeat as necessary until the load is evenly balanced.
- ✓ Follow “Conduct of Operator” requirements²
- ✓ Stop the job when any potentially unsafe conditions is recognized

1 Hoisting and Rigging: Lift Planning and Control Guidelines (SLAC-I-730-0A21T-008), <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingGuideLiftPlan.pdf>

2 DOE-STD-1090-2007 7.5, 8.5, 9.5, 10.5, 16.5

Characterize the Load(s)

This plan covers

- Single load only
- Variety of similar loads: enter dimensions and weight of largest load covered by the plan

Length _____

Width _____

Height _____

Diameter _____

Load weight* _____

*Weight determination (**choose one**)

- Marked on load Weighed Estimated Other _____ (**describe**)

- Weight calculated by _____ (**attach calculations**) Drawing number _____
Name

Characterize the Task *(Include directions for lifting, rotation, flipping, speeds, and travel)*

Evaluate the Hazards *(Define specific controls)*

Plan the Rigging

On a sketch or photo (see page 4 for sketch grid), show how the item will be rigged and the type of gear to be used:

1. Show location of shackles, hoist rings, spreader beams, slings, etc
2. Show attachment points (how rigging gear will be attached to load)
3. Show where padding of sharp edges are necessary
4. Provide the weight of heavy equipment such as a lifter or spreader beam
5. Show proper orientation of eyebolts
6. Indicate the center of gravity (horizontal and vertical)

Characterize Attachment Points

Note: Attach photos to illustrate, as necessary.

Manufacturer-provided lift point

Sling in choker hitch

Sling in basket hitch

Sling in vertical hitch

Threaded hole (**eyebolt or hoist ring**) Hole diameter _____ Material type _____

Other _____

Note: Confirm attachment points or hitch methods with the load owner if in doubt.

The lift points or attachment methods described in this lift plan can withstand the forces created by the rigging gear.

Load owner

Signature

Date

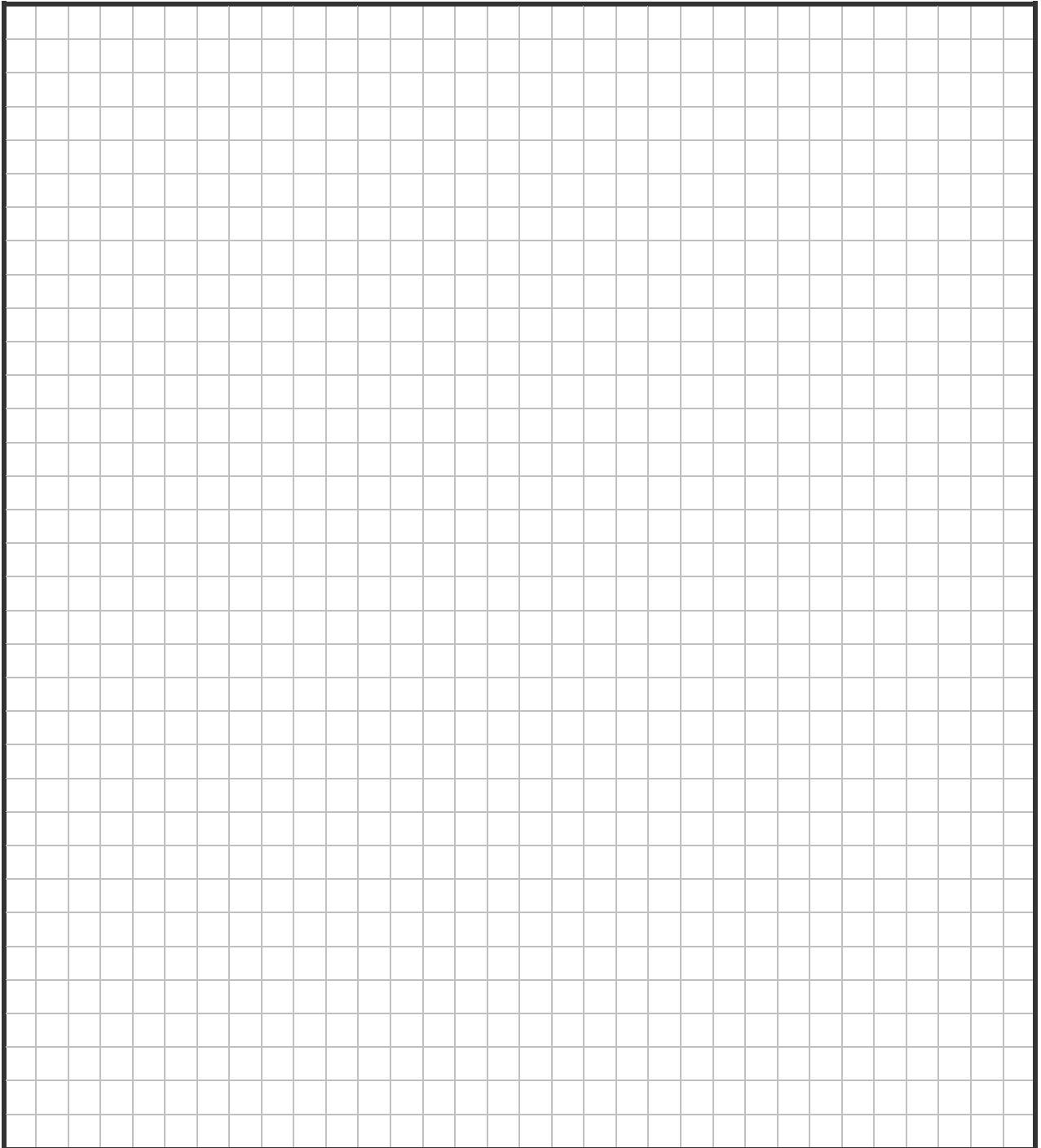
Define Rigging Gear Requirements

1. List each piece of rigging gear shown on the rigging sketch or photo in the table below (such as: load hook, shackles, slings, eye bolts). If a component weighs more than 10 pounds, include the weight in the weight column.
2. Label the sketch or photo using the corresponding letter for the gear.
3. Draw sling angles and the resulting load reduction factors for slings and eyebolts.
4. Calculate the force on each piece of rigging gear. Show that angles are accounted for in determining forces.
5. Determine the required rigging gear capacity and size. Indicate if this is an exact specification or a minimum.

Type	Weight	Force on rigging gear	Capacity / rating / working load limit	Size specification
A				
B				
C				
D				
E				
F				
G				
H				
I				

Rigging Sketch or Photo of Rigged Item

Include all information required to determine that the load is properly rigged and that appropriate rigging gear is selected. Include, as applicable, sling angles, eye bolt orientation, padding points, center of gravity, type of sling hitch, and any other pertinent information.





Hoisting and Rigging Review of Conformance Form

(See page 3 for instructions)

Hoisting and Rigging (H&R) Equipment Database Registration Information

Submitted by _____ Date _____

(Person responsible for ensuring that all required signatures, inspections, and approvals are obtained)

Equipment custodian _____ Dept. or group _____

Built by SLAC or Manufacturer _____ New or Existing

Equipment type _____ Working load limit (WLL) _____ Device weight¹ _____

(Only use equipment types listed in the table on page 4)

Model _____ Serial no. _____ Property control no. (PC #) _____

Additional equipment description, or description of "other" equipment types

Equipment location _____ Equipment ID _____ or Fac CRN # to be assigned

H&R Equipment Design Certification

Manufacturer's certification (Attach documentation that equipment meets applicable standards.)

or

SLAC qualified engineer certification (Attach engineering report, including drawings/sketches, calculations, and design factor. Additionally, complete the certification below.)

I certify that the design of this equipment (and the building and supportive structures for any fixed-location cranes) have been evaluated and found to comply with the following applicable standards.

List applicable standards _____

Specify structural weld inspection requirement²

Not required Visual inspection Non-destructive testing

Qualified engineer _____
Printed name Signature Date

or

Design certification or documentation is not available; an exemption is requested.
(Exemptions are rare but may be granted if the equipment is properly marked with the manufacturer's identification and it meets all other review of conformance requirements.)

Fixed Crane and Hoist Approval

Building Inspection Office

Department head or designee _____
Printed name Signature Date

Hoisting and Rigging Citizen Committee

Committee chair or designee _____
Printed name Signature Date

1 Required for below-the-hook lifting devices that weigh 100 pounds or more

2 If structural weld inspection is required, attach test report or completed inspection form (Hoisting and Rigging: Visual Structural Weld Inspection Criteria and Form (SLAC-I-730-0A21J-020), [pdf](#) or [Word](#))

<p>Load Test</p> <p><input type="checkbox"/> Performed by _____ <small>(attach documentation)</small> <i>Company name</i></p> <p>or</p> <p><input type="checkbox"/> Performed by SLAC qualified person <small>(attach documentation or complete certification below)</small></p> <p>I certify that this device was successfully load tested according to DOE STD-1090-2007. Required test weight _____ Actual test weight _____</p> <p>Qualified person _____ <i>Printed name Signature Date</i></p>
<p>Initial Inspection</p> <p><input type="checkbox"/> Conducted by _____ <small>(attach documentation)</small> <i>Company name</i></p> <p>or</p> <p><input type="checkbox"/> Conducted by SLAC qualified person <small>(attach documentation or complete certification below)</small></p> <p>I certify that I performed the initial inspection of this equipment and all applicable inspection requirements were met.</p> <p>DOE STD-1090-2007 sections used _____</p> <p>Qualified inspector _____ <i>Printed name Signature Date</i></p>
<p>H&R Equipment Design Certification Exemption <i>(H&R inspector: Complete only if an exemption is requested.)</i></p> <p><input type="checkbox"/> Exemption denied _____ <i>(Reason for denial)</i></p> <p>or</p> <p><input type="checkbox"/> Exemption approved <small>(Qualified crane or H&R inspector must complete certification of exemption below)</small></p> <p>I have evaluated this equipment, including the testing and inspection results. It is my professional judgment that this equipment is built to applicable standards.</p> <p>Qualified crane _____ or H&R inspector _____ <i>Printed name Signature Date</i></p>
<p>Final Review and Approval (SLAC inspection tag applied upon successful completion)</p> <p>I am qualified to authorize approval on this type of equipment. I have examined it and the attached documentation and have determined that both meet the requirements of DOE STD-1090-2007.</p> <p>Qualified inspector _____ <i>Printed name Signature Date</i></p>
<p>H&R Equipment Database Registration Confirmation</p> <p>This equipment is registered: the review of conformance and complete and this equipment can now be placed into service.</p> <p>Database _____ manager _____ <i>Printed name Signature Date</i></p> <p>Note: Facilities retains the original. A copy (without attachments) must be returned to the person who submitted the form, and that person must then distribute a copy to the equipment custodian, who will keep it on file for the duration of the life of the equipment.</p>

Hoisting and Rigging: Review of Conformance Form

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingFormConformance.pdf> or [Word](#)

Revision Record: <https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=427>

Department: Field Safety and Building Inspection

Program: Hoisting and Rigging

Authority: [ESH Manual, Chapter 41, Hoisting and Rigging](#)

Date Effective: 15 September 2009

The review of conformance process ensures that equipment is evaluated by qualified personnel for compliance with the requirements of Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090-2007](#)) and Chapter 41, “Hoisting and Rigging”. This process applies to all H&R equipment (including hooks but excluding other rigging hardware and accessories) and must be completed before equipment is placed into service as described below.

Note *Rigging hardware and accessories (excluding hooks) must only pass an initial inspection and is not subject to the review of conformance.*

For specific information on inspection requirements and responsible and/or qualified persons, see [Hoisting and Rigging: Inspection and Maintenance Requirements](#) (SLAC-I-730-0A21S-035).

1 Filling Out the Form

The table on the following page summarizes which equipment is subject to the review of conformance process and lists the steps to take to bring it into compliance. The table also specifies the type names that must be used to describe equipment when filling in the “H&R Equipment Database Registration Information” section. Additional information on filling out that section follows:

- **Equipment type.** Use only descriptions listed in the table. If the equipment type is not listed, indicate “other” and add explanatory detail.
- **Model #.** If available. For SLAC-fabricated items, use the drawing number.
- **Property control no. (PC #).** if available (SLAC number generated by Business Information Services)
- **Equipment ID #.** All H&R equipment must be assigned a unique identification number as follows:
 - Cranes, hoists, and miscellaneous lifting devices. All must have a Facilities CRN #, which is assigned and affixed to the equipment by the Facilities Department. If one has not yet been assigned, check the “Fac CRN # to be assigned” box.
 - Other equipment. Groups or departments assign a unique number, which is typically a combination of the department abbreviation and a sequential number (such as MFD-005, MFD-006, CEF-075, CEF-076, SSRL-042, SSRL-043).
- **Equipment location.** where the equipment is installed or usually stored

The remainder of the form includes explanatory detail for filling in fields. For more information, contact the hoisting and rigging program manager.

2 Requirements Summary

Table 1 Newly Fabricated or Newly Purchased Equipment

Equipment Type	Action to Satisfy Review of Conformance Requirement
All types of H&R equipment (including hooks but excluding other rigging hardware and accessories)	Submit Review of Conformance Use the equipment type designations listed below Note: Any fixed location cranes must be approved by the Hoisting and Rigging Committee and the Building Inspection Office prior to fabrication or purchase.
Rigging hardware and accessories (except hooks)	Only requirement: Initial inspection performed by <i>qualified person</i>

Table 2 Equipment Already in Inventory or Service

Required Equipment Type Designations	Required Action to Satisfy Review of Conformance Requirement
Crane, bridge Crane, jib, wall-mounted Crane, jib, free-standing Crane, monorail Crane, gantry, fixed location Crane, gantry, portable Crane, shop Cherry picker/engine hoist Crane, truck mounted Crane, mobile Hoist, electric Hoist, air Hoist, hydraulic Hoist, hand chain operated Hoist, manual lever operated	All cranes, hoists, and <i>miscellaneous lifting devices</i> (see Chapter 41 for definition) must have a Facilities CRN # and a current inspection tag. These two items on any such equipment confirm that the review of conformance process requirements have been met. If either requirement is not met: 1. Take equipment out of service 2. To apply for a Facilities CRN #, complete a review of conformance 3. To schedule an inspection, submit a Facilities service request 4. Return equipment to service only when both requirements are met
Lifting device, structural or mechanical Lifting device, vacuum Magnet, close-proximity operated Magnet, remote operated Sling, wire-rope (bridle) Sling, chain Sling, metal-mesh Sling, cylinder Sling, blanket Other	All other types of equipment (including hooks but excluding other H&R hardware and accessories) must have a review of conformance on file with the H&R inspector and a current inspection tag. If either requirement is not met: 1. Take equipment out of service 2. Submit a review of conformance (if not on file) 3. To schedule an inspection, submit a Facilities service request or contact other qualified inspector 4. Return equipment to service only when both requirements are met

Hoisting and Rigging: Visual Structural Weld Inspection Criteria and Form

Department: Field Safety and Building Inspection

Program: Hoisting and Rigging

Owner: Program Manager

Authority: ES&H Manual, Chapter 41, Hoisting and Rigging¹

Equipment serial number _____

Base materials

Carbon steel Stainless steel Aluminum Other – specify _____

Carbon steel: specifications, if known _____

All others: alloy, if known _____

Weld filler alloy, if known _____

Yes No

- Is the weld painted?
- Is surface corrosion within acceptable limits?
- Does the weld size match the engineering drawing?
- Does the weld type (joint design) match the engineering drawing?
- Is the weld joint "prequalified" per the American Institute of Steel Construction (AISC)?

Inspection criteria for the following "discontinuity categories" (in bold) are on page 2 of this form.

Yes No

- Is the weld bead and base material free of visible **cracks**?
- Does the weld appear to have good **fusion**?
- Is the weld bead free of **craters**?
- Is the **weld profile** acceptable?
- Is the **inspection timing** within the allowable time limit for the material?
- Is the weld bead **size** uniform?
- Is the **undercut** acceptable for material thickness and loading condition?
- Is the weld free of unacceptable **porosity**?

Observations and explanatory detail for any box checked "no" _____

Inspector _____ Inspection date _____

1 *SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001), Chapter 41, "Hoisting and Rigging", http://www-group.slac.stanford.edu/esh/hazardous_activities/hoisting_rigging/policies.htm*

Hoisting and Rigging: Visual Structural Weld Inspection Criteria and Form

Discontinuity Category and Inspection Criteria		Non-tubular connections		Tubular connections	
		Statically loaded	Cyclically loaded	All loads	
<i>Source: American Welding Society (AWS) D1.1/D1.1M:2002 Structural Welding Code - Steel</i>					
Crack prohibition	Any crack is unacceptable, regardless of size or location		X	X	X
Weld to base metal fusion	Thorough fusion must exist between adjacent layers of weld metal and between weld metal and base-metal		X	X	X
Crater cross section	All craters must be filled to the specified weld size, except for the ends of intermittent fillet welds outside of their effective length		X	X	X
Weld profiles	Weld profiles must be in conformance with AWS D1.1 Section 5.24		X	X	X
Inspection timing	Visual inspection of welds in all steels may begin immediately after the completed welds have cooled to ambient temperature. Acceptance criteria for ASTM-A514, A517, and A709 Grade 100 and 100W steels must be based on visual inspection performed not less than 48 hours after completion of the weld.		X	X	X
Undersized welds	The size of a fillet weld in any continuous weld may be less than the specified nominal size (L) without correction by the following amounts (U):		X	X	X
	L, specified nominal weld size, inches, [mm] less than or equal to 3/16 [5] 1/4 [6] greater than or equal to 5/16 [8]	U, allowable decrease from L, in, [mm] less than or equal to 1/16 [2] less than or equal to 3/32 [2.5] less than or equal to 1/8 [3]			
	In all cases, the undersize portion of the weld shall not exceed 10% of the weld length. On web-to-flange welds on girders, underrun shall be prohibited at the ends for a length equal to twice the width of the flange.				
Undercut	(A) For material less than 1 in. [25 mm] thick, undercut shall not exceed 1/32 in. [1 mm], with the following exception: undercut shall not exceed 1/16 in. [2 mm] for any accumulated length up to 2 in. [50 mm] in any 12 in. [300 mm]. For material equal to or greater than 1 in. thick, undercut shall not exceed 1/16 in. [2 mm] for any length of weld.		X		
	(B) In primary members, undercut shall be no more than 0.01 in. [25 mm] deep when the weld is transverse to tensile stress under any design loading condition. Undercut shall be no more than 1/32 in. [1 mm] deep for all other cases.			X	X
Porosity	(A) CJP groove welds in butt joints transverse to the direction of computed tensile stress shall have no visible piping porosity. For all other groove welds and for fillet welds, the sum of the visible piping porosity 1/32 in. [1 mm] or greater in diameter shall not exceed 3/8 in. [10 mm] in any linear inch of weld and shall not exceed 3/4 in. [20 mm] in any 12 in. [300 mm] length of weld.		X		
	(B) The frequency of piping porosity in fillet welds shall not exceed one in each 4 in. [100 mm] of weld length and the maximum diameter shall not exceed 3/32 in. [2.5 mm]. Exception: for fillet welds connecting stiffeners to web, the sum of the diameters of piping porosity shall not exceed 3/8 in. [10 mm] in any linear inch of weld and shall not exceed 3/4 in [20 mm] in any 12 in. [300 mm] length of weld.			X	X
	(C) CJP groove welds in butt joints transverse to the direction of computed tensile stress shall have no piping porosity. For all other groove welds, the frequency of piping porosity shall not exceed one in 4 in. [100 mm] of length and the maximum diameter shall not exceed 3/32 in. [2.5 mm].			X	X

Hoisting and Rigging: Forklift Attachment Approval Procedure

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingProcedForklift.pdf>

Revision Record: [https://www-](https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=429)

[internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=429](https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=429)

Department: Field Safety and Building Inspection

Program: Hoisting and Rigging

Authority: [ESH Manual, Chapter 41, Hoisting and Rigging](#)

Date Effective: 15 September 2009

1 Purpose

The purpose of this procedure is to ensure that any attachment that can affect the capacity or safe operation of a forklift is first evaluated and approved by either the forklift manufacturer or a qualified engineer.

Note Free rigging, or the direct attachment to or placement of rigging equipment (such as slings, shackles, or rings) onto the tines of a powered industrial truck for a below-the-tines (forks) lift is prohibited at SLAC.

2 Scope

This procedure covers all below-the-tine lifts performed with a *powered industrial vehicle (PIV)* (for example, a forklift).

3 Applicability

This procedure applies to all personnel: SLAC employees, users, visitors, and subcontractors.

4 Prerequisites

Commercially available attachments can only be used if they have passed the review of conformance and are within the rated capacity as specified on the forklift data plate.

5 Procedures

Step	Person	Action
1.	Line management	Follows the Hoisting and Rigging: Purchasing Procedure
2.	Operator, designated leader, or person-in-charge	Develops a written guideline or procedure, for each forklift that the attachment will be used on, that includes <ul style="list-style-type: none">▪ Equipment serial numbers▪ Capacities (pre- and post- attachment installation)▪ Fork placement▪ Safe operation guidelines once attachment is in place

Step	Person	Action
3.	Operator, designated leader, or person in charge	Submits procedure to line management
4.	Line management	<p>Seeks approval from manufacturer or qualified engineer:</p> <ul style="list-style-type: none"> ▪ Requests written approval from the forklift manufacturer to use the purchased attachment as described in the guideline developed in step 2. <p>OR</p> <ul style="list-style-type: none"> ▪ Designates a qualified engineer to examine the guideline developed in step 2.
5.	Forklift manufacturer	<p>Provides written approval: go to step 7.</p> <p>Denies approval or fails to respond: go to step 6.</p>
6.	Qualified engineer	<p>Performs a safety analysis to</p> <ul style="list-style-type: none"> ▪ Review maximum safe load moment for lifting loads with attachment outside the 24 inch load center as per OSHA standard 29 CFR 1910.178, App A. Establish new load ratings positions for the fork beam attachment outside of the 24-inch load center ▪ Address any safety and/or structural issues contained in a manufacturer's negative response <p>If the analysis shows that the attachment and its intended use meets all safety requirements, provides written approval.</p>
7.	Equipment custodian	<p>Attaches data plate to the forklift that the lifting attachment will be installed on (per Occupational Health and Safety Administration [OSHA] requirements), specifying</p> <ul style="list-style-type: none"> ▪ Serial number of attachment ▪ Tine positions ▪ Lifting attachment position ▪ Load ratings <p>Any attachment different than one that attaches to the tines (forks) must be reviewed by the Hoisting and Rigging Citizen Committee.</p>

6 References

- *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), [Chapter 41, “Hoisting and Rigging”](#)
- [Hoisting and Rigging: Purchasing Procedure](#) (SLAC-I-730-xxx)
- Title 29, *Code of Federal Regulations*, Part 1910, “Occupational Safety and Health Standards”, Section 178, “Powered Industrial Trucks” ([29 CFR 1910.178](#))
- [“10/22/1999 – Forklifts: free rigging requires manufacturer approval”](#)

Pre-use Inspection

Checklist for Floor-operated Cranes

Includes overhead and gantry cranes

Facilities CRN#: _____ PC#: _____ Hoist Type: _____

Crane Custodian: _____ Bldg: _____ Room: _____

Requirements A. Operators must perform a pre-use inspection (once per shift) for the items listed below. B. Any equipment found to be unsatisfactory must be removed from service. C. Operators must notify the equipment custodian, who will submit a Facilities service request to the crane inspector (call x8901). Continued use may be permitted if authorized by the crane inspector in notes/comments. D. Custodians must keep completed checklists on file for a minimum of 5 years.	Inspected by:																							
	Date:																							

Equipment Description and Inspection Criteria ✓ = Satisfactory, U = Unsatisfactory, N = Not Applicable

1	Operating mechanism - Check for proper operation and adjustment and note any unusual sounds or noise due to chain binding or bearing squeal																							
2	Limit switch - Test upper-limit switch. If the hoist has a lower-limit switch, test it with no load before lowering any load that could bring the lower-limit switch into operation.																							
3	Air or hydraulic systems - Check for leaks (as applicable) all along the air or hydraulic system, including tanks, valves, pumps, and lines (visual inspection from floor level only)																							
4	Hoist braking - Confirm that the brakes are functioning																							
5	Hooks & hook latches - Check for: excessive throat opening, bent or twisted elements, and sticky swivel or rough surfaces. Check latches (if present) for damaged spring, bent or missing hardware. Check self-locking hooks (if present) for proper operation and locking.																							
6	Hoist ropes and end connections - Check for rope distortions such as kinking, crushing, upstanding, birdcaging, main strand displacement or core protrusion; corrosion, broken or cut strands. Note number, distribution, and type of visible broken wires.																							
7	Spooling - Check ropes for proper spooling on drum(s) and sheave(s)																							
8	Festoon or trolley wiring - When applicable, ensure wire collects and moves freely																							
9	Bridge - Look for loose items or obstructions (visual inspection from floor level only)																							

Notes/comments:

Hoisting and Rigging: Pre-use Inspection Criteria for Below-the-Hook Lifting Devices, Slings, and Rigging Hardware and Accessories

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingReqBTHInspect.pdf>

Revision Record: <https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=431>

Department: Field Safety and Building Inspection

Program: Hoisting and Rigging

Authority: [ESH Manual, Chapter 41, Hoisting and Rigging](#)

Date Effective: 15 September 2009

1 Purpose

The purpose of these requirements is to ensure the listed equipment is properly inspected before each use by the lift operator.

2 Scope

These pre-use inspection criteria pertain to inspections done by operators only. For detailed criteria for the initial and periodic inspections conducted by a qualified inspector, see Department of Energy Standard 1090, "Hoisting and Rigging" ([DOE-STD-1090-2007](#)).

Note *The following criteria do not include operational requirements, proof testing, care, or information on maintenance or storage. For that level of detail, consult the appropriate sections in DOE-STD-1090-2007.*

3 Applicability

These requirements apply to lift operators.

4 Requirements

4.1 Below-the-Hook Lifting Devices

The following requirements apply to below-the-hook lifting devices such as spreader bars, lifting yokes, lifting baskets and lift fixtures.

4.1.1 Structural and Mechanical Lifting Devices

- The rated capacity of each lifting device must be marked on the main structure where it is visible and legible.
- If the lifting device comprises several items, each detachable from the assembly, each lifting device must be marked with its rated capacity.

- At a minimum, a nameplate, name tag, or other permanent marker must be affixed displaying the following data:
 - Manufacturer or contractor's name if fabricated on-site
 - Lifting device weight, if over 100 lbs
 - Serial number (if available)
 - Rated capacity
 - Proof of inspection label by hoist and rigging inspector
- A re-rated lifting device must be relabeled with the new rated capacity.
- Cases may exist where a lifting device cannot be marked with its rated capacity and weight. This may be due to the security classification of the load to be lifted or other reasons approved by the responsible manager. In these cases, the lifting device must be marked with an identification number, and its documentation must describe both its rated capacity and weight.

4.1.2 Vacuum Lifting Devices

- The rated capacity, maximum width and length, and minimum thickness of load must be marked on the main structure where it is visible and legible.
- Individual pads or groups of pads, controlled by shutoff valves, must be marked with the rated capacity of each pad or group of pads.
- At a minimum, a nameplate, name tag, or other permanent marker must be affixed to each lifter displaying the following data:
 - Manufacturer's name
 - Model number or unit identification
 - Weight of lifting-device
 - Electric power (when applicable)
 - Pressure and volume of compressed air (when applicable)
 - Rated capacity
 - Proof of inspection label by hoist and rigging inspector
- Manual shutoff valves on individual pads or groups of pads must be marked to show operating position.
- Cases may exist where a lifting device cannot be marked with its rated capacity and weight. This may be due to the security classification of the load to be lifted or other reasons approved by the responsible manager. In these cases, the lifting device must be marked with an identification number, and its documentation must contain both its rated capacity and weight.
- A label or labels must be affixed to each vacuum lifting device in a readable position that displays the word WARNING or other legend designed to bring the label to the attention of the operator. The label must also contain information cautioning against
 - Exceeding the rated capacity or lifting loads not specified in the manufacturer's instruction manual
 - Operating a damaged or malfunctioning unit or a unit with missing parts
 - Operating when vacuum indicators show insufficient vacuum
 - Operating the unit when vacuum pads are not spaced for equal loading
 - Incorrect positioning of the lifting device on the load

- Lifting people
 - Moving loads above people
 - Removing/obscuring warning labels
 - Operating the lifting device when the rated capacity, lifting-device weight, or
 - Safety markings are missing (except in cases where the device cannot, for security or other reasons, be marked).
 - Making alterations or modifications to the lifting device.
 - Lifting loads higher than necessary and leaving suspended loads unattended.
- A label must be affixed to each unit that directs the user to consult the manufacturer’s manual if the size or shape of the unit prohibits the inclusion of the above markings.

4.1.3 Magnets (close-proximity-operated)

- At a minimum, a nameplate, name tag, or other permanent marker must be affixed to each lifting magnet, and must display
- Manufacturer’s name, or if the magnet has been repaired or modified, the name and address of the repairer/modifier
 - Model or unit identification
 - Weight
 - Duty cycle, if applicable
 - Cold current
 - Rated capacity
 - Proof of inspection label by hoist and rigging inspector
- In addition, battery-powered and external-powered lifting electromagnets and electrically controlled permanent-magnet lifting magnets must be marked with
- The voltage of the battery or primary power supply
 - The cold current or watts at 68 degrees F (20 degrees C) and rated voltage
- Cases may exist where a lifting device cannot be marked with its rated capacity and weight. This may be due to the security classification of the load to be lifted or other reasons approved by the responsible manager. In these cases, the lifting device must be marked with an identification number, and its documentation must contain both its rated capacity and weight.
- A label or labels must be affixed to each lifting magnet in a readable position that displays the word CAUTION or other legend designed to bring the label to the attention of the operator. The label must also contain information cautioning against
- Operating when the battery capacity is inadequate
 - For externally powered electromagnets: exceeding magnet duty cycle and disconnecting the magnet with the power on
 - On electrically controlled permanent magnets: operating if the internal control function indicator, where applicable, does not indicate a complete cycle
 - On manually controlled permanent magnets: operating with the control handle not fully in the LIFT position

4.2 Rigging Hooks

- **Marking.** The manufacturer's identification must be forged, cast, or die-stamped on a low-stress and non-wearing area of the hook.
- **Inspecting.** The operator or other designated person must visually inspect hooks daily or prior to first use, or if the hook is not in regular service for
 - Cracks, nicks, gouges
 - Deformation
 - Damage from chemicals
 - Damage, engagement, or malfunction of latch (if provided)
 - Evidence of heat damage
 - Wear
 - Hook attachment and securing means

If any of these conditions are found, remove the hook from service and contact the equipment custodian.

4.3 Slings

4.3.1 Wire Rope Sling

- **Marking.** Wire-rope slings must be marked with the following information:
 1. Name of trademark of manufacturer
 2. Work load limit (WLL)
 3. Diameter or size
 4. Purchase order or serial number
 5. Inspection due date labeled by the hoist and rigging inspector.

Note *Marking requirements 1, 2, and 3 are ASME B30.9 requirements effective January 2001. Sling identification must be maintained by the user so as to be legible during the life of the sling. (Stenciling or stamping on the swages of a sling is not recommended.).*

Note *Slings may be marked with serial number or other identifying number that can be used to determine capacity in situations where it becomes impossible to mark the sling as described above due to security classification of the loads to be lifted or for other valid reasons approved by the responsible manager.*

- **Fabricating.** Wire rope purchased to fabricate slings must be made in the United States by a member of Wire Rope Technical Board (except stainless steel). Stainless steel wire rope must be made in the United States and must be 302 or 304 grade stainless steel.
- **Inspecting.** Wire-rope sling users must visually inspect all slings each day they are used or prior to use if the sling has not been in regular service (records are not required). Users must carefully note any deterioration that could result in an appreciable loss of original strength and determine whether further use of the sling would constitute a safety hazard. Slings must be immediately removed from service if any of the following conditions are present:
 - Missing or illegible sling identification

- Ten randomly distributed broken wires in one rope lay or five broken wires in one strand in one rope lay
- Wear or scraping of one-third the original diameter of the outside individual wire
- Kinking, crushing, bird caging or any other damage resulting in distortion of the rope structure
- Evidence of heat damage
- End attachments that are cracked, deformed, or worn
- Corrosion of the rope or end attachments

4.3.2 Metal-mesh Slings

- **Inspecting.** Metal-mesh slings must be visually inspected before each use. Metal-mesh slings must be removed from service if any of the following defects are present:
 - A broken weld or brazed joint along the sling edge
 - A broken wire in any part of the mesh
 - Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion
 - Lack of flexibility due to distortion of the mesh
 - Distortion of the female handle so the depth of the slot is increased by more than 10 percent
 - Distortion of either end fitting so the width of the eye opening is decreased by more than 10 percent
 - A 15 percent reduction of the original cross-sectional area of metal at any point around a handle eye
 - Any distortion or twisting of either end fitting out of its plane
 - Cracked end fitting
 - Evidence of heat damage

4.3.3 Synthetic-web Slings

- **Marking.** Each sling must be marked with
 - Manufacturer's name or trademark
 - Manufacturer's code or stock number
 - Type of synthetic web material
 - Rated loads for the type of hitches used

Note *Hand written or ink embossed markings are not acceptable. Sling tags must be indelibly marked and the lettering must not wear off with use. The markings must remain legible for the life of the sling.*

- **Inspecting.** Synthetic-web slings must be visually inspected before each use. Slings must be removed from service if any of the following defects are visible:
 - Acid or caustic burns
 - Melting or charring of any part of the surface
 - Snags, punctures, tears, or cuts
 - Broken or worn stitches

- Wear or elongation exceeding the amount recommended by the manufacturer
- Distortion of fittings
- Knots in any part
- Missing or illegible sling identification

4.3.4 Synthetic Roundslings

- **Marking.** Each polyester roundsling must be permanently marked or labeled showing
 - Name or trademark of manufacturer
 - Manufacturer's code or stock number
 - Rated capacities for the three basic hitches (vertical, choker, vertical basket)
 - Core fiber type – if cover(s) is of a different fiber type, both fiber types must be identified
 - Length (reach) – bearing point to bearing point
 - Each manufacturer must internally identify their product with name or trademark for traceability
- **Inspecting.** Synthetic roundslings must be visually inspected before each use. Slings must be removed from service if any of the following defects are visible:
 - Missing or illegible sling identification
 - Acid or caustic burns
 - Melting or charring of any part of the surface
 - Snags, punctures, tears, cuts or abrasive wear that expose the core yarns
 - Broken or worn stitches in the cover which exposes the core yarns
 - Wear or elongation exceeding the amount recommended by the manufacturer
 - Stretched, cracked, worn, pitted or distortion of fittings
 - Knots in any part

4.3.5 Alloy Steel-chain Slings

The following applies to slings made from grade 80 and 100 alloy chain manufactured and tested in accordance with National Association of Chain Manufacturers welded steel chain specifications – 1990. If chain other than this is used, it must be used in accordance with the recommendations of the chain manufacturer.

- **Marking.** Wire-rope slings must be marked with the following:
 - Size
 - Manufacturer's grade
 - Rated load and angle on which the rating is based.
 - Reach
 - Numbers of legs
 - Sling manufacturer
 - Inspection due date label by hoist and rigging inspector
- This information may be stenciled or stamped on a metal tag or tags affixed to the sling.

- Where slings have more than one leg, ensure that the tag is affixed to the master link.
- Ensure that the working load does not exceed the rated capacity of the sling.
- **Inspecting.** Steel-chain sling users must visually inspect all slings before they are used as follows:
 - Conduct a link-by-link inspection for the following defects: nicks, cracks, gouges, wear, bent links, stretched links, shearing of links, cracks in any section of link, scores, abrasions, heat damage, rust, corrosion or markings tending to weaken the links. Reject damaged items.
 - Check steel-chain slings for uneven lengths when sling legs are hanging free
 - Check rings and hooks for bends, distortion, cracks in weld areas, corrosion, and scores, heat damage, or markings tending to weaken the links. Reject damaged items.
 - Perform inspection on an individual-link basis. If any link does not hinge freely with the adjoining link, remove the assembly from service.
 - Remove from service assemblies with deformed master links or coupling links.
 - Remove from service assemblies if hooks have been opened more than 15 percent of the normal throat opening measured at the narrowest point or twisted more than 10 degrees from the plane of the unbent hook.
 - Do not straighten deformed hooks or other attachments on the job. Assemblies with such defects must be reconditioned by the manufacturer or discarded.
 - Remove from service assemblies with cracked hooks or other end attachments; assemblies with such defects must be reconditioned or repaired prior to return to service.
 - Do not use homemade links, makeshift fasteners formed from bolts, rods, and the like, or other nonstandard attachments. Reject if discovered.
 - Do not use makeshift or field-fabricated hooks on steel-chain slings. Reject if discovered.

4.3.6 Shackles

- **Marking.** Each shackle body must be permanently and legible marked in raised letters by the manufacturer. Raised or stamped letters on the side of the bow must be used to show:
 - Manufacturer's name or trademark
 - Size
 - Rated capacity, recommended safe working load
- Grade A shackles (regular strength), together with their pins and bolts must be forged from carbon steel
- Grade B shackles (high strength) together with their pins and bolts must be forged from alloy steel
- Shackle pins must fit freely (without binding), and seat properly

4.4 Rigging Hardware and Accessories

4.4.1 Eyebolts

- **Marking.**
 - Carbon steel eyebolts must have the manufacturer's name or identification trademark forged in raised characters on the surface of the eyebolt.

- Alloy steel eyebolts must have the symbol “A” (denoting alloy steel) and the manufacturer’s name or identification mark forged in raised characters on the surface of the eyebolt.
- Eyebolts used for hoisting must be fabricated from forged carbon or alloy steel.
- Carefully inspect each eyebolt before use
- Visually inspect the hole to ensure that there has been no deformation
- Check the condition of the threads in the hole to ensure that the eyebolt will secure and the shoulder can be brought down snug
- Ensure that the shank of the eyebolt is not undercut and is smoothly radiused into the plane of the shoulder or the contour of the ring for non-shouldered eyebolts
- Destroy eyebolts that are cracked, bent, or have damaged threads

4.4.2 Turnbuckles

Turnbuckles may be used in sling systems provided that they are engineered, designed, and approved as a part of the sling system. Approved turnbuckles must be marked and identified for use with the sling set for which they were designed and must be load-tested as part of the sling set.

- **Marking.** Manufacturer’s name or trademark and turnbuckle size must be permanently marked on the turnbuckle body.
- Eyebolts must be fabricated from forged alloy steel.
- Eyebolts must be provided with a jam nut of a type that does not depend upon deformation of the threads for security.
- Turnbuckles must be inspected for damage before each use. Damaged threads, jamb nuts, or bent frame members make the unit unsuitable for use.

4.4.3 Links and Rings

Links and rings are usually designed and manufactured as a part of the lifting hardware for a specific purpose, such as the peak link on multiple-leg slings. However, the rings and links may also be found on the load-attachment end of slings.

- **Marking.** Rings or links should be marked by the manufacturer with the manufacturer’s name or trademark and ring or link size.
- Rings must be forged or welded from low alloy steel.
- Welded rings or links must be subjected to a nondestructive weld test (NDT) and the results must be documented. (NDT is not required for forged rings or links.)

4.4.4 Swivel Hoist Rings

- **Marking.** Swivel hoist rings must have the manufacturer’s name or trademark, working load limit (WLL), and recommended torque value permanently marked (forged, stamped, or inscribed) by the manufacturer on the swivel hoist ring. Permanently attached metal tag bearing the same information may also be used.
- Check that swivel hoist rings for hoisting are be fabricated from forged carbon or alloy steel
- Inspect permanently installed hoist rings before each use to ensure free movement of bail and swivel
- Inspect swivel hoist rings thoroughly each before use
- Inspect the hole to ensure that there has been no deformation

- Check the condition of the threads in the hole to ensure that the hoist ring will secure and the bushing can be brought down for a snug fit
- Destroy hoist rings that are cracked, bent, have damaged threads, or do not operate freely

4.4.5 Wire Rope Clips (Clamps)

- **Marking.** Wire rope clips must be permanently and legibly marked with the size and manufacturer's identifying mark.

5 References

- *SLAC Environment, Safety, and Health Manual* (SLAC-I-720-0A29Z-001), [Chapter 41, "Hoisting and Rigging"](#)
- Department of Energy Standard 1090, "Hoisting and Rigging" ([DOE-STD-1090-2007](#)) and third-party standards referenced therein

Pre-use Inspection

Checklist for Hand-operated Hoists

Includes wire rope, chain, web-strap, manual-lever-operated (come-a-longs)

Facilities CRN#:

PC#:

Hoist Type:

Crane Custodian:

Bldg:

Room:

Requirements

- A. Operators must perform a pre-use inspection (once per shift) for the items listed below.
- B. Any equipment found to be unsatisfactory must be removed from service.
- C. Operators must notify the equipment custodian, who will submit a Facilities service request to the crane inspector (call x8901). Continued use may be permitted if authorized by the crane inspector in notes/comments.
- D. Custodians must keep completed checklists on file for a minimum of 5 years.

Inspected by:

Date:

Equipment Description and Inspection Criteria ✓ = Satisfactory, U = Unsatisfactory, N = Not Applicable

1	Operating mechanism - Check for proper operation and adjusts, no unusual sounds or noise due to chain binding or bearing squeal																		
2	Hooks - Check for distortion such as bending, twisting, or increased throat opening; wear, cracks, nicks or gouges; hook attachment and securing means																		
3	Hook latches - If provided, check for latch engagement, damaged or malfunctioning latch, check self-locking hooks for proper operation and locking																		
4-a	Load chain- (Welded Link) Check for wear, stretching, gouges, nicks, weld splatter, corrosion and distorted links; (Roller Chain) in addition to the preceding, check that: rollers run freely; side plates are not spread open; there is no pitting or discoloration																		
4-b	Wire rope - Check for broken, bent, kinked, distorted, birdcaging, crushed or corroded wire																		
4-c	Web strap - Check for melting or charring, chemical burns, weld splatter, broken stitches, cuts or tears, damage to eyes or fittings, abrasive wear, knots																		
5	Reeving - Check for proper reeving (chain, rope, or strap type)																		
6	Hoist lever - Check lever for bends, cracks, or other damage																		
7	Hoist support - Check for damage to hoist support																		

Notes/comments:

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Pre-use Inspection

Checklist for Electrical or Air Powered Hoists

Includes wire rope and chain type

Facilities CRN#: _____ PC#: _____ Hoist Type: _____

Crane Custodian: _____ Bldg: _____ Room: _____

Requirements A. Operators must perform a pre-use inspection (once per shift) for the items listed below. B. Any equipment found to be unsatisfactory must be removed from service. C. Operators must notify the equipment custodian, who will submit a Facilities service request to the crane inspector (call x8901). Continued use may be permitted if authorized by the crane inspector in notes/comments. D. Custodians must keep completed checklists on file for a minimum of 5 years.	Inspected by																			
	Date																			

#	Equipment Description and Inspection Criteria	✓ = Satisfactory, U = Unsatisfactory, N = Not applicable																			
1	Operating mechanism - Check for proper operation and adjustment and note any unusual sounds or noise due to chain binding or bearing squeal																				
2	Limit switch - Test upper-limit switch. If the hoist has a lower-limit switch, test it with no load before lowering any load that could bring the lower-limit switch into operation.																				
3	Air or hydraulic systems - Check for leaks (as applicable) all along the air or hydraulic system, including tanks, valves, pumps, and lines (visual inspection from floor level only)																				
4	Hoist braking - Confirm that the brakes are functioning																				
5	Hooks - Check for excessive throat opening, bent or twisted elements, sticky swivel or rough surfaces																				
6	Hook latches - If provided, check for latch engagement, damaged or malfunctioning latch, check self-locking hooks for proper operation and locking																				
7a	Load chain - (Welded link) Check for wear, stretch, gouges, nicks, weld splatter, corrosion and distorted links; (Roller chain) in addition to the preceding, check that: rollers run freely; side plates are not spread open; there is no pitting or discoloration																				
7b	Web strap - Check for melting or charring, chemical burns, weld splatter, broken stitches, cuts or tears, damage to eyes or fittings, abrasive wear, knots																				
7c	Wire rope - Check for broken, bent, kinked, distorted, birdcaging, crushed or corroded wire																				
8	Reeving - Check for proper reeving (chain, rope, or strap type)																				
9	Festoon cable - Check that cable collects evenly, does not bind or hang-up																				

Notes/comments: _____

Hoisting and Rigging: Crane and Hoist Monthly Inspection Form

Applies only to cranes or hoists with a capacity of more than 1 ton.

Facilities Department crane maintenance personnel:

Crane number:

Record monthly inspection on this form and keep with pre-use inspection forms.

Operator:

Review this inspection record before completing pre-use inspection.

Date	Name (please print)	Signature	Pass	Fail	N/A

Observations:

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingFormInspectMonth.pdf>
Revision Record: <https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=463>
Department: Field Safety and Building Inspection Office
Program: Hoisting and Rigging
Authority: [ESH Manual, Chapter 41, "Hoisting and Rigging"](#)
Date Effective: 15 September 2009

Hoisting and Rigging: Mobile Crane Pre-use Inspection Form

The operator completes inspection before beginning work, keeps the form on the crane during work, and forwards to the equipment custodian once work is completed.

Important: Operator makes a service request if any item fails inspection.

Operator:

Crane number:

Model:

Signature:

Date:

Visual Inspection

Pass Fail N/A

Visual Inspection	Pass	Fail	N/A
Engine fluid level correct (check dip stick or sight glass)			
Hydraulic fluid level correct (check dip stick or sight glass)			
Hydraulic system exhibits no apparent weeping or leaks			
Air system exhibits no audible leaks			
Tire pressure acceptable and tire not damaged			
Telescoping boom exhibits no damage to structure, wear pads, boom stops, or cylinder			
Wire rope free of dirt, excess lube, kinks, and wires and spooled correctly			
Reeving correct			
Wedge sockets and wire rope clips not distorted, cracked, or missing			
Block not damaged			
Ball and hook is free to swivel and rotate			
Guards are in place			
Outrigger float(s) secured with pad pin			
Cab			
Handrails in place and not damaged			
Operator's manual in vehicle			
Load chart legible and visible to operator			
Hand signal chart visible to workers			
Charged fire extinguisher in place			
Cab glass not cracked and wipers are functional			

Pass Fail N/A

Gauges and Indicators	Pass	Fail	N/A
Load moment indicator operational			
Drum rotation indicator functioning			
Boom length indicator functioning			
Boom angle indicator functioning			
Engine: hydraulic, air, electrical, oil pressure, temperature, and fuel			
Operational Inspection			
Correct counterweight for the load			
Main hoist control functioning			
Auxiliary hoist control functioning			
Anti-two block in place and functioning			
Swing brake			
Lights and horns functional			

URL: <http://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingFormMobile.pdf>

Revision Record: <https://www-internal.slac.stanford.edu/esh/docreview/reports/revisions.asp?ProductID=464>

Department: Field Safety and Building Inspection Office

Program: Hoisting and Rigging

Authority: [ESH Manual, Chapter 41, "Hoisting and Rigging"](#)

Date Effective: 15 September 2009