Chapter 41: Hoisting and Rigging

Lift Requirements

1 Purpose

The purpose of these requirements is to ensure that lifts are performed safely. They cover assigning personnel and planning, preparing, and performing lifts. They apply to workers (as operators, riggers, signal persons, and designated leaders/persons-in-charge), supervisors, load owners, ESH coordinators; and the hoisting and rigging program manager.

2 Requirements

Requirements for lifts vary with the type:

- **An ordinary lift** is any that lift that does not meet the requirements of a critical lift.

- **A critical lift** is one 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

  Any lift that involves more than one crane or motorized lifting device is considered a critical lift.

- **A pre-engineered lift** is a “repetitive lift that is performed by production line personnel in the assembly or disassembly of components or systems” in which the items to be lifted are “identical in terms of dimensions, weight, center of gravity, load path, method of attachment to the lifting equipment, and selection of lifting equipment” and “all items can be lifted in adherence to a specific step-by-step procedure that eliminates rigging decisions or calculations by lift personnel”.

Lifts are classified by the supervisor.

For guidance on classifying, planning, and performing lifts, see Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090](https://www-group.slac.stanford.edu/esh/eshmanual/references/hoistingReqLift.pdf)).
2.1 Personnel

2.1.1 Two-person Rule

All lifts require at least two persons to be present during lifting operations (that is, when the load is being lifted; two people are not required for pre-use inspections and positioning of equipment). Ordinary lifts may be performed without a second person provided the directorate ESH coordinator and supervisor approve the plan and the hoisting and rigging program manager is notified.

2.1.2 Qualifications

Only qualified persons may perform hoisting and rigging activities. (See Section 4 of Chapter 41, “Hoisting and Rigging” for training requirements.)

2.1.3 Designated Leader / Person-in-Charge

For ordinary lifts, the supervisor must assign a designated leader. For critical lifts, the supervisor designates a person-in-charge (PIC), who must be someone other than the operator.

2.1.4 Signal Person

For lifts performed with mobile cranes, a signal person is required. Signal persons must

1. Know and understand the type of signals used. If hand signals are used, the signal person must know and understand the Standard Method for hand signals.
2. Be competent in the application of the type of signals used
3. Have a basic understanding of equipment operation and limitations, including the crane dynamics involved in swinging and stopping loads and boom deflection from hoisting loads
4. Must be trained by a qualified evaluator

2.1.5 Professional Rigger

For lifts performed with mobile cranes, a qualified, professional rigger is required.

2.2 Planning

A written lift plan is required for all lifts. The preparer(s) of the plan must, at a minimum, do the following:

- Characterize the load in terms of dimensions, weight, and center of gravity (determined from drawings, calculations, markings or estimates).
  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.
- 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. 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), and on the identified load, task, and hazards. Ensure that sling angles are considered when determining forces on rigging equipment and the load.
• Include in critical lift plans
  – Specifications for the softeners to be utilized, including dimensions, materials of construction, and any special retaining mechanisms
  – Specifics on rigging configuration, including softener placement location, use of special retaining mechanisms, and use of supplemental sling protection (for example, cut resistant sleeves).
  – An analysis demonstrating that the specified softeners and rigging configuration provide an adequate factor of safety (as determined by the structural/mechanical engineer reviewing the lift plan) for preventing the slings from slipping off the softeners during the lift.

The plan must be documented using a lift planning and control form (for ordinary lifts or critical lifts). (If using an existing procedure, attach it to the form and fill out only the first page.)

Note Approved lift plans may be reused for similar lifts of like material. The location, time, and workers may be different. Plans must be signed only once: by preparers and approvers when being written and approved and by workers after reading the plan. Plans must be revised and reapproved if conditions change.

2.2.1 Approval

For ordinary lifts, the plan must be approved by someone with knowledge and experience in hoisting and rigging, either the supervisor, the supervisor’s designee, the ESH coordinator, or the hoisting and rigging program manager if requested.

For critical lifts, the hoisting and rigging program manager approves the plan, following review by a structural or mechanical engineer.

For the lifting of personnel, written approval from the hoisting and rigging program manager is required. Requests for approval must include detailed documentation.

For pre-engineered lifts, written approval from the hoisting and rigging program manager is required. Requests for approval must include detailed documentation.

Deviations from the approved plan must be reviewed by the original approver.

2.3 Preparing and Testing

The designated leader / person-in-charge must
• Verify that all equipment, fixtures, and accessories are operative, up-to-date on required periodic inspections, and in good condition before the operation begins (see Hoisting and Rigging: Equipment Requirements for details)
• Ensure that all equipment pre-use inspections are completed and forms submitted to the equipment custodian
• Survey the lift site for hazardous or unsafe conditions; clear lift path of obstructions
• 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 plan and their role in the operation and sign the lift plan

2.4 Performing the Lift

The designated leader / person-in-charge must
• Keep a copy of the plan at the work site and follow the plan
• Provide the task-qualified supervision specified in the planning process
• Vacate all non-essential personnel from the lift area
• Identify the operator
• Ensure a signal person is assigned, if required, and identified to the operator
• Check that basic operating instructions of all lifting equipment are posted or otherwise available to the operator
• Ensure that equipment is properly set up and positioned
• Ensure that the load hook is directly over the center of gravity of the load to the extent possible
• Check load lines after strain is put on them but before the load is lifted clear of the ground; if load lines are not equalized, reposition the slings or equipment so that the lines are equalized before continuing.
• Direct the lifting operation to ensure that the lift is completed safely and efficiently
• Direct operations if an accident or injury occurs

The operator / rigger must
• Follow the lift plan, including 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, and no binding of hoist rings. Ensure that
  – The load is attached to the hook by means of slings or other suitable and effective means that are rigged to ensure the safe handling of the load
  – Slings are freed of kinks or twists before use
  – Baskets, tubs, skips, or similar containers used for hoisting bulk materials are loaded so as not to exceed their safe carrying capacity
  – The load is well secured and properly balanced in the sling or lifting device before it is lifted more than a few inches
The hoist rope is not kinked
- Multiple part lines are not twisted around each other

- Ensure the hook is positioned over the load in such a manner as to prevent swinging of the load when lifted
- Slowly raise the crane to take the slack out of the rigging without 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.
- Wear hard hats and safety-toed shoes for all lifts and when handling the load. 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 supervisor.

**Warning** Personnel must never place any part of their bodies under a suspended load.

### 3 Forms

The following forms and systems are required by these requirements:

- [Hoisting and Rigging: Ordinary Lift Planning and Control Form](SLAC-I-730-0A21J-022). Form for documenting ordinary lift plans
- [Hoisting and Rigging: Critical Lift Planning and Control Form](SLAC-I-730-0A21J-058). Form for documenting critical lift plans

### 4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- The approved lift plan must be kept at the job site with other work planning and control documents (see Chapter 2, “Work Planning and Control”) for the duration of the lift.

### 5 References

**SLAC Environment, Safety, and Health Manual** (SLAC-I-720-0A29Z-001)

- Chapter 41, “Hoisting and Rigging”
  - [Hoisting and Rigging: Equipment Requirements](SLAC-I-730-0A21S-035)

- Chapter 2, “Work Planning and Control”

Other Documents

- Department of Energy Standard 1090, “Hoisting and Rigging” ([DOE-STD-1090](#)) and third-party standards referenced in it