Table 14-2
Outside Storage of LP-Gas Containers and Cylinders – Minimum Distances

Quantity of LP-Gas Stored	Distance
Less than 500 lb. (227 kg)	0 feet
500 lb. (227 kg)	10 feet (3 m)
6,000 lb. (2,722 kg)	10 feet (3 m)
6,000 lb. (2,722 kg)	20 feet (6.1 m)
10,000 lb. (4536 kg)	20 feet (6.1 m)
More than 10,000 lb. (4536 kg)	25 feet (7.6 m)

14-10. Checklists and Forms.
Not Applicable.

Chapter 15
Rigging

15-1. References.

a. ASME B30, Cranes and Related Equipment - Cableways, Derricks, Hoists, Hooks, Jacks, and Slings (https://www.asme.org) (15-1.a)

b. 29 CFR 1910.184, Slings (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol5/pdf/CFR-2020-title29-vol5-sec1910-184.pdf) (15-1.b)

c. 29 CFR 1926.251, Rigging Equipment for Material Handling (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-sec1926-251.pdf) (15-1.c)

d. 29 CFR 1926, Subpart CC Cranes and Derricks in Construction (https://www.govinfo.gov/content/pkg/CFR-2020-title29-vol8/pdf/CFR-2020-title29-vol8-part1926-subpartCC.pdf) (15-1.d)

15-2. Definitions.

a. Qualified Rigger (QR). A qualified rigger is a rigger who meets the criteria for a QP as defined in this manual (see paras 1-2 or 2-2, as applicable) and 29 CFR 1926, Subpart CC that is designated by the employer in writing to rig loads and/or oversee the rigging of loads for hoisting. (15-2.a)

b. Rated Load. The maximum allowable working load established by the rigging equipment manufacturer. The terms “rated capacity” and “working load limit” (WLL) are commonly used to describe rated load. (15-2.b)

c. Registered Professional Engineer (RPE). See paragraphs 1-2 or 2-2, as applicable. (15-2.c)

d. Rigging. Components used to secure, lift, and suspend loads (for example, chains, ropes, slings, cables). (15-2.d)

e. Rigging Hardware. Hardware components used in tandem with rigging to secure, lift, and suspend loads (for example, shackles, hooks, links, rings, swivels, turnbuckles, eyebolts, hoist rings, wire rope clips, wedge sockets). (15-2.e)

15-3. Personnel Required Qualification/Training.
Qualified Rigger (QR) will possess a recognized degree, certificate, or professional standing, or have extensive knowledge, training, and experience, and can successfully demonstrate the ability to solve problems related to rigging loads.

Note. The level of training, experience, and knowledge needed may vary depending on the rigging tasks. The employer must determine whether a person is qualified to perform specific rigging tasks.

a. Qualifications. QRs must meet at least the following minimum qualifications: (15-3.a)

(1) Have extensive knowledge, training, and experience and demonstrates such ability in safe rigging principles and procedures related to the work activities performed, to include calculating loads, load weights, and safe capacities.

(2) Be at least 18 years of age.

b. Training. QRs must be trained and demonstrate proficiency on the following related to the specific rigging operations they perform: (15-3.b)

(1) Load calculations and safe capacities.

(2) Rigging principles and procedures.

(3) Rigging and hoisting equipment operating characteristics, capabilities, and limitations.

(4) Personnel roles and responsibilities.

(5) Site preparation.

(6) Rigging and hoisting related hazards.

(7) Inspection procedures for rigging equipment.

Note. The term “rigger” or “Qualified Rigger (QR)” in this manual refers to the function performed, and in no way relates to the worker’s job classification or position.

15-4. Roles and Responsibilities.
QRs are responsible for rigging loads and overseeing rigging and hoisting operations to include the following:

a. Verify site preparation is suitable for operations. (15-4.a)

b. Identify rigging equipment and materials to be used. (15-4.b)

c. Inspect rigging according to paragraph 15-5. (15-4.c)

d. Establish and ensure adherence to safe operating and rigging procedures. (15-4.d)

e. Identify hazards, including environmental hazards and overhead interferences, and implement controls. (15-4.e)

f. Communicate with the crane operator, lift director, signal person, and other affected personnel. (15-4.f)

15-5. Inspection Requirements.
A QR must inspect all rigging and rigging hardware according to the manufacturer’s instructions and applicable OSHA and ASME B30 standards, and the following:

a. Shift Inspections. All rigging and rigging hardware must be inspected by a QR according to the manufacturer’s instructions and applicable OSHA and ASME B30 standards before use on each shift and as necessary during its use to ensure that it is free from damage or defects. (15-5.a)

b. Periodic Inspections. All rigging and rigging hardware must be inspected by a QR according to the manufacturer’s instructions and applicable OSHA and ASME B30 standards at least annually. All periodic inspections must be documented. A written record of the most recent periodic inspection of rigging and rigging hardware must be maintained and must include the condition of the rigging equipment. This documentation must be available onsite and available to the local SOHO/USACE supervisor/KO or COR upon request. The QR may adjust the frequency to require more frequent inspections based on any of the following: (15-5.b)

(1) Frequency of use.

(2) Severity of service conditions.

(3) Nature of load-handling activities.

(4) Experience gained on the service life of rigging equipment used in similar circumstances.

Note. Unlike general rigging, rigging hardware components do not need to be listed individually on inspection forms.

c. Markings. Required markings must remain legible on all rigging equipment and hardware. If markings become illegible, remove from service. (15-5.c)

d. Damaged or defective rigging must be immediately removed from service. (15-5.d)

15-6. Activity Hazard Analysis (AHA) Requirements.
Develop AHAs according to paragraphs 1-6 or 2-6, as applicable. Plan and address all rigging activities, identify use of any specialty-type hooks (for example, open hooks, grab hooks, foundry hooks, sorting hooks, chocker hooks) in the AHA and submit for approval by the USACE supervisor or acceptance by the KO or COR.

15-7. Minimum Plan Requirements.
If multiple lift rigging (MLR) assembly is used, a Critical Lift Plan is required (see para 16-7).

15-8. General Requirements.

a. General Rigging Equipment and Hardware Requirements. (15-8.a)

(1) Use, inspect, maintain, and store all rigging equipment and hardware according to the manufacturer's instructions and applicable OSHA and ASME B30 standards. Do not load in excess of the WLL.

(2) When not in use, remove rigging equipment and hardware from the immediate work area and properly store and maintain in a safe condition.

b. Hoist Rope. Do not wrap hoist rope around the load. Attach the load to the hook by means of slings or other devices of sufficient capacity. (15-5.b)

c. Slings. (15-5.c)

(1) Use slings according to 29 CFR 1910.184 and 29 CFR 1926.251, as applicable.

(2) When slings may contact edges, corners, protrusions, abrasive surfaces, or connecting hardware, provide protection with a material of sufficient strength, thickness, and construction to prevent damage, unless the edges are adequately rounded to a radius as recommended by the sling manufacturer or a QP.

(3) All slings must be manufactured under applicable ASME B30 guidelines and must have an affixed durable permanent identification tag that includes at least the following:

(a) Name or trademark of the manufacturer (country identification only is not acceptable).

(b) Type of material used (synthetic web slings, synthetic round slings or synthetic rope slings only).

(c) WLL for a given type of hitch and configuration.

(d) Number of legs if more than one.

(4) All eye splices must be made according to applicable ASME B30 standards.

(5) Do not use alloy steel wire rope clips or clamps with eye slings or endless loop slings to hoist or lift material, except where the application precludes the use of prefabricated slings. An RPE must design all slings fabricated using alloy steel wire rope clips or clamps for the specific application. (See figures 15-1 and 15-2)

(6) Do not use natural fiber rope to fabricate slings.

d. Alloy Steel Chain Slings. (15-5.d)

(1) Use only alloy chain Grade 80 or higher for rigging.

(2) When used with multiple leg slings, use only attachments (for example, alloy steel chains, hooks, rings, oblong links, pear-shaped links, welded or mechanical coupling links) with a WLL at least equal to that of the assembly chain.

(3) Multiple leg slings must have the number of legs and lengths identified on the tag.

e. Rigging Hardware. (15-5.e)

(1) Do not paint rigging hardware unless approved by the manufacturer and according to the manufacture's requirements. While the painting of rigging gear for identification is common, USACE considers this an unacceptable practice that constitutes a dangerous condition. Painting of hardware can potentially cover/hide defects creating an unsafe condition.

(2) Drums, sheaves, and pulleys must be smooth and free of surface defects that may damage rigging. Drums, sheaves, or pulleys having eccentric bores, cracked hubs, spokes, or flanges must be removed from service.

(3) Connections, fittings, fastenings, and attachments used with rigging must be of good quality, of proper size and strength, and must be installed according to the manufacturer's instructions.

(4) Do not use job hooks, shop hooks and links, makeshift fasteners formed from bolts and rods, or other similar attachments, unless they are according to paragraph 15-8.j.

f. Shackles. (15-5.f)

(1) All shackles must be manufactured according to ASME B30.26.

(2) Only shackles marked by manufacturer with name or trademark of manufacturer (country only is not acceptable), WLL, and size will be used. Shackles must be maintained by the user to be legible throughout the service life of the shackle.

(3) Each shackle pin must be marked by manufacturer to show name or trademark of manufacturer and grade material type or load rating.

(4) Shackle repairs and/or modifications may only be as specified by the manufacturer. Replacement parts and like pins must meet or exceed the original manufacturer's specifications.

(5) Use and load shackles according to the manufacturer's instructions. Do not apply multiple sling legs to the shackle pin.

(6) If a shackle is to be side loaded, the rated load must be reduced according to the recommendations of the manufacturer, ASME B30.26, or a QP.

g. Hooks. (15-5.g)

(1) All hooks used for lifting or load handling purposes must be manufactured and used according to ASME B30.10.

(2) Do not use hooks in any such manner other than that stated by the manufacturer's instructions.

(3) Remove from service any hooks that show wear exceeding 10% or an increase in the throat opening of 5%, maximum of one-quarter (¼) inch (0.6 cm), or as recommended by the manufacturer, or hooks that exhibit any visibly apparent bend or twist from the plane of the hook.

(4) Follow manufacturer's instructions when determining a hooks WLL as there are various sizes and types of specific and identifiable hooks. Any hook for which the manufacturer's instructions are not available must be tested to twice the intended safe

working load before it is put into use. The employer must maintain a record of the dates and results of such tests.

(5) Manufacturer's identification (country only is not acceptable) and WLL must be forged, cast, or die stamped on a low stress and non-wearing area of the hook. Hooks must be maintained by the user to be legible throughout the service life of the hook.

(6) Load equally duplex (sister) hooks on both sides unless the hook is specifically designed for single-point loading.

(7) If the duplex (sister) hook is loaded at the pinhole instead of at the two saddles, the load applied must not exceed the WLL that would normally be shared by the two saddles or the WLL of the supporting equipment.

(8) Use safety latch-type hooks (for example, self-closing, self-locking, screw-pin shackle, alloy anchor type shackle with a bolt, nut, and retaining pin) whenever possible. Open hooks (for example, grab hooks, foundry hooks, sorting hooks, choker hooks) may be used to hoist loads if they are inspected and maintained according to the manufacturer's instructions.

h. Eyebolts, Eye Nuts, Swivel Hoist Rings, and Turnbuckles. (15-5.h)

(1) All eyebolts, eye nuts, swivel hoist rings, and turnbuckles must be manufactured according to ASME B30.26.

(2) Do not exceed the manufacturer's WLLs.

(3) Each turnbuckle, eye nut, swivel hoist ring, and eyebolt must be marked with name or trademark of the manufacturer (country is not acceptable), size or WLL and grade (for alloy eyebolts). In addition, each swivel hoist ring must also be marked to show torque value (excluding trench cover hoist rings). Components must be maintained by the user to be legible throughout the service life.

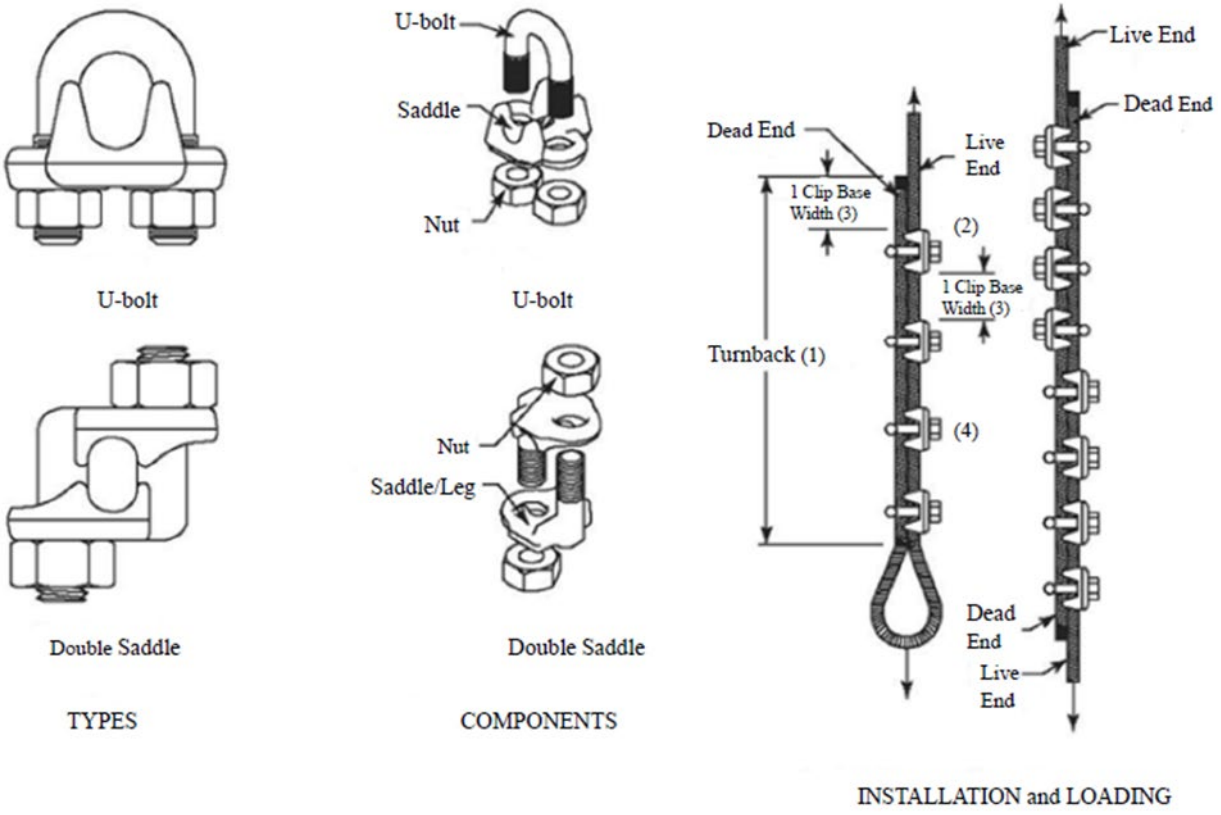
(4) Do not side load turnbuckles. Rig and secure to prevent unscrewing during the lift. In addition, end-fittings threads must be fully engaged in the body threads.

i. Non-Shoulder Eyebolts. Only use eyebolts not shouldered to the load for in-line loads. (15-5.i)

j. Custom Below-the-Hook Lifting devices. Custom below-the-hook lifting devices, (for example, structural and mechanical lifting devices, custom fabricated grabs, hooks, clamps, or other lifting accessories (for example, equalizing beams, lifting or spreader beams) for such units as modular panels, prefabricated structures and similar materials must be designed, tested, and used according to ASME B30.20. (15-5.j)

k. Multiple Lift Rigging (MLR). MLR assembly requirements are addressed in chapter 16. (15-5.k)

15-9. Figures and Tables.



GENERAL NOTE: Correct number of clips for wire rope size must be used.
NOTES:
(1) Correct turnback length should be used.
(2) Correct orientation of saddle on live end must be observed.
(3) Correct spacing of clips should be used.

Figure 15-1. Wire Rope Clip Spacing (see para 15-5.c)