The American Society of Mechanical Engineers

HANDLING LOADS SUSPENDED FROM ROTORCRAFT

AN AMERICAN NATIONAL STANDARD

ASME B30.12-2001

(Revision of ASME B30.12-1992)

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SAFETY STANDARD FOR CABLEWAYS, CRANES, DERRICKS, HOISTS, HOOKS, JACKS, AND SLINGS

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ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard.

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FOREWORD

This American National Standard, Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings, has been developed under the procedures accredited by the American National Standards Institute (formerly the United States of America Standards Institute). This Standard had its beginning in December 1916, when an eight-page Code of Safety Standards for Cranes, prepared by an ASME Committee on the Protection of Industrial Workers, was presented to the annual meeting of the ASME.

Meetings and discussions regarding safety on cranes, derricks, and hoists were held from 1920 to 1925, involving the ASME Safety Code Correlating Committee, the Association of Iron and Steel Electrical Engineers, the American Museum of Safety, the American Engineering Standards Committee (later changed to American Standards Association and subsequently to the USA Standards Institute), Department of Labor — State of New Jersey, Department of Labor and Industry — State of Pennsylvania, and the Locomotive Crane Manufacturers Association. On June 11, 1925, the American Engineering Standards Committee approved the ASME Safety Code Correlating Committee's recommendation and authorized the project with the U.S. Department of the Navy, Bureau of Yards and Docks, and ASME as sponsors.

In March 1926, invitations were issued to 50 organizations to appoint representatives to a Sectional Committee. The call for organization of this Sectional Committee was sent out October 2, 1926, and the committee organized November 4, 1926, with 57 members representing 29 national organizations. The Safety Code for Cranes, Derricks, and Hoists, ASA B30.2, 1943, was created from the eight-page document referred to in the first paragraph. This document was reaffirmed in 1952 and widely accepted as a safety standard.

Due to changes in design, advancement in techniques, and general interest of labor and industry in safety, the Sectional Committee, under the joint sponsorship of ASME and the Naval Facilities Engineering Command, U.S. Department of the Navy, was reorganized as an American National Standards Committee on January 31, 1962, with 39 members representing 27 national organizations.

The format of the previous code was changed so that separate standards (each complete as to construction and installation; inspection, testing, and maintenance; and operation) would cover the different types of equipment included in the scope of B30.

In 1982, the Committee was reorganized as an Accredited Organization Committee, operating under procedures developed by the ASME and accredited by the American National Standards Institute.

This Standard presents a coordinated set of rules that may serve as a guide to government and other regulatory bodies and municipal authorities responsible for the guarding and inspection of the equipment falling within its scope. The suggestions leading to accident prevention are given both as mandatory and advisory provisions; compliance with both types may be required by employers of their employees.

In case of practical difficulties, new developments, or unnecessary hardship, the administrative or regulatory authority may grant variances from the literal requirements or permit the use of other devices or methods, but only when it is clearly evident that an equivalent degree of protection is thereby secured. To secure uniform application and interpretation of this Standard, administrative or regulatory authorities are urged to consult the B30

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Committee, in accordance with the format described in Section III, before rendering decisions on disputed points.

Safety codes and standards are intended to enhance public safety. Revisions result from committee consideration of factors such as technological advances, new data, and changing environmental and industry needs. Revisions do not imply that previous editions were inadequate.

This volume of the Standard, which was approved by the B30 Committee and by ASME, was approved by ANSI and designated as an American National Standard on August 15, 2001.

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Safety Standards for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings

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ASME B30.12-2001
SUMMARY OF CHANGES

The 2001 edition of ASME B30.12 includes editorial changes, revisions, and corrections introduced in B30.12a-1994 and B30.12b-1998, as well as the following changes identified by a margin note **(01)**, placed next to the affected areas.

Page	*Location*	*Change*
1	General	List of B30 standards updated
4, 5	Section 12-0.2	Definition of *qualified person* revised
9	Fig. 3	Caption revised
16	12-4.4.15(h)	Revised
	12-4.4.16	Last line revised
18	12-5.3.1	Subparagraphs (a), (b), and (c) revised

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SAFETY STANDARD FOR CABLEWAYS, CRANES, DERRICKS, HOISTS, HOOKS, JACKS, AND SLINGS

INTRODUCTION

(01) General

This Standard is one of a series of safety standards on various subjects that have been formulated under the general auspices of the American National Standards Institute. One purpose of the Standard is to serve as a guide to governmental authorities having jurisdiction over subjects within the scope of the Standard. It is expected, however, that the Standard will find a major application in industry, serving as a guide to manufacturers, purchasers, and users of the equipment.

For the convenience of the user, the Standard has been divided into separate volumes:

B30.1 Jacks
B30.2 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
B30.3 Construction Tower Cranes
B30.4 Portal, Tower, and Pedestal Cranes
B30.5 Mobile and Locomotive Cranes
B30.6 Derricks
B30.7 Base Mounted Drum Hoists
B30.8 Floating Cranes and Floating Derricks
B30.9 Slings
B30.10 Hooks
B30.11 Monorails and Underhung Cranes
B30.12 Handling Loads Suspended From Rotorcraft
B30.13 Storage/Retrieval (S/R) Machines and Associated Equipment
B30.14 Side Boom Tractors
B30.15 Mobile Hydraulic Cranes
Note: B30.15-1973 has been withdrawn. The revision of B30.15 is included in the latest edition of B30.5.
B30.16 Overhead Hoists (Underhung)
B30.17 Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
B30.18 Stacker Cranes (Top or Under Running Bridge, Multiple Girder With Top or Under Running Trolley Hoist)
B30.19 Cableways
B30.20 Below-the-Hook Lifting Devices
B30.21 Manually Lever Operated Hoists
B30.22 Articulating Boom Cranes
B30.23 Personnel Lifting Systems
B30.24 Container Cranes[1]
B30.25 Scrap and Material Handlers
B30.26 Rigging Hardware[1]
B30.27 Material Placement Systems[1]
B30.28 Balance-Lifting Units[1]

If adopted for governmental use, the references to other national codes and standards in the specific volumes may be changed to refer to the corresponding regulations of the governmental authorities.

The use of cableways, cranes, derricks, hoists, hooks, jacks, and slings is subject to certain hazards that cannot be met by mechanical means but only by the exercise of intelligence, care, and common sense. It is therefore essential to have personnel involved in the use and operation of equipment who are competent, careful, physically and mentally qualified, and trained in the safe operation of the equipment and the handling of the loads. Serious hazards are overloading, dropping or slipping of the load caused by improper hitching or slinging, obstructing the free passage of the load, and using equipment for a purpose for which it was not intended or designed.

The Standards Committee fully realizes the importance of proper design factors, minimum or maximum sizes, and other limiting dimensions of wire rope or chain and their fastenings, sheaves, sprockets, drums, and similar equipment covered by the Standard, all of which are closely connected with safety. Sizes, strengths, and similar criteria are dependent on many different factors, often varying with the installation and uses. These factors depend on the condition of the equipment or material; on the loads; on the acceleration or speed of the ropes, chains, sheaves, sprockets, or drums; on the type of attachments; on the number, size, and arrangement of sheaves or other parts; on environmental conditions causing corrosion or wear; and on many

[1] B30.24, B30.26, B30.27, and B30.28 are in the developmental stage.

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variables that must be considered in each individual case. The rules given in the Standard must be interpreted accordingly, and judgment used in determining their application.

Some of the provisions of this Standard require compliance with information found in manuals or other documents supplied by the manufacturer with the equipment. The information includes recommendations, requirements, and instructions (e.g., "the reeving shall be checked for compliance with the recommendations of the manufacturer").

Compliance with the provisions should not preclude the possibility of consulting a qualified person. This is true particularly when: the equipment has been altered, repaired, or modified; the manuals or documents supplied by the manufacturer are no longer available; or the manufacturer or a successor is no longer in business and the manuals are no longer available. However, the purpose of consulting a qualified person shall not be to avoid contacting the manufacturer and using the information supplied by the manufacturer.

The Standards Committee will be glad to receive criticisms of this Standard's requirements and suggestions for its improvement, especially those based on actual experience in application of the rules.

Suggestions for changes to the Standard should be submitted to the Secretary of the B30 Committee, ASME, Three Park Avenue, New York, NY 10016-5990, and should be in accordance with the following format:

(a) cite the specific paragraph designation of the pertinent volume;

(b) indicate the suggested change (addition, deletion, revision, etc.);

(c) briefly state the reason and/or evidence for the suggested change;

(d) submit suggested changes to more than one paragraph in the order that the paragraphs appear in the volume.

The B30 Committee will consider each suggested change in a timely manner in accordance with its procedures.

Section I: Scope

This Standard applies to the construction, installation, operation, inspection, and maintenance of jacks; power-operated cranes, monorails, and crane runways; power-operated and manually operated derricks and hoists; lifting devices, hooks, and slings; and cableways.

This Standard does not apply to track and automotive jacks, railway or automobile wrecking cranes, shipboard cranes, shipboard cargo-handling equipment, well-drilling derricks, skip hoists, mine hoists, truck body hoists, car or barge pullers, conveyors, excavating equipment, or equipment coming within the scope of the following Committees: A10, A17, A90, A92, A120, B20, B56, and B77.

Section II: Purpose

This Standard is designed to:

(a) guard against and minimize injury to workers, and otherwise provide for the protection of life, limb, and property by prescribing safety requirements;

(b) provide direction to owners, employers, supervisors, and others concerned with, or responsible for, its application; and

(c) guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives.

Section III: Interpretations

Upon request, the B30 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B30 Committee, ASME, Three Park Avenue, New York, NY 10016-5990.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his request utilizing the following format.

Subject: Cite the applicable paragraph number(s) and provide a concise description.

Edition: Cite the applicable edition of the pertinent volume for which the interpretation is being requested.

Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain any proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which could change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information, which

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might affect an interpretation, is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Section IV: New and Existing Installations

(a) Effective Date. The effective date of this volume for the purpose of defining new and existing installations shall be one year after its date of issuance.

(b) New Installations. Construction, installation, inspection, testing, maintenance, and operation of equipment manufactured and facilities constructed after the effective date of this volume shall conform with the mandatory requirements of this volume.

(c) Existing Installations. Inspection, testing, maintenance, and operation of equipment manufactured and facilities constructed prior to the effective date of this volume shall be done, as applicable, in accordance with the requirements of this volume.

It is not the intent of this volume to require retrofitting of existing equipment. However, when an item is being modified, its performance requirement shall be reviewed relative to the current volume. If the performance differs substantially, the need to meet the current requirement shall be evaluated by a qualified person selected by the owner (user). Recommended changes shall be made by the owner (user) within one year.

Section V: Mandatory and Advisory Rules

Mandatory rules of this volume are characterized by use of the word *shall.* If a provision is of an advisory nature, it is indicated by use of the word *should* and is a recommendation to be considered, the advisability of which depends on the facts in each situation.

Section VI: Metric Conversions

The values stated in U.S. Customary units are to be regarded as the standard.

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HANDLING LOADS SUSPENDED FROM ROTORCRAFT

CHAPTER 12-0
SCOPE, DEFINITIONS, AND REFERENCES

Section 12-0.1: Scope of B30.12

This Standard applies to the protection of ground personnel working directly with or in the vicinity of rotorcraft. Within the general scope as defined in Section I, B30.12 applies to the handling of loads suspended from rotorcraft using a cargo sling or powered hoist, or other attaching means, to lift, carry, pull, or tow a jettisonable load outside of the rotorcraft airframe.

(01) Section 12-0.2: Definitions

administrative or regulatory authority: governmental agency or the employer in the absence of governmental jurisdiction.

aircraft: a device that is used or intended to be used for flight in the air.

airframe: the fuselage, booms, nacelles, cowlings, fairings, airfoil surfaces (including rotors but excluding propellers and rotating airfoils of engines), and landing gear of an aircraft and its accessories and controls.

apex fitting: a ring or attaching device between the hook and sling and the supporting cables to the load.

appointed: assigned specific responsibilities by the employer or the employer's representative.

attitude: the position of the rotorcraft or suspended load with reference to a horizontal position, such as nose up or nose down.

authorized: appointed by a duly constituted administrative or regulatory authority.

automatic release mechanism: a device for releasing the load without deliberate action by the pilot or crew.

birdcaging: the deformation of a section of wire rope imparting to such section a birdcage-like appearance.

chocking: blocking to prevent rolling or other inadvertent movement of the wheels of an aircraft when on the ground or other supported areas with a block of wood, metal, or other substance.

choker hitch: a method of rigging a sling in which the sling is passed around the load, then through one loop eye, end fitting, or other device with the other loop eye or end fitting attached to the lifting device. This hitch can be made with a sliding choker hook or similar device.

closed throat load beam: that weight-bearing part of a primary cargo hook that must be manually relatched or closed after an apex fitting has been placed on it (see Fig. 1).

contractor: the company, firm, individual, or other business enterprise that contracts with an operator to perform work.

copilot: a pilot who is second in command of an aircraft.

designated person: a person selected or assigned by the employer or employer's representative as being competent to perform specific duties.

emergency release device: a secondary means for releasing the external load from the aircraft in the event of a failure of the release mechanism of the primary hook.

external lift or load operation: any operation involving a rotorcraft carrying an external load.

external load: a jettisonable load that is suspended from the primary hook(s) or other rotorcraft load attachment points.

external load attaching means: the structural components used to attach an external load to an aircraft, the backup structure at the attachment points, and any quick-release device used to jettison the external load.

FAA: Federal Aviation Administration.

FAR: Federal Aviation Regulations.

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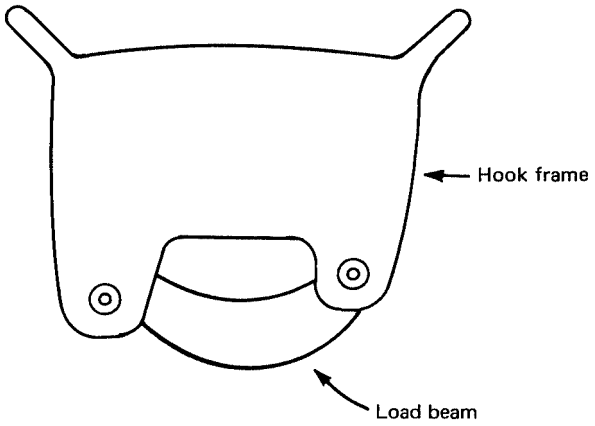

FIG. 1 HOOK WITH CLOSED THROAT LOAD BEAM

flight crewmember: a pilot, aft pilot, copilot, flight engineer, flight navigator, mechanic, or other such person assigned to duty in an aircraft during flight.

flight visibility: the average forward, horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.

ground base facility: the site from which operations are conducted on a continuous basis, of at least several days, until a job is completed.

ground crews: those individuals specifically required to be on or near the job site in connection with the actual conduct or performance of the external load operation.

ground visibility: prevailing horizontal visibility near the earth's surface as reported by the United States National Weather Service or an accredited observer.

helicopter: a rotorcraft that derives its horizontal and vertical flight ability primarily from its engine driven rotors; in this manual it will be the basic vehicle for lifting, hoisting, pulling, towing, and moving cargo.

hoist (noun): a powered device for raising or lowering a helicopter external load.

hoist (verb): to raise or lower a load with a rotorcraft. mounted hoist.

hook, cargo, primary: a device attached or suspended from an aircraft that is used to connect an external load to the aircraft through direct coupling or by lead lines; this unit has both mechanical and electrical locking/unlocking means.

keeper: a device, usually spring-loaded, that prevents the apex fitting of a sling from slipping off the load beam of the cargo hook.

kV: kilovolts. Equal to 1,000 V of electricity.

lift: to raise the load by flight of rotorcraft.

limit switch: a device that, by predetermined adjustment, limits the rotational or linear movement of a mechanism.

load: the static weight of the object being lifted or lowered, including the sling and any other ancillary attachments not included as part of the rotorcraft or the rotorcraft hoist system.

load ratings: the maximum load that a rotorcraft or other item of lifting equipment is authorized to lift, as specified by the manufacturer or the FAA.

main rotor: the rotor that supplies the principal lift to a rotorcraft.

maximum gross weight: the maximum FAA approved gross weight of the rotorcraft and its load in any configuration.

open throat load beam: that load-bearing member of a cargo hook, designed so that in its normal operating position, it is possible to slide the apex fitting of a sling directly onto the load beam without opening the hook (see Fig. 2).

operation: this pertains to the utilization of a rotorcraft lifting loads outside its fuselage in order to accomplish various lifting and setting tasks. The task may consist of just one lift, or may be of long or indefinite duration. See also *external lift* or *load operation*.

operator: the company, firm, individual, or other business enterprise owning or leasing the rotorcraft that is responsible for its functioning and airworthiness.

pendant: a synthetic or wire rope, chain, or webbing of specified length with fixed end connections.

pilot-in-command: the pilot responsible for the operation and safety of an aircraft from engine start to complete stoppage of engine and rotors.

qualified person: a person, who by possession of a recognized degree in an applicable field, certificate of professional standing, or, who by extensive knowledge, training, and experience, has successfully demonstrated

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the ability to solve or resolve problems relating to the subject matter and work.

rated load: see *load ratings*.

rating: a statement that, as a part of a certificate, sets forth special conditions, privileges, or limitations.

rope: refers to wire rope unless otherwise specified.

rotorcraft: a heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors.

rotorcraft external load combination operation manual: the FAA approved manual prepared or utilized by the aircraft operator, designating each rotorcraft model's limitations, performance, and procedures for which the airworthiness of the rotorcraft has been demonstrated.

rotorcraft flight manual: the FAA approved flight manual issued by the rotorcraft manufacturer that defines operating limitations for each aircraft.

rotorcraft ground crew: those personnel employed by a rotorcraft operator to support and assist the pilot-in-command in the conduct of an external load operation.

rotorcraft-load combination: the combination of a rotorcraft and an external load, including the external load attaching means.

shall: indicates that the rule is mandatory and must be followed.

should: indicates that the rule is a recommendation, the advisability of which depends on the facts in each situation.

signalperson: a designated individual who, through radio, intercom, or standardized hand signals, can direct the pilot-in-command when a load is being lifted or set in place.

tag line: a line attached to a load used as a guide or restraint by the ground or erecting crew.

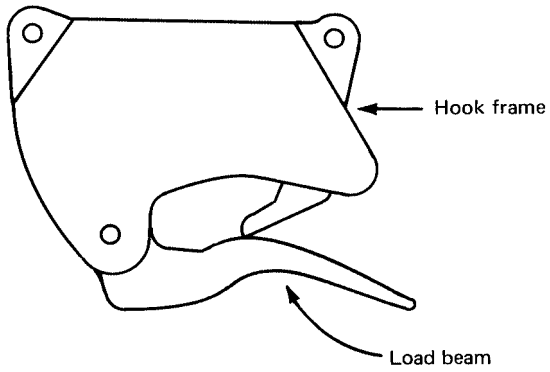

FIG. 2 HOOK WITH OPEN THROAT LOAD BEAM

Section 12-0.3: References to Other Codes and Standards

Within the text, reference is made to the following publications, copies of which may be obtained from the publishers as indicated:

Federal Aviation Regulations (FAR), Nos. 27, 29, 43, 61, 63, 65, 67, 91, and 133

USAAMRDL Technical Report 72-36, Design Guide for Load Suspension Points, Slings, and Aircraft Hard Points

Publisher: Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402

ASME B30.9-1990, Slings[1]

Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; ASME Order Department: 22 Law Drive, Box 2300, Fairfield, NJ 07007-2300

ASTM A 391-75, Specifications for Alloy Steel Chain

Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428

[1] May also be obtained from the American National Standards Institute (ANSI), 11 West 42nd Street, 13th floor, New York, NY 10036.

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CHAPTER 12-1
LOAD RATINGS AND CHARACTERISTICS

Section 12-1.1: Load Ratings

12-1.1.1 Rotorcraft. Rated loads for rotorcraft shall include the maximum gross weight of the rotorcraft-load combination.

12-1.1.2 Primary Hook(s). Rated load of the primary hook(s) shall be the maximum weight of the load to be lifted, carried, pulled, or towed. This maximum weight shall not exceed the weight approved by the FAA and specified in the rotorcraft flight manual, and that required by the FAA to be displayed on or adjacent to the hook.

12-1.1.3 Hoist. The maximum capacity of the hoist and its braking means shall not be exceeded as specified by the hoist manufacturer and approved by the FAA. This rating shall be included in the rotorcraft flight manual and displayed as required by the FAA on a placard attached to the hoist.

12-1.1.4 Sling Materials. Rated loads for sling materials shall be based on the catalog strength. In addition to the rated load of sling material to be used to lift any load, consideration shall be given to its age, environmental conditions, and the rotorcraft load factor (see para. 12-2.4.3).

Section 12-1.2: Load Characteristics

The size, type, and weight of a load shall not, in the judgment of the pilot-in-command, adversely affect the controllability of the rotorcraft.

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CHAPTER 12-2
LIFTING COMPONENTS

Section 12-2.1: Primary Cargo Hook

12-2.1.1 A primary cargo hook of the self-locking type (with quick-release device) shall be provided. The primary cargo hook shall be located as close to the rotorcraft as possible to prevent inadvertent entanglement of the hook and its suspension system with external fixed structures on the rotorcraft. The primary cargo hook shall include a quick-release device to enable the pilot to release the external load quickly during flight. The primary cargo hook and quick-release device, and the means by which they are controlled, shall conform to the following:

(a) A control for the quick-release device shall be installed on one of the pilot's primary controls and shall be designed and located so that it may be operated without hazardously limiting the pilot's ability to control the rotorcraft during an emergency situation.

(b) In addition to the control prescribed in (a) above, an emergency release device, mechanical, electrical, hydraulic, pneumatic, explosive, or a combination thereof, shall be provided. The power source of this system shall be independent of the normal primary hook release system power source. The control of this system shall be readily accessible to either the pilot or other crew members.

(c) The primary cargo hook and quick release device shall function with all external loads up to and including the maximum external load for which the rotorcraft is certified.

(d) The load beam of the primary cargo hook shall be provided with a means to positively retain the apex fitting on the load beam.

(e) The primary cargo hook and its attachment means shall comply with the applicable strength requirements of the FAR.

(f) Cargo hook automatic release mechanisms shall be used only for specific operations where ground crews are not used. It shall be activated only for actual placement of loads.

12-2.1.2 The intent of this Section is not to limit the number of primary cargo hooks that may be used. However, in the event more than one primary cargo hook is utilized, or such a hook is used as an emergency quick release, all such hooks shall provide simultaneous release of all loads as defined in para. 12-2.1.1(c).

Section 12-2.2: Hoist

A hoist, when provided, shall be considered an integral component part of the rotorcraft and shall be certified by the FAA.

12-2.2.1 The hoist shall have a powered drum containing the primary lifting member and shall be equipped with an emergency load release mechanism.

12-2.2.2 Hoist rated load shall be determined at the time of manufacture and shall be fully described and displayed in the rotorcraft operations and maintenance manuals.

12-2.2.3 Static load limits shall be displayed.

12-2.2.4 Hoist shall be equipped with upper and lower limit switches to control the length of the lifting member on the drum.

12-2.2.5 A combination of end attachments and wraps of rope on the drum shall be used to develop breaking strength.

Section 12-2.3: Rotorcraft

The rotorcraft shall be certified by the FAA and shall carry proof of same by display of the registration certificate, airworthiness certificate, and operating certificate, as required by the FAA.

Section 12-2.4: Sling

Sling strengths and configurations per ASME B30.9 do not apply because of the different dynamic load conditions present in flight operations vs ground based lifting equipment. Sling strengths shall be determined by the method given in para. 12-2.4.3.

12-2.4.1 Types of Slings. The types of slings considered are as follows:

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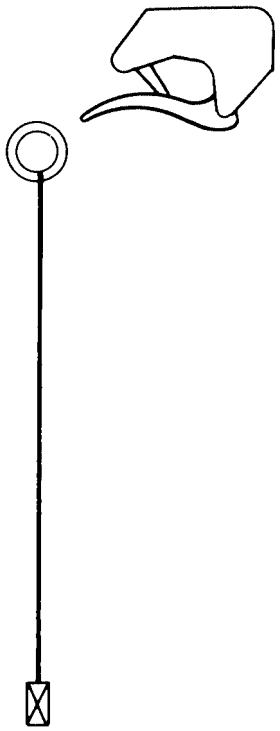

(01) **FIG. 3 VERTICAL HITCH**

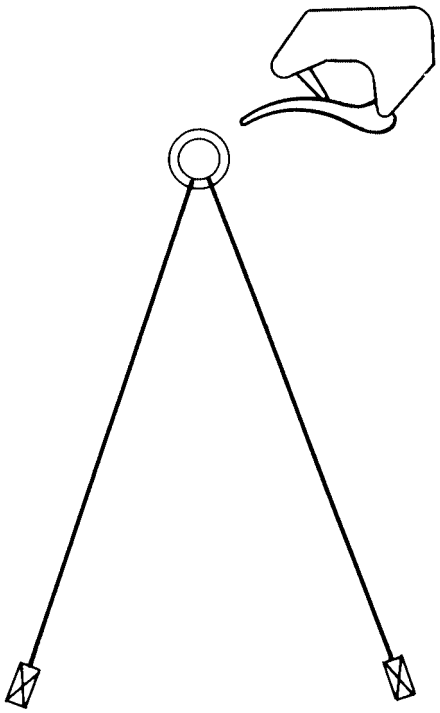

FIG. 4 TWO-LEG SLING

(a) Vertical hitch (see Fig. 3);
(b) Two-leg (see Fig. 4);
(c) Three-leg (see Fig. 5);
(d) Four-leg (see Fig. 6);
(e) Two-leg spreader (see Fig. 7); and
(f) Four-leg spreader (see Fig. 8).

12-2.4.2 Sling Materials. Slings should be constructed from synthetic ropes, webbing, wire rope, or chain. Wire rope slings should be IWRC (independent wire rope core, steel center). Natural fiber ropes shall not be used as sling materials since their strengths are not predictable.

12-2.4.3 Sling Strength

(a) Determining Sling Strength. Table 1 shall be used to determine the breaking strength *S* of each leg of the sling.

(b) Two-Leg Spreader Sling. The sling leg portion of a two-leg spreader assembly shall have the same strength requirement as a two-leg sling. In addition, the bar itself must take compressive forces along its axis equal to those imposed by the breaking strength of the sling legs.

(c) Four-Leg Spreader Sling. The sling leg portion of a four-leg spreader assembly shall have the same strength requirements as a four-leg sling. In addition, the members of the spreader bar must resist the compressive forces imposed by the breaking strength of the sling legs. The spreader bar shall have a diagonal brace or other device to prevent distortion of its shape under these loads.

(d) Length of Sling Legs. The length of sling legs shall be such that no sling leg makes an angle from the vertical greater than 45 deg.

(e) Multiple-Leg Slings. The legs of a multiple-leg sling shall be connected at the top by an apex fitting.

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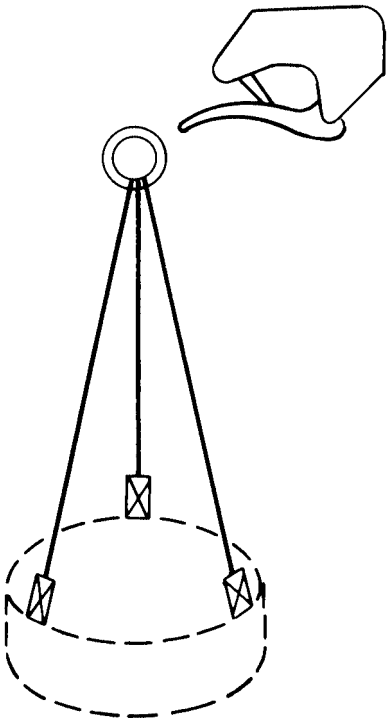

FIG. 5 THREE-LEG SLING

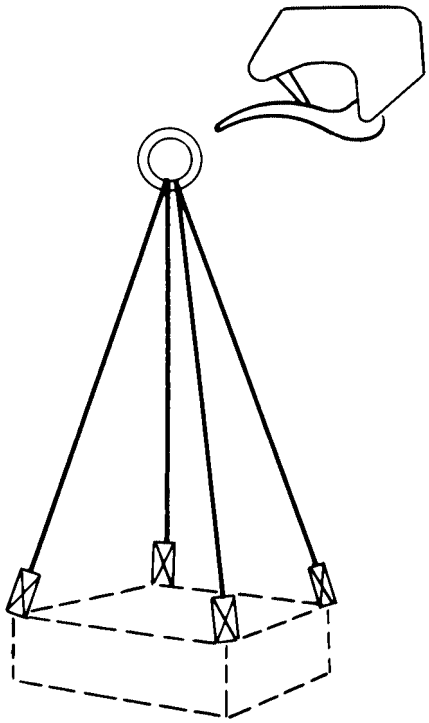

FIG. 6 FOUR-LEG SLING

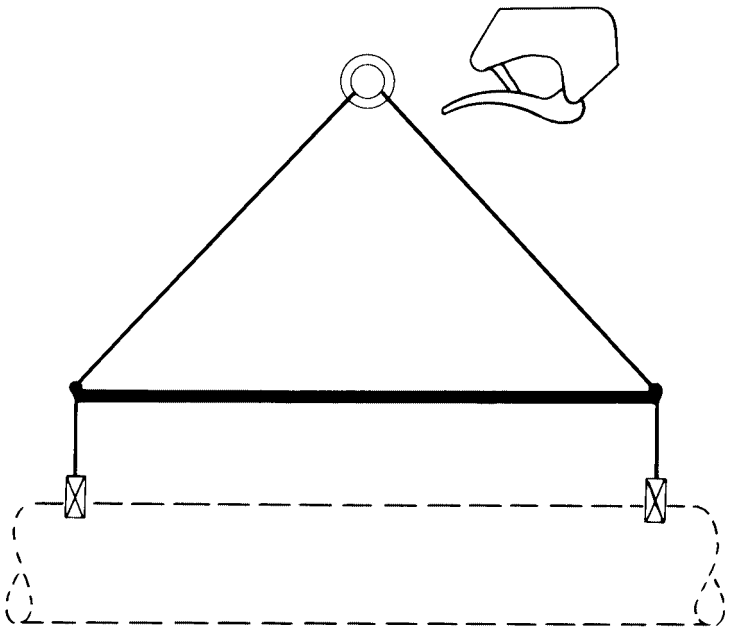

FIG. 7 TWO-LEG SPREADER SLING

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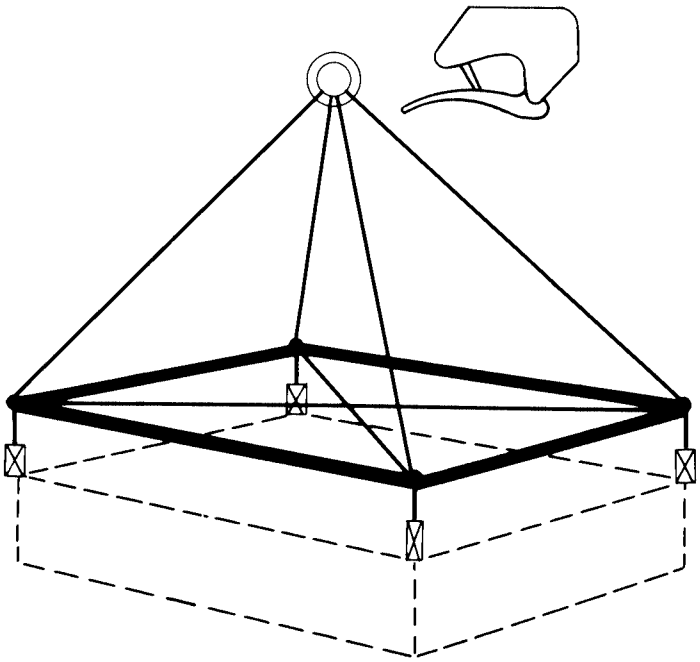

FIG. 8 FOUR-LEG SPREADER SLING

TABLE 1 DETERMINING SLING STRENGTH

Configuration	Single-Leg Breaking Strength, *S*	Design Factor—Sling Assembly With Legs Vertical
Single-leg	5 *W*	5.0
Two-leg	3.8 *W*	7.6
Three-leg	2.6 *W*	7.8
Four-leg	2 *W*	8.0

S = breaking strength of each leg.
W = rated capacity of the entire sling (i.e., the maximum load that can be safely lifted by the sling assembly).

GENERAL NOTE: This Table also applies to the primary lifting cable of a hoist.

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CHAPTER 12-3
INSPECTION AND MAINTENANCE

Section 12-3.1: Rotorcraft Inspection and Maintenance

Rotorcraft shall be inspected and maintained in accordance with the rotorcraft manufacturer's maintenance manuals and the requirements of the FAA.

Section 12-3.2: Primary Hook Inspection and Maintenance

12-3.2.1 Inspection. A prelift visual inspection shall be performed prior to conducting each operation, and on at least a daily basis during the operation. Unless the primary hook being used passes the following minimum requirements, it shall not be used.

(a) Check hook attachments for correct connections.

(b) Check hook for manual release.

(c) Check electrical connectors and wiring.

(d) Functionally check both normal and emergency release systems or circuits.

(e) Test the guillotine system on rotorcraft so equipped.

(f) Check the load beam for binding.

(g) Visually check the load beam and hook frame members for cracks, gouges, distortion, wear, and latch engagement.

(h) Test all other emergency release equipment.

(i) Check the suspension members, if used, for alignment.

(j) Check the primary hook suspension ropes for broken wires.

(k) Check the manual release cable conduit for kinks. Conduit shall not be used if it is found kinked.

12-3.2.2 Maintenance. The primary hook and support system shall be maintained and overhauled in accordance with the manufacturer's recommendations and maintenance manuals.

Section 12-3.3: Hoist and Hoist Rope Inspection and Maintenance

Hoist and hoist rope inspection and maintenance shall be performed by a qualified person in accordance with current FAR, FAA directives, and the manufacturer's recommendations as described in the maintenance manuals.

Section 12-3.4: Sling Inspection, Replacement, and Maintenance

12-3.4.1 Sling Inspection. All ropes or chain used for slings (pendants) in continuous service should be visually inspected each working day. Evidence of deterioration such as described in Sections 9-1.6, 9-1.8, and 9-2.8 of ASME B30.9, which could result in appreciable loss of original strength, should be carefully noted and a determination made as to whether or not further use of the rope or chain would constitute a hazard.

(a) Sections 9-1.6 and 9-1.8 of ASME B30.9 should be followed for inspection of chain.

(b) Section 9-2.8 of ASME B30.9 should be followed for inspection of wire rope slings.

(c) Sections 9-3.7, 9-3.8, and 9-3.9 of ASME B30.9 should be followed for inspection of metal mesh slings.

(d) Sections 9-4.7 and 9-4.8 of ASME B30.9 should be followed for inspection of synthetic fiber slings.

(e) Sections 9-5.6 and 9-5.7 of ASME B30.9 should be followed for inspection of synthetic webbing slings.

12-3.4.2 Rope or Chain Maintenance

(a) Rope or chain should be stored in such a manner as to prevent damage or deterioration.

(b) Unreeling or uncoiling of rope should be accomplished as recommended by the rope manufacturers and with special care to avoid kinking or inducing a twist.

(c) Before cutting a rope, seizings shall be placed on each side of the place where the rope is to be cut to prevent unlaying of the strands.

(d) During use, care should be exercised to avoid dragging the rope in dirt or around objects that will scrape, nick, crush, or induce sharp bends.

(e) Paragraph 9-1.9(1) of ASME B30.9 should be followed for chain storage.

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CHAPTER 12-4
OPERATIONS

Section 12-4.1: Pilots

12-4.1.1 External lift rotorcraft shall be operated by any one of the following personnel:

(a) pilot-in-command;

(b) copilot;

(c) rotorcraft pilots of at least commercial pilot rating accompanied by a company designated instructor pilot with appropriate external load operation qualifications.

12-4.1.2 No one, other than the personnel designated in Section 12-4.1, shall enter the rotorcraft or rotorcraft cockpit except qualified rotorcraft maintenance personnel, airborne signalpersons, or such other personnel considered essential for a specific lift operation, and then only in the performance of their duties and with the knowledge of the pilot-in-command.

Section 12-4.2: Pilot Qualifications

12-4.2.1 Each pilot listed in Section 12-4.1 shall be qualified in accordance with FAR, and shall have on hand during any lift operation, a commercial pilot or airline transport pilot license, a letter of competency (or equivalent), and a current medical certificate, Class I or II issued by or pursuant to the FAA and its applicable regulations.

12-4.2.2 Pilots shall be qualified in the class or type of rotorcraft utilized to perform external lift operations and this qualification shall be so recorded.

12-4.2.3 Instructor pilots, regardless of rating, shall have appropriate external load operation experience.

Section 12-4.3: Signalperson Qualifications and Responsibilities

12-4.3.1 Regular signalpersons, who are part of the rotorcraft crew, should be used for difficult precision setting airlifts to make certain the load is properly attached and set before lifting or releasing.

12-4.3.2 Except as provided for in para. 12-4.3.1 above, ground crews who have been thoroughly briefed and designated by the rotorcraft pilot for airlifts not requiring precision lifting or setting may be used.

12-4.3.3 If ground-to-air radios are used, the signalpersons shall:

(a) be able to communicate without undue interference from the rotorcraft; and

(b) have knowledge of applicable Federal Communications Commission regulations.

12-4.3.4 Signalpersons shall be knowledgeable in the hand signals used in Fig. 9.

12-4.3.5 Personnel trained or used as signalpersons should have a working knowledge of rigging procedures applicable to safety and operations.

12-4.3.6 Signalpersons shall keep the pilot-in-command advised of obstacles while directing the rotorcraft.

Section 12-4.4: Operating Practices

12-4.4.1 The pilot-in-command shall preflight inspect the rotorcraft prior to commencing any external lift operation. The pilot-in-command shall be satisfied that the rotorcraft and other lifting equipment are in safe condition before flight.

12-4.4.2 Prior to any operation with a load not previously accomplished by the operator, the following precautions shall be taken by the pilot-in-command.

(a) Determine that the weight of the external load is within the capability of the rotorcraft and other lifting equipment being utilized as specified by the FAA.

(b) Determine that the rotorcraft load combination is within the longitudinal center of gravity limits of the rotorcraft.

(c) Determine that the external load is fastened and that it does not interfere with devices provided for its emergency release.

(d) Make an initial liftoff and verify that load attitude and controllability are within acceptable limits.

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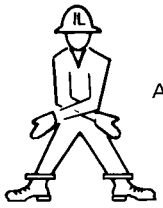
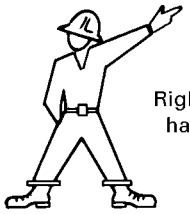


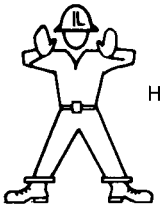
Arms crossed in front of body and pointing down.

LAND



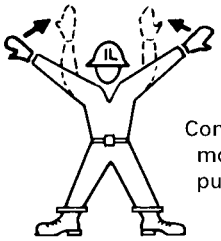
Right hand behind back, left hand pointing up.

TAKEOFF



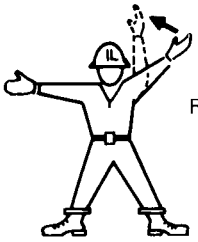
Hands above arm, palms out using a noticeable shoving motion.

MOVE REARWARD



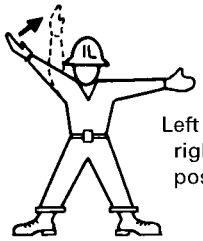
Combination of arm and hand movement in a collecting motion pulling toward body.

MOVE FORWARD



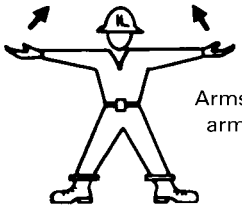
Right arm extended horizontally; left arm sweeps upward to position overhead.

MOVE LEFT



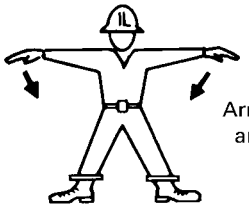
Left arm extended horizontally; right arm sweeps upward to position over head.

MOVE RIGHT



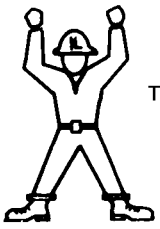
Arms extended, plams up, arms sweeping up.

MOVE UPWARD



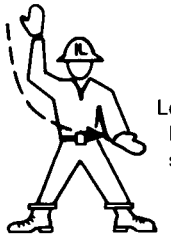
Arms extended, palms down; arms sweeping down.

MOVE DOWNWARD



The signal "hold" is executed by placing arms over head with clenched fists.

HOLD – HOVER



Left arm held down away from body. Right arm cuts across left arm in a slashing movement from above.

RELEASE SLING LOAD

FIG. 9 HELICOPTER HAND SIGNALS

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(e) While hovering the rotorcraft, verify that directional control of the rotorcraft load combination is within acceptable limits.

(f) Accelerate the rotorcraft into forward flight to verify that no attitude (whether of the rotorcraft or of the external load) is encountered wherein the rotorcraft is uncontrollable or otherwise hazardous.

(g) In forward flight, check for hazardous oscillations of the external load.

12-4.4.3 The pilot-in-command shall make certain that the maintenance records reflect the status of the rotorcraft. This person shall make certain that applicable certificates are with the rotorcraft.

12-4.4.4 Where required by FAR, regulatory authorities shall be notified that an external lift operation has been planned.

12-4.4.5 Personal protective equipment for persons connecting, disconnecting, or guiding a load into place shall consist of eye protection and hard hats securable by chin straps. The static electricity charge that may build up on a suspended load shall be dissipated with a grounding device before being touched by ground crews, or alternatively, rubber gloves shall be worn by all ground crews touching the suspended load.

12-4.4.6 The pilot-in-command shall survey the operation area for landing, pickup, and delivery and ascertain that no undue hazards such as blowing debris, trees, power lines, sand, poles, or other obstacles endanger persons or property.

12-4.4.7 The pilot-in-command shall approve all rigging procedures for the operation.

12-4.4.8 The pilot-in-command shall be responsible for making arrangements to restrain spectators and other nonground crew personnel from the rotorcraft work area including keeping them at least 50 ft (15.2 m) from the rotor blades.

12-4.4.9 The rotorcraft crew shall be responsible for refueling practices in accordance with provisions set forth in Section 12-7.1.

12-4.4.10 The pilot-in-command shall suspend operations when in the judgment of the pilot any of the following conditions exist:

(a) flight or ground visibility prevents the pilot from seeing obstructions in the operating area;

(b) the pilot becomes incapacitated due to illness, fatigue, or any other cause;

(c) electrical storms are in the immediate area;

(d) wind gusting or direction makes controllability of the rotorcraft difficult;

(e) any debris starts to blow that could cause injury to persons or property;

(f) any warning lights, other warning devices, or gages within the rotorcraft indicate possible dangerous mechanical problems;

(g) actions of rotorcraft ground crews or other workers directly involved in the operations endanger themselves or others;

(h) atmospheric condition changes create an adverse effect on the performance of the rotorcraft;

(i) damage is sustained by rigging used for airlifting that could affect its use; and

(j) crowd control becomes ineffective and persons are subject to dangerous conditions.

12-4.4.11 When rotorcraft operations include airlifting loads onto, or into, a building or building courtyard, all persons, except those working with the rotorcraft, shall be vacated along the flight path of the rotorcraft when carrying suspended cargo. Occupied buildings along the path shall be evaluated as to whether or not the occupants within need be removed.

12-4.4.12 Operating Near Electric Power Lines. If possible, the lines should be deenergized and the owner of the lines or their authorized representative shall be notified of this operation. There shall be a minimum clearance of at least 15 ft (4.6 m) between any energized power line, rated 50 kV or below, and any part of the rotorcraft load combination. This minimum clearance requirement shall increase proportionally to the increase in voltage of the line at the rate of 0.5 in. (12.7 mm) for each 1 kV.

EXCEPTION: These minimum clearances shall not apply to rotorcraft or external loads specifically designed for power line maintenance and repair.

12-4.4.13 Pre-Job Coordination — Pilot-in-Command and Signalpersons. Before any airlift operations are conducted, the rotorcraft pilot-in-command and the signalpersons shall confer and agree upon the following:

(a) position (or placement) the signalperson will assume so the signalperson can readily observe the load for pickup or delivery (setting) and still be seen or heard by the pilot;

(b) type of communication to be used for the specific airlift, i.e., hand signals, ground-to-air radio, intercom or relay signals, or a combination of them;

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(c) the use of hand signals shown in Fig. 9 and any additional agreed upon signals that would be used for the specific operation for safety or efficiency;

(d) alternative procedures to be followed if communications or sight are lost between the pilot-in-command and signalpersons;

(e) distinguishing clothes or gloves to be worn by appointed signalpersons. Only these individuals shall be authorized to give hand signals to the pilot-in-command;

(f) procedures to be used if any unforeseen hazards develop; and

(g) audible or other appropriate signals that should be used as a warning to ground crews working with the rotorcraft during airlift operations.

12-4.4.14 Pre-Job Coordination — Rotorcraft Operator and Contractor. When applicable, the rotorcraft operator's representative and the responsible contractor's representative shall have a pre-job conference or communication for purposes of coordination. This conference or communication shall cover the following:

(a) precautions to be in effect at the rotorcraft landing area, pickup area, route to be flown, and delivery (setting) area; arrangements for compliance with any other mutual requirements;

(b) design and strength of rigging and how it will attach to the load [see Section 12-2.4 and paras. 12-2.4.1 through 12-2.4.3(e)];

(c) accuracy of weights, structural strength of the loads, size and number of loads, and number of ground crews required for the operation;

(d) assignment of responsibility for clearing and securing pickup and setting sites (see para. 12-4.4.17);

(e) maximum time that rotorcraft can hover while ground crews are working beneath it;

(f) type and quantity of personal protection gear provided for the ground crews;

(g) type of scaffolding, if necessary, to be erected for ground crews to provide stable footing when attaching and unhooking the loads at elevated sites;

(h) working conditions that could be hazardous to ground crews such as rotorwash, rain, static electricity, and gusty winds;

(i) if applicable, operations of the rotorcraft in proximity to electric power lines (see para. 12-4.4.12);

(j) clearance of nonessential personnel from pick site, setting site, and from the route of flight;

(k) procedures for wetting down dusty and sandy areas; and

(l) provision for a point of reference when the rotorcraft is hovering.

12-4.4.15 Pre-Job Coordination — Instructions to the Ground Crew. Instructions to ground crews directly participating in the airlift shall be provided by the rotorcraft crew and shall include at least the following:

(a) Do not turn your back on the load.

(b) Avoid getting directly under the load when it is airborne, except when necessary to the operation.

(c) To avoid hand injury, keep hands clear and in view when steadying the load and grasp cables from the side, not underneath or between the cables and the load.

(d) Make certain keepers work on hooks.

(e) Use all hooks the way they are intended to be used.

(f) Make sure personal protection gear fits.

(g) When using tag lines, do not let them wrap around any limbs or portions of the body.

(h) Use railings, lifelines, or fall protection devices to prevent falling and watch your step when concentrating on the rotorcraft load. **(01)**

(i) Pull cinch cables on cargo nets tight before the airlift to prevent any objects from falling when the load is airborne.

(j) Notify rotorcraft crew member immediately if you see a damaged sling.

(k) Position hooks so when the strain is taken, cables will not break keepers and slip out.

(l) Free sling legs of all knots.

(m) Hold hook up after detaching from load so it can be seen by signalpersons and so that it will not snag objects on the ground when rotorcraft is moving away.

(n) Know the emergency signals to be used and the need for rapid response.

(o) Report any mishaps or near mishaps to rotorcraft crews immediately.

(p) To prevent being pinned and injured, do not go or move between the load and another object.

(q) Watch out for swinging rigging hanging from rotorcraft.

(r) Do not grasp load or tag line if it is rotating or swinging too fast.

12-4.4.16 If ground crews are transported by rotorcraft, they shall be briefed by the rotorcraft crew as to the method of entering or exiting the rotorcraft. The briefing shall include instructions against uphill movements, use of fall protection devices, and the danger of turning rotors. **(01)**

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12-4.4.17 Precautions to Prevent Hazards to Rotorcraft and Ground Personnel. Precautions shall be taken to provide for the protection of the rotorcraft from objects being blown or drawn into the rotor systems or aircraft engine intakes. All items capable of creating such hazards shall be secured or removed at the operating sites. In general, material of low density or objects of relatively high surface area are easily moved or blown by the rotor downwash. Typical of these are plywood, tarps or plastic sheeting, flashing, cartons, paper and plastic bags, rope, rags, sheetmetal panels, roofing material, and flimsy temporary structures.

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CHAPTER 12-5
HANDLING THE LOAD

Section 12-5.1: Hooking and Unhooking Loads

(a) When ground crews are required to work under hovering rotorcraft, means of access and egress shall be provided.

(b) Ground crews shall not perform work under hovering rotorcraft except to attach, detach, or guide loads into place.

(c) Signalpersons shall make certain that the load is free.

Section 12-5.2: Tag Lines

(a) Tag lines shall be of such a length that contact with rotors is precluded.

(b) Tag lines shall be free of knots and loops that might cause them to catch or snag or persons or objects.

Section 12-5.3: Attaching the Load

12-5.3.1 Attachment Methods. Rotorcraft cargo hooks or other rotorcraft load suspension systems should be attached to the suspended load by, but not limited to, one of the following: (01)

(a) slings attached to lifting points provided by the manufacturer of the load;

(b) slings attached to convenient structural points on the load;

(c) slings placed around the load without contacting sharp edges or being pinched;

(d) shackles, rings, and other hardware that attach directly between the load and cargo hook; and

(e) cargo nets.

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CHAPTER 12-6
SIGNALS

Section 12-6.1: Signal Systems

12-6.1.1 There shall be constant reliable communications between the pilot-in-command and a designated member of the ground crew during lifting operations. Signal systems shall be understood and checked prior to beginning each new operation.

12-6.1.2 Hand signals shall be as shown in Fig. 9. The speed with which the hand signals are given shall determine the rate of compliance requested of the pilot-in-command.

12-6.1.3 Operations shall be conducted in such a way that, in the event of radio communications failure, an effective backup system of communications shall be immediately available.

12-6.1.4 The signalperson shall wear a garment that distinguishes them as the signalperson.

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CHAPTER 12-7
FUELING AND GROUND BASE FACILITIES AT WORK AREA

Section 12-7.1: Fueling Operations

(a) Smoking, open flames, or other sources of ignition shall not be permitted within 50 ft (15.2 m) of fueling operations or fuel storage areas.

(b) No one other than authorized personnel shall be allowed within 50 ft (15.2 m) of fueling operations.

(c) At least two listed extinguishers having a rating of not less than 20 B each shall be provided.

(d) The extinguishers shall be located not more than 100 ft (30 m) from the aircraft and should be located up wind from the fueling operations.

Section 12-7.2: Ground Base Facilities Arrangement

(a) While the rotorcraft is on a landing site, horizontal clearance between the main or auxiliary rotors and any obstacle shall be not less than 15 ft (4.6 m).

(b) The degree of slope of a landing site shall not exceed the rotorcraft manufacturer's recommendation.

(c) A wind indicator shall be positioned near the landing site.

(d) All wheel type landing gear rotorcraft shall be chocked while on the ground or other supported area.

(e) The following warning signs shall be posted:

WARNING: No Smoking Within 50 ft (15.2 m) of Fueling Operations
CAUTION: Beware of Rotor Downwash and Clearance

(f) Efforts should be made for dust control on the landing site, using either water, gravel, crushed stone, or hard top, etc.

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