

**ASME B30.12-2006**  
**(Revision of ASME B30.12-2001)**

# Handling Loads Suspended From Rotorcraft

**Safety Standard for Cableways, Cranes, Derricks, Hoists,  
Hooks, Jacks, and Slings**

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

**ASME B30.12-2006**  
**(Revision of ASME B30.12-2001)**

# Handling Loads Suspended From Rotorcraft

---

**Safety Standard for Cableways, Cranes, Derricks, Hoists,  
Hooks, Jacks, and Slings**

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

**Three Park Avenue • New York, NY 10016**

Date of Issuance: February 6, 2007

The next edition of this Standard is scheduled for publication in 2011. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Interpretations are published on the ASME Web site under the Committee Pages at <http://www.asme.org/codes/> as they are issued, and will also be published within the next edition of the Standard.

ASME is the registered trademark of The American Society of Mechanical Engineers.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not “approve,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assume any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,  
in an electronic retrieval system or otherwise,  
without the prior written permission of the publisher.

The American Society of Mechanical Engineers  
Three Park Avenue, New York, NY 10016-5990

Copyright © 2007 by  
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
All rights reserved  
Printed in U.S.A.

# CONTENTS

Foreword .....	v
Committee Roster .....	vi
B30 Standard Introduction .....	viii
<b>Chapter 12-0 Scope, Definitions, and References</b> .....	<b>1</b>
Section 12-0.1 Scope of B30.12 .....	1
Section 12-0.2 Definitions .....	1
Section 12-0.3 References .....	4
<b>Chapter 12-1 External Load Ratings and Characteristics</b> .....	<b>5</b>
Section 12-1.1 Load Ratings .....	5
Section 12-1.2 Load Characteristics .....	5
<b>Chapter 12-2 Lifting Components</b> .....	<b>6</b>
Section 12-2.1 Primary Cargo Hook(s) .....	6
Section 12-2.2 Hoist/Winch .....	6
Section 12-2.3 Rotorcraft .....	7
Section 12-2.4 Slings .....	7
<b>Chapter 12-3 Inspection and Maintenance</b> .....	<b>10</b>
Section 12-3.1 Rotorcraft Inspection and Maintenance .....	10
Section 12-3.2 Primary Hook(s) and Attaching Means Inspection and Maintenance .....	10
Section 12-3.3 Hoist and Hoist Rope Inspection and Maintenance .....	10
Section 12-3.4 Sling Inspection, Replacement, and Maintenance .....	10
<b>Chapter 12-4 Operations</b> .....	<b>11</b>
Section 12-4.1 Pilots and Crew .....	11
Section 12-4.2 Pilot Qualifications .....	11
Section 12-4.3 Signalperson Qualifications and Responsibilities .....	11
Section 12-4.4 Operating Practices .....	13
<b>Chapter 12-5 Handling the Load</b> .....	<b>17</b>
Section 12-5.1 Hooking and Unhooking Loads .....	17
Section 12-5.2 Tag Lines .....	17
Section 12-5.3 Attachment Methods .....	17
<b>Chapter 12-6 Signals and Communication</b> .....	<b>18</b>
Section 12-6.1 Signal Systems .....	18
Section 12-6.2 Personnel .....	18
Section 12-6.3 Human External Cargo Communications .....	18
<b>Chapter 12-7 Fueling and Ground-Based Facilities at the Work Area</b> .....	<b>19</b>
Section 12-7.1 Fueling Operations .....	19
Section 12-7.2 Personnel Training .....	19
Section 12-7.3 Ground-Based Facilities Arrangement .....	19
<b>Figures</b>	
1 Hook With Closed Throat Load Beam .....	2
2 Hook With Open Throat Load Beam .....	3
3 Vertical Hitch .....	7
4 Two-Leg Sling .....	7
5 Three-Leg Sling .....	8
6 Four-Leg Sling .....	8
7 Two-Leg Spreader Sling .....	9

8	Four-Leg Spreader Sling .....	9
9	Helicopter Hand Signals .....	12
10	Personnel Approach/Departure Path (Level Ground) .....	15
11	Personnel Approach/Departure Path (Sloping Ground) .....	15
12	Personnel Approach/Departure With Tools .....	15
13	Helicopter Station .....	17
<b>Table</b>		
1	Determining Sling Strength .....	9

# 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) will 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 Committee, in accordance with the format described in Section IX, before rendering decisions on disputed points.

This Volume of the Standard, which was approved by the B30 Committee and ASME, was approved by ANSI and designated as an American National Standard on November 13, 2006.

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.

# ASME B30 COMMITTEE

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

(The following is the roster of the Committee at the time of approval of this Standard.)

### STANDARDS COMMITTEE OFFICERS

**P. S. Zorich**, *Chair*  
**B. D. Closson**, *Vice Chair*  
**J. D. Wendler**, *Secretary*

### STANDARDS COMMITTEE PERSONNEL

**N. E. Andrew**, Northrop Grumman Ship Systems  
**W. T. Hargrove**, *Alternate*, Mantech International Corp.  
**R. E. Bluff IV**, Gantry Constructors, Inc.  
**R. J. Bolen**, Consultant  
**G. B. Hetherston**, *Alternate*, E. I. DuPont  
**A. D. Brown**, A. D. Brown, Inc.  
**M. E. Brunet**, Manitowoc Crane Group  
**T. A. Christensen**, Alliance of American Insurers/Liberty Mutual Insurance  
**M. W. Mills**, *Alternate*, Liberty Mutual Group  
**B. D. Closson**, Craft Forensic Services, Inc.  
**T. L. Blanton**, *Alternate*, NACB Group, Inc.  
**J. P. Colletti**, John P. Colletti & Associates, Inc.  
**R. A. Dahlin**, Walker Magnetics Group  
**J. W. Downs, Jr.**, *Alternate*, Downs Crane and Hoist Co.  
**L. D. DeMark**, International Union of Operating Engineers  
**A. J. Lusi**, *Alternate*, International Union of Operating Engineers  
**D. W. Eckstine**, Eckstine and Associates  
**R. J. Edwards**, Schwing America  
**D. R. Remus**, *Alternate*, Reed Manufacturing  
**J. L. Gordon**, Acco Chain and Lifting Products  
**N. C. Hargreaves**, Terex Corp./Power Crane & Shovel Association  
**E. D. Fidler**, *Alternate*, Grove Worldwide  
**J. J. Headley**, Crane Institute of America  
**C. W. Ireland**, National Oilwell  
**A. J. Egging**, *Alternate*, National Oilwell  
**L. S. Johnson**, Fluor Construction Technology  
**E. P. Vliet**, *Alternate*, Turner Industries  
**R. M. Kohner**, Landmark Engineering Services  
**H. I. Shapiro**, *Alternate*, Specialized Carriers and Rigging Association/Howard I. Shapiro & Associates  
**C. E. Lucas**, The Crosby Group  
**P. A. Boeckman**, *Alternate*, The Crosby Group  
**E. K. Marburg**, Columbus McKinnon Corp.  
**R. J. Burkey**, *Alternate*, Columbus McKinnon Corp.  
**L. D. Means**, Means Engineering and Consulting/Wire Rope Technical Board  
**D. M. Sleightholm**, *Alternate*, Bridon American Corp.  
**K. J. Miller**, Jacobs Engineering  
**D. W. Smith**, *Alternate*, Chicago Bridge and Iron Co.  
**G. L. Owens**, Granite Construction, Inc.  
**R. M. Parnell**, Wire Rope Rigging Consultants/Industrial Training International  
**P. D. Sweeney**, *Alternate*, General Dynamics, Electric Boat  
**J. T. Perkins**, Ingersoll-Rand  
**H. G. Leidich**, *Alternate*, Ingersoll-Rand  
**J. E. Richardson**, U.S. Department of the Navy  
**D. W. Ritchie**, St. Paul Companies  
**W. P. Rollins**, Manitowoc Crane Group  
**J. W. Rowland III**, Consultant  
**J. C. Ryan**, Boh Bros. Construction Co.  
**A. R. Ruud**, *Alternate*, Atkinson Construction  
**D. Sayenga**, Associated Wire Rope Fabricators  
**J. A. Gilbert**, *Alternate*, Associated Wire Rope Fabricators  
**G. W. Shields**, Caterpillar, Inc.  
**W. J. Smith, Jr.**, U.S. Department of Labor: OSHA  
**R. G. Strain**, Advanced Automation Associates, Inc.  
**J. B. Hamill**, *Alternate*, Advanced Automation Associates, Inc.  
**A. R. Toth**, Morris Material Handling  
**B. E. Weir, Jr.**, National Erectors Association/Norris Brothers Co., Inc.  
**J. D. Wendler**, The American Society of Mechanical Engineers  
**R. C. Wild**, U.S. Army Corps of Engineers  
**D. N. Wolff**, National Crane Corp.  
**A. L. Calta**, *Alternate*, National Crane Corp.  
**P. S. Zorich**, RZP International Ltd.  
**H. W. Fair**, *Alternate*, H. Fair Associates, Inc.

### HONORARY MEMBERS

**J. M. Klibert**, Lift-All Co., Inc.  
**R. W. Parry**, Consultant

## **B30.12 SUBCOMMITTEE PERSONNEL**

**R. E. Bluff IV**, *Chair*, Gantry Constructors  
**T. L. Blanton**, NACB Group  
**A. L. Bradbury**, Southern California Edison  
**C. F. Brown**, Air Logistics  
**J. E. Chamberlin**, United Space Alliance  
**D. R. Chambers II**, Erickson Air-Crane

**J. L. Clark**, Clark Helicopters  
**J. D. Coates**, Columbia Helicopters  
**T. E. Evers**, Crane Institute of America  
**M. W. Mills**, Liberty Mutual Group  
**E. H. Richburg**, Sikorsky Aircraft

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

## B30 STANDARD INTRODUCTION

### SECTION I: SCOPE

The ASME B30 Standard contains provisions that apply to the construction, installation, operation, inspection, testing, maintenance, and use of cranes and other lifting and material-handling related equipment. For the convenience of the reader, the Standard has been divided into separate volumes. Each volume has been written under the direction of the ASME B30 Standards Committee and has successfully completed a consensus approval process under the general auspices of the American National Standards Institute (ANSI).

As of the date of issuance of this Volume, the B30 Standard comprises the following 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<sup>1</sup>
- B30.25 Scrap and Material Handlers
- B30.26 Rigging Hardware
- B30.27 Material Placement Systems
- B30.28 Balance Lifting Units<sup>1</sup>

### SECTION II: SCOPE EXCLUSIONS

The B30 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 covered under the scope of the following standards: A10, A17, A90, A92, A120, B20, B56, and B77.

### SECTION III: PURPOSE

The B30 Standard is intended to

- (a) prevent or minimize injury to workers, and otherwise provide for the protection of life, limb, and property by prescribing safety requirements
- (b) provide direction to manufacturers, owners, employers, users, and others concerned with, or responsible for, its application
- (c) guide governments and other regulatory bodies in the development, promulgation, and enforcement of appropriate safety directives

### SECTION IV: USE BY REGULATORY AGENCIES

These Volumes may be adopted in whole or in part for governmental or regulatory use. 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.

### SECTION V: EFFECTIVE DATE

(a) *Effective Date.* The effective date of this Volume of the B30 Standard shall be 1 year after its date of issuance. Construction, installation, inspection, testing, maintenance, and operation of equipment manufactured and facilities constructed after the effective date of this

<sup>1</sup> These Volumes are currently in the development process.

Volume shall conform to the mandatory requirements of this Volume.

(b) *Existing Installations.* Equipment manufactured and facilities constructed prior to the effective date of this Volume of the B30 Standard shall be subject to the inspection, testing, maintenance, and operation requirements of this Standard after the effective date.

It is not the intent of this Volume of the B30 Standard to require retrofitting of existing equipment. However, when an item is being modified, its performance requirements shall be reviewed relative to the requirements within the current volume. The need to meet the current requirements shall be evaluated by a qualified person selected by the owner (user). Recommended changes shall be made by the owner (user) within 1 year.

## SECTION VI: REQUIREMENTS AND RECOMMENDATIONS

Requirements of this Standard are characterized by use of the word *shall*. Recommendations of this Standard are characterized by the word *should*.

## SECTION VII: USE OF MEASUREMENT UNITS

This Standard contains SI (metric) units as well as U.S. Customary units. The values stated in customary units are to be regarded as the standard. The SI units are a direct (soft) conversion from the customary units.

## SECTION VIII: REQUESTS FOR REVISION

The B30 Standards Committee will consider requests for revision of any of the volumes within the B30 Standard. Such requests should be directed to:

Secretary, B30 Standards Committee  
ASME Codes and Standards  
Three Park Avenue  
New York, NY 10016-5990

The requests should be in the following format:

- Volume: Cite the designation and title of the volume.  
Edition: Cite the applicable edition of the volume.  
Subject: Cite the applicable paragraph number(s) and the relevant heading(s).  
Request: Indicate the suggested revision.  
Rationale: State the rationale for the suggested revision.

Upon receipt by the Secretary, the request will be forwarded to the relevant B30 Subcommittee for consideration and action. Correspondence will be provided to the requester defining the actions undertaken by the B30 Standards Committee.

## SECTION IX: REQUESTS FOR INTERPRETATION

The B30 Standards Committee will render an interpretation of the provisions of the B30 Standard. Such requests should be directed to:

Secretary, B30 Standards Committee  
ASME Codes and Standards  
Three Park Avenue  
New York, NY 10016-5990

The requests should be in the following format:

- Volume: Cite the designation and title of the volume.  
Edition: Cite the applicable edition of the volume.  
Subject: Cite the applicable paragraph number(s) and the relevant heading(s).  
Question: Phrase the question as a request for an interpretation of a specific provision suitable for general understanding and use, not as a request for approval of a proprietary design or situation. Plans or drawings that explain the question may be submitted to clarify the question. However, they should not contain any proprietary names or information.

Upon receipt by the Secretary, the request will be forwarded to the relevant B30 Subcommittee for a draft response, which will then be subject to approval by the B30 Standards Committee prior to its formal issuance.

Interpretations to the B30 Standard will be published in the subsequent edition of the respective volume and will be available online at <http://cstools.asme.org>.

## SECTION X: ADDITIONAL GUIDANCE

The equipment covered by the B30 Standard is subject to hazards that cannot be abated 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 proper operation of the equipment and the handling of loads. Serious hazards include, but are not limited to, improper or inadequate maintenance, overloading, dropping or slipping of the load, obstructing the free passage of the load, and using equipment for a purpose for which it was not intended or designed.

The B30 Standards Committee fully realizes the importance of proper design factors, minimum or maximum dimensions, and other limiting criteria 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

- (a) the condition of the equipment or material
- (b) the loads

(c) the acceleration or speed of the ropes, chains, sheaves, sprockets, or drums

(d) the type of attachments

(e) the number, size, and arrangement of sheaves or other parts

(f) environmental conditions causing corrosion or wear

(g) many variables that must be considered in each individual case

The requirements and recommendations provided in the volumes must be interpreted accordingly, and judgment used in determining their application.

# HANDLING LOADS SUSPENDED FROM ROTORCRAFT

## Chapter 12-0 Scope, Definitions, and References

### SECTION 12-0.1: SCOPE OF B30.12

This Volume applies to the protection of flight crews, ground personnel, and property on the surface while working directly with or in the vicinity of rotorcraft conducting external load operations. 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.

### SECTION 12-0.2: DEFINITIONS

#### 12-0.2.1 Rotorcraft External Load Classifications

*Class A Rotorcraft External Load:* a load combination in which the external load cannot move freely, cannot be jettisoned, and does not extend below the landing gear. This category usually features multiple attachments to the airframe. A typical example is a hard-mounted cargo basket attached to the rotorcraft airframe that is used to carry cargo from points A to B (included for reference only).

*Class B Rotorcraft External Load:* a load combination in which the external load is jettisonable and lifted free of land or water during the rotorcraft operation. The load is typically suspended from a hook or similar device. The hook may be attached to the rotorcraft structure, or it may be attached to a movable hoist cable and the hoist itself attached to the rotorcraft. Typical use is to lift a cargo load until it is completely airborne and fly it from points A to B.

*Class C Rotorcraft External Load:* a load combination in which the external load is jettisonable and remains in contact with land or water during rotorcraft operation. The load is typically in contact with land or water during rotorcraft operation. The load is typically partially suspended by a net, slings, or cables from a cargo hook or similar device. The cargo hook may be attached to the rotorcraft structure or a movable hoist cable and the hoist itself attached to the rotorcraft. It is typically used for stringing wire or laying cable where the load is partially suspended from the ground.

*Class D Rotorcraft External Load:* a load combination in which the external load is other than a Class A, B, or C and has been specifically approved by the Administrator for that operation. This load combination includes human cargo. For human cargo operations, the load, which typically consists of personnel and their containment device, is suspended from a hook or similar device during all or part of the flight. The hook may be attached to a movable hoist cable and the hoist itself rigidly attached to the rotorcraft. Typical use is for transfer of personnel to/from a ship. Carrying devices may transport one or more persons. Typical carrying devices are vest and straps, baskets, life preservers with straps and attachment devices, cages, or a suspended container.

#### 12-0.2.2 General Definitions

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

*administrator:* the Federal Aviation Administrator or any person to whom he has delegated his authority in the matter concerned.

*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 their accessories and controls.

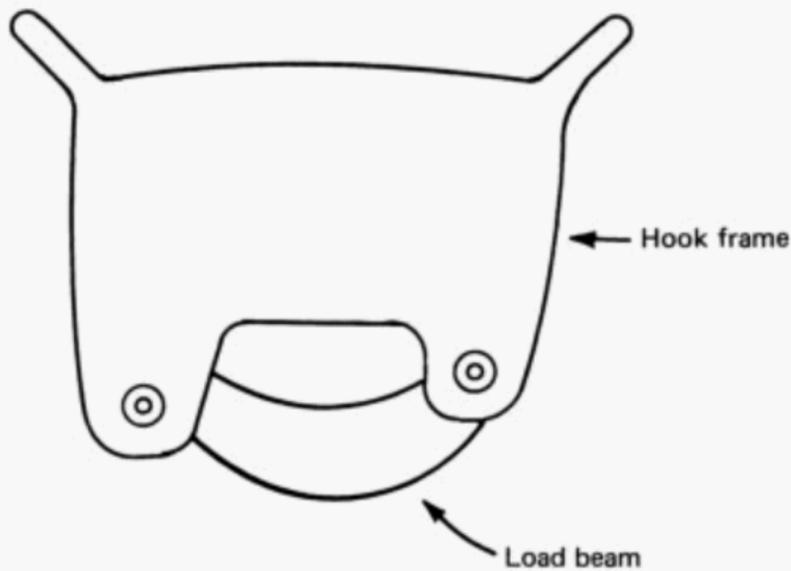
*altitude, AGL:* the height of a level, point, or object measured in feet Above Ground Level (AGL).

*altitude, MSL:* the height of a level, point, or object measured in feet from Mean Sea Level (MSL).

*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 down.

**Fig. 1 Hook With Closed Throat Load Beam**

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

*backup quick-release subsystem (BQRS)*: the secondary or "second choice" subsystem used to perform a normal or emergency jettison of external cargo.

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

*cargo*: the part of the rotorcraft load combination that is removable, changeable, and attached to the rotorcraft by an approved means.

*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 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 related or closed after an apex fitting has been placed on it (see Fig. 1).

*commercial operator*: the company, firm individual, or other business enterprise that, for compensation or hire, engages in the carriage by aircraft in air commerce of persons or property.

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

*copilot*: a pilot who is designated to be second in command of an aircraft during flight time.

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

*design factor*: ratio between nominal or minimum breaking strength and rated load of the component.

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

*external load*: a load that is carried, or extends, outside of the aircraft fuselage.

*external load attaching means*: the structural components used to attach an external load to an aircraft, including external load containers, 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.

*flight crew member*: a person assigned to perform duty in an aircraft during flight time.

*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 or until a job is completed.

*ground crew(s)*: those designated persons 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 Volume, it will be the basic vehicle for lifting, hoisting, pulling, towing, and moving cargo.

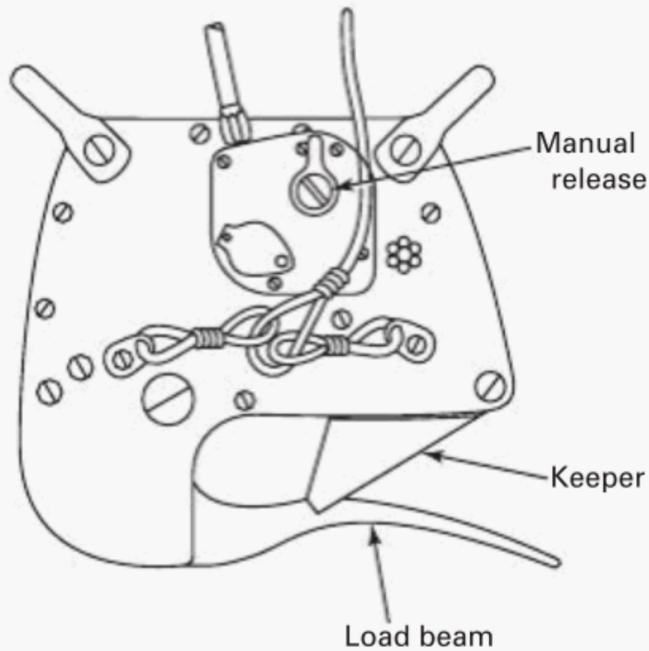
*hoist (noun)*: a powered, airframe-mounted device for raising or lowering a helicopter external load.

*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 features both a primary (electrical) quick release device and manual backup (mechanical) quick release device.

*human external cargo (HEC)*: a person(s) that at some point in the operation is carried external to the rotorcraft.

*jettison, emergency (complete load release)*: the intentional, instantaneous release of NHEC or HEC in a preset sequence by the QRS that is normally performed to achieve safer operation of the rotorcraft in an emergency.

**Fig. 2 Hook With Open Throat Load Beam**

*jettison, normal (selective load release):* the intentional release, normally at optimum jettison conditions, of an NHEC.

*jettisonable load:* a Class B, C, or D rotorcraft external load that can be intentionally released by the pilot or designated flight crew member, in flight, using either a primary or backup quick release system.

*keeper:* a device, usually spring loaded, that prevents the apex fitting of a sling from slipping off the load beam of the cargo hook (see Fig. 2).

*kV:* kilovolts. Equal to 1000 V of electricity.

*large aircraft:* an aircraft of more than 12,500 lb, maximum certificated takeoff weight.

*lift:* to raise the load by flight of the rotorcraft.

*limit loads:* the maximum load(s) to be expected in service.

*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 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, the FAA, or applicable regulatory authority.

*main rotor(s):* the rotor that supplies the principal lift to a rotorcraft.

*manual release device:* a cargo hook-mounted, mechanical release mechanism typically used by ground crews to open the cargo hook independent from the rotorcraft's primary or backup quick release system (see Fig. 2).

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

*nonhuman external cargo (NHEC):* any external cargo operation that does not, at any time, involve a person(s) carried external to the rotorcraft.

*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 placing 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 specific length with fixed end connections.

*personnel-carrying device system (PCDS):* the entire attached or suspended system used to carry human external cargo. This is any human external cargo-carrying configuration, such as a suspended (e.g., winch/hoist, cable, harness) human external cargo system or an attached (e.g., a rigid basket or cage attached to the skids) human external cargo system.

*pilot-in-command (PIC):* the person who has the final authority and responsibility for the operation and safety of the flight, has been designated as pilot in command before or during the flight, and holds the appropriate category, class, and type rating, if appropriate, for the conduct of the flight.

*primary quick-release subsystem (PQRS):* the primary or "first choice" subsystem used to perform a normal or emergency jettison of external cargo.

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

*quick-release system (QRS):* the entire release system for jettisonable external cargo (i.e., the sum total of both the primary and backup quick-release subsystems). The QRS consists of all components, including the controls, the release devices, and everything in between.

*rated load:* the maximum allowable working load established by the lifting component manufacturer.

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

*rescue hook:* a hook that can be rated for both HEC and NHEC. It is typically used in conjunction with a winch/hoist or equivalent system.

*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 flight manual*: the FAA- or other regulatory authority-approved flight manual issued by the rotorcraft manufacturer that defines the operating limitations for each aircraft.

*rotorcraft ground crew*: those personnel employed, and/or designated by a rotorcraft operator or the PIC, to support and assist the PIC in the conduct of an external load operation.

*rotorcraft load combination (RLC)*: the combination of a rotorcraft and an external load, including the external load attaching means. Rotorcraft load combinations are designated as Classes A, B, C, and D.

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

*second in command (SIC)*: a pilot who is designated to be second in command of an aircraft during flight time (see *copilot*).

*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 PIC when a load is being lifted or set into place.

*small aircraft*: an aircraft of 12,500 lb or less, maximum certificated takeoff weight.

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

*tail rotor*: a small, horizontally positioned auxiliary rotor system located at the rear (tail) of the helicopter that provides anti-torque thrust in the appropriate direction to neutralize the main rotor torque effect inherent in single rotor helicopters.

*ultimate loads*: limit loads multiplied by prescribed factors of safety.

### SECTION 12-0.3: REFERENCES

The following is a list of publications referenced in this Volume:

ASME B30.9-2003, Slings

ASME B30.16-2003, Overhead Hoists (Underhung)

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

ASTM A 391-2001, Specifications for Alloy Steel Chain

Publisher: ASTM International (ASTM), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959

Federal Aviation Regulations (FAR), Nos. 1, 21, 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

NFPA 10, Standard for Portable Fire Extinguishers, 2005 Edition

NFPA 407, Standard for Aircraft Fuel Servicing, 2001 Edition

Publisher: National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169-7471

# Chapter 12-1

## External 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 and external load combination. In addition, the rotorcraft load combination may only be operated within the weight and center of gravity limitations as established by the manufacturer.

#### 12-1.1.2 External Load Attaching Means

FAA airframe certification limit loads for rotorcraft load classifications Classes B, C, and D are 2.5 (minimum) at maximum gross weight and 3.5 for Class D (HEC only) at minimum gross weight. In addition, a 1.5 (minimum) safety factor is to be added to the weight of Classes B, C, and D loads being lifted for both NHEC and HEC.

#### 12-1.1.3 Primary Hook(s)

Rated capacity load of the primary hook(s) for both HEC and NHEC 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, or other regulatory authority, and as specified in the manufacturer's rotorcraft flight manual or as listed

within the operator's approved rotorcraft combination flight manual. A placard, marking, or instruction shall be displayed on or near the hook(s) stating the maximum external load.

#### 12-1.1.4 Hoist

The maximum capacity of the hoist or winch system and its braking means shall not be exceeded as specified by the hoist manufacturer and approved by the FAA or other regulatory authority. A placard, marking, or instruction shall be displayed on or near the hoist/winch system stating the maximum external load.

#### 12-1.1.5 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.

## Chapter 12-2

# Lifting Components

### SECTION 12-2.1: PRIMARY CARGO HOOK(S)

#### 12-2.1.1 System Requirements

A primary cargo hook of the self-locking type, including a quick-release system to enable the flight crew to release the load quickly during flight, 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 the external fixed structures of the rotorcraft. The quick-release system must consist of a primary and backup quick-release subsystem that are isolated from one another. The primary cargo hook quick-release system and the means by which it is controlled shall conform to the following:

(a) A control for the primary quick-release subsystem shall be installed either on one of the pilot's primary controls or in an equivalently accessible location and designed and located so that it may be operated either by the pilot or a crew member without hazardously limiting the ability to control the rotorcraft during an emergency situation.

(b) A control for the backup quick-release subsystem shall be provided and readily accessible to either the pilot or another crew member.

(c) Both the primary and backup quick-release subsystems shall be reliable, durable, and function properly with all external loads for which the rotorcraft is certified.

(d) Both the primary and backup quick-release subsystems shall be protected against electromagnetic interference (EMI) from external and internal sources and lightning to prevent inadvertent load release.

(e) The minimum level of protection required for jettisonable rotorcraft load combinations used for nonhuman external cargo is a radio frequency field strength of 20 volts per meter.

(f) The minimum level of protection required for jettisonable rotorcraft load combinations used for human external cargo is a radio frequency field strength of 200 volts per meter.

(g) Both the primary and backup quick-release subsystems shall be protected against any failure that could be induced by a failure mode of any other electrical or mechanical rotorcraft system.

(h) For rotorcraft load combinations to be used for human external load applications, the rotorcraft shall

(1) have a quick release system that meets the requirements of paras. 12-2.1.1(a) and (b) for jettisonable external loads

(2) provide a dual actuation device for the primary quick-release subsystem

(3) provide a separate dual actuation device for the backup quick-release subsystem

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

(j) The primary cargo hook and its attachment means shall comply with the applicable strength requirements of the applicable regulatory authority, or FAR Part 21, 27, or 29, as applicable to the rotorcraft airworthiness category.

(k) A placard or marking shall be installed next to the external-load attaching means clearly stating any operational limitations and the maximum authorized external load.

#### 12-2.1.2 Multiple Primary Hooks

The intent of this section is not to limit the number of primary cargo hooks which may be used. However, in the event that more than one primary cargo hook is utilized, all such hooks shall provide simultaneous release of all loads as defined in Section 12-2.1.

### SECTION 12-2.2: HOIST/WINCH

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

#### 12-2.2.1 Construction

The hoist or winch shall have a powered drum containing the primary lifting member and be equipped with an emergency load release mechanism or provisions for emergency load release.

#### 12-2.2.2 Load Rating

The hoist or winch load rating shall be determined by the manufacturer and fully described and displayed in the operator's rotorcraft load combination operation and flight manual, maintenance manual, and associated placards.

#### 12-2.2.3 Load Markings

Static load limits shall be displayed.

#### 12-2.2.4 Limit Switches

The hoist or winch shall be equipped with upper and lower limit switches to control the length of the lifting member on the drum.

#### 12-2.2.5 Breaking Strength

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

#### 12-2.2.6 Rope Marking

The length of hoist rope nearest the rope's attachment to the hoist/winch should be visually marked to indicate to the operator that the hoist rope is near full extension.

#### 12-2.2.7 Rope Attachment

The hoist rope should be positively attached to the hoist/winch drum, and the attachment should meet the ultimate load capability, or equivalent means should be provided to minimize the possibility of inadvertent, complete cable unspooling.

#### 12-2.2.8 Storage

The hoist or winch should be disabled (or an overriding, fail-safe mechanical safety device, such as a flagged, removable shear pin or load lowering brake, should be utilized) to prevent inadvertent load unspooling or release during any extended flight phase that involves HEC and in which hoist or winch operation is not intended.

### SECTION 12-2.3: ROTORCRAFT

The rotorcraft shall be certified by the FAA, or applicable regulatory authority, and carry proof of same by display of the registration certificate, airworthiness certificate, and rotorcraft load combination operation and flight manual.

### SECTION 12-2.4: SLINGS

Sling strengths and configurations per ASME B30.9 do not apply because of the different dynamic load conditions present in flight operations versus ground-based lifting equipment. Sling strengths should be determined by the method given in para. 12-2.4.3. However, in no case shall a design factor of less than 2.5 limit load factor be used for NHEC applications or less than a 3.0 design factor be used on the yield strength of the weakest component in the QRS, PCDS, and attachments for HEC applications.

#### 12-2.4.1 Types of Slings

The types of slings considered are as follows:

- (a) vertical hitch (see Fig. 3)
- (b) two leg (see Fig. 4)
- (c) three leg (see Fig. 5)

Fig. 3 Vertical Hitch

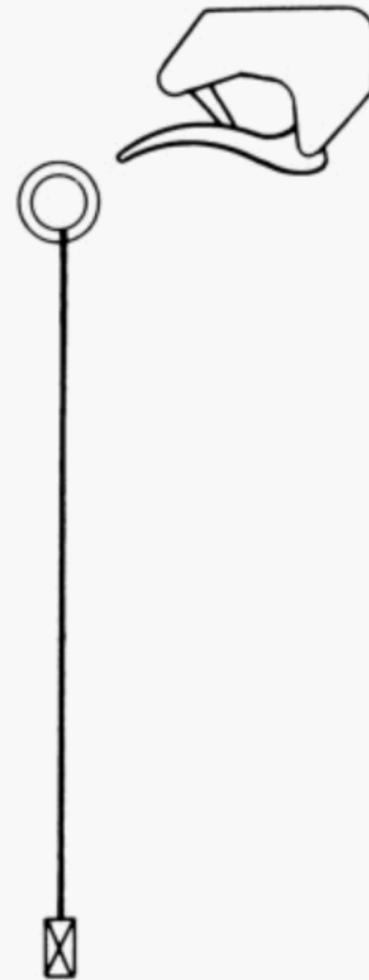


Fig. 4 Two-Leg Sling

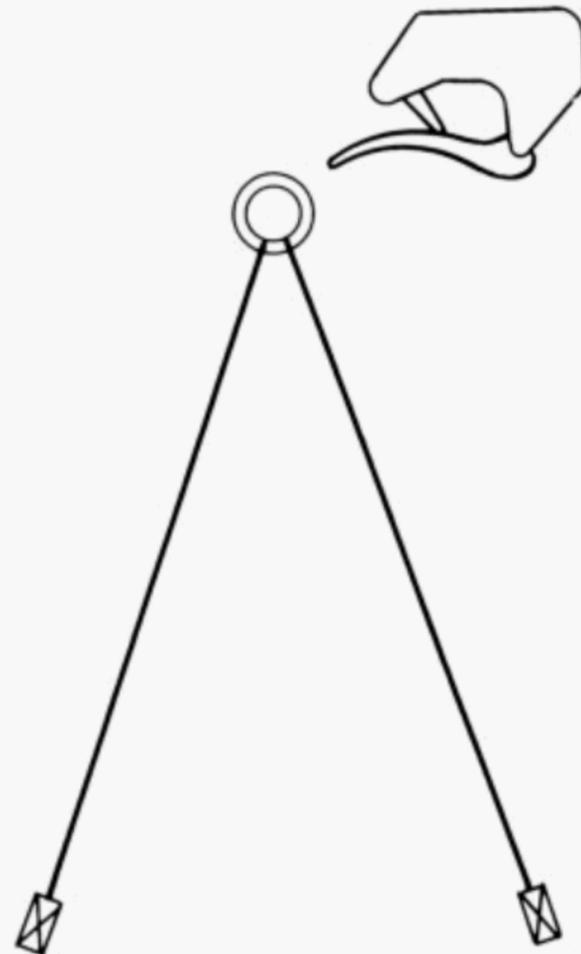


Fig. 5 Three-Leg Sling

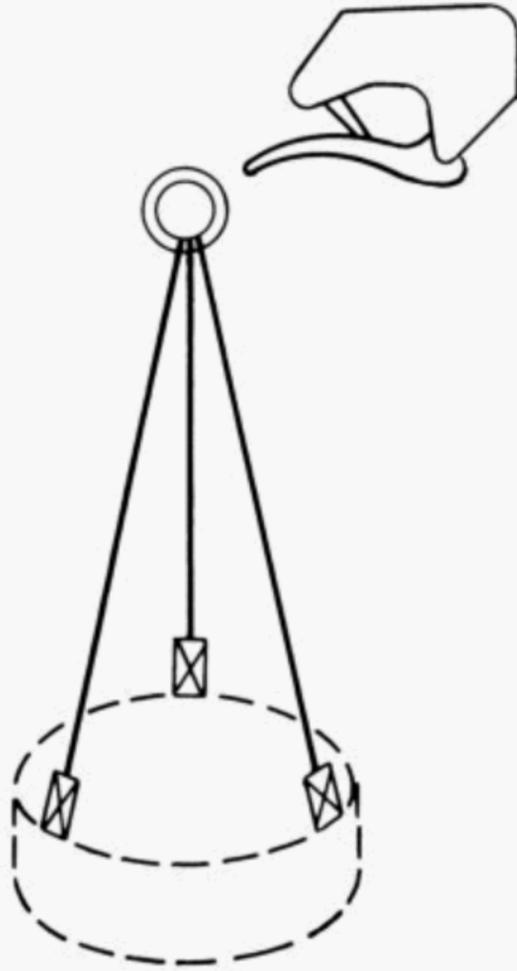
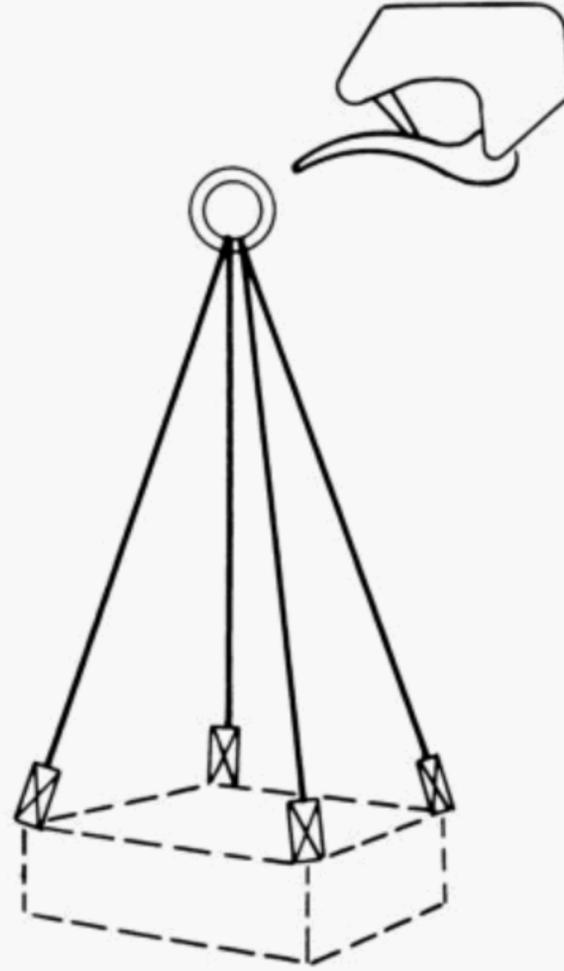


Fig. 6 Four-Leg Sling



- (d) four leg (see Fig. 6)
- (e) two-leg spreader (see Fig. 7)
- (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 should be used to determine the breaking strength,  $S$ , of each leg of the sling.

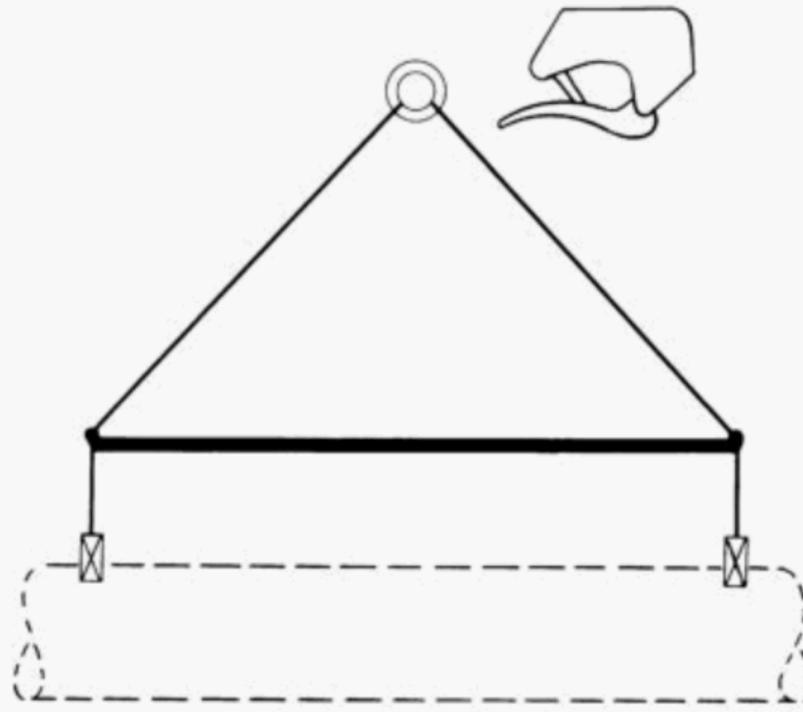
(b) *Two-Leg Spreader Sling.* The sling portion of a two-leg spreader assembly shall have the same strength requirements as a two-leg sling. In addition, the bar itself must take compressive forces along its axis equal to those imposed by the breaking strength of the sling legs.

(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.

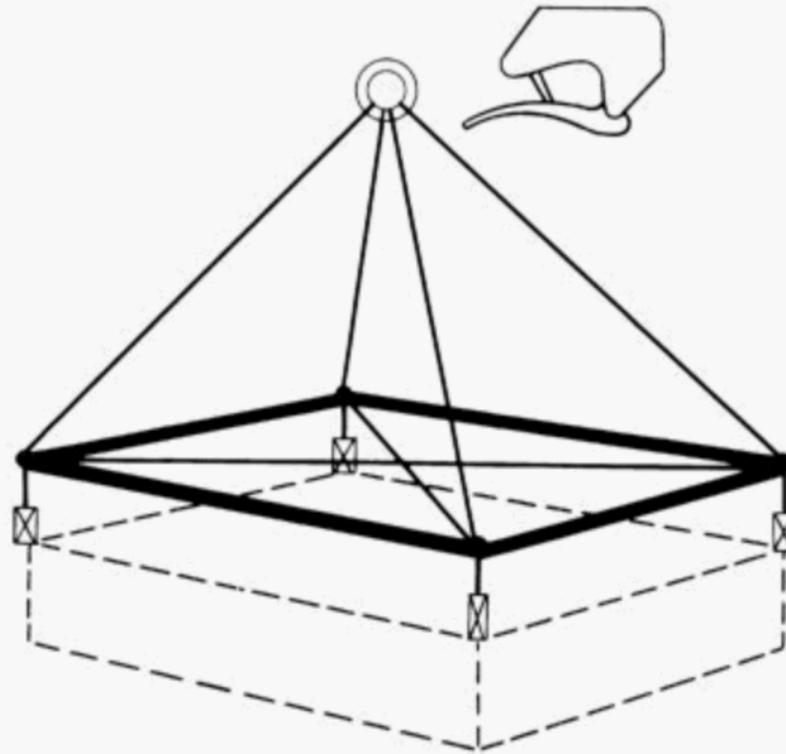
(d) *Length of Sling Legs.* The length of sling legs shall be such that no sling leg makes an angle from the vertical greater than 45 deg.

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

**Fig. 7 Two-Leg Spreader Sling**



**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

**GENERAL NOTES:**

- (a) This Table also applies to the primary lifting rope of a hoist.
- (b)  $S$  = breaking strength of each leg
- (c)  $W$  = rated capacity of the entire sling (i.e., the maximum load that can be safely lifted by the sling assembly)

## Chapter 12-3

# Inspection and Maintenance

### SECTION 12-3.1: ROTORCRAFT INSPECTION AND MAINTENANCE

Rotorcraft shall be inspected, operated, and maintained in accordance with the rotorcraft manufacturer's maintenance and flight manuals, the operator's approved maintenance practices and procedures, and the requirements of the FAA or other applicable regulatory authority.

### SECTION 12-3.2: PRIMARY HOOK(S) AND ATTACHING MEANS 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(s) and attaching means being used pass the following minimum requirements, they shall not be used:

- (a) Check hook attachments for correct connections.
- (b) Verify operation and integrity of both hook(s) primary quick-release system (PQRS) and backup quick-release system (BQRS).
- (c) Check electrical connectors and wiring.
- (d) Check the load beam for binding.
- (e) Visually check the load beam and hook frame members for cracks, gouges, distortion, wear, and latch engagement.
- (f) Test all other backup release equipment, as applicable.
- (g) Check suspension members, if used, for proper alignment.
- (h) Check the primary hook(s) suspension ropes for broken wires and overall condition.

#### 12-3.2.2 Maintenance

The primary hook(s) and support system shall be maintained, serviced, 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, or other regulatory directives and the manufacturer's recommendations as described in their operation and maintenance manuals, as well as the requirements of ASME B30.16.

### SECTION 12-3.4: SLING INSPECTION, REPLACEMENT, AND MAINTENANCE

#### 12-3.4.1 Sling Inspection

All ropes (including synthetic) or chain used for slings (pendants) shall be visually inspected by a qualified person each working day they are used. Evidence of deterioration, such as described in the applicable sections of ASME B30.9, which could result in appreciable loss of original strength, shall be carefully noted and a determination made by a qualified person as to whether or not future use would constitute a hazard.

- (a) Section 9-1.9 of ASME B30.9 should be followed for the inspection of chain.
- (b) Section 9-2.9 of ASME B30.9 should be followed for inspection of wire rope slings.
- (c) Section 9-4.9 of ASME B30.9 should be followed for inspection of synthetic fiber slings.
- (d) Section 9-5.9 of ASME B30.9 should be followed for inspection of synthetic webbing slings.
- (e) Section 9-6.9 of ASME B30.9 should be followed for the inspection of synthetic roundslings.
- (f) Synthetic slings should be stored in such a manner as to prevent damage and deterioration.

#### 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 could scrape, nick, crush, or induce sharp bends.

# Chapter 12-4

## Operations

### SECTION 12-4.1: PILOTS AND CREW

#### 12-4.1.1 Pilots

Rotorcraft used for commercial external load operations shall be operated by any one of the following personnel:

- (a) pilot-in-command
- (b) copilot
- (c) rotorcraft pilot(s) who holds a current commercial or airline transport certificate, or equivalent, with a rating appropriate for the rotorcraft or accompanied by a company-designated instructor or check pilot with the appropriate external load operation qualifications

#### 12-4.1.2 Crew

No one, other than the personnel designated in Section 12-4.1, shall be carried or otherwise enter the rotorcraft during rotorcraft external load operations unless that person

- (a) is a flight crew member
- (b) is a flight crew member trainee
- (c) performs an essential function in connection with the external load operation or
- (d) is necessary to accomplish the work activity directly associated with that operation

The pilot-in-command shall ensure that all persons are briefed before takeoff on all pertinent procedures to be followed, including normal, abnormal, and emergency procedures, and equipment to be used during the external load operation.

### SECTION 12-4.2: PILOT QUALIFICATIONS

#### 12-4.2.1 General Qualification

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

#### 12-4.2.2 Load-Handling Qualification

Pilots shall be qualified in both the class and type of rotorcraft utilized to perform the external load combination. This qualification shall be so recorded or otherwise documented as a letter of competency or an appropriate log book entry in the pilot's log book.

#### 12-4.2.3 External Load Qualification

Instructor pilots, regardless of rating, shall have both demonstrated and documented appropriate external load operation experience.

### SECTION 12-4.3: SIGNALPERSON QUALIFICATIONS AND RESPONSIBILITIES

#### 12-4.3.1 Precision Lifts

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

#### 12-4.3.2 General Lifts

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

#### 12-4.3.3 Radio Communication

If ground-to-air radios are used, the signalperson(s) shall be

- (a) able to communicate without undue interference from the rotorcraft
- (b) knowledgeable with applicable radio operation, phraseology, and Federal Communications Commission Regulations

#### 12-4.3.4 Hand Signals

Signalpersons shall be knowledgeable in the use of hand signals depicted in Fig. 9.

#### 12-4.3.5 Rigging and Emergency Procedures

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

#### 12-4.3.6 Responsibility

The signalperson(s) shall keep the pilot-in-command advised of any changed or otherwise unusual ground conditions, as well as ground-based and overhead obstacles, while directing the rotorcraft.

Fig. 9 Helicopter Hand Signals



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



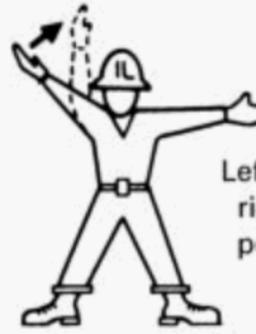
Combination of arm and hand movement in a collecting motion pulling toward body

Move Forward



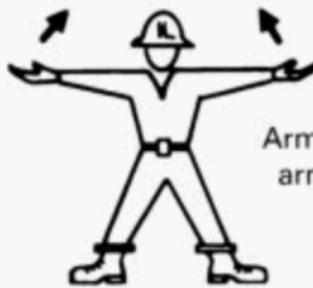
Right arm extended horizontally, left arm sweeps upward to position overhead

Move Left



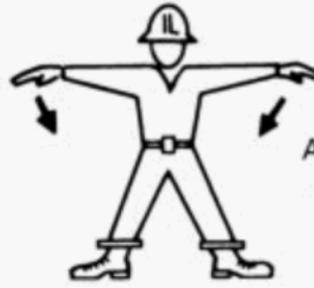
Left arm extended horizontally, right arm sweeps upward to position over head

Move Right



Arms extended, palms up, arms sweeping up

Move Upward



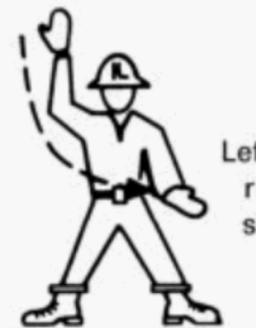
Arms extended, palms down, arms sweeping down

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

## SECTION 12-4.4: OPERATING PRACTICES

### 12-4.4.1 Preflight Inspection

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

### 12-4.4.2 Logs

The pilot-in-command shall make certain that the rotorcraft airframe and engine(s) log books reflect the status of the rotorcraft and that the aircraft is designated as airworthy. This person shall make certain that all applicable certificates and placards are with the rotorcraft.

### 12-4.4.3 Operational Test

Prior to any external load 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 rotorcraft/load combination and location of its center of gravity are within approved limits.

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

(c) Make an initial liftoff, and while hovering the rotorcraft, verify that directional control of the rotorcraft/load combination is within acceptable limits.

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

(e) In forward flight, check for hazardous oscillations of the external load, but if the external load is not visible to the pilot, other crew members or ground personnel may make this check and signal or otherwise notify the pilot.

(f) Increase the forward airspeed and determine an operational airspeed at which no hazardous oscillation or hazardous aerodynamic turbulence is encountered.

### 12-4.4.4 Plans

Where required by the FAR or other regulatory authority, rotorcraft external load operations planned over congested areas may be conducted if those operations are conducted without hazard to persons or property on the surface and comply with the following:

(a) The operator must develop a plan for each complete operation, coordinate this plan with the FAA Flight Standards District Office or applicable authority having jurisdiction over the area in which the operation will be conducted, and obtain approval for the operation from that district office or authority.

(b) The plan must include an agreement with the appropriate political subdivision that local officials will

exclude unauthorized persons from the area in which the operation will be conducted, coordination with air traffic control, if necessary, and a detailed chart depicting flight routes and altitudes.

(c) Each flight must be conducted at an altitude, and on a route, that will allow a jettisonable external load to be released, and the rotorcraft landed, in an emergency without hazards to persons or property on the surface.

### 12-4.4.5 Personal Protective Equipment

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 should be dissipated with a grounding device before being touched by ground crews, or alternatively, rubber gloves should be worn by all ground crews touching the suspended load.

### 12-4.4.6 Hazard Surveillance

The pilot-in-command shall survey the operation(s) 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 the rotorcraft, persons, or property.

### 12-4.4.7 Rigging Authority

The pilot-in-command shall approve and be the final authority for all rigging procedures for the operation.

### 12-4.4.8 Work Area Clearance

The rotorcraft operator shall be responsible for making arrangements to restrain bystanders and other non-ground 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 Refueling

The rotorcraft operator shall be responsible for developing written refueling procedures for each type of rotorcraft operated. At a minimum, these practices shall be in accordance with the provisions set forth in Chapter 12-7. The rotorcraft crew shall be trained and responsible for conducting refueling practices in accordance with both the rotorcraft operator's written procedures as well as the provisions set forth in Chapter 12-7.

### 12-4.4.10 Suspending Operations

The pilot-in-command shall have the authority to 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 or external load difficult

(e) any ground-based or airborne debris becomes hazardous and could cause damage to the rotorcraft or cause injury to persons or property on the ground

(f) any caution or warning light(s) or other device(s) or gage(s) within the rotorcraft indicate possible mechanical problems

(g) actions or inaction on behalf of rotorcraft ground crews or others 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 suspected or otherwise sustained by rigging used for airlifting that could affect its use

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

#### 12-4.4.11 Evacuation

When rotorcraft operations include airlifting loads onto, or into, a building or building courtyard (congested area), all persons, except those working with the rotorcraft, shall be vacated along the flight path of the rotorcraft. Occupied structures along the path shall be evaluated by the rotorcraft operator as to whether or not the occupants within need to be vacated (see para. 12-4.4.4).

#### 12-4.4.12 Operating Near Electrical Power Lines

If possible, the owner of the lines or their authorized representative shall be notified of the operation, and, if necessary, the lines shall be deenergized. 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 increase of 1 kV.

EXCEPTION: These minimum clearances shall not apply to rotorcraft or NHEC or HEC loads specifically designed and intended for use in power line inspection, maintenance, and repair.

#### 12-4.4.13 Pre-Job Coordination: Pilot-in-Command and Signalperson(s)

Before any external load operations are conducted, the rotorcraft pilot-in-command and signal-person(s) shall confer and agree upon the following:

(a) the position (or placement) the signalperson will assume so the signalperson can readily observe the hook-up/setting ground crew and load for pickup or delivery and still be seen or heard by the pilot

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

(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 become ineffective or are lost between the pilot-in-command and signalperson(s)

(e) distinguishing clothes, high-visibility safety vests, or gloves to be worn by the appointed signalperson(s). Only these designated individuals shall be authorized to give hand signals to the pilot-in-command

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

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

#### 12-4.4.14 Pre-Job Coordination: Rotorcraft Operator and Contractor

Where applicable, the rotorcraft operator's representative and responsible contractor's representative shall have a pre-job conference or communication for the purposes of coordination. This conference or communication shall cover, as a minimum, the following:

(a) precautions to be in effect at the rotorcraft landing area, pickup area, route to be flown, and delivery (setting) area and arrangements for compliance with any other mutual requirements, including preparation, submission, and FAA or other regulatory approval of any required lift plan

(b) design, strength, and quantity 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 load, including lift points, size, and number of loads; and number of ground crews and personnel 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 the rotorcraft can hover while ground crews are working beneath it

(f) type and quantity of personal protective 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, dust, static electricity discharge, and gusty winds

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

(j) clearance of nonessential personnel from pickup site, setting site, and along the route of flight

(k) procedures for wetting down dusty and sandy areas

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

(m) provisions for determining wind direction

(n) if applicable, designated location for refueling the rotorcraft

#### 12-4.4.15 Pre-Job Coordination: Instructions to the Ground Crew

Instructions to ground crews directly participating in the operation shall be provided by the rotorcraft crew and include at least the following:

(a) Do not turn your back to the load. Know your position in relation to both the rotorcraft and load at all times.

(b) Avoid working directly under any suspended load, except when necessary to the operation.

(c) To avoid injury, avoid being caught between the load and rotorcraft. Keep hands clear and in view when steadying the load, and grasp rigging from the sides or top, not underneath or between, the rigging and load.

(d) Verify installation and operation of keepers on all rigging hooks.

(e) Verify proper application of all hooks used for rigging.

(f) Wear all required personal protective equipment. Make sure personal protective gear fits properly.

(g) When using tag lines, avoid entanglement; do not 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. Be aware of obstacles on the ground or deck that may cause you to trip or fall. Take special care on slippery and wet surfaces.

(i) Pull cinch lines on cargo nets and rigging tight to prevent any objects from falling when the load is airborne. Avoid sharp objects protruding from cargo nets.

(j) Be alert for loads with damaged lifting provisions or rigging. Notify the rotorcraft crew immediately if you see or otherwise suspect damaged rigging or lifting components.

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

(l) Verify that all sling legs are free of detrimental twists or knots.

(m) Hold hook up during load attachment, and, when possible, load detachment so it can be seen by the signalperson(s) and that it will not snag objects on the ground when the rotorcraft is moving.

(n) Always watch the rotorcraft, and be ready to move quickly out of the way in the event of an emergency. Know the emergency signals and procedures to be used and the need for rapid response.

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

(p) To prevent being pinned and injured, do not stand or work between the load and other objects.

(q) Stay clear of swinging cargo hooks, rigging, and cargo suspended from rotorcraft.

**Fig. 10 Personnel Approach/Departure Path (Level Ground)**



**Fig. 11 Personnel Approach/Departure Path (Sloping Ground)**



**Fig. 12 Personnel Approach/Departure With Tools**



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

#### 12-4.4.16 Transportation of Ground Crew

If ground crews are transported by rotorcraft, the pilot-in-command shall ensure that all persons are briefed before takeoff on the following minimum procedures to be followed:

(a) the use of seat belts and shoulder harnesses, if installed

(b) location of exits and means of opening doors

(c) location and use of fire extinguishers and emergency gear as applicable to the type of operation being performed, i.e., for overwater flights, ditching procedures, and the location and use of flotation equipment

(d) in-flight operating procedures, including normal, abnormal, and emergency procedures

(e) applicable smoking restrictions in the aircraft and while on the ground

(f) ingress and egress procedures appropriate to the terrain, i.e., to depart downhill if the landing site is on a hill and always walk around to the front of the rotorcraft, never to the rear (see Figs. 10 and 11)

(g) approach the rotorcraft from the side or the front, never out of the pilot's line of sight

(h) to avoid contact with the rotors by tools or other handheld equipment; be carried horizontally (see Fig. 12)

(i) hold firmly to hats and loose articles

**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 otherwise drawn into the rotor systems or aircraft engine(s) 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.

## Chapter 12-5 Handling the Load

### SECTION 12-5.1: HOOKING AND UNHOOKING LOADS

(a) All loads shall be inspected and lifting points identified before rigging.

(b) The ground crew has the responsibility of assuring that the cargo/load to be transported has been correctly prepared and rigged for external transport.

(c) When ground crews are required to work under hovering rotorcraft, means of access and egress shall be provided. Figure 13 depicts the areas that the ground crew should avoid while working with rotorcraft.

(d) The ground crew shall be equipped with and use personal protective equipment, e.g., hard hat with chin strap, goggles, and gloves.

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

(f) Signalpersons shall make certain that the load being lifted is free and positioned correctly and that the rigging has not become entangled.

### SECTION 12-5.2: TAG LINES

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

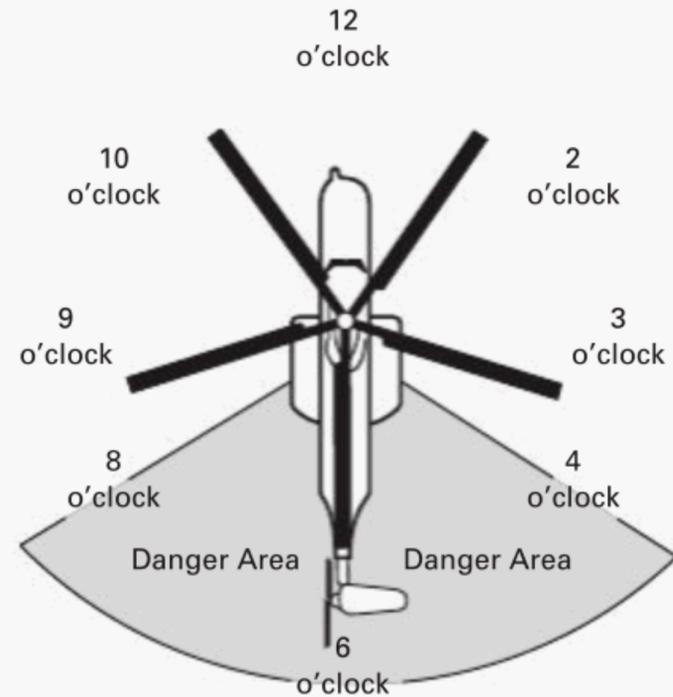
(b) Tag lines shall be free of knots and loops that might cause them to catch or snag persons or objects.

### SECTION 12-5.3: ATTACHMENT METHODS

Rotorcraft cargo hooks or other rotorcraft suspension systems should be attached to the suspended load by, but not limited to, one of the following:

- (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 rigging hardware that attach directly between the load and cargo hook
- (e) cargo nets

Fig. 13 Helicopter Station



## Chapter 12-6

# Signals and Communication

### SECTION 12-6.1: SIGNAL SYSTEMS

#### 12-6.1.1 General

There shall be constant reliable communications between the pilot-in-command and a designated member of the ground crew at each end of an external load operation while lifting operations are underway. Signal systems shall be agreed to, understood, and verified prior to each new operation or change of designated ground crew personnel or pilot-in-command.

#### 12-6.1.2 Hand Signal Communication

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 or, in the case of helicopter winch/hoist operations, requested of the winch/hoist operator.

#### 12-6.1.3 Signalperson Identification

The signalperson shall wear a garment that readily distinguishes themselves from a distance, to the pilot-in-command, as the signalperson.

#### 12-6.1.4 Radio Communication

The utilization of two-way radio communication between the ground crew and rotorcraft flight crew may be used in lieu of hand signals.

#### 12-6.1.5 Secondary Communication

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.

#### 12-6.1.6 Regulatory Requirements

Radio communications procedures shall comply with the requirements of the Federal Communications Commission (FCC), or other regulatory authority, and the rotorcraft operator's written procedures.

### SECTION 12-6.2: PERSONNEL

(a) Signalpersons shall be instructed by the rotorcraft operator in the proper use of hand signals.

(b) Signalpersons shall be instructed by the rotorcraft operator in the proper use of radio communications equipment and procedures if intended to be utilized.

(c) Signalpersons should be familiar with means and methods of determining wind direction at the landing area.

### SECTION 12-6.3: HUMAN EXTERNAL CARGO COMMUNICATIONS

For rotorcraft load combinations to be used for human external cargo applications, equipment shall be provided to allow for direct intercommunication among required crew members and external occupants.

## Chapter 12-7

# Fueling and Ground-Based Facilities at the Work Area

### SECTION 12-7.1: FUELING OPERATIONS

#### 12-7.1.1 Regulatory Requirements

Fueling operations, including storage and handling, shall comply with the airframe and engine manufacturer's recommendations and all applicable FAA or other regulatory standards. NFPA Standard No. 407, Aircraft Fuel Servicing, shall be used as a guide.

#### 12-7.1.2 Equipment

Fuel servicing equipment shall comply with the requirements of NFPA Standard No. 407 and be maintained in safe operating condition. Leaking or malfunctioning equipment shall be removed from service. Lighters or matches shall not be permitted on or in fueling equipment.

#### 12-7.1.3 Bonding

Prior to making any fueling connection to the aircraft, the fueling equipment shall be properly bonded to the aircraft by use of an approved bonding system.

#### 12-7.1.4 Ignition Hazards

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.

#### 12-7.1.5 Fire Extinguishers

During fueling operations, fire extinguishers shall be available at the work area landing zone. At least two listed extinguishers having a rating not less than 20-B:C each shall be provided. The extinguishers shall be located not more than 100 ft (30 m) from the aircraft and should be located upwind from the fueling operations. Extinguishers shall conform to the requirements of NFPA 10, Standard for Portable Fire Extinguishers.

### SECTION 12-7.2: PERSONNEL TRAINING

#### 12-7.2.1 Fueling Training

Only authorized personnel trained in the safe operation of the equipment they use, including the operation of emergency controls and procedures, shall fuel the aircraft.

#### 12-7.2.2 Fire Training

Fuel servicing personnel shall be trained in the use of the available fire extinguishing equipment they might be expected to use.

#### 12-7.2.3 Ignition Hazards

Refueling personnel shall not carry lighters or matches on their person.

### SECTION 12-7.3: GROUND-BASED FACILITIES ARRANGEMENT

#### 12-7.3.1 Clearances

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

#### 12-7.3.2 Grades

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

#### 12-7.3.3 Wind Indicator

A wind indicator or other means of determining wind direction shall be available at or near the landing site.

#### 12-7.3.4 Wheel Chocks

All wheel-type landing gear rotorcraft shall be chocked while unattended on the ground or other supported area.

#### 12-7.3.5 Warning Signs

The following warning signs or equivalent information shall be posted:

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

#### 12-7.3.6 Dust Control

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

#### 12-7.3.7 Debris

Efforts shall be made to clear the landing site of loose trash, debris, or other materials that may otherwise create a hazard due to rotor downwash.



## ASME Services

ASME is committed to developing and delivering technical information. At ASME's Information Central, we make every effort to answer your questions and expedite your orders. Our representatives are ready to assist you in the following areas:

ASME Press  
Codes & Standards  
Credit Card Orders  
IMEchE Publications  
Meetings & Conferences  
Member Dues Status

Member Services & Benefits  
Other ASME Programs  
Payment Inquiries  
Professional Development  
Short Courses  
Publications

Public Information  
Self-Study Courses  
Shipping Information  
Subscriptions/Journals/Magazines  
Symposia Volumes  
Technical Papers

### How can you reach us? It's easier than ever!

There are four options for making inquiries\* or placing orders. Simply mail, phone, fax, or E-mail us and an Information Central representative will handle your request.

*Mail*  
**ASME**  
22 Law Drive, Box 2900  
Fairfield, New Jersey  
07007-2900

*Call Toll Free*  
**US & Canada:** 800-THE-ASME  
(800-843-2763)  
**Mexico:** 95-800-THE-ASME  
(95-800-843-2763)  
**Universal:** 973-882-1167

*Fax—24 hours*  
973-882-1717  
973-882-5155

*E-Mail—24 hours*  
Infocentral@asme.org

\* Information Central staff are not permitted to answer inquiries about the technical content of this code or standard. Information as to whether or not technical inquiries are issued to this code or standard is shown on the copyright page. All technical inquiries must be submitted in writing to the staff secretary. Additional procedures for inquiries may be listed within.



# ASME B30.12-2006

www.asme.org

ISBN 0-7918-3032-2



9 780791 83032 1



J04706