

ASME B30.7-2011
(Revision of ASME B30.7-2006)

Winches

**(Formerly Titled Base-Mounted
Drum Hoists)**

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

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

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Mechanical Engineers**

Three Park Avenue • New York, NY • 10016 USA

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The next edition of this Standard is scheduled for publication in 2016. This Standard will become effective 1 year after the Date of Issuance. 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://cstools.asme.org> as they are issued, and will also be included with each edition.

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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 (ANSI) (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 at the annual meeting of 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 Volumes (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 ASME and accredited by ANSI.

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 of the B30 Standard Introduction, 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 2011 Edition of B30.7 is a complete rewrite of the Standard, and the title has changed from *Base-Mounted Drum Hoists* to *Winches*. Revisions were made to reflect current technology and terminology; this revision now addresses both vertical lifting and horizontal pulling applications. In

addition, changes have been made to update Chapters 7-2 and 7-3 to be more consistent with other B30 volumes.

This Volume of the Standard, which was approved by the B30 Committee and by ASME, was approved by ANSI and designated an American National Standard on June 28, 2011.

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ASME B30 COMMITTEE

Safety Standard 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.)

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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, Industrial Rollers, Air Casters, and Hydraulic Gantries
- B30.2 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
- B30.3 Tower Cranes
- B30.4 Portal and Pedestal Cranes
- B30.5 Mobile and Locomotive Cranes
- B30.6 Derricks
- B30.7 Winches
- 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
(withdrawn 1982 — requirements found in latest revision 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
- B30.25 Scrap and Material Handlers
- B30.26 Rigging Hardware
- B30.27 Material Placement Systems
- B30.28 Balance Lifting Units
- B30.29 Self-Erect Tower Cranes¹

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.

¹ This volume is currently in the development process.

SECTION V: EFFECTIVE DATE

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

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 U.S. Customary units are to be regarded as the standard. The SI units are a direct (soft) conversion from the U.S. 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

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

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.

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ASME B30.7-2011

SUMMARY OF CHANGES

Following approval by the ASME B30 Committee and ASME, and after public review, ASME B30.7-2011 was approved by the American National Standards Institute on June 28, 2011.

This Volume has been revised in its entirety.

SPECIAL NOTE:

The interpretations to ASME B30.7 are included in this edition as a separate section for the user's convenience.

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WINCHES

Chapter 7-0 Scope, Definitions, and References

SECTION 7-0.1: SCOPE OF B30.7

The B30.7 Volume includes provisions that apply to the construction, installation, operation, inspection, testing, and maintenance of winches arranged for mounting on a foundation or other supporting structure for moving loads. Winches addressed in this Volume are those typically used in industrial, construction, and maritime applications. The requirements included in this Volume apply to winches that are powered by internal combustion engines, electric motors, compressed air, or hydraulics, and that utilize drums and rope.

This Volume does not apply to overhead hoists, mine hoists, or winches installed as an integral part of the lifting system of other B30 equipment. Also excluded are winches used with

- (a) all-terrain-type recreational vehicles
- (b) drill rig relocation trucks
- (c) tow trucks
- (d) vehicle recovery units
- (e) boat trailers
- (f) amusement park rides
- (g) excavating equipment
- (h) equipment covered by ANSI A10, A17, A90, A92, A120, B20, B56, and B77 Standards
- (i) free-fall applications such as pile driving

Provisions of this Volume do not apply to the movement of personnel.

SECTION 7-0.2: DEFINITIONS

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

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

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

base: the mounting flanges or feet for attachment of a winch to its supporting structure or foundation.

brake: a device used for retarding or stopping motion.

capstan (winch head): a rotatable cylindrical drum with curved end flanges used for load handling by means of fiber rope with hand tension applied to the free end of the fiber rope.

clutch: a means for engagement or disengagement of power.

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

drum: the cylindrical member around which rope is wound for moving the load.

exposed: describes hazards not guarded or isolated (capable of being contacted inadvertently).

final stage manufacturer: an entity that assembles, installs, or permanently affixes a winch to complete a load movement system.

jaw clutch: a clutch composed of two hubs with jaws that engage each other. This type of clutch is either engaged or disengaged and cannot slip.

lifting/lowering: vertical movement of a freely suspended load by a winch.

limit device: a device that is activated by some part or motion of a winch to stop drum rotation.

minimum breaking force: the minimum load at which a new and unused wire rope will break when loaded to destruction in tension.

operating conditions, normal: conditions during which a winch is performing functions within the scope of its original design.

pawl (dog): a device for positively holding machinery against undesired motion.

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.

ratchet: a toothed component for engagement with the pawl.

rated line pull: the manufacturer's recommended load in pounds (kilograms) applied to the rope attachment on the winch drum.

rated load: winch rating in pounds (kilograms) established by the manufacturer in accordance with Section 7-1.1.

rope: refers to wire rope unless otherwise specified.

rotation-resistant rope: a wire rope consisting of an inner layer of strands laid in one direction covered by a layer of strands laid in the opposite direction; this has the effect of counteracting torque by reducing the tendency of the finished rope to rotate.

service, heavy: service that involves operation within the rated load limit but that exceeds normal service.

service, normal: distributed service that involves operation with randomly distributed loads within the rated load limit, or uniform loads less than 65% of rated load for not more than 25% of the time.

service, severe: service that involves normal or heavy service with abnormal conditions.

spooling: winding of rope on a cylindrical drum in evenly spaced wraps and uniform layers.

standby winch: a winch not in regular service but used occasionally or intermittently as required.

swinger drum: a drum that has a wire rope connection point at each flange to allow an overwind and underwind operation. When the rope is wrapped around a derrick bull wheel, it is used to slew or swing the derrick.

switch: a device for making, breaking, or changing the connections in an electric, hydraulic, or pneumatic circuit (valve).

winch: a power-driven drum(s) that when attached to a load is capable of moving the load. See Figs. 7-0.2-1 through 7-0.2-4.

SECTION 7-0.3: REFERENCES TO OTHER CODES AND STANDARDS

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

ANSI/ASSE Z244.1-2003 (R2008), Control of Hazardous Energy — Lockout/Tagout and Alternative Methods¹
 Publisher: The American Society of Safety Engineers (ASSE), 1800 East Oakton Street, Des Plaines, IL 60018 (www.asse.org)

ANSI/AWS D14.3/D14.3M-2006, Specification for Welding Earthmoving and Construction Equipment¹
 Publisher: American Welding Society (AWS), 550 NW LeJeune Road, Miami, FL 33126 (www.aws.org)

ASME B30.10-2005, Hooks

ASME B30.20-2006, Below-the-Hook Lifting Devices

ASME B30.26-2004, Rigging Hardware

Publisher: The American Society of Mechanical Engineers (ASME), Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

¹ May also be obtained from American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036 (www.ansi.org).

Fig. 7-0.2-1 Single-Drum Winch

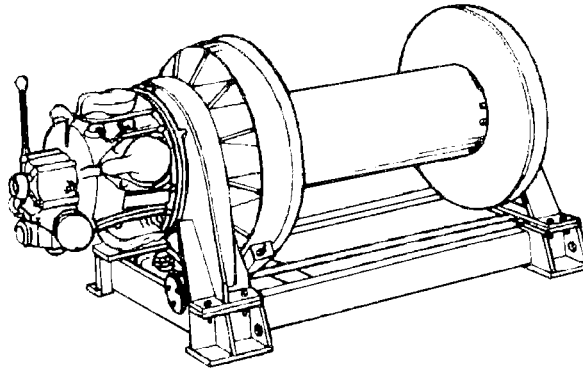


Fig. 7-0.2-2 Three-Drum Winch With Attached Swinger

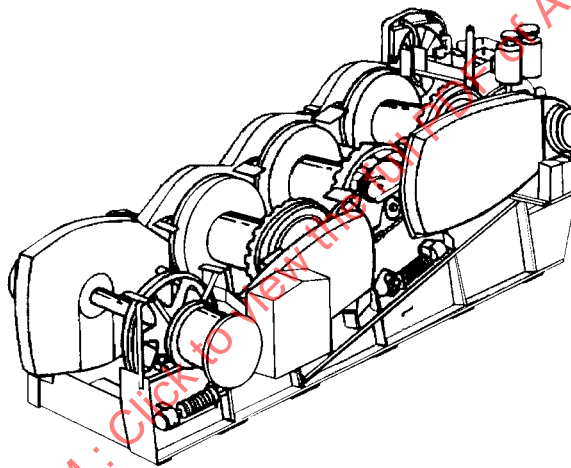


Fig. 7-0.2-3 Winch With Capstan

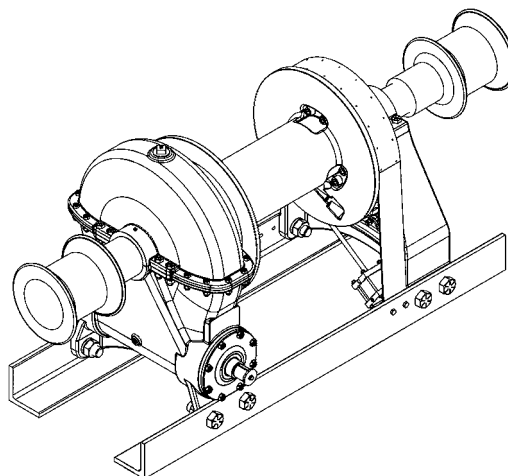
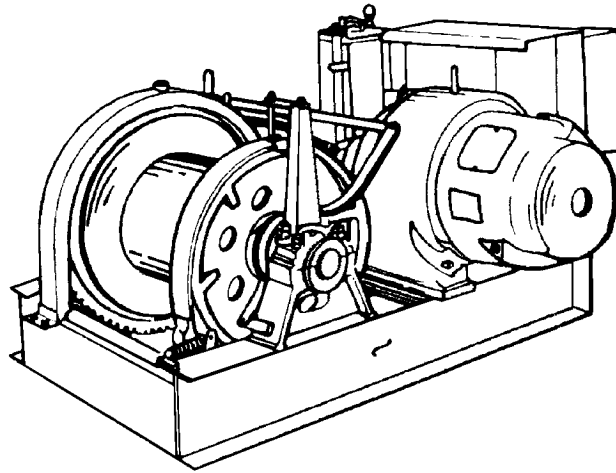


Fig. 7-0.2-4 Independent Direct Geared Swinger or Single-Drum Winch



Chapter 7-1

Construction and Installation

SECTION 7-1.1: RATINGS AND MARKINGS

7-1.1.1 Basis

Winch ratings are dependent upon such factors as applied power, layers of rope wound on the drum, rope diameter and minimum breaking force, drum size, and structural competence of the various winch components and mounting methods.

7-1.1.2 Winch Ratings

Winch ratings shall be the manufacturer's recommended total line pull in pounds (kilograms) at a specified rate of speed on a given size drum and prescribed number of layers of rope.

7-1.1.3 Markings

Winches shall be marked with the following identifications for each drum:

- (a) winch rating
- (b) drum size consisting of barrel diameter, barrel length, and flange diameter
- (c) rope diameter(s)
- (d) rope speed in feet per minute (meters per second) at rated load on specified layer
- (e) power requirement

7-1.1.4 Rope Layer Ratings

The manufacturer shall provide line pull ratings for each rope layer and a specified rope diameter.

SECTION 7-1.2: CONSTRUCTION

7-1.2.1 General

Winches shall be designed and constructed to meet the stresses imposed on their frames and components under all anticipated operating conditions when properly installed and when handling loads not exceeding the manufacturer's ratings. Welding shall conform to recommended practices of ANSI/AWS D14.3.

7-1.2.2 Winch Mechanisms

(a) Winches shall be provided with the power, cooling, and operational characteristics to perform all winch functions.

(b) The rope shall be anchored to the drum in a manner approved by the winch manufacturer. The anchorage shall hold the rated line pull with no less than two full wraps on the drum.

(c) Drum flanges shall extend a minimum of one-half rope diameter, but not less than 0.5 in. (13 mm) above the top layer of rope during operation.

(d) Diameter of the drum shall provide first layer rope pitch diameter of not less than 15 times the nominal diameter of the rope. Winch lines of material other than wire rope may require a different D/d ratio, based on the recommendation of the winch line manufacturer or a qualified person.

(e) Winches that hold loads while the winch is unattended shall be equipped with a mechanical holding device, other than a brake, capable of holding the rated load.

7-1.2.3 Brakes

(a) Each winch shall be equipped with at least one brake capable of holding not less than 125% of the rated load at the point where the brake is applied.

(b) Remote-operated winches shall be equipped with a self-setting brake.

(c) Foot-operated brakes, if provided, should be constructed so that the operator's foot, when in position, will not slip off the pedal.

(d) Winches designed to allow simultaneous underwind and overwind shall have a brake capable of holding 125% of the rated load in those directions.

(e) A means shall be provided for controlling the drum speed when moving the load.

(f) Braking systems shall have provision for adjustments where necessary to compensate for wear.

7-1.2.4 Guards

(a) Exposed moving parts, such as gears, projecting set screws, projecting keys, chains, chain sprockets, and reciprocating or rotating parts, that might constitute a hazard under normal operating conditions shall be guarded.

(b) Guards shall be capable of supporting, without permanent distortion, the weight of a 200 lb (90 kg) person unless the guard is located where it is unlikely that a person will step on it.

7-1.2.5 Ropes

(a) Ropes shall be of a size, minimum breaking force, and construction to withstand the loads imposed.

(b) Ropes of other materials shall be used only with the winch and rope manufacturer's or qualified person's recommendation.

(c) Ropes shall be of a length to allow for the entire range of movement specified for the application, with no less than two full wraps of rope on the drum at all times.

(d) The design factor for ropes, except rotation-resistant ropes, shall be not less than 3.5. The design factor for rotation-resistant ropes shall be not less than 5. [Design factor of 5 or greater for rotation-resistant ropes may be modified by the winch user by complying with the provisions of para. 7-3.2.2(c).]

(e) The design factors shall be determined on the basis of the published minimum breaking force of the rope.

(f) When exposed to temperatures at which fiber cores could be damaged, rope having an independent wire rope or wire-stand (strand) core, or other temperature-damage-resistant core shall be used.

7-1.2.6 Winch Controls

(a) All controls shall be marked for identification of function and direction of the drum rotation.

(b) All winch controls used during the normal operating conditions shall be located within reach of the operator while at the operator's station.

(c) Electric motor-driven winches shall be provided with a device that will disconnect all motors from the power source in event of a power failure, and will not permit any motor to be restarted until the controller handle is brought to the off position or a reset switch or button is operated.

(d) Remote-operated winches shall function so that if the control signal for any winch motion becomes ineffective, that winch motion shall stop.

(e) All prime mover controls shall return to neutral when released.

7-1.2.7 Control Forces and Movements

When a winch is operated within the manufacturer's ratings, the following shall apply under normal operation:

(a) forces not greater than 35 lb (156 N) on hand levers and forces not greater than 50 lb (222 N) or less than 8 lb (36 N) on foot pedals

(b) travel distance on hand levers not greater than 14 in. (356 mm) from neutral position on two-way levers,

and not greater than 24 in. (610 mm) on one way levers; travel distance on foot pedals not greater than 10 in. (254 mm)

7-1.2.8 Engine Clutch

Engine-driven winches shall be provided with a clutch for disengaging power to the winch. The clutch control shall be within reach from the operator's station.

7-1.2.9 Jaw Clutch

If a jaw clutch is installed, it shall not be possible to disengage the clutch while the winch is under load.

7-1.2.10 Electric Resistors

(a) Resistor units, if used, shall be supported to minimize vibration effect.

(b) Provision shall be made to prevent broken parts or molten metal from falling from the winch.

(c) If resistor enclosures are provided, the enclosures shall be installed to prevent the accumulation of combustible matter.

7-1.2.11 Switches

On electric-powered winches, a circuit switch or circuit breaker of the enclosed type with provisions for locking in open position shall be provided in the main power supply for the motor. These enclosures shall be suitable for the environment where they are installed.

7-1.2.12 Lubrication

Lubricating points should be accessible without the necessity of removing guards or other parts.

SECTION 7-1.3: INSTALLATION

7-1.3.1 Attachments and Anchorages

Winch attachments and anchorages are the responsibility of the user and shall be designed by a qualified person.

7-1.3.2 Installation Location of Winches

Winches shall be installed in a manner that allows proper rope spooling on the drums.

Chapter 7-2

Inspection, Testing, and Maintenance

SECTION 7-2.1: INSPECTION

7-2.1.1 General

There are five types of inspections

- (a) initial inspection and test
- (b) daily inspection and functional test
- (c) frequent inspection
- (d) periodic inspection
- (e) inspection of equipment not in regular use

7-2.1.2 Initial Inspection and Test

(a) An initial inspection and test is a visual and audible examination of the winch and the supporting structure conducted by a designated person to verify compliance with the applicable provisions of Chapter 7-1.

(b) Prior to use, new, altered, repaired, and modified winches and supporting structures shall be inspected by a designated person.

(c) Inspection of altered, repaired, and modified winches may be limited to the parts of the winch or supporting structure affected by the alteration, repair, or modification, as determined by a qualified person.

(d) The winch shall be tested in accordance with the requirements of Section 7-2.2.

(e) Prior to use, adjustments and repairs necessary to satisfy the requirements of this section shall be made in accordance with para. 7-2.3.3.

(f) The initial inspection shall include any additional items specified by the manufacturer or a qualified person.

(g) The initial inspection of a new winch shall be documented as the first periodic inspection. See para. 7-2.1.5(f).

7-2.1.3 Daily Inspection and Test

(a) A daily inspection and operational test is a visual and audible examination of the equipment conducted by a designated person each day the winch is used. As a minimum the following items shall be inspected and tested:

- (1) control mechanisms for proper operation
- (2) limit devices for proper operation
- (3) deterioration or leakage in air or hydraulic systems
- (4) ropes for excessive wear, damage, or distortion
- (5) indication of loose, damaged, or missing structural components including supports and anchorages

(6) any additional items specified by the manufacturer or a qualified person

(b) Prior to use, any adjustments, repairs, or replacements required shall be accomplished in accordance with para. 7-2.3.3.

(c) Written records are not required for daily inspections.

7-2.1.4 Frequent Inspection

(a) A frequent inspection is a visual and audible examination of the equipment conducted by a designated person.

(b) Equipment shall be inspected at intervals determined by a qualified person. The inspection intervals shall be based on the following types of service:

- (1) normal service — monthly
- (2) heavy service — weekly to monthly
- (3) severe service — daily to weekly
- (c) As a minimum, the following items shall be inspected:
 - (1) items described in para. 7-2.1.3
 - (2) electrical apparatus for
 - (a) malfunctioning
 - (b) signs of excessive deterioration
 - (c) dirt and moisture accumulation
 - (3) control and drive mechanisms for
 - (a) improper adjustment
 - (b) excessive wear
 - (4) tubing, piping, electrical cables, or hoses and their fittings for damage
 - (5) markings, warnings, and instructions that are illegible or missing
 - (6) fluids for adequate condition and supply
 - (7) gear boxes and lubrication systems for
 - (a) oil levels
 - (b) clogged filters
 - (8) hydraulic oil reservoir for proper level(s)
 - (9) ropes (see para. 7-2.4.1 for further guidance) for
 - (a) distortion such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion
 - (b) corrosion or pitting
 - (c) number, distribution, and type of visible broken wires
 - (d) rope end securement and fittings at the working end for

(1) hooks, if used, in accordance with ASME B30.10

(2) rigging hardware, if used, in accordance with ASME B30.26

(3) custom devices, if used, in accordance with ASME B30.20

(10) winch lines of materials other than wire rope in accordance with the winch line manufacturer's requirements

(11) warning device's proper operation

(12) any additional items specified by the winch manufacturer

(d) A qualified person shall determine whether conditions found during the inspection require further evaluation or disassembly or constitute a hazard that requires the equipment to be taken out of service.

(e) Adjustments, repairs, or replacements shall be made, as necessary, in accordance with para. 7-2.3.3.

(f) Written records are not required for frequent inspections.

7-2.1.5 Periodic Inspection

(a) A periodic inspection and test is a visual and audible examination of the equipment conducted by a designated person.

(b) Equipment shall be inspected at intervals determined by a qualified person. The inspection intervals shall be based on the following types of service:

(1) normal service — 6 mo to 12 mo

(2) heavy service — 3 mo to 6 mo

(3) severe service — 1 mo to 3 mo

(c) A qualified person shall determine whether conditions found during the inspection require further evaluation or disassembly or constitute a hazard that requires the equipment to be taken out of service.

(d) As a minimum, the following items shall be inspected:

(1) items described in para. 7-2.1.4

(2) pins, bearings, shafts, gears, rollers, and locking and clamping devices for

(a) excessive wear

(b) cracking

(c) distortion

(d) corrosion

(3) brake and clutch system parts and linings for

(a) excessive wear

(b) severe distortion

(c) damage

(4) pawls and ratchets for

(a) excessive wear

(b) deformation

(5) chain and chain drive sprockets for

(a) excessive wear

(b) excessive chain stretch

(6) power source, if integral to winch, for

(a) improper performance

(b) noncompliance with manufacturer's requirements

(7) any additional items specified by the manufacturer or a qualified person

(e) Prior to use, adjustments, repairs, or replacements shall be made, as necessary, in accordance with para. 7-2.3.3.

(f) Written records of the most recent periodic inspection shall be maintained and shall include the condition of the winch.

7-2.1.6 Winches Not in Regular Service

(a) A standby winch or a winch that has been taken out of service and been idle for a period of one month or more, but less than 6 mo, shall be given a frequent inspection before being placed in service.

(b) A standby winch or a winch that has been taken out of service and been idle for a period of over 6 mo shall be given a periodic inspection before being put into service.

SECTION 7-2.2: TESTING

7-2.2.1 Operational Tests

(a) Operational testing shall be performed when required by paras. 7-2.1.2, 7-2.1.3, 7-2.1.4, and 7-2.1.5 to verify proper operation of the following:

(1) drum rotation

(2) clutches, brakes, and pawls

(3) limit devices and all other aids

(b) Tests shall be conducted under no-load conditions and from minimum to maximum speed as applicable.

7-2.2.2 Load Test

(a) All new winches shall be load tested by the final stage manufacturer. This load test shall be used to verify the integrity of the winch and mounting structure. The load test shall not be less than the load required to verify the maximum design performance criteria.

(1) The load shall not be less than 110% of the rated load nor more than 125% of the rated load, unless otherwise recommended by the manufacturer or a qualified person.

(2) The winch shall have a minimum of five wraps of rope on the drum during the load test.

(3) The load shall be applied to the winch and held by the winch brake(s).

(4) A written report of the test shall be prepared and placed on file by the final stage manufacturer.

(b) For altered, modified, or repaired winches a qualified person shall determine if a load test is required, and if so, the load test shall include the following as minimum requirements:

(1) The load shall not be less than 110% of the rated load nor more than 125% of the rated load, unless otherwise recommended by the manufacturer or a qualified person.

(2) The winch shall have a minimum of five wraps of rope on the drum during the load test.

(3) The load shall be applied to the winch and held by the winch brake(s).

(4) A written report of the test shall be prepared and placed on file by the final stage manufacturer.

SECTION 7-2.3: MAINTENANCE

7-2.3.1 Preventive Maintenance

A preventive maintenance program shall be established. The maintenance program shall be based on the winch manufacturer's or a qualified person's recommendations. Maintenance records should be made and available to appointed personnel.

7-2.3.2 Maintenance Procedure

(a) Before adjustments and repairs are started on a winch, the following precautions shall be taken:

(1) Requirements of ANSI/ASSE Z244.1 for lockout/tagout shall be met for the maintenance activity to be undertaken.

(2) Drum pawls shall be engaged, or other means shall be provided to prevent inadvertent rotation of the drum.

(b) After adjustments and repairs have been made, the winch shall not be returned to service until all guards have been reinstalled, limit devices reactivated, and maintenance equipment removed.

7-2.3.3 Adjustments and Repairs

(a) Adjustments and repairs shall be performed by a designated person in accordance with the instructions of the manufacturer or a qualified person.

(b) Replacement parts should be purchased from the original manufacturer or shall have qualities at least equal to the original parts.

7-2.3.4 Lubrication

(a) All moving parts of the winch for which lubrication is specified should be regularly lubricated. Lubricating systems should be checked for proper delivery of lubricant. Care should be taken to follow manufacturer's recommendations as to points and frequency of lubrication, maintenance of lubricant levels, and types of lubricant used.

(b) Unless equipped for automatic or remote lubrication, all rotating machinery should be stopped while lubricants are being applied.

SECTION 7-2.4: ROPE INSPECTION, REPLACEMENT, AND MAINTENANCE

7-2.4.1 Rope Inspection

(a) Prior to use, the rope(s) shall be visually inspected each working day. This inspection shall consist of observation of the rope that can be reasonably expected to be under load during the day's operation.

(b) An inspection of the ropes shall be made at least monthly and a dated report of rope condition kept on file where available to appointed personnel.

(c) All inspections shall be performed by a designated person.

(d) Special attention shall be given to rope sections that are normally hidden during visual inspection, such as sections passing over sheaves.

(e) Any condition resulting in appreciable loss of original strength shall be noted and a determination shall be made as to whether continued use of the rope would constitute a hazard, such as the following:

(1) reduction of rope diameter due to loss of core support or internal or external corrosion

(2) a number of broken outside wires and the degree of distribution or concentration of such broken wires

(3) worn outside wires

(4) corroded or broken wires at end connections

(5) corroded, cracked, bent, worn, or improperly applied end connections

(6) kinking, crushing, cutting, or unstranding

(f) All rope that has been idle for a period of a month or more shall be given a periodic inspection [see para. 7-2.4.1(e)] by a designated person before it is placed in service. A dated report of the condition shall be filed.

7-2.4.2 Rope Replacement

(a) No precise rules can be given for determination of the exact time for rope replacement, since many variable factors are involved. Once a rope reaches any one of the specified removal criteria, it may be allowed to operate to the end of the work shift, based on the judgment of a qualified person. The rope shall be replaced after that work shift, at the end of the day, or at the latest time prior to the equipment being used by the next work shift.

(b) Removal criteria for rope replacement shall be as follows:

(1) broken wires

(a) in running ropes, six randomly distributed broken wires in six rope diameters or three broken wires in one strand in six rope diameters.

(b) in rotation-resistant ropes, two randomly distributed broken wires in six rope diameters and four randomly distributed broken wires in 30 rope diameters. For special conditions relating to rotation-resistant rope, refer to para. 7-3.2.2(c).

(2) one outer wire broken at the point of contact with the core of the rope that has worked its way out of the rope structure and protrudes or loops out from the rope structure. Additional inspection of this section is required.

(3) independent wire rope core (IWRC) or strand core protrusion between the outer strands.

(4) kinking, crushing, birdcaging, or any other damage resulting in distortion of the rope structure.

(5) evidence of heat damage.

(6) reduction of rope diameter due to loss of core support or internal or external corrosion.

(7) reduction from nominal diameter of more than 5%.

(c) Deviation shall be allowed from the removal criteria listed in para. 7-2.4.2(b) only with the written approval of the manufacturer of the specific wire rope to which the deviation is applicable.

(d) In order to establish data as a basis of judging the proper time for replacement, a continuing inspection record should be maintained. This record shall cover points of deterioration listed in para. 7-2.4.1.

(e) Replacement rope shall be the same size, grade, and construction as the original rope furnished or recommended by the manufacturer, unless otherwise recommended by a rope manufacturer or a qualified person.

7-2.4.3 Rope Maintenance

(a) Rope should be stored to prevent damage or deterioration.

(b) Unreeling or uncoiling of rope shall be done as recommended by the rope manufacturer(s) or a qualified person and with care to avoid kinking or inducing a twist.

(c) Before cutting a rope, means shall be used to prevent unlaying of the strands.

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

(e) Rope should be maintained in a well lubricated condition as recommended by the rope manufacturer or a qualified person.

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Chapter 7-3 Operations

SECTION 7-3.1: QUALIFICATIONS AND CONDUCT OF OPERATORS

7-3.1.1 Operators

(a) Winches shall be operated only by the following personnel:

- (1) persons who have met the requirements of paras. 7-3.1.2(a) through (e)
- (2) trainees under the direct supervision of an operator
- (3) maintenance, inspection, and test personnel who have been trained to use the controls necessary in the performance of their duties
- (b) No one other than personnel specified in para. 7-3.1.1(a) shall enter a winch operator's cab or operating position with the exception of persons whose duty requires them to do so, and then only in the performance of their duties and with the knowledge of the operator or other appointed person.

7-3.1.2 Qualifications for Operators

(a) Operators shall be required by the employer to be trained and pass a written or oral examination and a practical operating examination unless able to furnish satisfactory evidence of qualifications and experience. Qualifications shall be limited to the specific type of equipment for which examined.

(1) Operator training shall include but not be limited to the following:

- (a) pre-operational inspection
- (b) operational controls
- (c) responses to emergencies
- (d) communications
- (e) manufacturer's recommendations
- (f) equipment limitations
- (g) general operating practices
- (h) setup
- (i) hazard recognition

(2) Operator training should include but not be limited to the following:

- (a) maintenance requirements
- (b) refueling and/or power supply
- (c) basic rigging
- (d) multiple winch lifts

(b) Operators and the operator trainees shall meet the following physical qualifications:

- (1) vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses

(2) ability to distinguish colors, regardless of position, if color differentiation is required for operation

(3) hearing, with or without hearing aid, must be adequate for the specific operation

(4) sufficient strength, endurance, agility, coordination, and speed of reaction to meet the demands of equipment operation

(c) Evidence of physical limitations or emotional instability that could render the operator a hazard to himself or others, or that in the opinion of the examiner could interfere with the operator's safe performance, may be cause for disqualification. In such cases, specialized clinical or medical judgments and tests may be required.

(d) Evidence that an operator is subject to seizures or loss of physical control shall be reason for disqualification. Specialized medical tests may be required to determine these conditions.

(e) Operators and operator trainees should have good depth perception, field of vision, reaction time, manual dexterity, and coordination, and should not be prone to dizziness or similar undesirable characteristics.

7-3.1.3 Conduct of Operators

(a) The operator shall not engage in any practice that might divert attention while actually engaged in operating the winch.

(b) When physically or mentally unfit, an operator shall not engage in the operation of the winch.

(c) The operator shall respond to signals only from an appointed signalperson. However, the operator shall obey a stop signal at all times, no matter who gives it.

(d) If the operator has any concerns regarding the requested movement of the winch or needs to communicate with the signalperson, the operator shall stop all winch movement. Winch movement shall not resume until the operator and the signalperson agree the issue at hand has been resolved.

(e) If it is desired to give instructions to the operator other than those provided by the established signal system, the winch movements shall be stopped.

(f) The operator shall be held responsible for those operations under his direct control. Whenever there is any doubt as to safety, the operator shall consult with the supervisor before handling the load(s).

(g) Before leaving the winch unattended, the operator shall

(1) land or stabilize any attached load, except as defined in para. 7-3.2.4.

(2) engage manual brake or locking devices in the absence of automatic holding equipment.

(3) put the controls in the off or neutral position.

(4) isolate the winch from the power supply, e.g., open circuit breaker, close shut off valve, disengage master clutch, stop engine, etc.

(h) The operator shall not close the switch or start operations if the winch has been locked out or tagged out of service.

(i) Before powering the winch, the operator shall ensure that all controls are in the off or neutral position, and all personnel are in the clear.

(j) If power fails during operations, the winch operator shall

(1) set all brakes or locking devices

(2) move all clutch or other power controls to the off or neutral position

(3) stabilize or land the load if practical

(k) The operator shall confirm that the daily inspection has been performed.

(l) When winch adjustments or repairs are necessary, the operator shall notify supervision.

7-3.1.4 Cautions to Personnel

(a) Personnel shall not be allowed to be on a winch load while it is moving.

(b) To avoid crushing or pinch points, personnel should not pass between the moving load and fixed obstructions.

(c) Personnel should not stand in line with, pass over, or pass near a load line that is under tension.

(d) Personnel shall not stand or pass under a suspended load.

(e) Personnel shall stand clear of any slack, loops, or curves while the rope is being tensioned.

(f) A designated person shall evaluate the load line paths and operating areas and establish suitable barricades and guards. Barricades or guarding shall be used where tensioned load lines cross through pedestrian or vehicle routes.

(g) Personnel shall not place any portion of their body on a winch line that is under tension.

(h) Personnel should not wear loose clothing around winch operations.

SECTION 7-3.2: OPERATING PRACTICES

7-3.2.1 Winch Selection

(a) The winch selected for handling a load shall be evaluated by a designated person prior to use to verify that it has the operational configuration and capability to perform the load handling operation.

(b) Items such as automatic brakes, operational interlocks, guards, and winch mountings shall be considered.

(c) If extreme temperatures or chemically active or abrasive environments are involved, the recommendations of the manufacturer or qualified person shall be considered.

7-3.2.2 Size of Load

(a) No winch shall be loaded beyond the rated line pull, except for testing.

(b) The combined load applied to more than one drum, including a capstan drum, shall not exceed the load ratings of the winch.

(c) When rotation-resistant ropes are used with an operating design factor less than 5, but in no case less than 3.5, the special provisions that follow shall apply:

(1) For each such load-moving operation

(a) a designated person shall direct each load moving operation

(b) a designated person shall ascertain that the rope is in satisfactory condition [paras. 7-2.4.1(a) through (e)] both before and after each load-moving operation, but more than one broken wire in any one lay shall be reason to consider not using the rope for such operations

(c) operations shall be conducted in such manner and at such speeds as to minimize dynamic effects

(2) Each load-moving operation under these provisions shall be recorded in the winch inspection record, and such prior uses shall be considered before permitting another such operation.

(d) Provisions of para. 7-3.2.2(c) are not intended to permit duty cycle or repetitive operation to be made with design factors less than 5.

7-3.2.3 Moving the Load

(a) Precautions shall be taken in winch operation to be certain that

(1) winch ropes do not become kinked when the rope is tensioned

(2) there is no sudden acceleration or deceleration of the winch rope

(3) the rope is seated properly on drums, in sheaves, and in rigging blocks

(4) entanglement with personnel or obstructions is avoided

(5) the wire rope is not damaged by contacting electrical conductors or obstructions that can cause cutting or severe abrasion

(6) the integrity of the winch or block connection points are capable of withstanding loads imposed by the winch under operating conditions

(b) A plan should be developed and communicated to affected personnel before the winch operation begins. The plan should include load movement procedures and communication methods.

(c) When a load approaching the rated load is to be moved, the brakes should be tested by lifting or moving the load a few inches and applying the brakes.

(d) A loaded winch drum shall not be rotated beyond the point where less than two wraps of rope remain on the drum.

(e) When loads are moved for long distances, the user should check the thermal capacity of the brakes and motors to ensure they have adequate capacity for the movement operation. Where maximum rated loads are being payed out for long distances and power-controlled lowering (payout) is used, additional cooling provisions should be considered for fluid transmissions or torque converters.

(f) The operator shall not disengage a jaw clutch when the winch is moving a load.

(g) Only persons meeting the requirements of para. 7-3.4.3 shall be allowed to signal winch operations.

7-3.2.4 Holding the Load

(a) The operator shall not leave the controls while the load line is under tension unless at least the following precautions have been taken:

(1) a pawl or other equivalent means, in addition to the brake is used to hold the load

(2) a designated person has established the requirements for securing the winch and furnishes notices, sets up barricades, and other precautions

(b) When winches are used as constant tensioning devices using anchor lines or similar securements, a designated person shall establish the requirements for braking, securing, furnishing notices, setting up barricades, or other precautions.

7-3.2.5 Use of a Capstan Drum

(a) The capstan drum shall not be used without the winch operator's knowledge.

(b) The operator shall be within reach of the engine disconnect clutch control lever or the power control lever while a capstan drum is being used.

7-3.2.6 Storage

(a) Winches should be stored in an area where they will not be subjected to damage.

(b) If extreme temperatures or chemically active or abrasive environments are involved, the following should be considered:

(1) *Temperature.* When winches are to be stored at temperatures above 140°F (60°C) or below -20°F (-29°C), the winch manufacturer or a qualified person should be consulted.

(2) *Chemically Active Environments.* The strength and operation of winches can be affected by chemically active environments such as caustic or acid substances or fumes. The winch manufacturer or a qualified person

should be consulted before winches are stored in chemically active environments.

(3) *Other Environments.* The internal workings of winches can be affected by excessive moisture, gravel or sand, silt, grit, or other dust-laden air. Winches subject to these environments should have their inner components frequently cleaned, inspected, and lubricated.

SECTION 7-3.3: MISCELLANEOUS

7-3.3.1 Fire Extinguisher

(a) A fire extinguisher, if installed, shall have a minimum extinguisher rating of 10 BC.

(b) Operating and maintenance personnel shall be familiar with the use and care of the fire extinguishers provided.

7-3.3.2 Refueling

(a) When refueling with a portable container, it shall be equipped with an automatic closing cap and flame arrester.

(b) Winches shall not be refueled with the engine running.

(c) Fuel containers shall not be stored in the enclosed operator cab winch enclosures.

(d) Smoking, open flames, and the use of nonintrinsically safe devices shall be prohibited within 25 ft of the refueling operation.

SECTION 7-3.4: COMMUNICATIONS

7-3.4.1 General

When using a signalperson, communication between the operator and the signalperson shall be maintained during all winch movements. If at any time communication is disrupted or not understood, the operator shall stop all winch movements until communication is re-established.

7-3.4.2 Standard Signals

Standard signals to the operator shall be in accordance with the standards prescribed in para. 7-3.4.4 or 7-3.4.5.

7-3.4.3 Signalperson Qualifications

Prior to signaling winch operations, all signalpersons shall be competent in the following areas:

(a) basic understanding of winch operations

(b) standard hand signals described in para. 7-3.4.4 whenever hand signals are used

(c) standard voice signals described in para. 7-3.4.5 whenever voice signals are used

7-3.4.4 Standard Hand Signals

Hand signals are shown in Fig. 7-3.4.4-1.

7-3.4.5 Standard Voice Signals

Prior to beginning lifting operations using voice signals, the signals shall be discussed and agreed upon by the operator and signalperson.

7-3.4.6 Special Signals

If special signals are required, they shall be agreed upon in advance by the winch operator and the signalperson. These special signals should not be in conflict with the standard signals.

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