

ASME B30.8-2015
(Revision of ASME B30.8-2010)

Floating Cranes and Floating Derricks

**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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**The American Society of
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

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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. Interpretations 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). This Standard had its beginning in December 1916 when an eight-page Code of Safety Standards for Cranes, prepared by the ASME Committee on the Protection of Industrial Workers, was presented at 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 (AESC) [later changed to American Standards Association (ASA)], then to the USA Standards Institute (USASI), and finally to ANSI], 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 AESC 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 on November 4, 1926, with 57 members representing 29 national organizations. Commencing June 1, 1927, and using the eight-page code published by ASME in 1916 as a basis, the Sectional Committee developed the Safety Code for Cranes, Derricks, and Hoists. The early drafts of this safety code included requirements for jacks, but due to inputs and comments on those drafts, the Sectional Committee decided in 1938 to make the requirements for jacks a separate code. In January 1943, ASA B30.2-1943 was published addressing a multitude of equipment types and in August 1943, ASA B30.1-1943 was published just addressing jacks. Both documents were reaffirmed in 1952 and widely accepted as safety standards.

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 Bureau of Yards and Docks (now the Naval Facilities Engineering Command) was reorganized on January 31, 1962, with 39 members representing 27 national organizations. The new committee changed the format of ASA B30.2-1943 so that the multitude of equipment types it addressed could be published in separate volumes that could completely cover the construction, installation, inspection, testing, maintenance, and operation of each type of equipment that was included in the scope of ASA B30.2. This format change resulted in the initial publication of B30.3, B30.5, B30.6, B30.11, and B30.16 being designated as revisions of B30.2 with the remainder of the B30 volumes being published as totally new volumes. ASA changed its name to USASI in 1966 and to ANSI in 1969, which resulted in B30 volumes from 1943 to 1968 being designated as ASA B30, USAS B30, or ANSI B30, depending on their date of publication.

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 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.

ASME B30.8 was first published in 1977; new editions were published in 1982, 1988, 1993, 1999, 2004, and 2010. This 2015 edition incorporates many global B30 changes including the addition of sections on personnel competence, translations, responsibilities, along with other revisions.

This edition of the ASME B30.8 Volume was approved by the B30 Committee and by ASME, and was approved by ANSI and designated as an American National Standard on March 18, 2015.

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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

(15)

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-movement 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 Standard 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 Lever 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-Erecting Tower Cranes
- B30.30 Ropes¹

SECTION II: SCOPE EXCLUSIONS

Any exclusion of, or limitations applicable to the equipment, requirements, recommendations, or operations contained in this Standard are established in the affected volume's scope.

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 yr after its date of issuance.

¹ This volume is currently in the development process.

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

Secretary, B30 Standard Committee
ASME Codes and Standards
Two 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 Standard Committee.

SECTION IX: REQUESTS FOR INTERPRETATION

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

Secretary, B30 Standard Committee
ASME Codes and Standards
Two 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 Standard 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 Standard 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 B30.8-2015

SUMMARY OF CHANGES

Following approval by the ASME B30 Committee and ASME, and after public review, ASME B30.8-2015 was approved by the American National Standards Institute on March 18, 2015.

ASME B30.8-2015 includes editorial changes, revisions, and corrections identified by a margin note, (15).

<i>Page</i>	<i>Location</i>	<i>Change</i>
ix–xi	Introduction	Revised
1–4	Chapter 8-0	Title revised
	Section 8-0.2	(1) Deleted definitions of <i>appointed</i> , <i>authorized</i> , <i>designated person</i> , and <i>ton</i> (2) Added definitions of <i>list</i> , <i>machine</i> ; <i>load indicator</i> ; <i>minimum breaking force</i> ; <i>operational aid</i> ; <i>rated capacity indicator</i> ; <i>rated capacity (load) limiter</i> ; <i>two-block damage prevention feature</i> ; <i>two-block warning feature</i> ; and <i>two-blocking</i> (3) Revised definitions of <i>angle indicator</i> , <i>boom</i> ; <i>brake</i> ; <i>clutch</i> ; <i>drum</i> ; <i>load block</i> , <i>upper</i> ; <i>rope</i> , <i>rotation resistant</i> ; and <i>trim</i> , <i>machine</i>
	Section 8-0.3	Added
5, 6	Section 8-0.4	Added
	Section 8-0.5	Updated
7, 8	8-1.1.1	Subparagraph (b) revised
	8-1.1.3	First paragraph revised
	8-1.2.2	Subparagraphs (a)(1)(-a) and (a)(1)(-b) revised
	8-1.3.1	Subparagraph (c) revised
9	8-1.3.5	Subparagraph (a) revised
	8-1.4.3	Added
	8-1.4.4	(1) Redesignated (2) Subparagraph (e) revised (3) Subparagraph (f) deleted
11	8-1.8.1	New subparagraph (b) added, and subsequent paragraphs redesignated
	8-1.8.7	Subparagraph (a) deleted, and subsequent subparagraphs redesignated
12	8-1.9.1	(1) Subparagraph (d) revised (2) Note deleted

<i>Page</i>	<i>Location</i>	<i>Change</i>
	8-1.9.3	Subparagraph (d) revised
13	Figure 8-1.9.3-1	Revised in its entirety
14	8-1.10.2	Subparagraph (b) revised
	8-1.10.3	Revised
	8-1.10.4	Revised
	8-1.11.1	Subparagraphs (a), (d), (g), and (h) revised
15	Section 8-2.1	Subparagraph (b) added
	8-2.1.1	Subparagraph (a) revised
	8-2.1.2	First paragraph, (a)(3), and (a)(4) revised
	8-2.1.3	First paragraph and (a)(6) revised
16, 17	8-2.1.4	Revised in its entirety
	8-2.1.5	Revised
	8-2.1.6	Added
	8-2.2.1	(1) Subparagraph (a)(6) revised (2) Subparagraph (a)(7) added
	8-2.3.1	Subparagraph (a) revised
	8-2.3.2	Subparagraph (b) revised
	8-2.3.3	Subparagraph (b)(2) revised
18, 19	Section 8-2.4	First paragraph added
	8-2.4.2	Subparagraph (b) revised
	8-2.4.3	Subparagraph (b) revised
	8-2.4.4	Revised
	8-2.4.5	Subparagraph (b) revised
20–23	Section 8-3.1	Title revised
	8-3.1.1	Subparagraphs (a)(2) and (b) revised
	8-3.1.3	Revised in its entirety
	8-3.2.1	Subparagraph (d) revised
	8-3.2.2	Added, and subsequent paragraphs redesignated

<i>Page</i>	<i>Location</i>	<i>Change</i>
24	8-3.2.4	Subparagraphs (a) and (j) revised
	8-3.2.9	Revised in its entirety
25	8-3.4.3	In subpara. (a), Exception (1) revised

SPECIAL NOTE:

The interpretations to ASME B30.8 are included in this edition as a separate section for the user's convenience.

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FLOATING CRANES AND FLOATING DERRICKS

Chapter 8-0

(15)

Scope, Definitions, Personnel Competence, Translations, and References

SECTION 8-0.1: SCOPE OF ASME B30.8

Within the general scope defined in Section I of the Introduction, ASME B30.8 applies to cranes and derricks mounted on barges or pontoons. Floating cranes are convertible for excavation service and other uses that are categorically not considered to be lifting service. The requirements of this Volume are applicable only to floating cranes and floating derricks used for vertical lifting and lowering of freely suspended unguided loads (see Figs. 8-0.1-1 through 8-0.1-5).

(15) SECTION 8-0.2: DEFINITIONS

accessory: a secondary part or assembly of parts that contributes to the overall function and usefulness of a machine.

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

anchorage: a point of attachment for tie-downs.

angle indicator, boom: an accessory that measures the angle of the boom to the horizontal.

auxiliary hoist: a secondary hoist rope system used either in conjunction with, or independently of, the main hoist system.

axis of rotation: the vertical axis around which the crane superstructure rotates.

billboard: a flat, usually inclined platform on which to stow spare or emergency anchors.

bitt (bollard): an upright wooden or metal post on a dock, barge, or pontoon to which hawsers may be secured.

boom: a member hinged to the superstructure and used for supporting the hoisting tackle.

boom angle: the angle above or below horizontal of the longitudinal axis of the base boom section.

boom harness: the block and sheave arrangement on the boom point to which the topping lift rope is reeved for raising and lowering the boom.

boom hoist mechanism: a means for supporting the boom and controlling the boom angle.

boom point: the outward end of the top section of the boom.

boom stop (crane): a device used to limit the angle of the boom at the highest position.

brake: a device used for retarding or stopping motion.

cab: the operator's compartment on a crane or derrick.

capstan: a spool-shaped revolving drum, manually or power operated, used for heaving in of heavy mooring lines. A capstan head may be a component of an anchor windlass.

chock: a mooring fitting having faired inner surfaces or rollers for guiding lines.

cleat: a mooring fitting having two horizontal arms to which mooring lines are secured.

clutch: a means for engagement or disengagement of power.

counterweight: weight used to supplement the weight of the machine in providing stability for lifting working loads.

cross angle: the lateral angle between the load tackle and center plane of boom caused by list and trim.

derrick, shearleg: a boom with or without a mast, not capable of swinging, hinged at the bottom, and raised and lowered by a boom hoist mechanism or a hydraulic cylinder.

derrick, stiffleg: a rigid member supporting the mast at the head.

drum: a cylindrical member around which a rope is wound for lifting and lowering the load or boom.

dynamic loading: loads introduced into the machine or its components by forces in motion.

eye: a loop formed at the end of a rope by securing the dead end to the live end at the base of the loop.

Fig. 8-0.1-1 Floating Crane

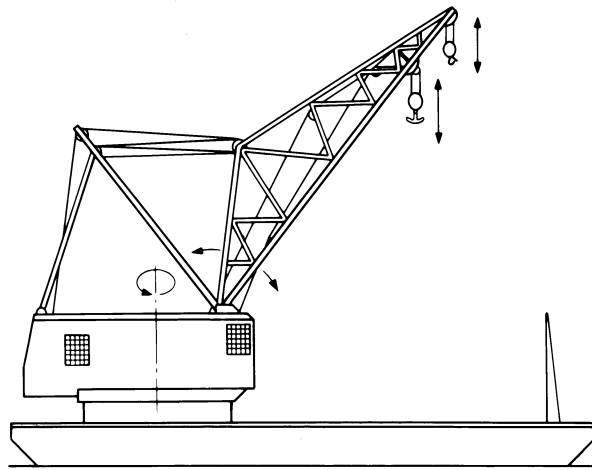


Fig. 8-0.1-2 Barge-Mounted Shearleg

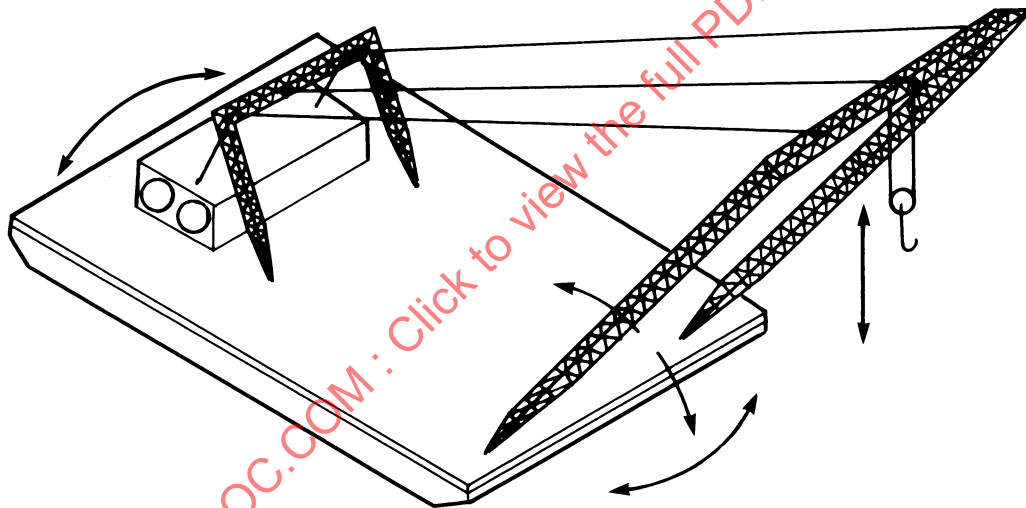


Fig. 8-0.1-3 Barge-Mounted Land Crane

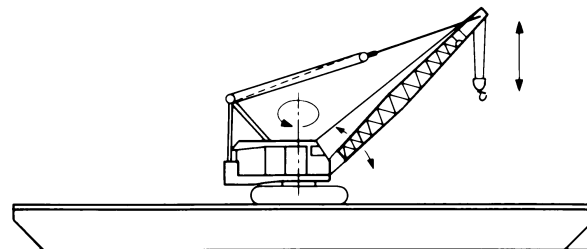
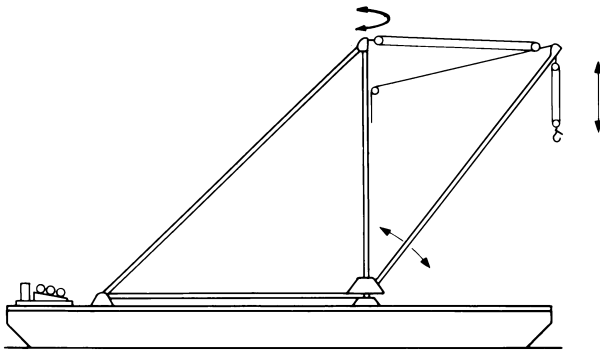
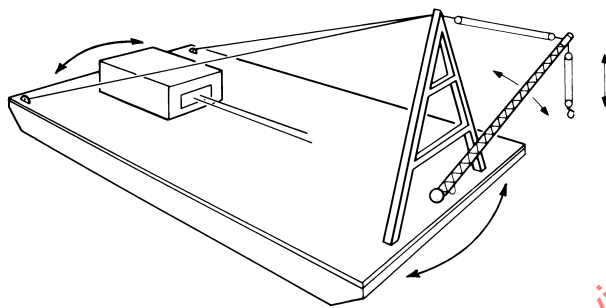


Fig. 8-0.1-4 Floating Stiffleg Derrick**Fig. 8-0.1-5 Floating A-Frame Derrick**

fiddle block: a type of tandem block consisting of two sheaves in the same plane held in place by the same cheek plates.

floating crane: a rotating superstructure, power plant, operating machinery, and boom mounted on a barge or pontoon. The power plant may be installed below decks. The crane's function is to handle loads at various radii.

floating derrick: a mast or equivalent member held at the head by guys or braces, with or without a boom, for use with a hoisting mechanism and operating ropes, mounted on a barge or pontoon. The power plant may be installed below decks.

foot bearing or block (sill block): the lower support on which the derrick mast rotates.

gantry (A-frame): a structural frame, extending above the superstructure, to which the boom support ropes are reeved.

gudgeon pin: a pin connecting the mast cap to a derrick mast allowing rotation of the mast.

guy, derrick: a rope used to steady or secure the mast or other member in the desired position.

hoist mechanism: a hoist drum and rope reeving system used for lifting and lowering loads.

hook, latch-type: a type of hook with a mechanical device to close the throat opening of the hook.

jib: an extension attached to the boom point to provide added boom length for lifting specified loads. The jib may be in line with the boom or offset to various angles in the vertical plane of the boom.

land crane: a crane designed primarily for operation on land.

liquid free surface: the unchecked movement of a liquid in a tank or compartment. This results in a virtual rise in the vertical center of gravity of the barge or pontoon and is detrimental to transverse stability.

list: angle of inclination about longitudinal axis of barge or pontoon.

list, machine: the inclination of the transverse centerline of the base of the crane or derrick from the horizontal.

load, rated: the maximum allowable working load in pounds (kilograms) designated by the manufacturer in accordance with Section 8-1.1.

load, working: the external load in pounds (kilograms) applied to the crane or derrick, including the weight of load-attaching equipment, such as load blocks, shackles, and slings.

load block, lower: the assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.

load block, upper: the assembly of sheaves, pins, and frame attached to or suspended from the boom.

load indicator: a device that measures the weight of the load.

loadlines: horizontal lines painted on the side of a barge to indicate maximum drafts.

mast (derrick): the upright member of the derrick used for support of the boom.

mast cap (spider): the fitting at the top of the derrick mast to which the guys are connected.

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

multiple sheave block: a block consisting of two or more sheaves held in place by the same cheek plates.

normal operating conditions: conditions during which a crane or derrick is performing functions within the scope of the original or modified design. Under these conditions, the operator is at the operating control devices.

operational aid: an accessory that provides information to facilitate operation of a crane or derrick or that takes control of particular functions without action of the operator when a limiting condition is sensed. Examples of such devices include, but are not limited to, the following: anti-two-block device, rated capacity indicator,

rated capacity (load) limiter, boom angle or radius indicator, lattice boom hoist disconnect device, boom length indicator, crane level indicator, drum rotation indicator, load indicator, and wind speed indicator.

pawl (dog): a device for positively holding a member against motion in one or more directions.

pin, boom foot: the pin connecting the foot of the boom to the boom seat or superstructure.

pitch diameter: the diameter of a sheave or rope drum measured at the centerline of the rope.

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.

rated capacity indicator: a device that automatically monitors radius, load weight, and load rating and warns the crane operator of an overload condition.

rated capacity (load) limiter: a device that automatically monitors radius, load weight, and load rating and prevents movements of the crane, which would result in an overload condition.

radius (reach): the horizontal distance from the theoretical intersection of the axis of rotation and the waterline to the center of the hoist line(s) at the waterline (see Fig. 8-0.2-1).

rope: refers to wire rope unless otherwise specified.

rope, rotation resistant: a stranded wire rope designed to generate reduced levels of torque and rotation when loaded and comprising an assembly of two or more layers of strands laid helically around a center, the direction of lay of the outer strands being opposite to that of the underlying layer.

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.

side loading: lateral load on boom and crane due to list, trim, wind, or other sources.

sill, derrick: a horizontal member connecting the foot block and stiff leg or a horizontal member connecting the lower ends of a double member mast.

soft patch: gasketed metal plate bolted over a deck or bulkhead opening.

stability (barge): the tendency of a vessel to return to an upright position after having been inclined by an external force.

standby: a crane or derrick that is not in regular service, but one that is used occasionally or intermittently as required.

standing rope (pendant): a supporting rope that maintains a constant distance between the two components connected by the rope.

structural competence: the ability of the machine and its components to withstand the stresses imposed by applied loads.

superstructure: the rotating upper frame structure of the crane and the operating machinery mounted thereon.

swing: rotation of the superstructure or derrick boom for movement of loads in a horizontal direction about the axis of rotation.

swing mechanism: the machinery involved in providing rotation of the superstructure or derrick boom.

tackle: an assembly of ropes and sheaves arranged for lifting, lowering, and pulling.

towing pad: a large pad eye to which mooring lines are secured.

trim: angle of inclination about transverse axis of the barge or pontoon.

trim, machine: the inclination of the longitudinal centerline of the base of the crane or derrick from the horizontal.

two-block damage prevention feature: a system that will stall when two-blocking occurs without causing damage to the hoist rope or crane machinery components.

two-block warning feature: a warning device to alert the operator of an impending two-blocking condition.

two-blocking: the condition in which the lower load block or hook assembly comes in contact with the upper load block or boom assembly.

vangs (vang lines): tackle attached to each side of a derrick boom near the outer end, and to the base or pontoon at a lateral distance, by means of which the boom is rotated (slewed) from one side to the other (usually used on floating derricks).

whipline (runner or auxiliary line): a separate hoist rope system usually of a lighter load capacity than provided by the main hoist.

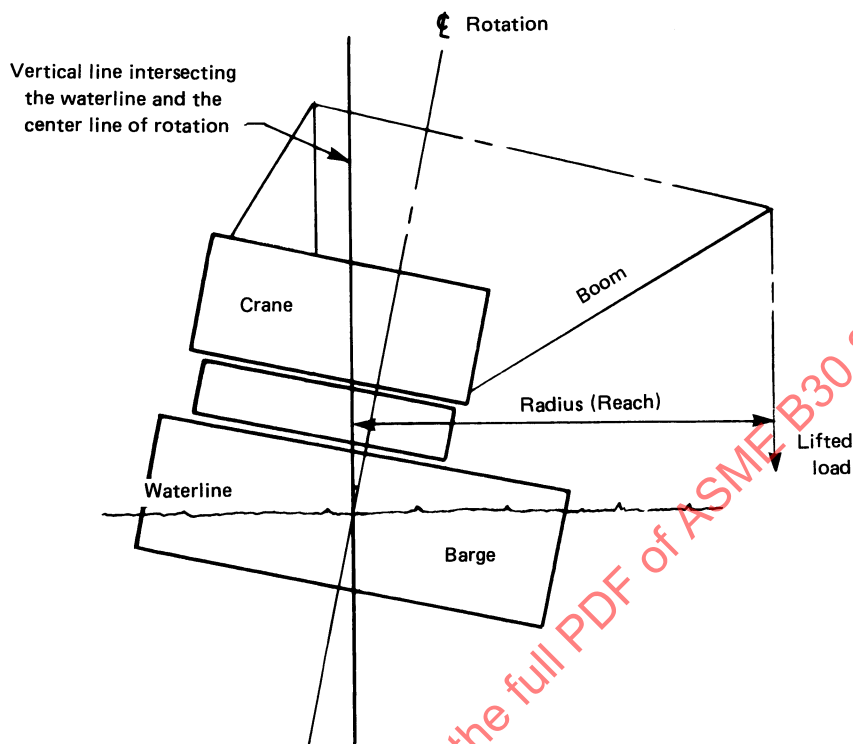
windlass: a deck machine, usually power operated, used for heaving in or paying out anchor chain.

SECTION 8-0.3: PERSONNEL COMPETENCE

(15)

Persons performing the functions identified in this Volume shall meet the applicable qualifying criteria stated in this Volume and shall, through education, training, experience, skill, and physical ability, as necessary, be competent and capable to perform the functions as determined by the employer or employer's representative.

Fig. 8-0.2-1 Reach for Floating Cranes

**(15) SECTION 8-0.4: TRANSLATIONS**

(a) *Translation of Non-English Documentation Into English*

(1) The wording of written non-English safety information and manuals regarding use, inspection, and maintenance shall be translated into English by professional translation industry standards, which include but are not limited to the following:

- (-a) translation of the complete paragraph message, instead of word by word
- (-b) grammatical accuracy
- (-c) respectfulness of the source document content without omitting or expanding the text
- (-d) accurate translation of the terminology
- (-e) reflection of the level of sophistication of the original document

(2) The finished translation shall be verified for compliance with paras. 8-0.4(a)(1)(-a) through (a)(1)(-e) by a qualified person having an understanding of the technical content of the subject matter.

(3) Pictograms used to identify controls shall be described in the manuals. The pictograms should comply with ISO 7000, ISO 7296, or other recognized source, if previously defined. The text of the description shall meet the criteria of paras. 8-0.4(a)(1) and (a)(2).

(b) Any non-English documentation provided in addition to English shall be translated and reviewed in accordance with the requirements listed above.

SECTION 8-0.5: REFERENCES**(15)**

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

ANSI A14.3-2008, Ladders — Fixed — Safety Requirements
 ANSI Z26.1-1996, Safety Code for Safety Glazing Materials for Glazing Motor Vehicles Operating on Land Highways

Publisher: American National Standards Institute (ANSI), 25 West 43rd Street, New York, NY 10036 (www.ansi.org)

ANSI/AWS D1.1-2011, Structural Welding Code—Steel
 ANSI/AWS D14.3-2011, Specification for Welding Earthmoving and Construction Equipment

Publisher: American Welding Society (AWS), 8669 NW 36 Street, No. 130, Miami, FL 33166 (www.aws.org)

ANSI/SAE J987-2012, Lattice Boom Cranes — Method of Test

ANSI/SAE J1063-2013, Cantilevered Boom Cranes Structures — Method of Test

ANSI/SAE J2703-Oct 2008, Cranes — Access and Egress

Publisher: SAE International, 400 Commonwealth Drive, Warrendale, PA 15096 (www.sae.org)

ASME B30.5-2011, Mobile and Locomotive Cranes

ASME B30.6-2010, Derricks

ASME B30.7-2011, Winches

ASME B30.10-2010, Hooks

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990 (www.asme.org)

ICS 3-2010, National Electrical Manufacturers Association Industrial Control Standard

Publisher: National Electrical Manufacturers Association (NEMA), 1300 North 17th Street, Rosslyn, VA 22209 (www.nema.org)

IEEE 45-2002, Recommended Practice for Electrical Installations on Shipboard

Publisher: Institute of Electrical and Electronics Engineers (IEEE), Three Park Avenue, 17th Floor, New York, NY 10016 (www.ieee.org)

ISO 7000-2012, Graphical symbols for use on equipment — Registered symbols

ISO 7296-1991, Cranes — Graphical symbols — Parts 1 – 3

Publisher: International Organization for Standardization (ISO), ISO Central Secretariat, Chemin de Blandonnet 8, Case Postale 401, 1214 Vernier, Geneva, Switzerland (www.iso.org)

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Chapter 8-1

Construction and Installation

SECTION 8-1.1: LOAD RATINGS AND MARKINGS

(15) 8-1.1.1 Basis

(a) *Cranes and Derricks Designed for Barge or Pontoon Mounting.* The load rating of cranes or derricks designed for barge or pontoon mounting is dependent upon structural competence, rope strength, hoist capacity, and structural attachment to the floating platform, and upon stability and freeboard of the floating platform, barge, or pontoon upon which they are mounted. Potential reductions in the crane's capacity due to machine list or machine trim shall be made when these conditions are present.

(b) *Land Cranes and Derricks Mounted on Barges or Pontoons.* The load rating of land cranes and derricks mounted on barges is dependent upon stability; mechanical, hydraulic, or pneumatic limitations; rope strength; hoist capacity of the crane or derrick; and upon stability and freeboard of the floating platform, barge, or pontoon upon which they are mounted. Potential reductions in the crane's capacity due to machine list or machine trim shall be made when these conditions are present.

8-1.1.2 Rated Loads

(a) Rated loads shall be the maximum working loads at various radii as determined by the crane or derrick manufacturer or qualified person considering machine list and machine trim for each installation.

(b) When deck loads are to be carried while lifting, the overall lift operation should be specifically analyzed with regard to their effect on the stability of the floating platform, barge, or pontoons, and requirements for tie-downs and anchorages.

(c) The rated loads and load radii of land cranes and derricks mounted on barges or pontoons shall be modified as recommended by the manufacturer or qualified person.

(15) 8-1.1.3 Rated Load Marking

A durable load rating chart(s) with legible letters and figures shall be provided in paper, plastic, metal, or electronic display form with each crane or derrick and attached in a location accessible to the operator while at the controls. The data and information to be provided shall include, but not necessarily be limited to, the following:

(a) a full and complete range of crane or derrick load ratings at all stated operating radii and boom angles,

and for all permissible boom lengths, jib lengths, and angles

(b) the list and trim conditions on which the load rating chart is based

(c) recommended parts of hoist reeving, size, and type of rope for various loads should be shown either on the rating chart or in the operating manual

(d) essential precautionary or warning notes relative to limitations on equipment, operating procedures, and stability factors such as deck loads, list, trim, weather conditions, and paras. 8-1.2.2(b)(2)(-b) through (b)(2)(-f) should be shown either on the rating chart or in the operating manual

SECTION 8-1.2: CONSTRUCTION AND LOADING CONDITIONS

8-1.2.1 Structural Competence

(a) Floating cranes and floating derricks shall be capable of withstanding the loads imposed on all components under normal operation conditions when installed and handling loads not exceeding the manufacturer's load ratings with recommended reeving, and in accordance with other conditions specified herein. Stresses created by such loads shall not exceed the limitations specified in the code or standard governing the design of the crane or derrick.

(b) Barges or pontoons shall be capable of withstanding the weight of the crane or derrick plus lift weight and other anticipated deck loads without damage or permanent deformation under static and dynamic conditions. Stresses created by such loads shall not exceed the limitations of good marine design practice as determined by a naval architect or marine engineer.

(c) Welding shall conform to recommended practices of the American Welding Society as outlined in ANSI/AWS D1.1 or ANSI/AWS D14.3 as applicable.

8-1.2.2 Operational Criteria

(15)

(a) *Operating List and Trim.* The lift system, comprising the crane or derrick mounted on the barge hull or pontoon, shall be analyzed by a qualified person to determine barge or pontoon list and trim under all permitted operating conditions do not exceed the following:

(1) *Cranes Designed for Barge or Pontoon Mounting*

(-a) Rated at 50,000 lb (22 680 kg) capacity or less, the maximum allowable list or trim shall be 5 deg.

(-b) Rated at over 50,000 lb (22 680 kg), the maximum allowable list or trim shall be 7 deg; however, 5 deg is recommended.

(-c) *Wind Load.* A wind load created by a minimum wind speed of 40 mph shall be considered in establishing operating criteria.

(2) *Derricks Designed for Barge or Pontoon Mounting.* For any capacity, the maximum allowable list or trim shall be 10 deg.

(3) *Land Cranes and Derricks Mounted on Barges or Pontoons.* The maximum allowable machine list and machine trim shall be the lesser of 5 deg or the maximum recommended by the crane manufacturer. If required information is not available from the manufacturer, a qualified person shall be consulted.

(b) *Design Loading Conditions.* The crane or derrick designed for barge or pontoon mounting shall be stable under the following conditions:

(1) *Cranes and Derricks Designed for Barge or Pontoon Mounting*

(-a) rated load, 60 mph (100 km/h) wind 2 ft (610 mm) minimum freeboard

(-b) rated load, plus 25%, 60 mph (100 km/h) wind, 1 ft (300 mm) minimum freeboard

(-c) high boom, no load, 60 mph (100 km/h) wind 2 ft (610 mm) minimum freeboard

(-d) for backward stability of the boom: high boom, no load, full back list (least stable condition), 90 mph (142 km/h) wind

(2) *Land Cranes and Derricks Mounted on Barges or Pontoons*

(-a) A stability analysis shall be performed for each land crane or derrick mounted on a barge or pontoon. Crane or derrick list and trim, barge or pontoon roll, pitch, yaw, heave, sway, surge, wind, and liquid free surface shall be taken into consideration when developing modified load charts. The ratings shall not exceed those recommended by the manufacturer or a qualified person for the expected environmental conditions.

(-b) Liquid-free surface during lift operations shall be minimized to no more than the amount identified in the stability analysis.

(-c) All deck surfaces of the pontoon or barge shall be above the water.

(-d) The entire bottom area of the barge or pontoon shall be submerged.

(-e) Tie-downs shall be provided for derricks to transmit the loading to the barge or pontoon.

(-f) Cranes shall be blocked and secured to prevent shifting. When stability of the barge or pontoons is not a factor and control barriers are provided, limited travel may be authorized with consideration given to deck loads and blocking.

SECTION 8-1.3: GENERAL REQUIREMENTS FOR PONTOONS AND BARGES

8-1.3.1 Machinery and Electrical Equipment

(15)

(a) Machinery and electrical equipment should be located clear of the deck loading area and for desirable effect on floating stability.

(b) Working areas, companionways, and ladders providing access to equipment shall be surfaced with anti-slip material.

(c) Wiring and equipment shall comply with IEEE 45.

8-1.3.2 Compartments

(a) *Watertight Compartments.* For seagoing barges or pontoons, barges requiring loadlines and barges operating or transiting more than 20 mi (32 km) offshore, there shall be enough watertight compartments to prevent capsizing or sinking when any one compartment is flooded while the boom is stowed and the barge or pontoon is fully loaded with its design deckload and fuel. Bulkheads designated as watertight shall not be breached by piping, electrical wiring, or manways unless such penetrations are also fitted with watertight fittings at the penetrations.

(b) For inland deck barges or pontoons, there shall be enough watertight compartments to prevent capsizing or sinking when any one compartment is flooded while the boom is stowed and the barge or pontoon is fully loaded with its design deckload and fuel. Bulkheads designated as watertight shall not be breached by piping, electrical wiring, or manways unless such penetrations are also fitted with watertight fittings or closing appliances at the penetrations.

(c) For inland hopper barges operating on rivers, lakes, bays, and sounds within 20 mi (32 km) from shore, watertight integrity of the cargo deck and hopper sides and ends shall be maintained. Any accumulation of water shall be investigated to determine the source and need for repair to restore the watertight condition.

(d) When barges in para. 8-1.3.2(a) or (b) require watertight bulkheads, they shall have at least one longitudinal watertight bulkhead on the centerline or at least two longitudinal watertight bulkheads at one quarter the breadth of the barge off the centerline to port and starboard. This configuration limits free surface.

(e) *Machinery and Equipment Compartments.* Compartments below deck shall be floored with easily removable, skid-resistant metal flooring and provided with watertight hatches for access and ventilation. They shall be of ample size for repair of machinery and equipment. Companionways and ladders shall be supplied.

8-1.3.3 Manholes and Hatches

(a) Manholes shall be no smaller than 15 in. × 22 in. (380 mm × 560 mm).

(b) Access shall be provided to all void compartments and shall not be obscured or covered by timber mats,

deck cargo, or any other materials. Access hatches shall be maintained watertight and shall not be sealed by welding or caulking.

8-1.3.4 Fittings

The following fittings shall be provided as needed:

- (a) for oceangoing barges or pontoons, and for barges or pontoons operating more than 20 mi (32 km) offshore, a removable guard rail system along all edges of the weather deck of the barge or pontoons
- (b) capstan(s) or winch(es), forward and aft
- (c) anchor(s)
- (d) towing lugs and chocks
- (e) boarding ladder, port and starboard
- (f) double bitt at each corner and cleats along sides on deck

(15) 8-1.3.5 Life Preservers

(a) At least one Coast Guard-approved life jacket or work vest shall be provided for each person aboard. It is recommended that such life jackets and work vests be capable of floating an unconscious person with his/her face out of the water.

(b) Two ring buoys, 30 in. (760 mm) in diameter, each with at least 90 ft (27 m) of line, shall be provided.

(c) For night operations, one of the life rings shall have water lights attached to it.

8-1.3.6 Rescue Skiff

A rescue skiff with oars and ring buoy 30 in. (760 mm) in diameter with at least 90 ft (27 m) of line shall be provided.

SECTION 8-1.4: GENERAL REQUIREMENTS FOR CRANES AND DERRICKS

8-1.4.1 Guards

(a) Electrical equipment shall be so located or enclosed that live parts will not be exposed to accidental contact under normal operating conditions.

(b) Electrical equipment shall be protected from dirt, grease, oil, and moisture.

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

(d) Guards shall be secured.

(e) Guards shall be capable of supporting, without permanent distortion or making contact with electrical or moving parts, the weight of a 200 lb (90 kg) person, unless the guard is located where it is improbable for a person to step on it.

(f) Brake(s) and clutches shall be provided with rain and spray guards unless otherwise protected.

8-1.4.2 Lubrication

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

8-1.4.3 Operational Aids

(15)

The crane and/or device manufacturer's instructions shall describe the purpose of the device.

(a) *Two-Blocking Features*

(1) Telescopic boom cranes shall be equipped with an anti-two-block device or a two-block damage prevention feature for all points of two-blocking (e.g., jibs, extensions).

(2) Lattice boom cranes shall be equipped with an anti-two-block device or a two-block warning feature that functions for all points of two-blocking.

(b) *Load Indicators, Rated Capacity Indicators, and Rated Capacity Limiters.* All cranes with a maximum rated load capacity of 6,000 lb (2 720 kg) or more shall have a load indicator, rated capacity indicator, or rated capacity (load) limiter.

(c) *Boom Angle Indicator.* See para. 8-1.11.1(c).

(d) *Boom Hoist Disconnect, Shutoff, or Hydraulic Relief.* See para. 8-1.11.1(d).

(e) *Boom Length Indicator.* See para. 8-1.11.1(e).

(f) *Drum Rotation Indicator.* See para. 8-1.6.2(k).

(g) *Lower Travel Limit Switch.* See para. 8-1.8.7(a).

(h) *Machine List and Trim Indicators.* See para. 8-1.4.4(e).

8-1.4.4 Miscellaneous Equipment

(15)

(a) A Coast Guard-approved portable fire extinguisher with a basic minimum rating of 10 BC shall be provided in the crane cab and outside the machinery spaces at all times.

(b) Equipment of a permanent nature, such as tool boxes, shall be secured to the crane derrick or deck.

(c) An audible warning device shall be provided. The controls for the device shall be within reach of the operator.

(d) Fuel tanks should be equipped with a self-closing filler cap. Where gasoline is the fuel, a flame arrester should be provided on both fill pipe and vent lines.

(e) Means shall be provided for the operator to visually determine the machine list and machine trim.

(f) Navigational lights as required by Coast Guard regulations shall be provided.

SECTION 8-1.5: VERTICAL CLEARANCE

The counterweight or other projections that rotate to and from positions accessible to personnel shall have the area over which the projection moves barricaded unless there is 7 ft (2.1 m) or greater clearance from the deck.

SECTION 8-1.6: BOOM HOIST (LUFFING HOIST) AND LOAD HOIST MECHANISMS

8-1.6.1 Boom Hoist (Luffing Hoist)

(a) When using recommended reeving and with rated loads suspended, the boom hoist shall be capable of raising the boom, holding it stationary without action by the operator, and lowering it only when coupled to its prime mover or suitable retarder.

(b) Unless directly coupled, the boom hoist mechanism shall be provided with a suitable clutching or power-engaging device.

(c) The boom hoist mechanism shall be equipped with at least one brake having not less than 125% of the maximum full load hoisting torque at the point where the brake is applied.

(d) The brake(s) shall have sufficient thermal capacity for the service required.

(e) Brakes and clutches shall be provided with adjustments to compensate for wear.

(f) The boom hoist drum shall be provided with an auxiliary ratchet and pawl or other positive locking device that is controllable from the operator's station to hold the drum from rotating in the lowering direction and to hold the rated load indefinitely.

(g) The boom hoist drum shall have sufficient rope capacity to operate the boom at all positions from horizontal to the highest angle recommended when using the manufacturer's recommended reeving and rope size.

(1) No less than two full wraps of rope shall remain on the drums with boom point lowered to its lowest possible position.

(2) The drum end of each rope shall be anchored by a clamp securely attached to the drum or by a socket arrangement recommended by the crane, hoist, or rope manufacturer.

(3) 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.

(h) The diameter of the boom hoist drum(s) shall provide a first layer rope pitch diameter no less than 15 times the nominal diameter of the rope used.

(i) When land cranes are mounted on barges or pontoons, the requirements of ASME B30.5, para. 5-1.3.1 shall apply.

8-1.6.2 Load Hoist

(a) When using recommended reeving, the load hoist shall be capable of lifting and lowering rated loads with operational characteristics required in crane and derrick service.

(b) Unless directly coupled, the load hoist mechanism shall be provided with a suitable clutching or power engaging device.

(c) Each load hoist mechanism shall be equipped with at least one brake having no less than 125% of the maximum rated line pull at the maximum rated rope layer on the drum.

(d) A means controllable from the operator's station shall be provided to hold the drum from rotating in the lowering direction and to hold the rated load without further action by the operator. Foot-operated brakes having a continuous mechanical linkage between the actuating and braking forces and equipped with a positive mechanical means to hold the linkage in the applied position meet this requirement.

(e) Brakes and clutches shall be provided with adjustments to compensate for wear.

(f) A power control braking means, such as regenerative, dynamic, or countertorque braking; power-load lowering; or a mechanically controlled braking means, shall be provided and shall be capable of maintaining rated lowering speeds of rated loads.

(g) Mechanically or electrically controlled braking means shall have thermal capacity for the frequency of operation required by the service.

(h) The load hoist drum shall have sufficient rope capacity with recommended rope size and reeving to perform lifting services within the range of boom lengths, operating radii, and lifts stipulated by the manufacturer.

(1) No less than two full wraps of rope shall remain on the drum when the hook is in its extreme lower position.

(2) The drum end of each rope shall be anchored by a clamp securely attached to the drum or by a socket arrangement recommended by the crane, hoist, or rope manufacturer.

(3) Drum flanges shall extend a minimum of 0.5 in. (13 mm) over the top layer of rope at all times.

(i) The diameter of load hoist drum(s) shall provide a first layer rope pitch diameter of not less than 18 times the nominal diameter of the rope used.

(j) A means controllable from the operator's station shall be provided to hold the drum from rotating in the lowering direction and to hold the rated load without further action by the operator.

(k) Drum rotation indicators should be provided and located to afford sensing by the operator.

(l) Foot-operated brake pedals shall be constructed so that the operator's feet will not readily slip off. The pedal shall be equipped with a means for latching in the applied position.

(m) When land cranes are mounted on barges or pontoons, the requirements of ASME B30.5, para. 5-1.3.2 shall apply.

SECTION 8-1.7: SWING MECHANISM

8-1.7.1 Swing Control

The swing mechanism shall be capable of controlling the swing of the rated load under all operating conditions.

8-1.7.2 Swing Brake and Locking Device

(a) A brake(s) with holding power in both directions shall be provided to restrict movement of the rotating superstructure, when desired, under normal operation. The brake shall be capable of being set in the holding position and remaining so without further action by the operator.

(b) A device for positively locking the rotating superstructure should be provided. When provided, it shall be constructed to prevent inadvertent engagement or disengagement.

(c) Brake(s) shall have sufficient thermal capacity for the service required.

(d) Brakes shall be provided with adjustment means to compensate for wear.

(e) When land cranes are mounted on barges or pontoons, the requirements of ASME B30.5, para. 5-1.4.2 shall apply.

SECTION 8-1.8: CONTROLS

(15) 8-1.8.1 General

(a) All controls used during the normal crane or derrick operating cycle shall be located within reach of the operator while at the operator's station. Controls for load hoist, boom hoist, and swing clutches, when provided, shall have means for holding in the neutral position without the use of latches.

(b) Controls shall have legible markings indicating function and direction of motion.

(c) Remote-operated cranes shall function so that if the control signal for any crane motion becomes ineffective, that crane motion shall stop.

(d) Electric motor-operated cranes or derricks shall be provided with a device that will disconnect all motors from the line on failure of power, and will not permit any motor to be restarted until the controller handle is brought to the neutral position and a reset switch or button is operated. When the prime mover is an electric motor, a self-setting electric motor brake or other self-setting braking means shall be provided to prevent drum rotation in the event of power failure. The load may then be lowered by declutching or manual brake release. In case of circuit failure, electrically controlled cranes shall be equipped with a quick disconnect means in the cab to stop all motion.

(e) Electric motor-operated cranes or derricks that are capable of overspeeding the power plant on overhauling regenerative loads shall be provided with means to prevent such overspeeding.

8-1.8.2 Power Plant Control

Controls for operating the power plant shall be within reach of the operator and shall include, where applicable, the means to

(a) start and stop, with provision to lock in the off position

(b) control the speed of internal combustion engines

(c) stop diesel engines under emergency conditions

(d) shift selective transmissions

8-1.8.3 Control Forces and Movements

When a crane is operated within the manufacturer's ratings and recommended reeving, the following shall be provided 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)

8-1.8.4 Engine Clutch

All cranes with a direct mechanical or hydrodynamic (such as torque converter or fluid coupling) drive to any crane function shall be provided with a clutch or other means for disengaging power. The control shall be within reach from the operator's station.

8-1.8.5 Electric Drive Control Panels

(a) Controller for the boom hoist, main load hoist, auxiliary load hoist, and swing motor shall conform to Part 443 of ICS 3, as applicable.

(b) Controls shall be electrically interlocked to prevent operation of the motion if its locking device is engaged.

8-1.8.6 Resistors

(a) Resistors and connectors shall be of corrosion-resistant material, protected or enclosed with provision for ventilation, and installed to prevent the accumulation of combustible matter near hot parts.

(b) Resistor units shall be supported so as to minimize vibration effects.

8-1.8.7 Switches

(a) Lower overtravel limit switches are recommended for all load hoists where the hook enters areas not visible to the operator.

(b) All cranes or derricks using a lifting magnet shall have a magnet circuit disconnect switch of the enclosed type with provision for locking in the open position. Means for discharging the inductive load of the magnet shall be provided.

(15)

SECTION 8-1.9: ROPES AND REEVING ACCESSORIES

(15) 8-1.9.1 Rope Design Factors

(a) For supporting rated loads and the boom and working attachments at recommended travel or transit positions and boom lengths

(1) the design factor for live or running ropes that wind on drums or travel over sheaves shall not be less than 3.5

(2) the design factor for boom pendants or standing ropes shall not be less than 3.0

(b) For supporting the boom under recommended boom erection conditions

(1) the design factor for live or running ropes shall not be less than 3.0

(2) the design factor for boom pendants or standing ropes shall not be less than 2.5

(c) Rotation-resistant ropes shall have a design factor of 5 or greater. The design factor of 5 or greater for rotation-resistant ropes may be modified by the crane user by complying with the provisions of para. 8-3.2.1(d).

(d) The design factors specified in paras. 8-1.9.1(a), (b), and (c) shall be the total minimum breaking force of all ropes in the system divided by the load imposed on the rope system when supporting the static weights of structure and crane rated load.

(e) Ropes for derrick-mounted and base-mounted drum hoists shall conform to ASME B30.6 and ASME B30.7, respectively.

8-1.9.2 Ropes: General

(a) The ropes shall be of a construction recommended by the rope or crane manufacturer or qualified person for that service.

(b) Rotation-resistant and fiber core ropes shall not be used for boom hoist reeving.

(c) Rotation-resistant rope shall be given special care in installations, as it is easily damaged.

(d) Socketing shall be done in the manner specified by the manufacturer of the wire rope or fitting.

(e) If a load is supported by more than one part of rope, the tension in the parts shall be equalized.

(f) Wherever exposed to ambient temperatures at the rope in excess of 180°F (82°C), rope having an independent wire-rope or wire-strand core, or other temperature damage-resistant core shall be used.

(g) The drum end of each rope shall be anchored by a clamp securely attached to the drum or by a socket arrangement recommended by the crane, hoist, or rope manufacturer.

(h) Tie-downs (kicker devices) shall have locknuts or other provision to prevent loosening.

(i) The live rope reeving system in a boom suspension shall withstand the maximum load imposed and be of a length to permit lowering the boom point to the deck

level or to a boom cradle with at least two full wraps of rope remaining on the hoist drum.

(j) Load and boom hoist ropes shall be of a length to serve the entire range movement specified for the application, with at least two full wraps of rope remaining on the hoist drum when the hook is in its extreme lower position.

(k) Ropes of material other than steel may be used only in accordance with crane or derrick manufacturer's recommendation.

8-1.9.3 Reeving Accessories

(15)

(a) Eye splices shall be made in a manner recommended by the rope, crane, or derrick manufacturer or qualified person, and rope thimbles should be used in the eye.

(b) Wire rope clips shall be drop-forged steel of the single saddle (U-bolt) or double saddle type clip. Malleable cast iron clips shall not be used. For spacing, number of clips, and torque values, refer to the clip manufacturer's recommendation. Wire rope clips attached with U-bolts shall have the U-bolt over the dead end of the rope and the live rope resting in the clip saddle. Clips shall be tightened evenly to the recommended torque. After the initial load is applied to the rope, the clip nuts shall be retightened to the recommended torque to compensate for any decrease in rope diameter caused by the load. Rope clip nuts should be retightened periodically to compensate for any further decrease in rope diameter during usage.

(c) Swaged, compressed, or wedge socket fittings shall be applied as recommended by the rope, crane, derrick, or fitting manufacturer.

(d) Wire rope clips used in conjunction with wedge sockets shall be attached to the unloaded dead end of the rope only (see Fig. 8-1.9.3-1). This does not preclude the use of devices specifically designed for dead-ending rope in a wedge socket.

8-1.9.4 Sheaves

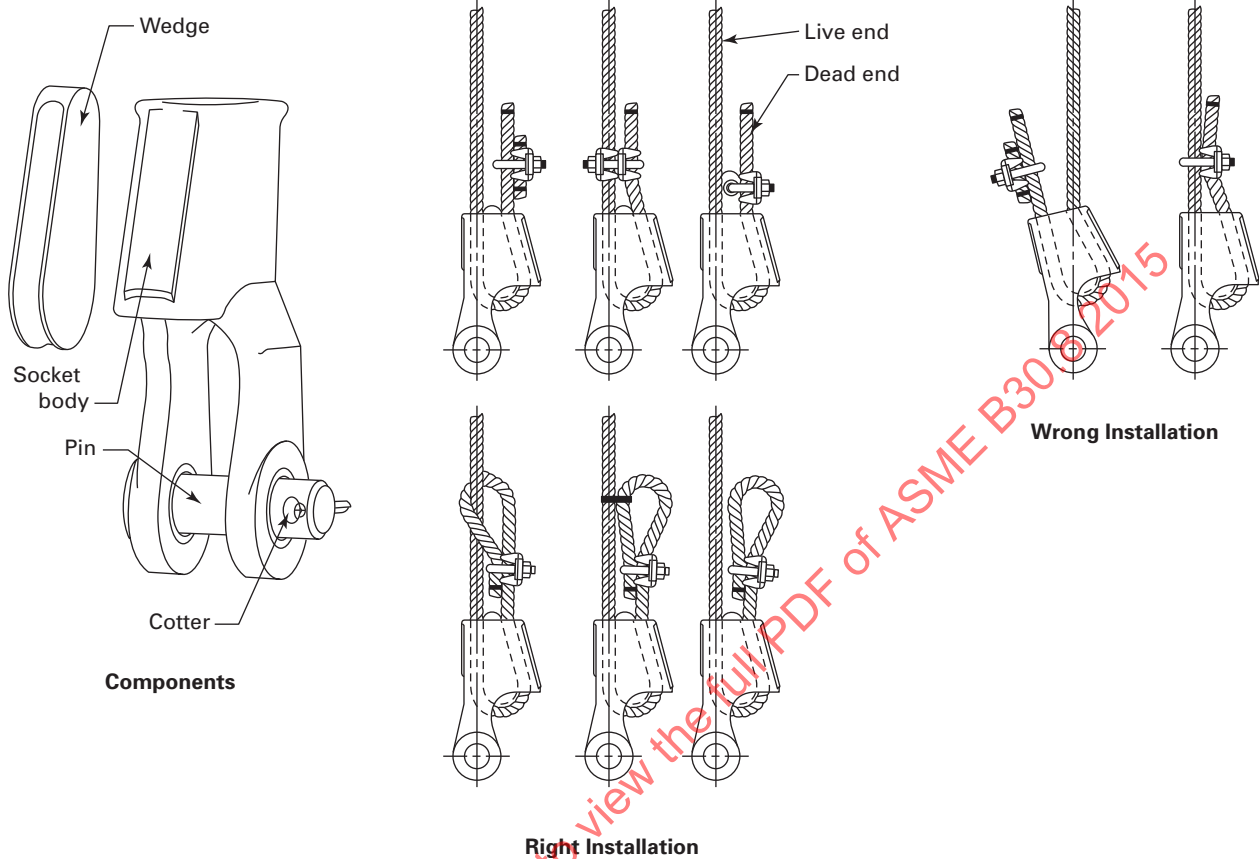
(a) Sheave grooves shall be smooth and free from surface conditions that could cause rope damage. The cross-sectional radius at the bottom of the groove should be such so as to form a saddle for the size of rope used; the sides of the groove should be tapered outwardly to facilitate entrance of the rope into the groove. Flange corners should be rounded and the rims should run true about the axis of rotation.

(b) Sheaves carrying ropes that can be momentarily unloaded shall be provided with close-fitting guards or other devices to keep the rope in the sheave.

(c) The sheaves in the lower load block shall be equipped with close-fitting guards or other devices that will prevent ropes from becoming fouled when the block is lying on the deck of the barge or pontoon with ropes loose.

Fig. 8-1.9.3-1 Dead-Ending Rope in a Wedge Socket

(15)



(d) Means should be provided, if necessary, to prevent chafing of the ropes.

(e) All sheave bearings shall be provided with means for lubrication. Permanently lubricated bearings are acceptable.

8-1.9.5 Sheave Sizes

(a) Boom hoist sheaves shall have pitch diameters not less than 15 times the nominal diameter of the rope used.

(b) Load hoist sheaves shall have pitch diameters not less than 18 times the nominal diameter of the rope used.

(c) Load block sheaves shall have pitch diameters not less than 16 times the nominal diameter of the rope used.

8-1.9.6 Load Hooks, Ball Assemblies, and Load Blocks

Load hooks, ball assemblies, and load blocks shall be of sufficient weight to overhaul the line from the highest hook position for boom or boom and jib lengths and the number of parts of line in use. All hook and ball assemblies and load blocks shall be labeled with their rated capacity and weight. Hooks shall be equipped

with latches unless the application makes the use of a latch impractical. When provided, the latch shall bridge the throat opening of the hook for the purpose of retaining slings or other lifting devices, under slack conditions (see ASME B30.10).

SECTION 8-1.10: CABS

8-1.10.1 Construction

(a) All cabs and enclosures should be constructed to protect the superstructure machinery, brakes, and the operator's station from the weather.

(b) All cab glazing shall be safety glazing as defined in ANSI Z26.1. Windows shall be provided in the front and on both sides of the cab or operator's compartment for visibility forward and to both sides. Visibility forward shall include a vertical range adequate to cover the boom point at all times. The front window may have a section that can be removed or held open if desired. If the section is of the type held in the open position, it shall be secured to prevent inadvertent closure. A

windshield wiper should be provided on the front window.

(c) All cab doors, whether of the sliding or swinging type, shall be restrained from inadvertent opening or closing while the machine is in operation. The door adjacent to the operator, if swinging type, should open outward and, if sliding type, should slide rearward to open.

(d) A clear passageway shall be provided from the operator's station to an exit on the operator's side or rear.

(e) Means shall be provided for cleaning the windows.

(15) 8-1.10.2 Platforms to Cab

(a) Principal walking surfaces shall be of a skid-resistant type.

(b) Outside platforms, if furnished, shall be provided with guardrails in accordance with ANSI A14.3 and ANSI/SAE J2703. On barge-mounted land cranes where platforms are too narrow to use guardrails, handholds shall be provided at convenient points above the platform.

(15) 8-1.10.3 Access to Cab

Handholds or steps shall be provided in accordance with ANSI A14.3 and ANSI/SAE J2703 to facilitate entrance to and exit from the cab.

(15) 8-1.10.4 Cab Roof

Where necessary for rigging or service requirements, a ladder or steps shall be provided to give access to the cab roof. The ladder or steps shall conform to the requirements of ANSI A14.3 and ANSI/SAE J2703. Where necessary, areas of the cab roof shall be capable of supporting the weight of a 200-lb (90-kg) person without permanent distortion.

8-1.10.5 Exhaust Gases

Engine exhaust gases shall be piped to the outside of the cab and discharged in a direction away from the operator. All exhaust pipes shall be guarded or insulated to prevent contact with personnel when performing normal duties.

SECTION 8-1.11: GENERAL REQUIREMENTS FOR BOOMS

8-1.11.1 Booms

(15)

(a) Boom stops shall be provided to resist the boom falling backwards. Boom stops should be one of the following types:

(1) fixed or telescoping bumper

(2) shock absorbing bumper

(3) hydraulic boom elevation cylinder(s)

(4) derrick masts, if designed by the manufacturer to be used as a boom stop

(b) Jibs shall be restrained from backward overturning.

(c) A boom angle indicator readable from the operator's station shall be provided on all floating cranes.

(d) A boom hoist disconnect, shutoff, or hydraulic relief shall be provided to stop the boom hoist automatically when the boom reaches a predetermined angle.

(e) A boom length indicator readable from the operator's station shall be provided for telescoping booms unless the load rating is independent of the boom length.

(f) Booms, boom sections, and jibs shall be identified and shall be used only for the purposes recommended by the manufacturer.

(g) Prototype booms, jibs, gantries, masts, outriggers, carrier frames, and upper frames of production models of rope-supported lattice boom cranes shall meet the performance requirements of ANSI/SAE J987. For special designs (not production models) or specific lift situations, calculations made by the manufacturer or a qualified person that verify the equipment's ability to meet the performance requirements of ANSI/SAE J987 are acceptable.

(h) Prototype booms, jibs, masts, lattice extensions (jibs), outriggers, carrier frames, and upper frames of production models of telescopic cantilever boom cranes shall meet the performance requirements of ANSI/SAE J1063. For special designs (not production models) or specific lift situations, calculations made by the manufacturer or a qualified person that verify the equipment's ability to meet the performance requirements of ANSI/SAE J1063 are acceptable.

Chapter 8-2

Inspection, Testing, and Maintenance

(15) SECTION 8-2.1: INSPECTION: GENERAL

(a) The manufacturer shall furnish operation and maintenance information.

(b) All inspections shall be performed by a designated person. Any deficiency identified shall be examined and a determination made by a qualified person as to whether it constitutes a hazard.

(15) 8-2.1.1 Inspection Classifications

(a) *Initial Inspection.* Prior to initial use, all new, reinstalled, altered, or modified cranes and derricks shall be inspected to verify compliance with provisions of this Volume.

(b) *Regular Inspection.* Inspection procedure for cranes and derricks in regular service is divided into two general classifications based on the intervals at which inspection should be performed. The intervals, in turn, are dependent upon the nature of the critical components of the crane or derrick and the degree of their exposure to wear, deterioration, or malfunction. The two general classifications are *frequent* and *periodic*, with respective intervals between inspections as defined below.

(1) *Frequent Inspection.* Daily to monthly intervals.

(2) *Periodic Inspection.* Intervals of 1 month to 12 months, or as specifically recommended by the manufacturer.

(15) 8-2.1.2 Frequent Inspection

The following shall be inspected at intervals as defined in para. 8-2.1.1(b)(1), or as specifically indicated, including observation during operation for any deficiency that may appear between regular inspections. This inspection does not require dismantling unless external conditions indicate further examination is required.

(a) *Cranes and Derricks*

(1) all control mechanisms for maladjustment interfering with proper operation — daily, when used

(2) all chords and lacing — visually inspected daily, when used

(3) all control mechanisms for legible markings, excessive wear of components, and contamination by lubricants or other foreign matter

(4) operational aids for malfunction or inaccuracies: daily when used (para. 8-2.1.6)

(5) all air and hydraulic hoses, particularly those that flex in normal operation of crane functions, should be visually inspected

(6) hooks in accordance with ASME B30.10

(7) rope reeving for compliance with crane or derrick manufacturer's recommendations

(8) electrical apparatus for malfunctioning, signs of excessive deterioration, dirt, and moisture accumulation

(9) guys for tension — inspected daily, when used (guy derricks only)

(10) derrick mast fittings and connections for compliance with manufacturer's recommendations

(11) hoist brakes, clutches, and operating levers for proper functioning before beginning operation — daily, when used

(b) *Barge or Pontoon*

(1) ballast compartments for proper ballast

(2) deckloads for proper securing

(3) chain lockers, storage, fuel compartments, and battening of hatches

(4) firefighting and lifesaving equipment in place and functional

(5) null void compartments sounded for leakage — inspected weekly

8-2.1.3 Periodic Inspection

(15)

Complete inspections shall be performed at intervals as generally defined in para. 8-2.1.1(b)(2), depending on the activity, severity of service, and environment, or as specifically indicated below. These inspections shall include the requirements of para. 8-2.1.2 and the following. This inspection does not require dismantling unless external conditions indicate further examination is required.

(a) *Cranes and Derricks*

(1) structural members including boom for deformed, cracked, or corroded members

(2) bolts or rivets for tightness

(3) sheaves and drums for cracked or worn surfaces

(4) pins, bearings, shafts, gears, rollers, and locking devices for wear, cracks, and distortion

(5) brake and clutch system parts, linings, pawls, and ratchets for excessive wear

(6) operational aids for malfunction or any inaccuracy (para. 8-2.1.6)

(7) gasoline, diesel, electric, or other power plants for proper performance or compliance with applicable safety requirements

(8) chain drive sprockets for excessive wear and chain for stretch

- (9) hooks for cracks
- (10) tie-downs on barge-mounted land cranes for wear, corrosion, and tightness
- (11) gudgeon pin for cracks, wear, and distortion
- (12) supports for continued ability to sustain the imposed loads
- (13) hydraulic and pneumatic hose, fittings, and tubing inspection
 - (-a) evidence of leakage at the surface of the flexible host or its junction with the end fittings
 - (-b) blistering or abnormal deformation of the outer covering of the hydraulic or pneumatic hose
 - (-c) leakage at threaded or clamped joints that cannot be eliminated by normal tightening or recommended procedures
 - (-d) evidence of excessive abrasion or scrubbing on the outer surface of a hose, rigid tube, or fitting. Means shall be taken to eliminate the interference of elements in contact or otherwise to protect the components.
- (14) hydraulic and pneumatic pumps and motors
 - (-a) loose bolts or fasteners
 - (-b) leaks at joints between sections
 - (-c) shaft seal leaks
 - (-d) unusual noises or vibration
 - (-e) loss of operating speed
 - (-f) excessive heating of the fluid
 - (-g) loss of pressure
- (15) hydraulic and pneumatic valves
 - (-a) cracks in valve housing
 - (-b) improper return of spool to neutral position
 - (-c) leaks at spools or joints
 - (-d) sticking spools
 - (-e) failure of relief valves to attain correct pressure setting
 - (-f) relief valve pressures shall be checked as specified by the manufacturer
- (16) hydraulic and pneumatic cylinders
 - (-a) drifting caused by fluid leaking across the piston
 - (-b) rod seal(s) leakage
 - (-c) leaks at welded joints
 - (-d) scored, nicked, or dented cylinder rods
 - (-e) dented cylinder barrel
 - (-f) loose or deformed rod eyes or connecting joints
- (17) hydraulic filters: evidence of rubber particles on the filter element may indicate hose, O-ring, or other rubber component deterioration. Metal chips or pieces on the filter may denote failure in pumps, motors, or cylinders. Further checking will be necessary to determine the origin of the problem before corrective action can be taken.

(b) Barge or Pontoon

- (1) cleats, bitts, chocks, fenders, capstans, ladders, stanchions for corrosion, wear, deterioration, and deformation
- (2) compartments for leakage and structural damage; void compartment atmosphere shall be tested before entering
- (3) rescue skiff, lifelines, work vests, life preservers, and ring buoys for deterioration and seaworthiness
- (4) four-corner draft readings
- (5) firefighting equipment for serviceability

8-2.1.4 Cranes or Derricks Not in Regular Use (15)

- (a) A crane or derrick that has been idle for a period of 1 month or more, but less than 6 months, shall be given an inspection conforming with the requirements of paras. 8-2.1.2 and 8-2.4.1 before being placed in service.
- (b) A crane or derrick that has been idle for a period of over 6 months shall be given a complete inspection conforming with the requirements of paras. 8-2.1.2, 8-2.1.3, and 8-2.4.2 before being placed in service.

8-2.1.5 Inspection Records (15)

Dated records shall be made on critical items such as brakes, hooks, and ropes. Records should be available.

8-2.1.6 Operational Aids (15)

- (a) Prior to daily operation, operational aids shall be checked in accordance with the device/crane manufacturer's recommended procedures to determine if they are functioning properly.
- (b) Operational aids shall be inspected and tested in accordance with the device/crane manufacturer's recommended procedures as part of the periodic inspection of para. 8-2.1.3.
- (c) When operational aids are inoperative or malfunctioning, the crane and/or device manufacturer's recommendations for continued operation or shutdown of the crane shall be followed until the problems are corrected. Without such recommendations and any prohibition from the manufacturer against further operation, the requirements of para. 8-3.2.2(b) shall apply.

SECTION 8-2.2: TESTING

8-2.2.1 Operational Tests (15)

- (a) *New or Reinstalled Floating Cranes or Derricks.* Prior to initial use, all new or reinstalled floating cranes or derricks shall be tested with no hook load, under the direction of a qualified person to ensure compliance with this Volume, including but not limited to the following:
 - (1) lifting and lowering the hook(s) through full range of hook travel.
 - (2) raising and lowering the boom through full range of boom travel.

(3) swinging each direction through full range of swing.

(4) operating hoist clutches and brakes.

(5) over-hoist limit devices (when provided). The actuating mechanism of the limit device shall be located so it will trip the device under all conditions in sufficient time to prevent two-blocking.

(6) locking, limiting, and indicating devices.

(7) operational aids

(b) *Anchorage*s. All anchorages shall be inspected by a designated person prior to performing an operational or load test.

(c) *Repaired, Altered, or Modified Floating Cranes or Derricks*. Prior to use, a repaired, altered, or modified floating crane or derrick shall be tested. Testing may be limited to the function(s) affected by the repair.

8-2.2.2 Load Test

(a) *New or Reinstalled Floating Cranes or Derricks*

(1) Prior to initial use, all new or reinstalled floating cranes or derricks shall be inspected and load tested by or under the direction of a qualified person. A written test report shall be prepared by the qualified person and placed on file. Test loads shall not be less than 100% or more than 110% of the rated load unless otherwise recommended by the manufacturer or a qualified person.

(2) The load test shall consist of the following operations as a minimum requirement:

(-a) hoist the test load to ensure that the load is supported by the floating crane or derrick and held by the hoist brake(s)

(-b) swing the floating crane or derrick, if applicable, the full range of its swing with the test load

(-c) boom the floating crane or derrick up and down within the allowable working radius for the test load

(-d) lower the test load, stop, and hold the load with the brake(s)

(b) *Repaired, Altered, or Modified Floating Cranes or Derricks*. The need for load testing a repaired, altered, or modified floating crane or derrick shall be determined by a qualified person. When a load test is required, testing shall be in accordance with para. 8-2.2.2(a).

SECTION 8-2.3: MAINTENANCE

(15) 8-2.3.1 Preventive Maintenance

(a) A preventive maintenance program shall be established and should be based on the recommendation outlined by the crane or derrick manufacturer's manual. If a qualified person determines it is appropriate, the program should also include that individual's additional recommendations based on a review of the crane application and operations. Dated records should be placed on file.

(b) Replacement parts shall be at least equal to the original equipment manufacturer's specifications.

8-2.3.2 Maintenance Procedure

(15)

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

(1) crane or derrick placed where it will cause the least interference with other equipment or operations in the area and secured from movement

(2) boom lowered to the boom rest, if possible, or otherwise secured against inadvertent lowering

(3) all controls at the off position and all dogs engaged

(4) starting means rendered inoperative, or main or emergency switch locked in open position if electric hoist is used

(5) "Warning" or "Out of Service" signs placed on the crane or derrick

(6) power plant stopped or disconnected at takeoff, and tagged

(7) procedures for repairs by welding shall be approved by a qualified person

(8) relieve hydraulic oil pressure from all hydraulic circuits before loosening or removing hydraulic components

(b) After adjustments and repairs have been made, the crane or derrick shall not be placed back in service until all guards have been reinstalled and maintenance equipment removed.

8-2.3.3 Adjustments and Repairs

(15)

(a) Any hazardous condition disclosed by the inspection requirements of Section 8-2.1 shall be corrected before operation is resumed. Adjustments and repairs shall be done only by designated personnel.

(b) Adjustments shall be maintained to ensure correct functioning of components. The following are examples:

(1) functional operating mechanisms

(2) operational aids

(3) control systems

(4) power plants

(5) vang lines

(6) brakes and clutches

(7) signal systems

(c) Repairs or replacements shall be provided as needed for operation. The following are examples:

(1) Critical parts of functional operating mechanisms that are cracked, bent, broken, corroded, or excessively worn shall be repaired or replaced.

(2) Critical parts of the structure that are cracked, bent, broken, or excessively corroded shall be repaired or replaced.

(3) Hooks showing indications described in para. 8-2.1.2 shall be discarded if after examination a determination is made that they constitute a hazard. Repairs by welding or reshaping are not recommended.

(4) Pitted or burned electrical contacts should be corrected only by replacement in sets.

8-2.3.4 Lubrication

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

(b) Machinery shall be stationary while lubricants are being applied and protection provided as called for in paras. 8-2.3.2(a)(2) through (a)(5), unless equipped for automatic or remote lubrication.

(c) The operator shall be notified immediately before any crane, derrick, winch, or capstan parts are to be lubricated.

(15) SECTION 8-2.4: ROPE INSPECTION, REPLACEMENT, AND MAINTENANCE

All inspections shall be performed by a designated person. Any deficiency identified shall be examined and a determination made by a qualified person as to whether it constitutes a hazard.

8-2.4.1 Frequent Inspection

(a) All crane and derrick running ropes in continuous service should be visually inspected once each working day. As a minimum, a visual inspection shall consist of observation of all rope that can reasonably be expected to be used during the day's operations. These visual observations should be concerned with discovering gross damage such as the following, which may be an immediate hazard:

(1) distortion of the rope such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion.

(2) general corrosion.

(3) broken or cut strands.

(4) number, distribution, and type of visible broken wires [see paras. 8-2.4.3(b)(1) and (b)(2) for further guidance]. When such damage is discovered, the rope shall either be removed from service or given an inspection as detailed in para. 8-2.4.2.

(b) Care shall be taken when inspecting sections of rapid deterioration such as flange points, crossover points, and repetitive pickup points on drums.

(c) Care shall be taken when inspecting certain ropes such as

(1) rotation-resistant rope because of its higher susceptibility to damage, increased deterioration, and core failure (see Fig. 8-2.4.1-1) when working on equipment

with limited design parameters. The internal deterioration of rotation-resistant ropes may not be readily observable.

(2) boom hoist ropes because of the difficulties of inspection and important nature of these ropes.

8-2.4.2 Periodic Inspection

(15)

(a) The inspection frequency shall be determined by a qualified person and shall be based on such factors as expected rope life as determined by experience on the particular installation or similar installations, severity of environment, percentage of capacity lifts, frequency rates of operation, and exposure to shock loads. Inspections need not be at equal calendar intervals; they should be more frequent as the rope approaches the end of its useful life. This inspection shall be made at least annually.

(b) Periodic inspection covers the entire length of the rope. Only the surface wires of the rope need be inspected. No attempt should be made to open the rope. In addition to the conditions described in para. 8-2.4.1, any deterioration resulting in appreciable loss of original strength, such as the following, shall be noted and determination made as to whether further use of the rope would constitute a hazard:

(1) reduction of rope diameter below nominal diameter due to loss of core support, internal or external corrosion, or wear of outside wires (see Fig. 8-2.4.1-1)

(2) severely corroded or broken wires at end connections

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

(4) wire rope clips for tightness

(c) Care shall be taken when inspecting sections of rapid deterioration, such as the following:

(1) sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited

(2) sections of the rope at or near terminal ends where corroded or broken wires may protrude

8-2.4.3 Rope Replacement

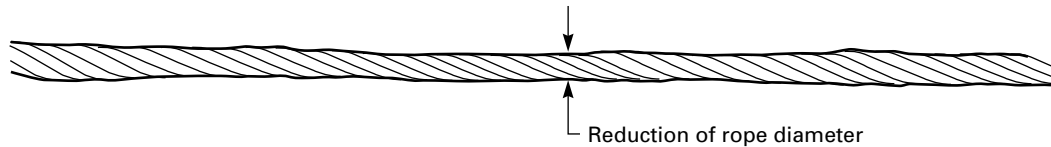
(15)

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

Fig. 8-2.4.1-1 Core Failure in 19 × 7 Rotation-Resistant Rope

GENERAL NOTE: Note the lengthening of lay and reduction of diameter.

(2) in rotation resistant wire ropes, two randomly distributed broken wires in six rope diameters, or four randomly distributed broken wires in 30 rope diameters

(3) one outer wire broken at the contact point 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

(4) wear of one-third the original diameter of outside individual wires

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

(6) evidence of heat damage

(7) reductions in nominal diameter of more than 5%

(8) in standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection

(c) Broken wire removal criteria cited in this Volume apply to wire rope operating on steel sheaves and drums. The user shall contact the sheave, drum, crane, or derrick manufacturer, or a qualified person for broken wire removal criteria for wire ropes operating on sheaves and drums made of material other than steel.

(d) Replacement rope shall have a strength rating at least as great as the original rope furnished by the crane manufacturer. Any deviation from the original size, grade, or construction shall be specified by the rope manufacturer, crane manufacturer, or a qualified person.

(15) 8-2.4.4 Ropes Not in Regular Use

All rope that has been idle for a period of 1 month or more due to shutdown or storage of a crane or derrick on which it is installed shall be given an inspection in accordance with para. 8-2.4.2 before it is placed in service. This inspection shall be for all types of deterioration.

(15) 8-2.4.5 Inspection Records

(a) *Frequent Inspection.* No records required.

(b) *Periodic Inspection.* In order to establish data as a basis for judging the proper time for replacement, a

dated report of rope condition at each periodic inspection shall be kept on file, available to designated personnel. This report shall cover points of deterioration listed in para. 8-2.4.2(b).

(c) *Service History.* A historical inspection program should be established and include records on examination of ropes removed from service so a relationship can be established between visual observation and actual condition of the internal structure.

8-2.4.6 Rope Maintenance

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

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

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

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

(e) Rope should be maintained in a well-lubricated condition. It is important that lubricant applied as part of a maintenance program shall be compatible with the original lubricant, and to this end, the rope manufacturer should be consulted. Lubricant applied should be the type that does not hinder visual inspection. Those sections of rope that are located over sheaves or otherwise hidden during inspection and maintenance procedures require special attention when lubricating the rope. The object of rope lubrication is to reduce internal friction and to prevent corrosion. Periodic field lubrication is particularly important for rotation-resistant rope.

(f) When an operating rope shows greater wear at well-defined localized areas than on the remainder of the rope, rope life can be extended (in cases where a reduced rope length is adequate) by cutting off a section at one end, thus shifting the wear to different areas on the rope.

Chapter 8-3

Operation

(15) SECTION 8-3.1: QUALIFICATIONS AND RESPONSIBILITIES

(15) 8-3.1.1 Operators

(a) Cranes and derricks shall be operated only by the following personnel:

(1) designated persons.

(2) trainees under the supervision of a designated person. The number of trainees permitted to be supervised by a single designated person, the physical location of the designated person while supervising, and the type of communication required between the designated person and the trainee shall be determined by a qualified person.

(3) maintenance and test personnel (when it is necessary in the performance of their duties).

(4) inspectors.

(b) No one other than the personnel specified in para. 8-3.1.1(a) shall enter a crane cab or operator's station, with the exception of persons such as oilers, supervisors, and those specific persons authorized by supervisors, whose duty requires them to do so, and then only in the performance of those duties and with the knowledge of the operator.

8-3.1.2 Qualifications for Operators

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

(b) Operators and 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 color, if color differentiation is required for operation

(3) adequate hearing, with or without hearing aid, 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 a hazard to the operator 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, coordination, and no tendencies to dizziness or similar undesirable characteristics.

(f) When physically or otherwise unfit, an operator shall not engage in the operation of the equipment.

8-3.1.3 Responsibilities

(15)

While the organizational structure of various projects may differ, the following roles are described for the purpose of delineating responsibilities. All responsibilities listed below shall be assigned in the worksite organization. (A single individual may perform one or more of these roles.)

(a) *Crane Owner*. The crane owner has custodial control of a crane by virtue of lease or ownership.

(b) *Crane User*. The crane user arranges the crane's presence on a worksite and controls its use there.

(c) *Site Supervisor*. The site supervisor exercises supervisory control over the worksite on which a crane is being used and over the work that is being performed on that site.

(d) *Lift Director*. The lift director oversees the work being performed by a crane and the associated rigging crew.

(e) *Crane Operator*. The crane operator directly controls the crane's functions.

8-3.1.3.1 Responsibilities of the Crane Owner and Crane User.

In some situations the owner and the user may be the same entity and is therefore accountable for all of the following responsibilities. In other cases, the user may lease or rent a crane or derrick from the owner without supervisory, operational, maintenance, support personnel, or services from the owner. In these situations, paras. 8-3.1.3.1.1 and 8-3.1.3.1.2 shall apply.

8-3.1.3.1.1 Crane Owner. The crane owner's responsibilities shall include the following:

(a) providing a crane or derrick that meets the requirements of Chapters 8-1 and 8-2 as well as specific job requirements defined by the user

(b) providing a crane or derrick and all necessary components specified by the manufacturer that meets the user's requested configuration and capacity

(c) providing all applicable load/capacity chart(s) and diagrams

(d) providing additional technical information pertaining to the crane or derrick necessary for operation when requested by the crane user

(e) providing field assembly, disassembly, operation, maintenance information, and warning decals and placards installed as prescribed by the crane or derrick manufacturer

(f) establishing an inspection, testing, and maintenance program in accordance with Chapter 8-2 and informing the crane user of the requirements of this program

(g) designating personnel for the purposes of inspection, maintenance, repair, transport, assembly, and disassembly

8-3.1.3.1.2 Crane User. The crane user's responsibilities shall include the following:

(a) complying with the requirements of this Volume, manufacturer's requirements, and those regulations applicable at the worksite

(b) designating personnel to supervise crane or derrick activities

(c) ensuring that the crane or derrick is in proper operating condition prior to initial use at the worksite by

(1) verifying that the crane owner has provided documentation that the crane or derrick and barge or pontoon meet the inspection and test requirements of paras. 8-2.1.3, 8-2.2.1, and 8-2.4.2

(2) verifying that a frequent inspection has been performed as defined in para. 8-2.1.2

(d) verifying that the crane or derrick has the necessary lifting capacity to perform the proposed lifting operations in the planned configuration

(e) using operators that meet the requirements of para. 8-3.1.2 and are qualified to perform the tasks that will be required with the crane or derrick to which they are assigned to operate

(f) ensuring the operator(s) has been notified of adjustments or repairs that have not yet been completed, prior to commencing crane operations

(g) designating personnel for inspections as required in Sections 8-2.1 and 8-2.4

(h) designating personnel for the purposes of maintenance, repair, transport, assembly, and disassembly, as applicable

(i) ensuring that all personnel involved in maintenance, repair, transport, assembly, disassembly, and inspection, as applicable, are aware of their responsibilities, assigned duties, and the associated hazards

(j) ensuring that the inspection, testing, and maintenance programs specified by the crane owner are followed

8-3.1.3.2 Responsibilities of Site Supervisor and Lift Director. In some situations, the site supervisor and the lift director may be the same person.

8-3.1.3.2.1 Site Supervisor. The site supervisor's responsibilities shall include the following:

(a) ensuring that the crane or derrick meets the requirements of Chapter 8-2 prior to initial site usage

(b) determining if additional regulations are applicable to crane or derrick operations

(c) ensuring that a qualified person is designated as the lift director

(d) ensuring that crane or derrick operations are coordinated with other jobsite activities that will be affected by or will affect lift operations

(e) ensuring that the area for the crane or derrick is adequately prepared; such preparation includes but is not limited to the following:

(1) sufficient room to assemble and disassemble the crane or derrick, as applicable

(2) an operating area that is suitable for the crane or derrick with respect to water conditions, support capability, proximity to power lines, and obstructions to crane operation

(3) traffic control as necessary to restrict unauthorized access to the crane or derrick's working area

(f) ensuring that work involving the assembly and disassembly, as applicable, of the crane or derrick is supervised by a qualified person

(g) ensuring that crane operators meet the requirements of para. 8-3.1.2

(h) ensuring that conditions that may adversely affect crane or derrick operations are addressed; such conditions include but are not limited to the following:

(1) wind velocity or gusting winds

(2) heavy rain

(3) fog

(4) extreme cold

(5) artificial lighting

(6) river traffic

(i) allowing crane or derrick operation near electric power lines only when the requirements of para. 8-3.4.3 are met

(j) permitting special lifting operations only when equipment and procedures required by this Volume, the crane or derrick manufacturer, or a qualified person are employed; such operations include but are not limited to the following:

(1) multiple crane and derrick lifts

(2) lifting personnel

(3) pick-and-carry operations

(k) ensuring that work performed by rigging crew is supervised by a designated person

(l) ensuring that crane or derrick maintenance is performed by a designated person

8-3.1.3.2.2 Lift Director. The lift director's responsibilities shall include the following:

(a) being present at the jobsite during lifting operations.

(b) stopping crane or derrick operations if alerted to an unsafe condition affecting those operations.

(c) ensuring that the preparation of the area needed to support crane or derrick operations has been completed before operations commence.

(d) ensuring necessary traffic controls are in place to restrict unauthorized access to the crane or derrick's work area.

(e) ensuring that personnel involved in crane or derrick operations understand their responsibilities, assigned duties, and the associated hazards.

(f) addressing safety concerns raised by the operator or other personnel and being responsible if it is decided to overrule those concerns and crane or derrick operations are directed to continue. (In all cases, the manufacturer's criteria for safe operation and the requirements of this Volume shall be adhered to.)

(g) designating the signalperson(s) and conveying that information to the crane or derrick operator.

(h) ensuring that signalperson(s) is designated.

(i) allowing crane or derrick operation near electric power lines only when the requirements of para. 8-3.4.3 and any additional requirements determined by the site supervisor have been met.

(j) ensuring precautions are implemented when hazards associated with special lifting operations are present; such operations include but are not limited to the following:

(1) multiple crane or derrick lifts

(2) lifting personnel

(3) pick-and-carry operations

(k) ensuring that the applicable requirements of ASME B30.23 are met when lifting personnel.

(l) informing the crane or derrick operator of the weight of loads to be lifted, as well as the lifting, moving, and placing locations for these loads.

(m) obtaining the crane or derrick operator's verification that this weight does not exceed the crane or derrick's rated capacity.

(n) ensuring that a crane or derrick's load rigging is performed by designated personnel

(o) ensuring that the load is properly rigged and balanced before it is lifted more than a few inches.

8-3.1.3.3 Responsibilities of Crane Operators. The crane or derrick operator shall be responsible for the following. The operator shall not be responsible for hazards or conditions that are not under his/her direct control and that adversely affect the lift operations. Whenever the operator has doubt as to the safety of operations, the operator shall stop the crane or derrick's functions in a controlled manner. Lift operations shall

resume only after safety concerns have been addressed, or the continuation of crane or derrick operations is directed by the lift director.

The crane operator's responsibilities shall include the following:

(a) reviewing the requirements for the crane or derrick with the lift director before operations.

(b) knowing what types of site conditions could adversely affect the operation of the crane or derrick and consulting with the lift director concerning the possible presence of those conditions.

(c) understanding and applying the information contained in the crane or derrick manufacturer's operating manual.

(d) understanding the crane or derrick's functions and limitations as well as its particular operating characteristics.

(e) using the crane or derrick's load/capacity chart(s) and diagrams and applying all notes and warnings related to the charts to confirm the correct crane or derrick configuration to suit the load, site, and lift conditions.

(f) refusing to operate the crane or derrick when any portion of the load, crane, or derrick could enter the danger zone of energized power lines shown in Fig. 8-3.4.3-1.

(g) performing a daily inspection of the crane or derrick as specified in para. 8-2.1.2(a).

(h) promptly reporting the need for any adjustments or repairs.

(i) following applicable lock out/tag out procedures.

(j) not operating the crane or derrick when physically or mentally unfit.

(k) ensuring that all controls are in the off or neutral position and that all personnel are in the clear before energizing the crane or derrick or starting the engine.

(l) not engaging in any practice that will divert his/her attention while actually operating the crane or derrick controls.

(m) testing the crane or derrick function controls that will be used and operating only if those function controls respond properly.

(n) operating the crane or derrick's functions under normal operating conditions in a smooth and controlled manner.

(o) knowing and following the procedures specified by the manufacturer or approved by a qualified person for assembly, disassembly, setting up, and reeving the crane or derrick, as applicable.

(p) knowing how to travel the crane

(q) observing each outrigger during extension, setting, and retraction or using a signalperson to observe each outrigger during extension, setting, or retraction, as applicable.

(r) ensuring that the load and rigging weight(s) have been provided.

(s) calculating or determining the net capacity for all configurations that will be used and verifying by using the load/capacity chart(s) that the crane or derrick has sufficient net capacity for the proposed lift.

(t) considering all factors known that may affect the crane or derrick capacity and informing the lift director of the need to make appropriate adjustments.

(u) knowing the standard and special signals as specified in Section 8-3.3 and responding to such signals from the person who is directing the lift or a designated signalperson. (When a signalperson is not required as part of the lift operation, the operator is then responsible for the movement of the crane or derrick. However, the operator shall obey a stop signal at all times, no matter who gives it.)

(v) understanding basic load rigging procedures. For responsibility of rigging the load and ensuring that the load is rigged properly, see paras. 8-3.1.3.2.2(n) and (o).

(w) if power fails during operations

(1) setting all brakes and locking devices

(2) moving all clutches or other power controls to the off or neutral position

(3) landing any load suspended below the hook under brake control, if practical

(x) before leaving the crane or derrick unattended

(1) landing any load suspended below the hook

(2) disengaging the master clutch.

(3) setting hoist brakes, swing brakes, boom brakes, and other locking devices.

(4) putting controls in the off or neutral position.

(5) stopping the engine. An exception to this may exist when crane or derrick operation is frequently interrupted during a shift and the operator must leave the crane or derrick. Under these circumstances, the engine may remain running, and paras. 8-3.1.3.3(x)(1) through (x)(4) shall apply. The operator shall be situated where any entry to the crane or derrick can be observed.

(6) considering the recommendations of the manufacturer for securing the crane or derrick, when a local weather storm warning exists.

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

(1) a designated person shall direct each lift.

(2) a qualified person shall ascertain that the rope is in satisfactory condition before and after each lift. See paras. 8-2.4.1(a)(1) through (a)(4).

(3) if more than one broken wire in any one lay is found, the lift shall not be made.

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

8-3.2.2 Operational Aids

(15)

(a) In all cases, verified weights, measured radii, load rating chart capacities, and instructions shall take precedence over operational aids when handling a load. If it is necessary to temporarily override an operational aid to handle a rated capacity load within the limits established by the load capacity chart and instructions, the user shall comply with paras. 8-3.2.1(a) and (b).

(b) When operational aids are inoperative or malfunctioning, the crane and/or device manufacturer's recommendations for continued operation or shutdown of the crane shall be followed until the problems are corrected. Without such recommendations and any prohibitions from the manufacturer against further operation, the following requirements shall apply:

(1) Recalibration or repair of the operational aid shall be accomplished as soon as is reasonably possible, as determined by a qualified person.

(2) When a load indicator, rated capacity indicator, or rated capacity limiter is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish procedures for determining load weights and for conducting the lifts in accordance with paras. 8-3.2.1(a) through (c).

(3) When a boom angle or radius indicator is inoperative or malfunctioning, the radii or boom angle shall be determined by measurement.

(4) When an anti-two-block device, two-block damage prevention device, or two-block warning device is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish procedures, such as assigning an additional signalperson, to furnish equivalent protection. This does not apply when lifting personnel. Personnel shall not be lifted when two-block devices are not functioning properly.

(5) When a boom length indicator is inoperative or malfunctioning, the designated person responsible for supervising the lifting operations shall establish procedures for conducting the lifts in accordance with paras. 8-3.2.1(a) through (c).

8-3.2.3 Attaching the Load

(a) The hoist rope shall not be wrapped around the load.

SECTION 8-3.2: OPERATING PRACTICES

(15) 8-3.2.1 Load Weight

(a) No crane or derrick shall be loaded beyond the load rating, except for test purposes as provided in Section 8-2.2.

(b) When loads approach the maximum rating of the crane or derrick, the person responsible for the job shall ascertain that the weight of the load has been determined within $\pm 10\%$ before it is lifted.

(c) When operating in windy conditions, the rated load shall be reduced to allow for the wind effect on the lifted load.

(b) The load shall be attached to the hook by means of slings or other devices of sufficient capacity.

(15) 8-3.2.4 Moving the Load

(a) The lift director shall see that the load is secured and balanced in the sling or lifting device before it is lifted more than a few inches.

(b) Before starting to hoist, the following conditions shall be observed:

(1) The hoist rope shall not be kinked.

(2) Multiple-part lines shall not be twisted around each other.

(3) The hook shall be brought over the load in such a manner as to minimize swinging.

(4) If there is a slack rope condition, it shall be determined that the rope is properly seated on the drum and in the sheaves as the slack is removed.

(c) During lifting operations, care shall be taken that

(1) there is no sudden acceleration or deceleration of the moving load

(2) the load does not contact any obstructions

(d) A crane or derrick shall not be used for side loading except when specifically authorized by a qualified person who has determined that the various structural components will not be overstressed. Otherwise, side loading of a crane boom shall be limited to freely suspended loads. Cranes shall not be used for dragging loads sideways.

(e) The operator should avoid carrying loads over people.

(f) The operator shall test the brakes each time a load approaching the rated load is handled by raising it a few inches and applying the brakes.

(g) Neither the load nor the boom shall be lowered below the point where no less than two full wraps of rope remain on their respective drums.

(h) When rotating a crane or derrick, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radius at which it can be controlled. A tag or restraint line shall be used when rotation of the load is hazardous.

(i) Boom and hoisting rope systems shall not be twisted.

(j) When two or more cranes or derricks are used to lift one load, one designated person shall be responsible for the operation. The designated person shall analyze the operation and instruct all personnel involved in the proper positioning, rigging of the load, and the movements to be made.

(k) When a crane is to be operated with the boom at a fixed radius, the boom-hoist-pawl or other positive locking device shall be engaged.

8-3.2.5 Holding the Load

(a) The operator shall not leave the controls while the load is suspended.

(b) No person should be permitted to stand or pass under a load on the hook.

(c) If the load hoist mechanism is not equipped with an automatic brake and the load must remain suspended for any considerable length of time, the operator shall hold the drum from rotating in the lowering direction by activating the device specified in para. 8-1.6.2(d). The boom hoist brakes shall be set and the device specified in para. 8-1.6.1(f) shall be engaged.

8-3.2.6 Use of Winch Heads

(a) Ropes shall not be handled on a winch head without the knowledge of the operator.

(b) While a winch head is being used, the operator shall be within reach of the power unit control lever.

8-3.2.7 Securing Booms

Crane booms and derrick booms are not normally designed to resist high wind loads. Unloaded booms shall not be left at high boom angles. Unless otherwise specified by the manufacturer, booms shall be lowered to deck level when winds exceed 50 mph (80 km/h).

(a) *Derrick Booms.* When not in use, the derrick boom shall be

(1) laid down

(2) secured to a stationary member, as near under the head as possible, by attachment of a sling to the load block

(3) raised to a vertical position and secured to the mast

(b) *Crane Booms.* When not in use, the crane boom shall be

(1) lowered to the deck of the barge and secured

(2) secured on the boom rest or boom cradle, when provided

(c) *Derrick and Crane Booms.* Dogs, pawls, or other positive locking mechanisms on the boom hoist shall be engaged.

8-3.2.8 Personnel Access

Means suitable for embarking and disembarking barges or pontoons shall be provided in accordance with applicable regulatory requirements.

8-3.2.9 Personnel Lifting

(15)

This Volume recognizes that floating cranes and floating derricks are designed and intended for handling materials, not personnel. Personnel are only permitted to ride in a personnel platform supported by the crane-load line attachment or boom-mounted platform when used in accordance with the requirements of ASME B30.23 and the crane manufacturer's instructions. The crane shall not be used for other purposes while handling personnel (refer to ASME B30.23.)

SECTION 8-3.3: SIGNALS

8-3.3.1 Standard Signals

Standard signals to the operator shall be in accordance with the standards prescribed in paras. 8-3.3.2 and 8-3.3.3, unless voice communication equipment (telephone, radio, or equivalent) is utilized. Signals shall be discernible or audible at all times. No response shall be made unless signals are clearly understood.

8-3.3.2 Hand Signals

Hand signals shall be in accordance with Fig. 8-3.3.2-1 and shall be posted conspicuously.

8-3.3.3 Bell Signals

Bells of different tone shall be used for boom and load. The signals shall be as follows:

- (a) When operating, one bell means stop.
- (b) When stopped, one bell means raise; two bells mean lower.
- (c) When temporarily stopped, two bells alternately on boom and load mean dog it off or stop for some time.
- (d) When dogged off, before starting, ring four bells alternately on boom and load, which means get ready to start work again.

8-3.3.4 Special Signals

Some special operations may require additions to, or modifications of, the basic signals standardized herein. In all such cases, these special signals should be agreed upon and understood by both the signalperson and the operator and should not be in conflict with the standard signals.

8-3.3.5 Instructions

If it is desired to give instructions to the operator other than provided for in the standard signal system, the crane or derrick motions shall be stopped.

SECTION 8-3.4: MISCELLANEOUS

8-3.4.1 Fire Extinguishers

Operating and maintenance personnel shall be familiar with the use and care of the fire extinguishers provided [see para. 8-1.4.4(a)].

8-3.4.2 Refueling

(a) When refueling with a portable container, it shall be a safety type and equipped with automatic closing spout and flame arrester.

(b) Machines shall not be refueled while the engine is running.

(c) Smoking or open flames shall be prohibited in the refueling area.

8-3.4.3 Operating Near Electric Power Lines

(15)

(a) Cranes or derricks shall be operated so that no part of the crane, derrick, or load enters into the danger zone shown in Fig. 8-3.4.3-1.

EXCEPTIONS:

- (1) The danger zone may be entered if the electrical distribution and transmission lines have been de-energized and visibly grounded at the point of work.
- (2) The danger zone may be entered if insulating barriers (not a part of nor attachment to the crane or derrick) have been erected to prevent physical contact with the lines.

(1) For lines rated 50 kV or below, minimum clearance between the lines and any part of the crane or load (including handling appendages) shall be 10 ft (3 m). For higher voltages, see Table 8-3.4.3-1.

(2) Caution shall be exercised when working near overhead lines, because they can move horizontally or vertically due to wind, moving the danger zone to new positions.

(3) In transit, with no load and boom lowered, the clearance shall be as specified in Table 8-3.4.3-1.

(4) A qualified signalperson shall be assigned to observe the clearance and give warning when the crane or derrick is within a boom's length before approaching the above limits.

(b) If cage-type boom guards, insulating links, or proximity warning devices were used on cranes or derricks, such devices shall not be a substitute for the requirements of para. 8-3.4.3(a), even if such devices are required by law or regulation. In view of the complex, invisible, and lethal nature of the electrical hazard involved and to lessen the potential of false security, limitations of such devices, if used, shall be understood by operating personnel and tested in the manner and intervals prescribed by the manufacturer of the device. Compliance with para. 8-3.4.3(a) is the recommended practice of this Volume in determining proximity of the crane or derrick and its protuberances, including load, to electric power lines.

(c) Before the commencement of operations near electrical lines, the person responsible for the job shall notify the owners of the lines or their authorized representatives, provide them with all pertinent information, and request their cooperation.

(d) Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities verifies that it is not an energized line.

(e) Exceptions to this procedure, if approved by the owner of the electrical lines, may be granted by the administrative or regulatory authority if the alternate procedure provides protection and is set forth in writing.