

Operation and Maintenance of Offshore Cranes

API RECOMMENDED PRACTICE 2D
SEVENTH EDITION, DECEMBER 2014

ERRATA, AUGUST 2015

ADDENDUM 1, OCTOBER 2020



Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

Users of this standard should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein.

All rights reserved. No part of this work may be reproduced, translated, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Copyright © 2014 American Petroleum Institute

Foreword

The verbal forms used to express the provisions in this standard are as follows:

- the term “shall” denotes a minimum requirement in order to conform to the standard;
- the term “should” denotes a recommendation or that which is advised but not required in order to conform to the standard;
- the term “may” is used to express permission or a provision that is optional;
- the term “can” is used to express possibility or capability.

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001, standards@api.org.

Contents

Page

1	Scope	1
2	Normative References	1
3	Terms, Definitions, and Abbreviations	2
3.1	Terms and Definitions	2
3.2	Abbreviations	9
4	Operation	9
4.1	Crane Operator and Rigger Qualifications and Operating Practices	9
4.2	Handling the Load	12
4.3	Signals	13
4.4	Personnel Transfer	13
4.5	Refueling	14
4.6	Fire Extinguishers	14
4.7	Load Test	14
4.8	Pull Test	18
5	Inspection, Testing, and Maintenance	18
5.1	Usage and Inspection	18
5.2	Inspection and Load Test Records	20
5.3	Maintenance	21
5.4	Lubrication	22
5.5	Crane Rerating	22
5.6	Crane Derating	22
6	Wire Rope and Sling Inspection, Maintenance, and Replacement	23
6.1	General	23
6.2	Wire Rope	23
6.3	Slings	25
7	Lift Planning	26
7.1	General	26
7.2	Roles and Responsibilities	27
7.3	Planning the Lift	28
7.4	Lift Categorization	30
7.5	Risk Assessment	30
7.6	Personnel Transfer	31
7.7	Personnel Qualifications	31
7.8	Documentation of a Lift Plan	31
7.9	Approval of Lift Plans	32
7.10	Changes to lift Plans	32
7.11	Summary Questions for a Safe Lift	32
8	Personnel Training Qualifications	32
8.1	Qualified Rigger	32
8.2	Qualified Crane Operator	33
8.3	Qualified Crane Inspector	33

Contents

	Page
9 Temporary Crane Installation	33
9.1 Planning the Installation	33
9.2 Installing the Temporary Cranes	34
9.3 Testing and Inspecting the Installation	34
9.4 Usage	34
9.5 Crane Design	35
9.6 Crane Equipment	36
9.7 Load Test Requirements	36
9.8 Preventative Maintenance	36
9.9 Work History	37
9.10 Rental Checklist	37
9.11 Tie-down Weld Design	38
9.12 Torque Procedure	38
9.13 Weld Procedure	38
9.14 Load Test	38
9.15 Load Test Procedure	38
9.16 Inspection of Temporary Cranes after Installation	39
Annex A (informative) Crane Operation	40
Annex B (informative) Usage, Inspection, Testing, and Maintenance	42
Annex C (informative) Crane-assisted Personnel Transfer	54
Annex D (normative) Load Testing	60
Annex E (informative) Crane Maintenance	64
Annex F (normative) Wire Rope and Sling Inspection, Maintenance, and Replacement	65
Annex G (informative) Lift Categories	79
Annex H (informative) Loading and Unloading Offshore Support Vessels	82
Bibliography	85
Figures	
1 General Crane Illustrations	ix
2 Standard Hand Signals for Controlling Crane Operations	15
3 Usage/Inspection/Inspector Qualification Matrix	21
B.1 Pre-use Inspection Checklist (Example)	44
B.2 Tilt Method	49
B.3 Depression Measurement Method	50
B.4 Rotation Method	51
D.1 Capacity vs. Radius for a Typical Crane	60
D.2 Example of a Typical Load Chart	61
F.1 Three Basic Components of Wire Rope	65
F.2 Showing Distance of One Rope Lay	66
F.3 Measurement-Diameter	67
F.4 Core Failures in Rotation-Resistant Wire Rope	68

Contents

	Page
F.5 Valley Breaks	68
F.6 Right and Wrong Way to Measure Wire Rope Diameter	70
F.7 Transferring Rope from Reel to Drum	72
F.8 Method of Installing Wedge-socket Attachment	74
F.9 Choker Configuration	76
F.10 Rated Sling Capacity Calculation Example (Included Angle)	76
F.11 Rated Sling Capacity Calculation Example (Horizontal Angle)	77
 Table	
1 Static/Onboard Test Load and Radius	17

Introduction

The API crane standards provide the design basis and construction, operations and maintenance, and training guidelines and requirements for pedestal-mounted cranes intended for use in offshore oil and gas applications on fixed and floating structures or vessels. They are intended to be used together, as appropriate, in order to better serve the product manufacturers and users. These include:

- Specification 2C, *Offshore Pedestal-Mounted Cranes*
- Recommended Practice 2D, *Operation and Maintenance of Offshore Cranes*
- Recommended Practice 2D-2, *Training for Offshore Pedestal-Mounted Crane Riggers, Operators, and Inspectors*

The requirements, procedures, and guidance provided are based on internationally recognized industry standards and global best practices, as well as the collective knowledge and experiences of those that participated in developing these standards. As such, the material in these standards represent the contribution from industry representatives of crane users, crane manufacturers, wire rope manufacturers, and ancillary crane device or component manufacturers. Conformance to the intent of the practices herein is intended to result in cranes that operate safely and efficiently between inspection periods and in accordance with a company's safety and environmental management system (see API 75).

It should be understood that the crane operating and maintenance practices cover a wide range of crane types and configurations. Not all practices are applicable to all cranes. When applying this standard, care should be taken to review each item as stated and use those items specifically applicable to the crane's type, usage, and duty-cycle. It may be necessary to modify a procedure due to a particular crane requirement. This modification would be wholly acceptable as long as the original intent of the practice or procedure is met.

See Figure 1 below for general illustrations of the various types of cranes.

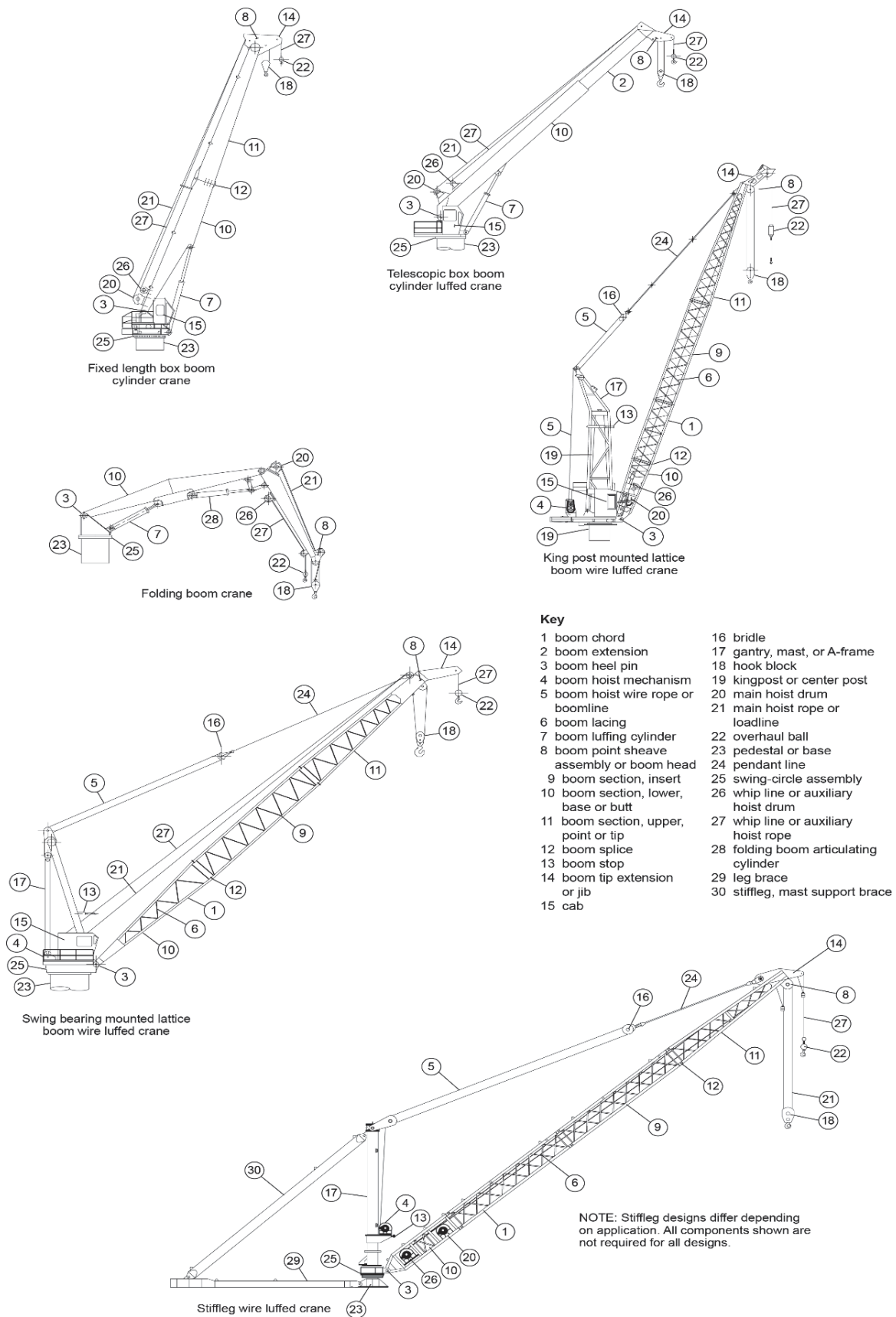


Figure 1—General Crane Illustrations

Operation and Maintenance of Offshore Cranes

1 Scope

1.1 This standard establishes general principles for the safe operation and maintenance of offshore pedestal-mounted revolving cranes on fixed or floating offshore platforms, offshore support vessels, jackup drilling rigs, semi-submersible drilling rigs and other types of mobile offshore drilling units (MODUs), as a companion to API 2C and API 2D-2. This standard also provides requirements and recommendations for lift planning, pre-use inspection, and testing of temporary cranes that are erected offshore.

1.2 Typical applications can include:

- a) Offshore oil exploration and production applications: These cranes are typically mounted on a fixed (bottom-supported) structure, floating platform structure, or vessel used in drilling and production operations.
- b) Shipboard applications: These lifting devices are mounted on surface-type vessels and are used to move cargo, containers, and other materials while the crane is within a harbor or sheltered area.
- c) Crane vessel applications: These cranes are typically mounted on ship-shaped vessels, semi-submersibles, barges, or self-elevating-type marine vessels specialized in lifting heavy and/or unique loads for construction, pipe lay, renewable energy, salvage, and subsea applications in both harbor and offshore waters.

1.3 Equipment (e.g. davits, launch frames) used only for launching life-saving appliances (life boats or life rafts) are not included in the scope of this standard.

1.4 Lifting devices not covered by this standard would be operated, inspected, and maintained in accordance with the manufacturer's recommendations.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Recommended Practice 2A-WSD, *Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design*

API Specification 2C, *Offshore Pedestal-mounted Cranes*

API Specification 2C, *Offshore Pedestal-mounted Cranes*, 3rd Edition

API Recommended Practice 2D-2, *Training for Offshore Pedestal-mounted Crane Riggers, Operators, and Inspectors*

API Specification 9A, *Specification for Wire Rope*

API Recommended Practice 9B, *Application, Care and Use of Wire Rope for Oil Field Service*

ASME ¹, B30.9, *Slings*

AWS ², D1.1, *Structural Welding Code—Steel*

WRTB ³, *Wire Rope Sling User's Manual*

WSTDA RS-1 ⁴, *Recommended Standard for Synthetic Polyester Roundslings*

WSTDA WS-1, *Recommended Standard for Synthetic Web Slings*

3 Terms, Definitions, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1.1

**A-frame
gantry
mast**

A structural frame, extending above the machinery deck or upper-structure to which the boom support ropes are reeved.

3.1.2

authorized surveyor

A person who works for a third-party certifying authority who is hired to inspect the crane.

3.1.3

**auxiliary hoist line
whip line**

A secondary hoist rope (if present) on a crane.

3.1.4

anti-two-blocking

A means to protect hoist ropes, structural components, and machinery from damage that can occur when two sheave groups (e.g. load block and boom tip) come into contact as the hoist cable is drawn in.

3.1.5

**base (mounting)
pedestal (base)**

The supporting substructure upon which the revolving upper-structure is mounted.

3.1.6

bearing raceway

The surface of the bearing rings which contact the rolling element (balls or rollers) of the swing-bearing assembly.

¹ ASME International, 2 Park Avenue, New York, NY 10016-5990, www.asme.org.

² American Welding Society, 8669 NW 36 Street, #130, Miami, Florida 33166-6672, www.aws.org.

³ Wire Rope Technical Board, 7011A Manchester Blvd., #178, Alexandria, VA 22310-3203, www.wireropetechnicalboard.org.

⁴ Web Sling Tie Down Association, 2105 Laurel Bush Road, Suite 201, Bel Air, MD 21015, www.wstda.com

3.1.7**blind lift**

Lift where the load is made out of the view of the crane operator.

3.1.8**boom**

A member hinged to the revolving upper-structure and used for supporting the hoist tackle.

3.1.9**boom angle**

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

3.1.10**boom angle indicator**

An accessory that indicates the angle of the boom above horizontal.

3.1.11**boom hoist****boom hoist mechanism**

A mechanism responsible for raising and lowering the boom.

3.1.12**boom length**

The straight-line distance from the centerline of boom heel-pin to the centerline of the boom-point main load hoist sheave pin, measured along the longitudinal axis of the boom.

3.1.13**boom stop**

A device used to prevent the boom from falling backwards in the case of high winds or a sudden release of load.

3.1.14**boom tip extension****jib**

An extension attached to the boom point to provide added boom length for lifting specified loads.

3.1.15**brake**

A device used for holding, retarding, or stopping motion.

3.1.16**bridle sling**

A multi-leg sling attached to a single point ring.

3.1.17**cab**

An enclosure for the operator and the machine operation controls.

3.1.18**certifying authority**

A third-party organization used to certify and approve the design, fabrication, equipment and operation of the crane.

3.1.19**clutch**

A means for engagement or disengagement of power.

**3.1.20
counterweight**

Weight used to supplement the weight of the machine in providing stability for lifting working loads and usually attached to the rear of the revolving upper-structure.

**3.1.21
crane**

A pedestal-mounted elevating and rotating lift device for transfer of materials and/or personnel to or from marine vessels, barges, and structures, including the sea or the seabed.

**3.1.22
crane owner**

The individual, partnership, firm, or corporation who owns the crane.

NOTE For the purposes of this document, a crane owner can be the lease operator (i.e. oil company), drilling or well service contractor, vessel owner, or company that provides temporary crane service.

**3.1.23
critical component**

Any component of the crane assembly devoid of redundancy and/or auxiliary restraining devices whose failure would result in an uncontrolled descent of the load or uncontrolled rotation of the upper-structure.

**3.1.24
derate**

To reduce the lifting capacity of a crane due to damage or deterioration of a critical component.

**3.1.25
designated representative**

Selected or assigned by the employer or the employer's representative as being qualified to perform specific duties.

**3.1.26
enclosure**

A structure that provides environmental protection for the machine.

**3.1.27
fixed platform**

A bottom-supported stationary structure without significant movement in response to waves and currents in operating conditions.

EXAMPLE Fixed platforms with jacket and pile supports, jack-up rigs, and submersible bottom-supported rigs are similar in that they are effectively stationary.

**3.1.28
hoist**

A device used for lifting, lowering, and supporting "dead weight."

NOTE Hoisting is the process of lifting.

**3.1.29
hoist rope**

Wire rope involved in the process of lifting.

**3.1.30
hook block**

Block with a hook attached used in lifting service.

NOTE A hook block can have a single sheave for double or triple line or multiple sheaves for four or more parts of line.

3.1.31**hook load**

The load being lifted, including the weight of all rigging.

3.1.32**hook rollers**

A means to connect the upper structure to the foundation or pedestal by using rollers to prevent the revolving upper structure from toppling.

3.1.33**in-service**

When a crane is capable of operating in a safe manner in accordance with the capacities shown on the posted load chart.

NOTE In-service conditions can be with the boom out of the boom rest or in the boom rest (stowed).

3.1.34**king pin**

Vertical pin or shaft that acts as a rotation-centering device and connects the revolving upper-structure and base mounting.

3.1.35**king post**

A fixed tubular member that acts as a centerline of rotation for the revolving upper structure and as the connective member to the platform.

3.1.36**lifting authority****lift supervisor**

An individual with the appropriate knowledge, skills, and experience to carry out the responsibilities as determined by the crane owner or Person in Charge (PIC).

3.1.37**load line****hoist line**

The main hoist rope.

3.1.38**load ratings**

Crane ratings in pounds (kilograms) established by the manufacturer.

3.1.39**log**

A means to record activities conducted.

EXAMPLE Record, a record book, a logbook, a computerized database, or an electronic data collector.

3.1.40**luffing**

The operation of changing boom angle in a vertical plane (in effect changing the working radius).

3.1.41**offboard lift****dynamic lift**

The operation of raising a load (cargo or personnel) off of or landing a load onto a deck where no relative motion exists between the cargo and the crane.

3.1.42**onboard lift
static lift**

The operation of raising a load (cargo or personnel) off of or landing a load onto a deck where no relative motion exists between the cargo and the crane.

3.1.43**out-of-service**

A situation when the operator is not controlling the crane and no load is suspended from the hook, or when a crane is not capable of operating in a safe manner.

NOTE Out-of-service conditions can be with the boom out of the boom rest or in the boom rest (stowed).

3.1.44**overhaul ball**

The weight on a single part line used to pull the wire rope off the drum with gravitational assistance.

3.1.45**pawl
dog**

A mechanical device that prevents motion in one or more directions.

3.1.46**pedestal
base**

The supporting substructure upon which the revolving upper-structure is mounted.

3.1.47**pendant line**

A standing (not running) rope of specified length with fixed end connections.

3.1.48**practical exercises
hands-on**

A technique used during a training session that permits students to acquire and practice the knowledge, skills, and behavior necessary to successfully perform one or more training objectives.

3.1.49**pull test**

A load that is applied to the crane structure that will not exceed 100 % of the crane's onboard rated capacity as identified on the crane's load chart.

NOTE This is not a load test as described in 4.7.2 and Annex D.

3.1.50**qualified**

A person who, by possession of a recognized degree, 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.

3.1.51**qualified crane operator**

A person who performs the act or process of raising or lowering a load using a mechanical or non-mechanical crane.

3.1.52**qualified crane inspector**

A person who conducts the necessary inspection of cranes based on usage, condition, and performance to ensure conformance with manufacturer's specifications, regulatory requirements (as applicable), any other pertinent criteria, and the provisions of this standard.

3.1.53**qualified rigger**

Anyone who attaches or detaches loads or loose gear to lifting devices.

3.1.54**rated capacity****safe working load (SWL)**

The rated load or safe working load (SWL) at specified radii as established by the manufacturer which are the maximum loads at those radii for the conditions specified.

NOTE Items considered are, for example, boom configuration, reeving arrangement, offlead/sidelead, heel/trim, radius, wave height, and so forth.

3.1.55**rerate**

The act of changing the lifting capacity or operations of a crane.

NOTE Refer to 5.5.

3.1.56**restricted service**

The usage of a crane or lifting device with limited operational deficiencies that have been evaluated and approved by responsible parties (e.g. crane owner, inspector, etc.).

3.1.57**reeving**

A rope system where the rope travels around drums and sheaves.

3.1.58**roller path**

The surface upon which the rollers that support the revolving upper-structure bear.

NOTE A roller path can accommodate cone rollers, cylindrical rollers, or live rollers.

3.1.59**rolling element**

The balls or rollers contained between the rings of the swing bearing.

3.1.60**rope**

Wire rope, unless otherwise specified.

3.1.61**rotation-resistant rope**

A wire rope consisting of an inner layer of strand laid in one direction covered by a layer of strand laid in the opposite direction.

NOTE A rotation-resistant rope has the effect of counteracting torque by reducing the tendency of the finished rope to rotate.

3.1.62**running rope**

A rope which travels around sheaves or drums.

3.1.63**signalman**

A designated representative who directs the operation of a crane from the point near where loads are attached and detached.

NOTE May also be referred to as banksman.

3.1.64**sling**

An assembly that connects the load to the material handling equipment.

3.1.65**swing****slewing**

Rotation of the upper-structure for movement of loads in a horizontal direction about the axis of rotation.

NOTE Axis of rotation is the vertical axis around which the crane upper structure rotates.

3.1.66**swing bearing****swing circle**

A combination of rings with balls or rollers capable of sustaining radial, axial, and moment loads of the revolving upper-structure with boom and load.

3.1.67**swing-circle assembly**

The swing-circle assembly is the connecting component between the crane revolving upper structure and the pedestal for cranes of certain types.

NOTE The swing-circle assembly allows crane rotation and sustains the moment, axial, and radial loads imposed by crane operation.

3.1.68**swing gear****ring gear**

External or internal gear with which the swing pinion on the revolving upper-structure meshes to provide swing motion.

3.1.69**swivel**

A load-carrying member with thrust bearings that allows the load to rotate.

3.1.70**tailgate meeting****toolbox talk**

Work team meetings held at the work site prior to the job starting to review potential hazards and discuss aspects of planned operations.

NOTE Normally consists of crew members and any supervisor or technical resources required to perform the work.

3.1.71**temporary installation crane****TIC**

A crane that is purposefully designed to be repeatedly mounted, unmounted, and moved to different locations, i.e. not “permanently” installed.

NOTE A rental crane is an example of a temporary installation crane.

3.1.72**two-block**

The condition when the lower load block or hook assembly contacts the upper load block or boom-point sheave assembly.

3.1.73**wire rope**

A flexible, multi-wired member usually consisting of a core member around which a number of multi-wired strands are “laid” or helically wound.

3.1.74**working load**

The external load in pounds (kilograms), applied to the crane including the weight of load-attaching equipment such as load block, shackles, and slings.

NOTE The maximum allowable working load for a given condition is the safe working load (SWL).

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

JSA	job safety analysis
JSEA	job safety environment analysis
LOTO	lock-out, tag-out
MODU	mobile offshore drilling unit
NDE	nondestructive examination
OIM	offshore installation manager
OTM	over-turning moment
PIC	person in charge
PFD	personal flotation device
PPE	personal protective equipment
PTW	permit to work
SDS	safety data sheet [formerly known as material safety data sheet (MSDS)]
SWL	safe working load

4 Operation**4.1 Crane Operator and Rigger Qualifications and Operating Practices****4.1.1 Crane Operators**

Only the following personnel should operate cranes:

- a) qualified crane operators who have met the requirements of 4.1.2;

- b) trainees under the direct supervision of a qualified crane operator;
- c) appropriate maintenance and supervisory personnel, when it is necessary for them to do so in the performance of their duties;
- d) qualified inspectors in the performance of their inspection duties.

4.1.2 Qualifications for Crane Operators

4.1.2.1 Crane operators shall meet the requirements of a qualified crane operator in 8.2 and API 2D-2.

4.1.2.3 The employer shall ensure that crane operator qualifications are maintained, at a minimum every 4 years, through requalification in accordance with API 2D-2. This shall also include current vision and medical condition evaluations as in accordance with 4.1.2.1.

4.1.3 Riggers

Load rigging shall only be performed by a qualified rigger.

4.1.4 Qualification for Riggers

Riggers shall meet the minimum requirements of a qualified rigger contained in 8.1 and API 2D-2

4.1.5 Operating Practices

4.1.5.1 The qualified crane operator (herein also called crane operator) is responsible for those operations under his or her direct control. Whenever there is any doubt as to safety, the crane operator should have the authority to stop and refuse to handle loads or continue operations as safety dictates. See Annex A for additional safety considerations.

4.1.5.2 The crane operator should be aware of the operating characteristics of the crane. Mechanical and non-mechanical cranes can require different operating techniques, especially with regards to engine speed, control operation, control arrangement and braking. Upon initial purchase, the crane manufacturer should provide operating instructions or be consulted for specific information.

4.1.5.3 The crane operator should be familiar with the equipment and its proper care. If adjustments or repairs to the crane are necessary, or any deficiencies that impair safe operation are known, the crane should be taken out of service or its operations restricted to eliminate the unsafe condition. See 5.1.1 for restricted service conditions.

4.1.5.4 Before starting the crane, the crane operator should verify the following:

- a) the pre-use inspection outlined in Annex B has been completed;
- b) all controls are in the "off" or "neutral" position;
- c) all personnel are in the clear.

4.1.5.5 For mechanical cranes, the crane operator should operationally test the brakes each time a load approaching the rated load is to be handled. Prior to raising the load, exposed brakes should be warmed and rusted surfaces on the drums cleaned by raising and lowering the boom and load brakes under slight pressure.

4.1.5.6 When handling loads, the crane operator shall not start machine movement unless the load is within his or her range of vision or they are in contact with the appointed signal person who has given the appropriate signal for movement.

4.1.5.7 The crane operator should respond to signals only from the appointed signal person but should obey an emergency stop signal at any time, no matter who gives the signal.

4.1.5.8 The crane operator should verify that the appropriate onboard/static and offboard/dynamic load rating charts are in place for the crane configuration in use (i.e. boom length, load line reeving, counterweight, jib, etc.).

4.1.5.9 Before leaving the control station unattended for a prolonged period, the crane operator should:

- a) land any attached load;
- b) disengage the master clutch, where applicable;
- c) set all locking devices;
- d) put controls in the off or neutral position;
- e) stop the prime mover;
- f) ensure that no component of the crane will interfere with normal helicopter flight operations.

NOTE On unattended control stations, some operations (e.g. wireline) require the crane to be left attached to the suspended load (e.g. lubricator stabbed and resting on the tree connection). This is an acceptable practice as long as the procedures listed above have been followed and a safe work plan has been conducted.

4.1.5.10 The crane should be secured against swinging when not in use.

4.1.5.11 The crane operator should be aware of heat sources such as natural gas engines, flares, or any other heat source that exhausts near the crane. Stress corrosion cracking, paint damage, accelerated corrosion, and loss of lubricant can result in reduced service life of components.

4.1.5.12 If power or a necessary control function fails during operation, the crane operator should:

- a) set all brakes and locking devices;
- b) move all clutch or other power controls to the off or neutral position; and
- c) if practical, land the suspended load by controlled lowering and stopping.

4.1.5.13 Where cranes are positioned in the proximity of helidecks or approach/take-off zones, they should not be operated while the helicopter is landing or taking off. The boom should be positioned and secured against swinging so there is no interference with flight operations. The crane operator should not be at the control station during helicopter landing/take-off operations, unless the crane operator is in direct voice communication with the helicopter pilot.

4.1.5.14 Where cranes are to be used at night, the crane operator should ensure that there is sufficient lighting for safe operation. The load and landing area should be illuminated.

4.1.5.15 Field welding shall not be performed on load hooks or sling hooks. Hooks should not be exposed to excessive heat.

4.1.5.16 The crane operator shall keep and maintain a log of the pre-use inspection with the name, date, and time of inspection. This record should be kept in an appropriate location. See A.1.3 for the appropriate location for storing logs.

4.2 Handling the Load

4.2.1 The Load

4.2.1.1 Crane lifting capacities are based on relative motion conditions between the crane and the load to be handled. All cranes shall have one onboard/static and at least one offboard/dynamic load rating chart, developed specifically for each crane. The charts shall be derived in accordance with the procedures outlined in API 2C that were applicable at the time of manufacture or subsequent editions, at the discretion of the crane owner. Other qualified sources, such as an API 2C-licensed crane manufacturer, authorized surveyor, or an engineer experienced in the design of the crane, as determined by the crane owner, may be used.

4.2.1.2 The appropriate load-rating chart for the configuration in use shall be visible to the crane operator at the control station.

4.2.1.3 The crane operator should verify that the hook load is within the crane's applicable onboard/static or offboard/dynamic rated load at the radius at which the load is to be lifted. See A.1.4 for clarification of hook load.

4.2.2 Attaching the Load

4.2.2.1 The load should be attached to the hook by means of slings or other suitable devices. The latch should be closed to secure loose slings.

4.2.2.2 The hoist rope should not be wrapped around the load.

4.2.2.3 Sling use should be in accordance with the guidelines of 6.3.2 and A.1.5.

4.2.3 Moving the Load

4.2.3.1 Guidance on procedures for moving the load can be found in A.2.

4.2.3.2 No external forces should be applied to suspended loads that will create significant side loading of the boom. Care should be taken when swinging the crane so as to minimize the pendulum action of the hook and suspended load.

4.2.3.3 Cranes should not be used for dragging loads unless properly rigged for a vertical pull not exceeding the rated capacity of the crane or rigging.

4.2.3.4 The crane operator should be aware of the effect of velocity and weight of the load when lowering to minimize shock load.

4.2.3.5 The crane operator shall not hoist, lower or swing while any personnel are on the load or hook (other than in a personnel carrier or basket).

4.2.3.6 The crane operator should avoid moving loads over personnel. Loads that are suspended by use of slings or hoists should be blocked or cribbed before personnel are permitted to work beneath or between them.

4.2.3.7 No fewer than five full wraps of rope should remain on the drum(s) in any operating condition. Due consideration should be given to the hoist manufacturer's recommendations, especially for breakaway anchor-type hoists.

4.2.3.8 When two or more cranes are used to lift one load, one Qualified Crane Operator or Lifting Authority should be responsible for the operation. The responsible crane operator should analyze the operation, and instruct all personnel involved in the proper positioning, rigging of the load and the movements to be made.

4.2.3.9 Appropriate tag or restraining lines should be used where necessary to control the load.

4.2.3.10 When a crane is to be operated at a fixed radius, the boom hoist auxiliary holding device, where fitted, should be engaged, especially in the case of mechanical cranes or those without automatic pawl control.

4.3 Signals

4.3.1 Standard Signals

Signals between the crane operator and the designated signal person should be discernible, audibly or visually, at all times. The crane operator should not respond unless signals are clearly understood.

4.3.2 Hand Signals

Hand signals shall be understood and performed in accordance with API 2D-2 and Figure 2 below.

4.3.3 Special Signals

For operations not covered in Figure 2 or API 2D-2, or for special conditions, additions or modifications to the recommended standard signals may be required. In such cases, these special signals should be agreed upon in advance by the crane operator and the designated signal person and should not be in conflict with, or have the potential to be confused with standard signals.

4.3.4 Instructions

If it is desired to give instructions to the crane operator other than those provided by the established signal system, the crane motion should be stopped.

4.3.5 Signaling

When operations are required to be controlled by signals, a designated signal person should be assigned to work with the crane. The designated signal person should:

- a) be qualified by experience with the operations and knowledgeable of the standard hand signals as shown in Figure 2 or API 2D-2; and
- b) be in clear view of the crane operator to ensure that their signals can be seen or in radio contact with the designated signal person. Their position should give them a clear view of the load, crane, personnel, and area of operation. If the crane operator's view of the primary signal person is obstructed or they do not have radio contact, a secondary signal person should be provided.

4.4 Personnel Transfer

4.4.1 Personnel transfer devices shall be inspected, maintained and refurbished in accordance with the manufacturer's recommendations.

4.4.2 All hooks used for support of personnel shall have an operable latch that can be closed and locked, with a pinned or positive locking device, which eliminates the hook throat opening, shall be used for any personnel lifts. Additionally, a hook with a purposefully designed lifting eye integral to the hook may be used in conjunction with a shackle that may be pinned to prevent opening. These hooks are designed to prevent the personnel basket sling from coming off the hook accidentally.

4.4.3 When making personnel lifts, the load shall be under control in both up and down directions.

4.4.4 All personnel to be lifted on a personnel carrier or basket shall use U.S. Coast Guard-approved (or equivalent may be used if approved by appropriate recognized authority when in non-U.S. waters) personnel

flotation devices (PFD) when being lifted or lowered over water. Personnel riding on net type personnel baskets should stand on the outer rim facing inward or as provided by manufacturer's instructions.

4.4.5 The weight of the loaded personnel carrier or basket should not exceed the personnel rated load as defined by the crane load rating chart and API 2C.

4.4.6 See Annex C for additional information on personnel transfer.

4.5 Refueling

4.5.1 Cranes should not be refueled with the engine running.

4.5.2 Fuel tanks shall be filled in a manner such that fuel spills or overflows will not run onto engine, exhaust, or electrical equipment, and should have spill containment to provide environmental protection.

4.6 Fire Extinguishers

Fire extinguishers shall be kept in the cab or vicinity of the crane and be of a size and type not less than specified by the proper authorities.

Personnel who are expected to respond to fires should be trained in the use of fire extinguishers.

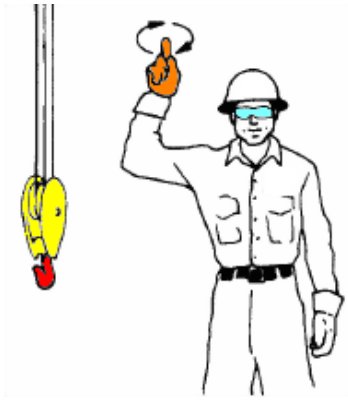
4.7 Load Test

4.7.1 Conditions Requiring Load Testing

A crane load test shall be performed under the following conditions:

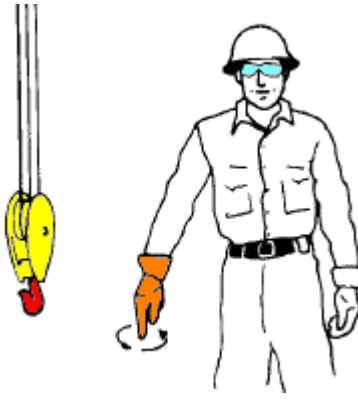
- a) new cranes being placed into service;
- b) cranes that are being permanently relocated;
- c) temporary cranes after each rig-up or relocation.

Crane load testing is not required to determine the fitness of repairs or alterations, provided the repair and replacement procedures are in accordance with 5.3.3.



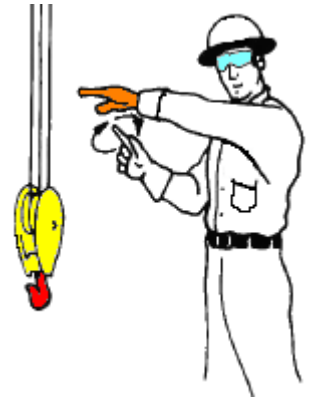
Hoist: With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

Articulating Boom Crane(with hoist option) – Hoist loadline

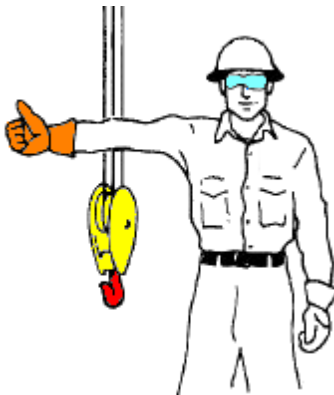


Lower: With arm extended downward, forefinger pointing down, move hand in small horizontal circles.

Articulating Boom Crane (with hoist option) – Lower loadline

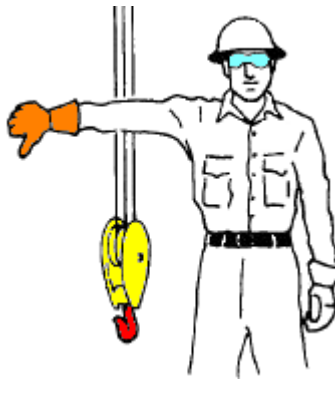


Move Slowly: Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal.



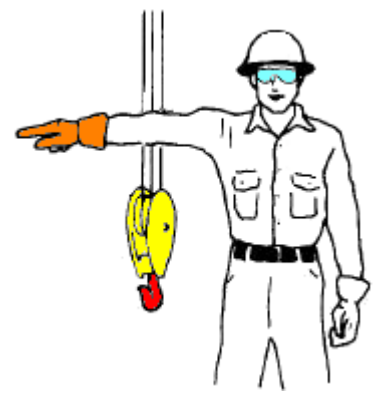
Raise Boom: Arm extended, fingers closed, thumb pointing upward.

Articulating Crane – Raise boom tip vertically

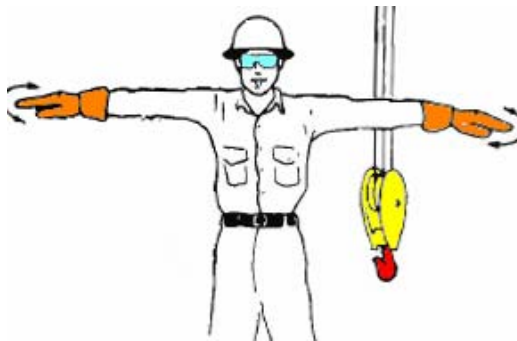


Lower Boom: Arm extended, fingers closed, thumb pointing downward.

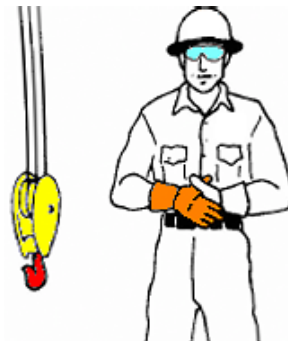
Articulating Boom Crane – Lower Boom Tip Vertically



Swing: Arm extended, point finger in direction of swing boom.

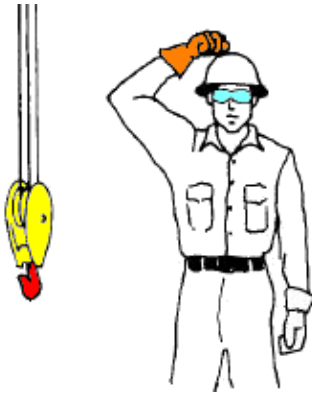


Emergency Stop: Both arms extended, pointing down, move arms rapidly up and down.

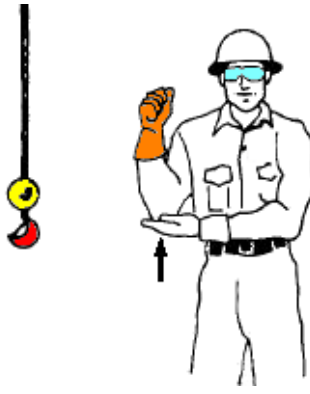


Dog Everything: Clasp hands in front of body.

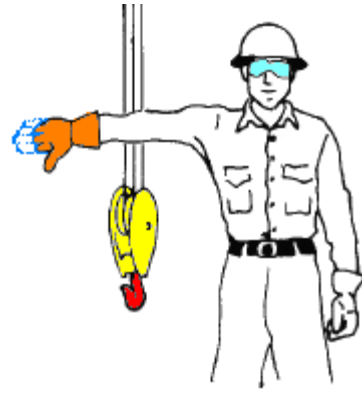
Figure 2—Standard Hand Signals for Controlling Crane Operations



Use Main Hoist: Tap fist on head, then use regular signals.

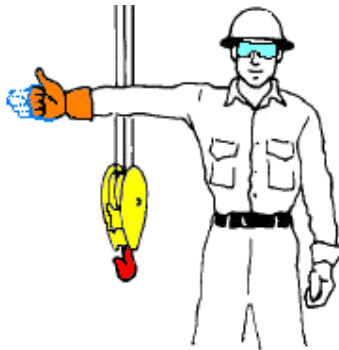


Use Whip Line: (Auxiliary Hoist) Tap elbow with one hand, and then use regular signals.



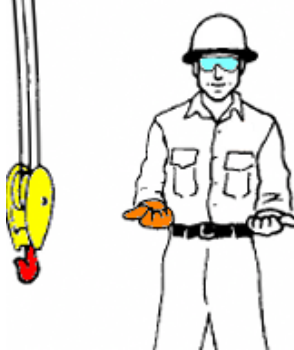
Lower the Boom and Raise the Load: With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

Articulating Boom Crane (with Hoist option) – Lower the boom tip and raise the load



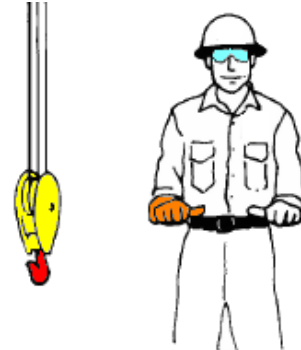
Raise the Boom and Lower the Load: With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

Articulating Boom Crane (with hoist option) – Raise the boom tip and lower the load



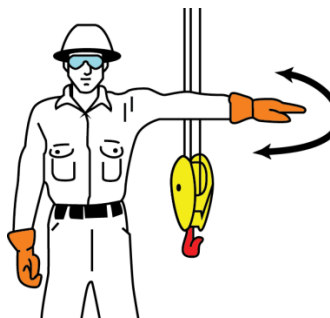
Extended Boom: (Telescoping Booms) both fists in front of body with thumbs pointing outward.

Articulating Boom Crane – Increase radius of Boom Tip



Retract Boom: (Telescoping Booms) both fists in front of body with thumbs pointing toward each other.

Articulating Boom Crane: Decrease Radius of Boom Tip



Stop: Arms extended, palm down, move arm back and forth horizontally.

Figure 2 (continued)—Standard Hand Signals for Controlling Crane Operations

4.7.2 Load Test Requirements

The following shall apply to load tests.

- a) The crane shall be operated during testing in accordance with Section 4.
- b) The crane shall be inspected in accordance with the annual inspection requirements before and after each test. Attention should be given to rigging used to attach loads. Tag lines should be used on test loads.
- c) The test weights or dynamometer should be verified for accuracy by a qualified inspector.
- d) All lifts should be planned in advance, taking into account the crane's physical location, the available space for staging and assembling the test loads, and the potentially hazardous areas to be avoided. See 7.3 for more information on planning the lift.
- e) When the test load is lifted the crane operator shall allow the control lever/s to return to the neutral position. The load test should be held for a minimum of 5 minutes.
- f) When a dynamometer is used to verify the test weight(s) the weights shall be allowed to freely rotate in order not to create a torsional stress in the dynamometer which can lead to inaccurate readings.
- g) Crane load indicators shall not be used to test cranes.
- h) Relief valves on hydraulic cranes should not be adjusted above manufacturer's recommended pressures and current limiting devices on electric cranes should not be bypassed or adjusted to increase available hoist line pull. The test may be conducted with the highest load the hoist can lift as long as it is equal to the rated load.
- i) Engine speed should not be adjusted above the manufacturer's recommended maximum rated RPM.
- j) The test load for all lifts shall be based on crane rating chart, wire rope strength, available hoist line pull, and number of parts of line. The static/onboard test load and the test radius should be calculated to load the crane as shown in Table 1.

Table 1—Static/Onboard Test Load and Radius

Static/Onboard Rated Load at a Specific Radius lb (kg)	Test Loads in Excess of Static/Onboard Rated Load at a Specific Radius
≤ 40,000 (18,144)	25 %
> 40,000 ≤ 100,000 (>18,144 ≤ 45,356)	10,000 lb (4536 kg)
> 100,000 (45,356)	10 %

- k) All cranes should be tested as they are normally rigged. Cranes should not be rigged with extra parts of line or have their hydraulic pressures, electric currents, or engine output increased. The load test should not necessarily be based on the highest load shown on the rating chart.
- l) A live weight test shall be performed for initial and temporary installations and for relocated cranes as follows:
 - load test weight/s shall be swung in all directions which the crane will be operated, avoiding obstructions (e.g. derricks, living quarters, well heads, compressors, etc.) that are present;

- test load shall be raised and lowered to demonstrate the hoist will function properly and test the static brakes;
- when the hoist is the limiting factor the hoist shall lift the safe working load as a minimum (see Figure D.2 for example).

m) Most recent Load test records should be maintained in crane records.

See Annex D for additional information on load testing.

4.8 Pull Test

A pull test may be conducted at the discretion of the crane owner or the crane owner representative.

When the crane owner or crane owner's representative elects to have a crane pull tested, a calibrated dynamometer or calibrated load cell attached to an engineered fixed point or a known suspended weight should be used and the pull test should be held for a minimum of five minutes. Upon the completion of the pull test, a qualified crane operator or qualified inspector should perform a pre-use inspection of the crane to ensure no damage occurred during the test.

5 Inspection, Testing, and Maintenance

5.1 Usage and Inspection

5.1.1 General

Inspections are intended to identify all deficiencies or items, which can affect the safe operation or reduce the lifting capability of the crane. Inspections should utilize methods and procedures appropriate for the crane type and its past and anticipated usage, as determined by the crane owner.

Restricted service may, in some cases, be continued after the identification and before correction of a deficiency. In such cases, it is the responsibility of the qualified crane operator or qualified inspector to document the deficiency, reporting it to the crane owners. Based on this information, the crane owner should define the appropriate restriction and post necessary cautionary notices, after consultation with the crane manufacturer, authorized surveyor, certifying authority or other qualified source (such as an API 2C-licensed crane manufacturer, or an engineer experienced in the design of the crane, as determined by the crane owner).

Action taken to correct a deficiency should be made as soon as practicable.

5.1.2 Crane Usage Categories

5.1.2.1 General

Inspection procedures for cranes in-service are divided into three general categories based upon their usage or duty cycle, which in turn determines different, appropriate intervals at which inspections are to be performed. The usage categories should be assigned by the users on a consistent crane-by-crane basis. The intent is to measure their duty cycle as the duration of time for which the crane is in actual use. See Annex B for further information. The three crane usage categories are described in 5.1.2.2 through 5.1.2.4. Special attention should be given to wire rope, condition, spooling and lubrication on these cranes during pre-use inspections.

5.1.2.2 Infrequent Usage Production Duty Cycle

Infrequent usage applies to those cranes that are used for 10 hours or less per month, based on the averaged use over a quarter. These cranes shall be subject to a pre-use inspection and an annual inspection. However, if the crane sits idle for three months or more the crane shall be subject to a monthly

inspection and a full function operation check. Crane usage should be reviewed on a periodic basis by the crane owner to ensure proper inspection intervals.

Special attention should be given to wire rope on these cranes during pre-use inspections.

5.1.2.3 Moderate Usage Intermittent Duty Cycle

Moderate usage applies to those cranes that are used for more than 10 hours/month but less than 50 hours/month, based on the averaged use over a quarter. These cranes shall be subject to pre-use, quarterly, and annual inspections. Crane usage should be reviewed on a periodic basis by the crane owner to ensure proper inspection intervals.

5.1.2.4 Heavy Usage

Heavy usage applies to those cranes that are used for 50 hours or more per month based on an average use over a quarter. These cranes shall be subject to pre-use, monthly, quarterly, and annual inspections. Cranes assigned this category usage need not be reviewed to determine the number of hours used each month, unless otherwise specified by the crane owner.

5.1.3 Inspection Categories

5.1.3.1 General

All cranes should receive inspections in accordance with the categories described in 5.1.3.2, 5.1.3.3, 5.1.3.4, 5.1.3.5, 5.1.3.6. These inspections are more clearly defined in Annex B. These inspection requirements apply to all cranes including those installed for temporary use. These inspection guidelines are minimum requirements. The crane owner should determine the actual scope of the inspections, with input from manufacturers and other relevant sources, as appropriate.

5.1.3.2 Initial Inspection

Initial inspections apply to cranes that are new and are being placed into service, cranes that are being permanently relocated, and temporary cranes. A qualified inspector shall perform these inspections. Every initial inspection shall include a load test performed in accordance with the procedures outlined in 4.7 and Annex D.

5.1.3.3 Pre-use Inspection

The pre-use inspection shall be performed and documented prior to the first crane use of the day, prior to or during each change in crane operator, and then as the qualified crane operator deems necessary during the day for extended operations. A qualified crane operator shall perform this inspection, and it applies to all cranes, regardless of usage category. A qualified inspector may also perform these inspections.

5.1.3.4 Monthly Inspection

The monthly inspection shall be performed once per month, for all cranes assigned a heavy usage category. A qualified crane operator shall perform this inspection. A qualified inspector may also perform these inspections.

5.1.3.5 Quarterly Inspection

The quarterly inspection shall be performed once every three months for all cranes assigned a moderate or heavy usage category. A qualified inspector shall perform this inspection.

5.1.3.6 Annual Inspection

5.1.3.6.1 The annual inspection shall be performed on all cranes by a qualified inspector once every 12 months, regardless of usage category.

See B.3.5 for more information on annual inspections.

5.1.3.6.2 A crane that is taken out of service for more than twelve months should have an "OUT-OF-SERVICE" sign placed over the primary controls. Before the crane is placed into service, an annual inspection shall be performed.

5.1.3.6.3 Temporary cranes shall be inspected in accordance with B.3.5. After each rig-up or relocation, temporary cranes shall be load tested in accordance with the procedures in Annex D.

5.1.3.6.4 Before installation of temporary cranes, a new crane, or a refurbished replacement crane, the structure and deck of the fixed platform shall be evaluated to ensure that it can accommodate the proposed crane installation and operation. The crane may be derated in accordance with the platform's limitation; and appropriate load rating charts shall be installed on the crane, readily visible to the crane operator.

When the structure on which the crane is mounted is the limiting factor for the crane, one or more of the following shall be in place:

- a) a durable information chart attached at the control station;
- b) an indication in the Notes section on the load chart;
- c) a written report placed in the permanent crane records.

5.1.3.6.5 Figure 3 shows a usage/inspection/inspector qualification matrix that summarizes the recommended minimum crane maintenance requirements discussed above.

5.2 Inspection and Load Test Records

5.2.1 A log of pre-use inspections should be maintained in accordance with 4.1.5.16 and A.1.3.

5.2.2 Written, dated and initialed, initial, monthly, quarterly and annual inspection reports, as well as records of repairs and modifications carried out on cranes in accordance with this document, should be kept readily available for a period of four years at an appropriate location. The person performing the inspection should be identified on the inspection record.

5.2.3 When a load test is required, written reports should be furnished to the crane owner by a qualified inspector showing load test procedures and the results. Additional guidance on load testing is provided in Annex D.

The most recent load test records should be maintained in the crane records.