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Training for Offshore Pedestal-Mounted Crane Riggers, Operators, and Inspectors

API RECOMMENDED PRACTICE 2D-2
FIRST EDITION, [MONTH][YEAR]

BALLOT DRAFT

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NOTE The *Special Notes, Foreword, and Table of Contents* will be inserted by API during the page proofing stage prior to publication.

BALLOT DRAFT

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.

1 Scope

This recommended practice establishes general principles for the training of personnel for safe operations and maintenance of offshore pedestal-mounted cranes, as a companion to API 2D. This document also provides requirements and recommendations for personnel seeking qualification as a crane rigger, operator, or inspector.

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 addenda or errata) applies.

API Recommended Practice 2D, *Operation and Maintenance of Offshore Cranes*

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

3 Terms, Definitions, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following terms and 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

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.

3.1.3

auxiliary hook

A supplemental load block of lighter capacity and usually higher speed than provided for the main load block.

3.1.4

axis of rotation

The vertical axis around which the crane upper structure rotates.

3.1.5

base (mounting)

pedestal (base)

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

3.1.6

basket hitch

A sling configuration whereby the sling is passed under the load and has both ends, end attachments, eyes or handles on the hook or a single master link.

3.1.7

blind lift

Lifts 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 hoist wire rope

Wire rope that operates on a drum controlling the angle positioning of the boom.

3.1.13

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.

3.1.14

boom stop

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

3.1.15

boomline

Boom hoist rope that reels on drums or passes over sheaves.

NOTE See 3.1.10 for boom hoist wire rope.

3.1.16

brake

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

3.1.17

bridle sling

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

3.1.18

cab

An enclosure for the operator and the machine operation controls.

3.1.19

center of gravity

Point at which the total mass of a body may be regarded as being concentrated, or about which the parts of a body exactly balance each other.

3.1.20

check valve

A mechanical device that normally allows fluid to flow through it in only one direction.

3.1.21

choker hitch

A sling configuration with one end of the sling passing under the load and through an end attachment, handle or eye on the other end of the sling.

3.1.22

clutch

A means for engagement or disengagement of power.

3.1.23

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.

3.1.24

crane

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

3.1.25

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.

3.1.26

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.

3.1.27

critical rigging component

Any component of the rigging equipment devoid of redundancy and/or auxiliary restraining devices whose failure would result in an uncontrolled descent of the load.

3.1.28

designated representative

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

3.1.29

emergency load lowering

A means of lowering in the event of power failure or control-system failures.

**3.1.30
enclosure**

A structure that provides environmental protection for the machine.

**3.1.31
folding boom
knuckle boom**

A type of crane boom where the boom tip can change its angle relative to the base section of the boom.

**3.1.32
gross overload protection system
GOPS**

A system or device used to protect the crane operator's cabin in the event of an unbounded overload applied to the crane hook.

**3.1.33
hitch**

A sling configuration whereby the sling is fastened to an object or load, either directly to it or around it.

**3.1.34
hoist**

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

NOTE Hoisting is the process of lifting.

**3.1.35
hoist mechanism**

A hoist drum and rope reeving system used for lifting and lowering loads.

**3.1.36
hoist rope**

Wire rope involved in the process of lifting.

**3.1.37
hoist tackle**

Assembly of ropes and sheaves arranged for pulling.

**3.1.38
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.

**3.1.39
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.

**3.1.40
inspection**

Critical examination, measurement, testing, gauging, and comparison of the lifting equipment and materials by an appropriately qualified person.

NOTE In determining the suitability, scope, and periodicity of the inspection, reference the manufacturer's instructions and relevant industry standards as a good practice.

3.1.41

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.

3.1.42

lift plan

A plan or set of plans which is created for use in crane lifting operations and it consists of all the important information to be considered in a lifting operation thus ensuring that the lifting operation is carried out safely.

NOTE It is an important planning process that will identify hazardous situations that may be encountered during lifting.

3.1.43

load block

The assembly of hook or shackle, swivel, sheaves, pins, and frame suspended by the hoisting ropes.

3.1.44

load chart

A document at the operator's station that contains rated capacity at multiple radii (radius), along with other crane specific information.

3.1.45

load indicator system

LIS

A device that tells the operator the load on the hook.

3.1.46

load line

hoist line

The main hoist rope.

3.1.47

load rating

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

3.1.48

load tension

The force that is transmitted through a string, rope, cable or wire when it is pulled tight by forces acting from opposite ends.

3.1.49

load test

Test wherein a load is applied in excess of rated capacity under controlled and monitored conditions to verify the serviceability of equipment, without resulting in permanent deformation or other defects.

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NOTE 1 Refer to the appropriate manufacturer, industrial or regulatory standard for the required test load, periodicity and guidelines for performing the load test.

NOTE 2 This is not the same as a pull test; see 3.1.63.

**3.1.50
load-moment indicator system
LMIS**

A device that tells the operator the load on the hook, the distance from the axis of rotation to the center of the load, and the rated capacity at that distance.

**3.1.51
log**

A means to record activities conducted.

NOTE Some example types are a record book, log book, computerized database, or electronic data collector.

**3.1.52
luffing**

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

**3.1.53
luffing cylinder**

A hydraulic actuator used to change the boom angle.

**3.1.54
motion compensation system**

A system used to control hoist rope tension or relative hook position to counteract vessel motion.

**3.1.55
offboard lift
dynamic lift**

The operation of raising a load (cargo or personnel) off of or landing a load onto a deck where relative motion exists between the load and the crane.

**3.1.56
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.

**3.1.57
overhaul ball**

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

**3.1.58
overload**

A condition where the applied load exceeds the designated rated capacity, of the crane and/or rigging equipment.

NOTE Overload does not include shockload, and this standard does not define shockload.

3.1.59

**pawl
dog**

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

3.1.60

pendant line

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

3.1.61

Person in Charge

PIC

If you are in charge in a particular situation, you are the most senior person and have control over something or someone.

NOTE May also be the offshore installation manager (OIM), ultimate work authority (UWA), or other recognized equivalent.

3.1.62

power plant

The power plant is comprised of the prime mover and its auxiliary systems, including the power take-off means and the starting system.

3.1.63

**practical exercise
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.

3.1.64

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 the same as a load test; see 3.1.47.

3.1.65

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.

3.1.66

qualified crane operator

A person who is qualified to perform the act or process of raising, lowering, or slewing a load using a mechanical or non-mechanical crane.

3.1.67

qualified crane inspector

A person is qualified to conduct 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.

3.1.68

qualified crane rigger

A person who is qualified to attach or detach loads or loose gear for crane lifts.

3.1.69

radial load

A load applied perpendicular to an object.

3.1.70

radius

radii

The horizontal distance between the axis of rotation of the lifting appliance (crane) and the vertical center line passing through the boom head sheave and load hook.

3.1.71

rated capacity

safe working load (SWL)

The rated load or SWL at specified radii (radius) 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.

3.1.72

reeving

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

3.1.73

revolving upper structure

The rotating upper frame structure where the operating machinery is mounted.

3.1.74

rigging

The process used to secure materials to be moved by cranes.

3.1.75

rigging equipment

The equipment such as shackles, master links, slings, wire rope, turnbuckles, clevis, and pad eyes used with cranes in material handling and structure relocation.

3.1.76

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.

3.1.77

rolling element

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

3.1.78

rope

Wire rope, unless otherwise specified.

NOTE See 3.1.98 for wire rope.

3.1.79
sea state

The general condition of the free surface on a large body of water—with respect to wind waves and swell—at a certain location and moment.

3.1.80
sheave

A round object with a groove to retain/support wire rope that is used to change the direction of the rope.

3.1.81
sideload
sideloading

A load applied at the boom tip perpendicular to the boom and parallel to the horizontal plane.

3.1.82
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.

3.1.83
simulator

A machine with a similar set of controls designed to provide a realistic imitation of the operation of a crane, used for training purposes.

3.1.84
sling

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

3.1.85
stop work authority

A program to provide employees and contract workers with the responsibility and obligation to stop work when a perceived unsafe condition or behavior may result in an unwanted event.

3.1.86
subsea lift

A lift in which the load is submerged in or below the surface waterline.

3.1.87
swing
slew

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

3.1.88
swing bearing
slew 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.

3.1.89

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.

3.1.90

swing gear

ring gear

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

3.1.91

swing mechanism

The machinery involved in rotating the revolving upper structure about the axis of rotation in both directions.

3.1.92

swivel

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

3.1.93

tagline

Manila/fiber rope or other aids attached to loads to aid in their orientation during lifting.

3.1.94

telescoping boom

Consists of a base boom from which one or more boom sections are moved axially in relation to each other to increase the boom length.

3.1.95

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.

3.1.96

two-block

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

3.1.97

vertical hitch

A method of supporting a load by a single, vertical part or leg of the sling.

3.1.98

wind load

A load applied by air movement at a certain velocity passing over the crane structure.

3.1.99

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.

3.1.100

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 crane rated capacity or working load limit for rigging equipment.

3.1.101

working load limit

WLL

The maximum allowable working load established by the sling manufacturer.

NOTE The terms rated capacity and working load limit are commonly used to describe rated load.

3.2 Abbreviations

JSA	job safety analysis
JSEA	job safety environment analysis
PIC	person in charge
PPE	personal protective equipment

4 Qualification Training

4.1 General

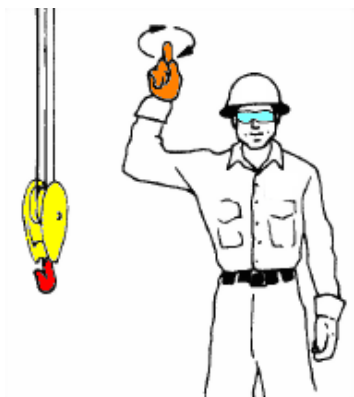
Training requirements in this standard include the following:

- Qualified crane rigger training
- Qualified crane operator training
- Qualified crane inspector training

Also included are requirements for qualification in the use of hand signals to complement each of the three crane qualification types in accordance with this standard.

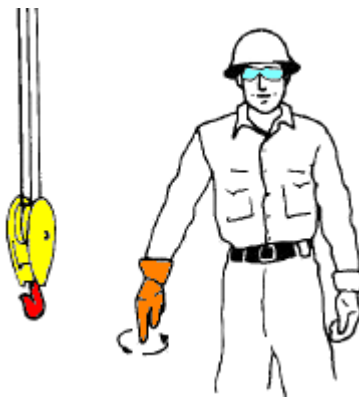
4.2 Hand Signals

Recommended standard hand signals are identified in Figure 1. This figure has been supplemented with hand signals for articulating boom cranes. For articulating boom cranes, some of the hand signals/hand movements may be the same as for a mechanical or telescoping boom crane but the intended action is slightly different, these are noted in the figure. If articulating boom cranes is not mentioned, it means that the hand signal is universal to all cranes. The use of these recommended standard hand signals is encouraged.



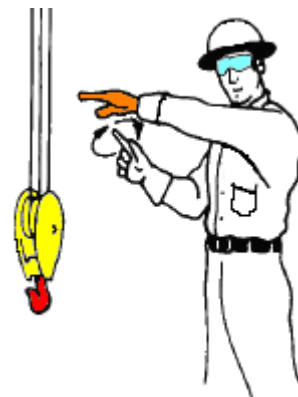
Hoist: With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

Articulating Boom Crane (with hoist option) – Hoist loadline

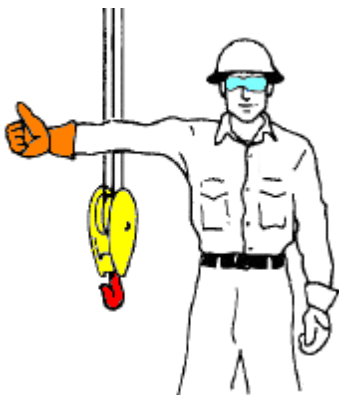


Lower: With arm extended downward, forefinger pointing down, move hand in small horizontal circles.

Articulating Boom Crane (with hoist option) – Lower loadline

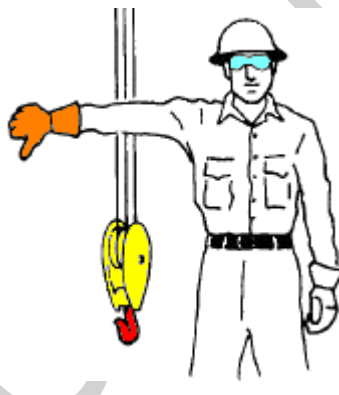


Move Slowly: Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal.



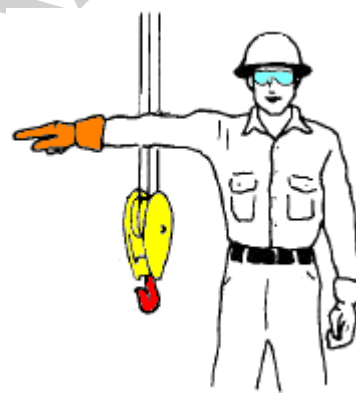
Raise Boom: Arm extended, fingers closed, thumb pointing upward.

Articulating Crane – Raise boom tip vertically

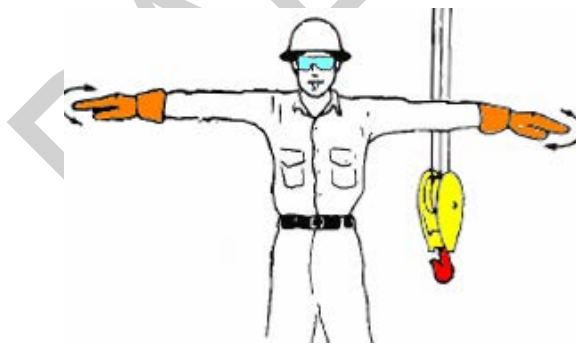


Lower Boom: Arm extended, fingers closed, thumb pointing downward.

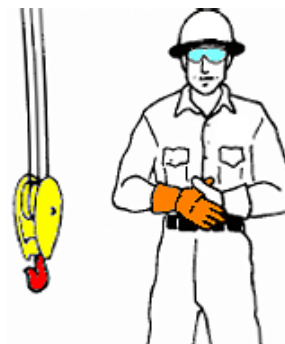
Articulating Boom Crane – Lower Boom Tip Vertically



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

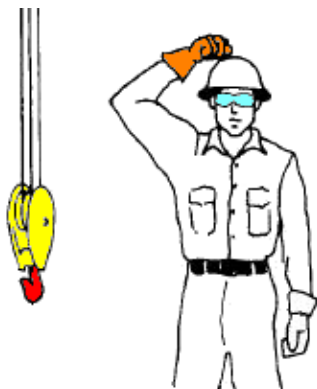


Emergency Stop: Both arms extended, pointing down, move arms rapidly up and down.

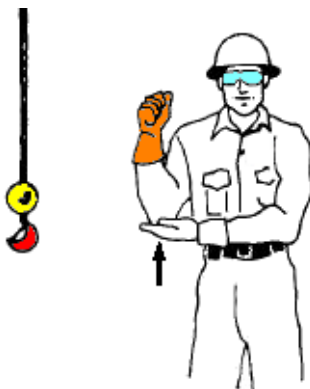


Dog Everything: Clasp hands in front of body.

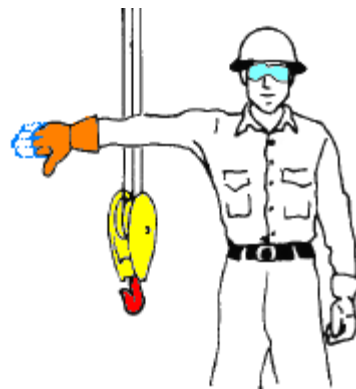
Figure 1—Standard Hand Signals for Controlling Crane Operations



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

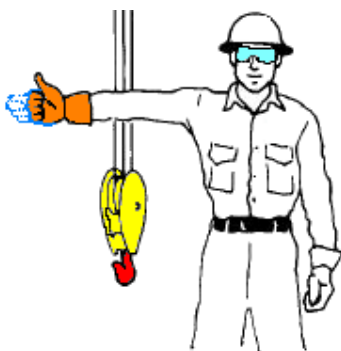


Use Whip Line: (Auxiliary Hoist) Tap elbow with one hand, and then use regular signals.



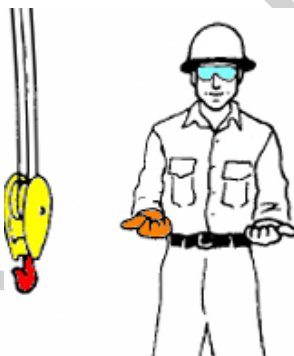
Lower the Boom and Raise the Load: With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.

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



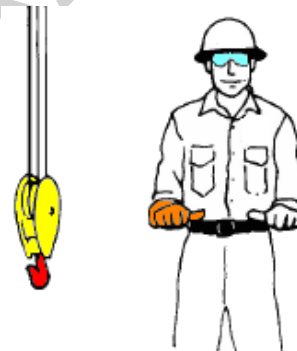
Raise the Boom and Lower the Load: With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.

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



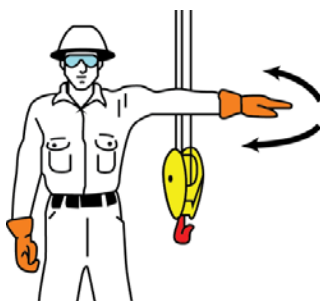
Extended Boom: (Telescoping Booms) both fists in front of body with thumbs pointing outward.

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 1 (continued)—Standard Hand Signals for Controlling Crane Operations

4.3 Hand Signals Qualification

The objective of the hand signal task is to test the student's ability to understand and perform the basic hand signals in this standard for the purposes of API 2D. The examiner should try to use the appropriate hand signal to the crane configuration (e.g. telescoping, folding (knuckle) boom crane, etc.).

The testing of hand signal proficiency shall include the following.

- a) The designated signal person shall have the opportunity at the start of this task, to discuss any special hand signals.
- b) Verify hand signal chart is posted.
- c) At the examiner's indication to start.
- d) The student will be asked to respond and/or describe verbally five or more of the standard hand signals in this document.
- e) The examiner may give the hand signal request in any sequence. Then the student will perform the signal for the following (for additional hand signals, see API 2D):
 - 1) hoist,
 - 2) lower,
 - 3) dog everything,
 - 4) emergency stop,
 - 5) raise boom,
 - 6) lower boom,
 - 7) swing as directed (e.g. left or right direction),
 - 8) move slowly.

At the examiners indication the task is concluded. The examiner will review the test results of the practical and ensure the student has an acceptable understanding.

The examiner and student will sign the practical exercise form. The student signing the practical exercise form validates they have an acceptable understanding and knows their responsibilities.

4.4 Qualification Recognition for Crane Rigger, Operator, and Inspector

Qualifying in the use and understanding of hand signals is required in order to fully qualify as a crane rigger, operator, and inspector. Upon successful completion of the hand signals qualification, and the qualified crane rigger, operator or inspection training, the qualifying student will be issued a certificate and card with the minimum information shown in Figure 2 and Figure 3 (as applicable).

A full training is required for initial qualification and shall be repeated (requalified) at least every four years. If a partial retraining is performed prior to requalification training, the full training will still be required.

Hand Signals Qualification

Name (print): _____ Date: _____

The examiner and student will sign the practical exercise form. The student signing the practical exercise validates they have an acceptable understanding and knows their responsibilities.

Circle One

- | | | |
|---|------|------|
| 1. Signal #1 (hand signal given): _____ | Pass | Fail |
| 2. Signal #2 (hand signal given): _____ | Pass | Fail |
| 3. Signal #3 (hand signal given): _____ | Pass | Fail |
| 4. Signal #4 (hand signal given): _____ | Pass | Fail |
| 5. Signal #5 (hand signal given): _____ | Pass | Fail |
| 6. Signal #6 (hand signal given): _____ | Pass | Fail |
| 7. Signal #7 (hand signal given): _____ | Pass | Fail |
| 8. Signal #8 (hand signal given): _____ | Pass | Fail |
| 9. Signal #9 (hand signal given): _____ | Pass | Fail |
| 10. Signal #10 (hand signal given): _____ | Pass | Fail |
| 11. Hand signal chart is posted: _____ | Pass | Fail |
| 12. Pulled the correct lever(s): _____ | Pass | Fail |

Comments:

Examiner Signature

Student Signature

Figure 2—Hand Signals Testing Form Example

[Front Side]

COMPANY LOGO	(Company Name) _____			
	(Company Address) _____			
	(Company Phone) _____			
Hand Signals Qualification <input type="checkbox"/>	Qualified Crane:	Rigger <input type="checkbox"/>	Operator <input type="checkbox"/>	Inspector <input type="checkbox"/>
(First Name) _____		(Last Name) _____		(Last four ID#) _____
The above individual has satisfactorily demonstrated necessary skills through written, practical and oral evaluation, and has successfully completed the API 2D-2 course of instruction in accordance with latest edition of the API 2D.				
Date Completed: ____/____/____			Instructor/Examiner Name: _____	

[Back Side]

CRANE OWNER'S NOTES:	1) It is advised that all crane owners give due consideration to the following when requiring the use of a qualified crane rigger, operator, or inspector. 2) The crane owner is responsible for qualified crane rigger, operator, and inspector requirements to be met in accordance with the latest edition of API 2D.		
Crane Type Qualified to Operate	Lattice boom	Mechanical <input type="checkbox"/>	Non-mechanical <input type="checkbox"/>
	Folding (knuckle) boom	Box/telescopic boom <input type="checkbox"/>	
Date Expires: ____/____/____		Tracking No.: _____	

Figure 3—Qualification Example Certificate

5 Qualified Crane Rigger Training

5.1 General

An important part of crane safety is proper training of crane rigging personnel. Training should incorporate familiarization in lifting loads with slings, rigging hardware, and safety issues associated with JSA's/JSEA's and lift plans.

Training should include classroom-type, practical exercise, and examination. Instructors should provide students with a written description of the exercises on a form dated and to be signed by instructor and student.

5.2 Rigger Training

The training program shall include a written exam. Practical exercise training should include proper inspection, use, selection, and maintenance of rigging gear (slings, rigging hardware).

The student/employer shall provide proof of compliance with the physical requirements in accordance with API 2D (e.g. verification that there is no disabling condition or history of one that could be a sufficient reason for disqualification).

5.3 Rigger Training Outline

5.3.1 Course Content

Course content shall discuss lift planning in accordance with the *Lift Planning* section of API 2D and this standard.

5.3.1.1 Course content shall include the following topics related to each piece of rigging hardware.

- a) Rigging hardware:
 - 1) blocks
 - i. type of blocks
 - ii. block application
 - iii. block inspection/rejection criteria
 - 2) sheaves
 - i. type of sheaves
 - ii. sheave application
 - iii. sheave inspection/rejection criteria
 - 3) hooks/latches
 - i. type of hooks
 - ii. type of latches
 - iii. hooks application
 - iv. hook inspection/rejection criteria

- 4) rings, links, swivels
 - i. type of rings, links, swivels
 - ii. ring, link, swivel application
 - iii. ring, link, swivel inspection/rejection criteria
 - 5) shackles
 - i. type of shackles
 - ii. shackle application
 - iii. shackle inspection/rejection criteria
 - 6) turnbuckles
 - i. type of turnbuckles
 - ii. turnbuckle application
 - iii. turnbuckle inspection/rejection criteria
 - 7) spreader and equalizer beams
 - i. type of spreader and equalizer beams
 - ii. spreader and equalizer beams application
 - iii. spreader and equalizer beams inspection/rejection criteria
 - 8) cable clips
 - i. type of cable clips
 - ii. cable clip application/rejection criteria
 - iii. cable clip inspection
 - 9) pad eyes
 - i. type of pad eyes
 - ii. pad eye application/rejection criteria
 - iii. pad eye inspection
 - 10) eyebolts
 - i. type of eyebolts
 - ii. eyebolt application
 - iii. eyebolt inspection/rejection criteria
 - 11) Any other attachment points.
- b) Identify rigging hardware through actual parts, models, or other suitable representation to help students learn to recognize the rigging hardware.
 - c) Describe the application of each piece of rigging hardware.
 - d) Describe inspection points, how to inspect, and criteria for removal of each piece of rigging hardware.
 - e) Describe and explain safe and unsafe conditions for usage.
 - f) Describe the purpose and proper use of different types/variations of basic rigging hardware under discussion.

- g) Describe rigging hardware working load limit (WLL) rating where applicable.
- h) Describe how to properly maintain hardware.
- i) Describe safe and proper storage techniques/practices for each piece of rigging hardware.

5.3.1.2 Course content shall discuss, and the appropriate section objectives shall include the following topics related to slings.

- a) Slings:
 - 1) type of slings and material
 - i. wire rope
 - ii. synthetic
 - iii. chain
 - iv. two-, three-, and four-leg bridle
 - 2) sling application (configuration and function)
 - 3) sling inspection/rejection criteria
 - 4) sling handling and storage
 - 5) sling angle and load tension
 - 6) D/d ratio
 - 7) cargo nets and other basket types (e.g. bulk bags/flexible fabric).
- b) Describe configurations to include different types of hitches (vertical, choker, basket).
- c) Describe function, applications, and safety precautions of hitches (vertical, choker, basket).
- d) Describe when to use and how to use.
- e) Describe the effect of the sling load at different sling angles.
- f) Describe safe and proper storage techniques/practices for all rigging hardware.

5.3.1.3 Course content shall discuss, and the appropriate section objectives shall include the following topics related to procedures and precautions:

- a) Procedures and precautions:
 - 1) load control/taglines
 - 2) unbinding loads
 - 3) personnel transfer/pre-lift considerations
 - 4) sling handling and storage
 - 5) determining load weights and center of gravity of load
 - 6) softeners (e.g. wear pads)
 - 7) attaching unused sling legs
 - 8) improving sling efficiency
 - 9) turning loads

- 10) securing loads
 - 11) placement of loads.
- b) Describe the procedures and inspection for each type of personnel transfer equipment.

5.3.1.4 Course content shall discuss, and the appropriate section objectives shall include the following topics related to rigging basics:

- a) pinch points/body positions,
- b) personal protective equipment (PPE),
- c) hand signals/radio communications.

5.3.2 Practical Exercises

5.3.2.1 General

The examiner shall mentor or coach until completed to ensure acceptable understanding and responsibility.

Training shall document and ensure that practical exercises include the following.

- a) A crane should be used during these exercises.
- b) Actual hardware typically used on the job.
- c) Minimum of one practical exercise for each student on each appropriate topic item as follows:
 - 1) rigging hardware,
 - 2) slings,
 - 3) procedures and precaution,
 - 4) rigging basics.

NOTE Follow the manufacturer's recommendations on inspection, maintenance, installation, and identification.

- d) The minimum practical exercises are as follows:
 - 1) pre-lift rigging inspection,
 - 2) rigging hitches,
 - 3) hand signals.

5.3.2.2 Task 1—Pre-lift Rigging Hardware and Sling Inspection Practical Exercise

5.3.2.2.1 The objective of the pre-lift rigging inspection is to test student's ability to understand and perform inspection of rigging hardware that is intended to be used:

- wire rope slings,
- synthetic sling,
- shackle,
- hook and latch,
- load block.

NOTE See Figure 4 for an example form.

5.3.2.2.2 At the examiner's indication to start, the student will perform a visual inspection identifying the criteria for removal for each of the following.

a) Visually check the wire rope sling for the following:

- 1) wear,
- 2) abrasion,
- 3) broken wires,
- 4) corrosion,
- 5) kinks,
- 6) eye deformation,
- 7) end fitting condition,
- 8) identification tag.

b) Visually check the synthetic sling for the following:

- 1) wear,
- 2) broken stitches,
- 3) heat damage,
- 4) chemical damage,
- 5) holes,
- 6) tears,
- 7) cuts,
- 8) snags,
- 9) ultra-violet (sun) damage,
- 10) eye fitting condition,
- 11) identification label.

c) Visually check shackle for the following:

- 1) wear on bow,
- 2) wear on pin,
- 3) pin flush w/shackle,
- 4) throat opening,
- 5) cracks and nicks,
- 6) any modifications,
- 7) missing parts,
- 8) markings.

d) Visually check hook and latch for the following:

- 1) wear,

- 2) cracks or nicks,
 - 3) latch (positive locking for personnel transfer),
 - 4) throat opening,
 - 5) bent tip,
 - 6) any modification,
 - 7) parts missing,
 - 8) markings.
- e) Visually check block for the following:
- 1) wear of pins,
 - 2) trunnion,
 - 3) swivel clearance,
 - 4) sheave condition,
 - 5) identification label,
 - 6) side and cheek plates fasteners are tight.

5.3.2.2.3 The examiner shall review the test results of the practical and ensure the student has an acceptable understanding.

5.3.2.2.4 The examiner and student shall sign the practical exercise form. The student signing on the practical exercise form validates they have an acceptable understanding and knows their responsibilities.

TASK 1 Pre-Lift Rigging Hardware and Sling Inspection

Name (print): _____

Date: _____

NOTE The examiner and student signatures validate the student has an acceptable understanding of their responsibilities.

Wire Rope Sling:

Circle One

- | | | |
|--|-------------|-------------|
| 1. Wear and abrasion/broken wires: | Pass | Fail |
| 2. Corrosion: | Pass | Fail |
| 3. Kinks: | Pass | Fail |
| 4. Eye deformation and condition of end fitting: | Pass | Fail |
| 5. Identification tag: | Pass | Fail |

Synthetic Sling:

- | | | |
|--------------------------------------|-------------|-------------|
| 1. Wear and broken stitches: | Pass | Fail |
| 2. Heat damage and chemical damage: | Pass | Fail |
| 3. Holes or tears and cuts or snags: | Pass | Fail |
| 4. Condition of end fitting: | Pass | Fail |
| 5. Identification label: | Pass | Fail |

Shackle:

- | | | |
|--|-------------|-------------|
| 1. Wear on bow and wear on pin: | Pass | Fail |
| 2. Throat opening: | Pass | Fail |
| 3. Cracks and nicks: | Pass | Fail |
| 4. Any modifications or missing parts: | Pass | Fail |
| 5. Markings: | Pass | Fail |

Hook:

- | | | |
|---------------------------------------|-------------|-------------|
| 1. Wear/cracks or nicks: | Pass | Fail |
| 2. Latch: | Pass | Fail |
| 3. Throat opening and bent tip: | Pass | Fail |
| 4. Any modification or parts missing: | Pass | Fail |
| 5. Markings: | Pass | Fail |

Load Block:

- | | | |
|------------------------------------|-------------|-------------|
| 1. Wear of pins: | Pass | Fail |
| 2. Side plate/fasteners tight: | Pass | Fail |
| 3. Sheave alignment and condition: | Pass | Fail |
| 4. Swivel clearance: | Pass | Fail |
| 5. Identification label: | Pass | Fail |

Comments:

Examiner Signature

Student Signature

Figure 4—Pre-lift Rigging Hardware and Sling Testing Form Example

5.3.2.3 Task 2—Rigging Hitches Practical Exercise

5.3.2.3.1 The objective of the rigging hitches is to test your ability to understand and perform the basic hitches to be used:

- vertical hitch;
- choker hitch;
- basket hitch;
- two- and/or four-part bridle sling. (e.g. > 60°).

NOTE See Figure 5 for a typical form.

5.3.2.3.2 At the examiner's indication to start, the student will perform a visual inspection of all rigging slings and hardware and perform the four described hitches. Select those items that meet the *remove from service* criteria and set them off to the side and obtain a replacement. All components to complete the basic hitches will be on site.

5.3.2.3.3 At the examiner's indication to start, the student will perform the basic hitches and perform and/or explain the process describe below.

- a) Configure vertical hitch: (attach vertical sling to load with rigging gear given).
 - 1) Perform a visual inspection on all rigging hardware and slings on location.
 - 2) Those items that meet the *remove from service* criteria and remove from location and obtain a replacement.
 - 3) If lift plan and JSA is completed.
 - 4) Correct personal protective equipment (PPE).
 - 5) Observe pinch points and body positioning.
 - 6) Know the person in charge (PIC).
 - 7) Have an escape route/emergency plan.
 - 8) Verify the weight of the load.
 - 9) Attach tagline.
 - 10) Observe conditions of the load.
 - 11) Verify sling working load limit (WLL)
 - 12) The vertical hitch was assembled correctly.
 - 13) Verify if the load is safe or not safe to lift.
 - 14) The sling is attached properly to the hook.
 - 15) Verify if load is balance (center of gravity).
 - 16) Assembled rigging is disassembled and stowed properly.
 - 17) Utilize stop work authority.
- b) Configure choker hitch (attach choker sling to load with rigging gear given).
 - 1) Perform a visual inspection on all rigging hardware and slings on location.

- 2) Those items that meet the *remove from service* criteria and remove from location and obtain a replacement.
 - 3) If lift plan and JSA is completed.
 - 4) Correct personal protective equipment (PPE).
 - 5) Observe pinch points and body positioning.
 - 6) Know the person in charge (PIC).
 - 7) Have an escape route/emergency plan.
 - 8) Verify the weight of the load.
 - 9) Attach tagline.
 - 10) Observe conditions of the load.
 - 11) Verify sling working load limit (WLL)
 - 12) The choker hitch was assembled correctly.
 - 13) Verify if the load is safe or not safe to lift.
 - 14) The sling is attached properly to the hook.
 - 15) Verify if load is balance (center of gravity).
 - 16) The assembled rigging is disassembled and stowed properly.
 - 17) Utilize stop work authority.
- c) Basket hitch (attach basket hitch to load with rigging gear given).
- 1) Perform a visual inspection on all rigging hardware and slings on location.
 - 2) Those items that meet the *remove from service* criteria and remove from location and obtain a replacement.
 - 3) If lift plan and JSA is completed.
 - 4) Correct personal protective equipment (PPE).
 - 5) Observe pinch points and body positioning.
 - 6) Know the person in charge (PIC).
 - 7) Have an escape route/emergency plan.
 - 8) Verify the weight of the load.
 - 9) Attach tagline.
 - 10) Observe conditions of the load.
 - 11) Verify sling working load limit (WLL).
 - 12) The basket hitch was assembled correctly.
 - 13) Verify safe or not safe to lift.
 - 14) The sling is attached properly to the hook.
 - 15) Verify if load is balance (center of gravity).
 - 16) The assembled rigging is disassembled and stowed properly.
 - 17) Utilize stop work authority.

- d) Configure two- and/or four-part bridle $\geq 60^\circ$.
- 1) Perform a visual inspection on all rigging hardware and slings on location.
 - 2) Those items that meet the *remove from service* criteria and remove from location and obtain a replacement.
 - 3) If lift plan and JSA is completed.
 - 4) Correct personal protective equipment (PPE).
 - 5) Observe pinch points and body positioning.
 - 6) Know the person in charge (PIC).
 - 7) Have an escape route/emergency plan.
 - 8) Verify the weight of the load.
 - 9) Attach tagline.
 - 10) Observe conditions of the load.
 - 11) Verify sling working load limit (WLL).
 - 12) The two- and/or four-part bridle was assembled $\geq 60^\circ$ correctly.
 - 13) Verify approximate load tension.
 - 14) Verify safe or not safe to lift.
 - 15) The sling is attached properly to the hook.
 - 16) Verify if load is balance (center of gravity).
 - 17) The assembled rigging is disassembled and stowed properly.
 - 18) Utilize stop work authority.

5.3.2.3.4 When the student has completed rigging assignment, the student will announce that they are *DONE*. The examiner will evaluate the completed rigging setup.

5.3.2.3.5 Then the examiner will indicate that the task is concluded. The student will disassemble the rigging assembly before continuing on to the next rigging assignment and properly stow the rigging hardware in the designated location.

5.3.2.3.6 The examiner will review the test results of the practical and ensure the student has an acceptable understanding.

5.3.2.3.7 The examiner and student will sign the practical exercise form. The student signing the practical exercise form validates they have an acceptable understanding and knows their responsibilities.

Task 2 Rigging Hitches

Name (print): _____

Date: _____

NOTE The examiner and student signatures validate the student has an acceptable understanding of their responsibilities.

Vertical Hitch:

Circle One

1. Perform a visual inspection on all rigging hardware and slings:	Pass	Fail
2. Verify items meeting the <i>remove from service</i> criteria were set aside and obtain a replacement:	Pass	Fail
3. Verify if lift plan and JSA are completed:	Pass	Fail
4. Verify personal protective equipment (PPE):	Pass	Fail
5. Verify pinch points and body positioning:	Pass	Fail
6. Verify person in charge (PIC):	Pass	Fail
7. Verify escape route and emergency plan:	Pass	Fail
8. Verify the weight of the load:	Pass	Fail
9. Verify taglines:	Pass	Fail
10. Verify condition of the load:	Pass	Fail
11. Verify sling working load limit (WLL):	Pass	Fail
12. Verify vertical hitch was assembled:	Pass	Fail
13. Verify safe or not safe to lift:	Pass	Fail
14. Verify sling is attached properly to hook:	Pass	Fail
15. Verify if load is balance: (center of gravity):	Pass	Fail
16. Verify assembled rigging is disassemble and stowed properly:	Pass	Fail
17. Utilize stop work authority:	Pass	Fail

Choker Hitch:

1. Perform a visual inspection on all rigging slings and hardware:	Pass	Fail
2. Verify items meeting the <i>remove from service</i> criteria were set aside and obtain a replacement:	Pass	Fail
3. Verify if lift plan and JSA are completed:	Pass	Fail
4. Verify personal protective equipment (PPE):	Pass	Fail
5. Verify pinch points and body positioning:	Pass	Fail
6. Verify person in charge (PIC):	Pass	Fail
7. Verify escape route/emergency plan:	Pass	Fail
8. Verify the weight of the load:	Pass	Fail
9. Verify taglines:	Pass	Fail
10. Verify condition of the load:	Pass	Fail
11. Verify sling working load limit (WLL):	Pass	Fail
12. Verify choker hitch was assembled:	Pass	Fail
13. Verify safe or not safe to lift:	Pass	Fail
14. Verify sling is attached properly to the hook:	Pass	Fail
15. Verify if load is balance (center of gravity):	Pass	Fail
16. Verify assembled rigging is disassemble and stowed properly:	Pass	Fail
17. Stop work authority:	Pass	Fail

Basket Hitch:

1. Perform a visual inspection on all rigging slings and hardware:	Pass	Fail
2. Verify items meeting the <i>remove from service</i> criteria were set aside and obtain a replacement:	Pass	Fail
3. Verify if lift plan and JSA are completed:	Pass	Fail
4. Verify person protective equipment (PPE):	Pass	Fail
5. Verify pinch points and body positioning:	Pass	Fail
6. Verify person in charge (PIC):	Pass	Fail
7. Verify escape route/emergency plan:	Pass	Fail
8. Verify the weight of the load:	Pass	Fail
9. Verify taglines:	Pass	Fail
10. Verify condition of the load:	Pass	Fail
11. Verify sling working load limit:	Pass	Fail
12. Verify basket hitch was assembled:	Pass	Fail
13. Verify safe or not safe to lift:	Pass	Fail
14. Attached to hook properly:	Pass	Fail
15. Verify if load is balance (center of gravity):	Pass	Fail
16. Verify assembled rigging is disassemble and stowed properly:	Pass	Fail
17. Stop work authority:	Pass	Fail

Two- and/or Four-part Bridle Sling ($\geq 60^\circ$):

1. Perform a visual inspection on all rigging slings and hardware:	Pass	Fail
2. Verify items meeting the <i>remove from service</i> criteria were set aside and obtain a replacement:	Pass	Fail
3. Verify if lift plan and JSA are completed:	Pass	Fail
4. Verify personal protective equipment (PPE):	Pass	Fail
5. Verify pinch points and body positioning:	Pass	Fail
6. Verify person in charge (PIC):	Pass	Fail
7. Verify escape route/emergency plan:	Pass	Fail
8. Verify the weight of the load:	Pass	Fail
9. Verify taglines:	Pass	Fail
10. Verify condition of the load:	Pass	Fail
11. Verify sling working load limit:	Pass	Fail
12. Verify two- and/or four-part bridle was assembled $\geq 60^\circ$:	Pass	Fail
13. Verify approximate load tension:	Pass	Fail
14. Verify safe or not safe to lift:	Pass	Fail
15. Attached to hook properly:	Pass	Fail
16. Verify if load is balance:	Pass	Fail
17. Verify assembled rigging is disassemble and stowed properly:	Pass	Fail
18. Stop work authority:	Pass	Fail

Comments: _____

Examiner Signature _____

Student Signature _____

Figure 5—Rigging Hitches Testing Form Example

6 Crane Operator Training

6.1 General

6.1.1 The student shall present a valid qualified crane rigger certification to the instructor.

The crane operator shall be qualified to safely operate the crane(s) on which they have been trained in accordance with 6.2. By completing the training in 6.2, the crane operator shall also be qualified to perform the crane inspections, with the exception of the initial, quarterly, and annual inspections.

The crane owner shall establish written procedures for crane operator assessment and rating, the program shall take into consideration the following at a minimum:

- a) Individual crane operator experience and competency
- b) Installation type (fixed or floating),
- c) Crane type (mechanical or non-mechanical),
- d) Crane application (production, intermediate, drilling or construction duty),
- e) Lift categories (routine lifts, non-routine lifts: (a) simple; b) complicated; c) complex/critical.)
 - 1) Crane manufacturer's recommendations.
 - 2) Atmospheric site conditions (weather, day / night)
 - 3) Types of lifts to be performed:
 - i. onboard or offboard
 - ii. loading and unloading offshore support vessels
 - iii. crane-assisted personnel transfer
 - iv. subsea

6.1.2 All crane operators seeking qualification shall meet the minimum training requirements as defined in this section and shall be assessed to a determined level and furnish documentation stating their level (see below example). This can be done by the crane owner, their designee or third-party assessor utilizing established guidelines by the crane owner or by the example below.

EXAMPLE Level 1, 2, 3 or A, B, C, or other such equivalent designations such as Stage or Class 1, 2, 3 or A, B, C.

At a minimum, crane operator levels shall address the following:

- a) Level 1: Crane Operator "Trainee" – able to perform supervised lifts only
- b) Level 2: Crane Operator Restricted – able to perform restricted lifts only
- c) Level 3: Unrestricted – able to perform all lifts

Instructors who teach crane operator training shall have applicable field experience in lifting and rigging operations and have taken a train the trainer course to teach.

6.2 Operator Training

6.2.1 One important part of crane safety is proper training of crane operators. Training should incorporate familiarization in lifting loads with slings, rigging hardware and safety issues associated with JSAs and lift plans.

6.2.2 Practical exercise proficiency is the last segment of crane operator qualification training. It should be held on a crane similar to the type of crane to be operated by the qualified crane operator, in order to allow them to demonstrate their ability. For hands-on proficiency in practical exercises, a crane simulator may be used to fully achieved all practical elements in 6.3.3. Simulators may be used in addition to an actual crane.

When a simulator is used, it shall be able to perform the following:

- a) real-life scenarios of the offshore environment,
- b) onboard lifts,
- c) offboard lifts,
- d) various weather condition and sea states, and
- e) crane/rigging malfunctions to challenge operator.

6.2.3 The following are requirements for crane operator training.

- a) Classroom-type sessions with written and practical exercise examinations on the type of crane to be operated by the qualified crane operator.
 - 1) Such classroom-type sessions and examinations shall cover all major crane components; the operational and maintenance procedures appropriate for the type and rated capacity of crane to be operated; and all major issues and guidelines addressed in this document.
 - 2) Training shall also cover lubricating points; adjustments; principles of crane operation, especially boom operating procedures; safety devices and anti-two-blocking system; the proper use and care of all running cables and pendant line(s) and the proper reading and understanding of crane rated capacity and reeving charts, boom and indicator charts and hand signal charts.
- b) The qualified crane operator shall demonstrate by written examination an appropriate understanding of the provisions of this document.
- c) If a mechanical or non-mechanical crane is to be operated, the necessary experience and training:
 - 1) shall be focused on each type of crane classification; and
 - 2) shall be more intense on mechanical than for non-mechanical, due to the greater skills required to safely operate mechanical cranes.

6.2.4 The qualified crane operator shall have attended practical exercise training on the proper inspection, use and maintenance of rigging gear (i.e. slings, shackles, hooks, nylon slings, etc.) and be trained (qualified) in all crane rigger requirements.

The training program shall include a written exam, and the qualified crane operator shall have demonstrated proficiency during the practical exercises for the safe operation of the types of cranes they are to operate.

The student/employer shall provide proof of compliance with the physical requirements in accordance with the API 2D section for *Qualified Crane Operator*.

6.3 Operator Training Outline

6.3.1 Course Content

6.3.1.1 Course content shall discuss the appropriate objectives and shall include the following topics:

- a) lift plan,
- b) JSA/JSEA.

6.3.1.2 Course content shall discuss, and the appropriate objectives shall include the following topics related to a qualified crane operator.

- a) Types of cranes used offshore:
 - 1) mechanical,
 - 2) non-mechanical.
- b) Crane components and lifting capacities.
 - 1) Components of a stationary mounted crane. Identify and describe the standard components on each type of crane.
 - 2) Basic crane terminology and their definitions.
 - 3) Boom angle and load radius and how load weight directly affects the rated capacity of any crane as well as how to use the various tools available (boom angle indicator, load rating charts) to evaluate and perform a safe lift.
 - 4) Basic lifting principles are affected by different variables including boom angle, length, and radius as well as load weight, as such, the items below should be discussed in the training:
 - i. lever principles;
 - ii. lifting principles;
 - iii. types of lifts;
 - iv. onboard;
 - v. shock loading;
 - vi. offboard lifts.
 - 5) Reading a load rating chart as specified in the following:
 - i. correct and configured to crane;
 - ii. weight that can be lifted at a specified boom length and boom angle;
 - iii. working radius;
 - iv. parts of line;
 - v. crane is de-rated;
 - vi. exceeding the loads and/or conditions stated on load rating chart;
 - vii. the weight of the hook block, overhaul ball, slings etc. also be considered part of the load;

- viii. comparison of load weights relative to boom angle and length of boom.
- 6) Load charts are placed on a crane for safety. The qualified crane operator should:
 - i. study and know how to read the chart and use it for every lift;
 - ii. identify the different procedures for onboard and offboard lifting; and
 - iii. consider the sea state, wind and other operating conditions.
- 7) Number of parts of line and relationship to rated load.
- 8) Limitations of the size and type of wire rope used in boom hoist lines, pendant line(s), and load hoist line.
- 9) Rated capacity of the main and auxiliary hook.
- 10) Rated capacity of load and boom hoist drums (speed vs. line pull).
- c) Wire rope construction and use.
 - 1) Mechanics of wire rope.
 - 2) Classes, designation, and characteristics of wire rope:
 - i. lay length;
 - ii. right regular lay;
 - iii. left regular lay;
 - iv. rotation resistant.
 - 3) Handling and installation precautions of wire rope.
 - 4) Guidelines for replacement of wire rope and wedge socket installation.
 - 5) Rope maintenance (lubrication).
 - 6) Recommended storage and handling procedures.
 - 7) Wire rope inspection/replacement criteria.
- d) Mounting features of the revolving upper structure:
 - 1) hook rollers,
 - 2) swing/slew bearing,
 - 3) king post,
 - 4) others.
- e) Boom structure:
 - 1) types of boom construction (lattice, box, etc.),
 - 2) wire rope rollers/guides,
 - 3) boom bolts,
 - 4) pins and pin connections.
- f) Limit devices:
 - 1) boom-hoist limit,
 - 2) load hoist limits,

- 3) boom stops,
 - 4) all locking devices,
 - 5) anti-two-blocking devices.
- g) Additional items:
- 1) sheaves,
 - 2) hand signals,
 - 3) control identification,
 - 4) power plant emergency shutdown (ESD),
 - 5) air intake shutdown (specific to internal combustion engines),
 - 6) Emergency load lowering,
 - 7) Vessel to vessel transfers (offboard) – effects, operational,
 - 8) Sub-sea lifting,
 - 9) GOPS (gross overload protection systems),
 - 10) Qualified crane operators shall keep a log of lifts (sample below of log book content),
 - i. Date,
 - ii. Location/Vessel,
 - iii. Type of crane (folding (knuckle), lattice, box boom or stiff leg),
 - iv. Sub-type of crane (i.e. mechanical or non-mechanical)
 - v. Type of lift- offboard/onboard,
 - vi. Sea states,
 - vii. Wind,
 - viii. Number of lifts,
 - ix. Max weight,
 - 11) Verified by.

6.3.2 Practical Exercises

6.3.2.1 General

The training provider shall document, ensure that hands-on exercises and demonstrations include the following:

- a) pre-use inspection;
- b) lift plan for the three unique types of lifts;
- c) swing crane and control load;
- d) performance of at least three unique types of lifts:
 - 1) onboard lift,
 - 2) offboard lift,

- 3) blind lift;
- e) one or more depth perception exercises;
- f) interpretation of load chart during lifting exercises;
- g) hand signals;
- h) the minimum practical exercises:
 - 1) pre-use inspection,
 - 2) hand signals,
 - 3) lift procedures:
 - i. Lift #1 onboard,
 - ii. Lift #2 offboard,
 - iii. Lift #3 blind.

6.3.2.2 Task 1—Pre-use Inspection Practical Exercise

The objective of Task 1 is to test the student's ability to understand the minimum API 2D requirements.

- a) The task shall be completed in order to pass. Any student not performing this portion of test will constitute a failure of the task. The examiner will proceed to coach the student on the correction needed and retest the student until completion is attained.
- b) The student has the opportunity at the start of this task to discuss any special instructions.
- c) Check entry and exit for personnel on crane before starting task and finishing task. Perform a walk around to verify personnel are not around crane before starting and shutting down the crane and verify entry/exit gate is secured.
- d) The examiner will provide the student with a pre-use inspection form to fill out.
- e) At the examiner's indication to stop, hand the pre-use inspection to examiner.
- f) The examiner will review the test results of the task to see if completed.
- g) The examiner and student will sign the practical exercise form. The student signing the practical exercise form validates they have an acceptable understanding and knows their responsibilities.

NOTE See Figures 6 and 7 for example forms.

TASK 1 Pre-use (daily) Inspection

Name (print): _____ **Date:** _____

NOTE The examiner and student will sign the practical exercise form. The student signing the practical exercise form validates they have an acceptable understanding and knows their responsibilities.

Student participated and completed pre-use inspection (circle one): **Pass** **Fail**

Comments:

Examiner Signature

Student Signature

Figure 6—Pre-use Daily Inspection Testing Form Example

Pre-use Inspection Form Reference Maintenance Section			
Pre-use Checklist	Date: _____ Time: _____		
	Platform/Rig Name: _____		
Crane Manufacturer: _____	Qualified Crane Operator Name (print): _____		
Crane Model: _____	Qualified Crane Operator Signature: _____		
Crane S/N: _____			
	Ok	Fault	Comments
1) Visually examine hoist boom and support structure for damage (walk-around).			
2) Check engine oil and hydraulic oil levels.			
3) Check coolant/ fuel level.			
4) Check fan/and any belts.			
5) Check for fuel, oil, coolant, hydraulic, and air leaks.			
6) Power plant start and stop prior to use.			
7) Check for hoist lubricant oil leakage.			
8) Check operation of anti-two-blocking devices.			
9) Check boom hoist pawl.			
10) Check control mechanisms including brakes and clutches for proper operation.			
11) Check for loose, missing, or corroded bolts, pins, keeper, or cotter pins.			
12) Examine condition of wire rope for evident deterioration and damage, or improper reeving.			
13) Visually check rigging gear to be used such as slings, sling hooks and shackles.			
14) Check hoist hook latch.			
15) Check condition and operation of weight indicator.			
16) Confirm that correct & configure load chart is posted.			
17) Check aircraft warning light (if installed).			
18) Ensure lock pin in hook for personnel lift.			
19) Check for leakage or damage to the air and non-mechanical systems.			
20) Check entry & exit for personnel and gate is secured.			

Figure 7—Pre-use Inspection Checklist Example

6.3.2.3 Task 2—Lift Procedures

The objective of this practical exercise is to test the student's ability to understand and perform lift procedures, swing crane and control load, depth perception, interpretation of load chart during lifting exercises.

The task shall be completed in order to pass the lift procedure practical exercise. Any failed portion of this test will constitute a failure of the task. The examiner will proceed to coach the student on the correction needed and retest you until completion is attained.

The qualified crane operator has the opportunity at the start of this task, to discuss any further explanation.

NOTE See Figure 8 for examples of lift procedures forms.

6.3.2.3.1 The student shall perform the following lift procedures.

a) Lift #1—Onboard

- 1) At the examiner's indication, bring the load block over the load used for test and center the load block at the start position.
- 2) The load will be attached to the crane hook by the designated qualified crane rigger.
- 3) At the examiner's indication to start:
 - i. verify the weight of the load used for test,
 - ii. check load chart to verify crane rated capacity,
 - iii. determine if it's safe or not safe to lift, and
 - iv. verify tagline on load.
- 4) At the start position, the student will move the load used for the test to the second designated location performing the procedures listed below.
 - i. The student will lift the load used for test slowly (approximately 6 in. to 12 in.) off deck.
 - ii. Stop and check hoist brake.
 - iii. The student will make sure the path is clear:
 - a. of all obstacle—when test weight reaches an obstacle, lift load high enough to clear the obstacle, swing over the obstacle and lower the load to a safe height; and
 - b. of all personnel—never move test weight over personnel.
 - iv. Watching for overload.
 - v. The student will make sure the load is under control.
 - vi. Watching for dragging the load on the deck (sideloading).
 - vii. Watching for load contacting any part of the course.
 - viii. Checking depth perception to see if load in place at position #2.
 - ix. Once the test weight reaches position #2, place it there so that the load used for test is under control.
 - x. The student will then slowly lower the test weight on to the deck.
 - xi. The examiner will give you a stop signal once the test weight is in the #2 position.

- xii. Remain at the controls until the examiner gives a clear indication that Lift #1 is finished.
 - xiii. The examiner will review the test results of Lift #1.
 - xiv. The examiner and student will sign the practical exercise form. The student signing the practical exercise form validates they have an acceptable understanding and knows their responsibilities.
- b) Lift #2—Offboard (where practical and/or simulated)
- 1) At the examiner's indication, bring the load block over the load used for test and center the load block at the start position.
 - 2) The load will be attached to the crane hook by the designated qualified crane rigger.
 - 3) At the examiner's indication to start:
 - i. verify the weight of the load;
 - ii. check load chart to verify crane rated capacity;
 - iii. determine if it's safe or not safe to lift;
 - iv. verify tagline on load.
 - 4) At start position, the student will move the test weight to the third designated location performing the procedures listed.
 - i. The student will lift test weight slowly off deck.
 - ii. The student will make sure the path is clear:
 - a. of all obstacle—when test weight reaches an obstacle, lift load high enough to clear the obstacle, swing over the obstacle, and lower the load to a safe height; and
 - b. of all personnel—never move test weight over personnel.
 - iii. Watching for overload.
 - iv. The student will make sure the load is under control.
 - v. Watching for dragging the load on the deck (sideloading).
 - vi. Watching for load contacting any part of the course.
 - vii. Checking depth perception to see if load in place at position #3.
 - viii. Once the test weight reaches position #3, place it there so that the test weight is under control.
 - ix. The student will then slowly lower the test weight on to the deck.
 - x. The examiner will give you a stop signal once the test weight is in the #3 position.
 - xi. Remain at the controls until the examiner gives a clear indication that the Lift #2 offboard is finished.
 - xii. The examiner will review the test results of the Lift #2.
 - xiii. The examiner and student will sign on the practical exam form.
- c) Lift #3—Blind
- 1) The student has the opportunity to discuss any special hand signals needed to perform blind lift with examiner and signalman. Radio communication can also be used as an option (if available).

- 2) Watching the designated signalman hand signals, bring the load block over the load used for the test at position #3 and center the block.
- 3) The load will be attached to the crane hook by the designated qualified crane rigger.
- 4) Watching designated signalman hand signal indication to start:
 - i. verify the weight of the load;
 - ii. check load chart to verify crane rated capacity;
 - iii. determine if it's safe or not safe to lift;
 - iv. verify tagline on load.
- 5) At the #3 position, move the test weight to position #4 designated location performing the procedures listed.
 - i. Watching the designated signal man, lift test weight slowly (about 6 in. to 12 in.) off deck.
 - ii. Stop and check hoist brake.
 - iii. The designated signalman will direct you to position #4 by watching the following.
 - a. When test weight reaches an obstacle—the signalman will direct you to lift the load high enough to clear the obstacle, swing over the obstacle and lower the load to a safe height.
 - b. Qualified crane operator will be watching for overload.
 - iv. Watching for overload.
 - v. Once the test weight reaches position #4, place it there by watching the signalman hand signals so that the test weight is under control.
 - vi. You will then slowly lower the test weight on to the deck by watching the signalman.
 - vii. The signalman will give you a stop signal once the test weight is in position #4.
 - viii. Remain at the controls until the examiner gives a clear indication that the Lift #3 is finished.
 - ix. The examiner will review the test results of the Lift #3.
 - x. The examiner and student will sign the practical exercise form. The student signing the practical exercise form validates they have an acceptable understanding and knows their responsibilities.

TASK 2 Lift Procedures

Name (print): _____ Date: _____

Check Lift #: Lift #1—Onboard Lift #2—Offboard Lift #3—Blind

The examiner and student will sign the practical exercise form. The student signing the practical exercise form validates they have an acceptable understanding and knows their responsibilities.

Circle One

1. Student participated in the (group) pre use Inspection:	Pass	Fail
2. Lift Plan on hand:	Pass	Fail
3. Verify the Entry/Exit (before starting):	Pass	Fail
4. Verify the weight of the load:	Pass	Fail
5. Check interpretation of load chart:	Pass	Fail
6. Determine if the load is safe or not safe to lift:	Pass	Fail
7. Centering the ball or load block over the load:	Pass	Fail
8. Verify tagline on load:	Pass	Fail
9. Testing the hoist brakes:	Pass	Fail
10. Clearing all obstacles:	Pass	Fail
11. Lifting load over personnel:	Pass	Fail
12. Watch for overload:	Pass	Fail
13. Watch for two-blocking:	Pass	Fail
14. Control of the load:	Pass	Fail
15. Dragging the load (sideloading):	Pass	Fail
16. Load contacting any part of the course:	Pass	Fail
17. Check depth perception to see if place at:		
a. position #2	Pass	Fail
b. position #3	Pass	Fail
c. blind (interpretation of hand signals)	Pass	Fail

Comments:

Examiner Signature

Student Signature

Figure 8—Lift Procedures Testing Form

7 Qualified Crane Inspector Training

7.1 General

Crane inspector training is a critical part of the prevention of crane accidents due to component failure. Training shall reference a formalized, written training program. An outline of the major items that should be included in this training program is listed. In addition to the recommended training elements for qualified crane operators the crane inspector training program shall be tailored to the particular cranes or crane types for which the crane inspector is to be qualified.

7.2 Inspector Training

7.2.1 Important part of crane safety is proper training of inspectors. Training shall incorporate familiarization on crane maintenance, troubleshooting, inspecting, and JSAs/JSEAs.

7.2.2 Qualified crane inspectors shall be trained as follows on the type of cranes they will inspect.

a) Maintenance and troubleshooting of non-mechanical functions to include:

- 1) hydraulic,
- 2) electric.

b) Maintenance and troubleshooting of mechanical functions (e.g. friction).

7.2.3 The following shall be included as requirements for qualified crane inspector training.

a) Classroom-type sessions with written and practical exercise examinations on the type of crane to be inspected by the qualified crane inspector.

- 1) Such classroom-type sessions and examinations shall cover all major crane components; the operational and maintenance procedures appropriate for the type and rated capacity of crane to be operated; and all major issues and guidelines addressed in this document.
- 2) Training shall also cover hoist overhaul and troubleshooting, structural aspects of offshore cranes; knowledge of structural critical components inspection areas and additionally applicable recognized regulatory compliance requirements.

b) The qualified crane inspector shall demonstrate by written examination an appropriate understanding of the requirements of this standard.

7.2.4 With this minimum training, the qualified crane inspector should be qualified to maintain, troubleshoot, and perform inspections on the crane(s) on which they have been trained.

7.3 Inspector Training Outline

7.3.1 Course Content

Course content shall include the entire body of information contained within API 2D, and API 2C (as applicable); and the appropriate section objectives shall include the following objectives related to API 2D for offshore pedestal mounted cranes as appropriate for the type of crane used.

7.3.1.1 Course content shall discuss, and the appropriate section objectives shall include the following objectives related to relative API 2C edition(s) (as applicable for when the crane was manufactured) for offshore pedestal mounted cranes, as appropriate for the type of crane used. The following should be reviewed:

- a) critical components;
- b) API 2C definitions;
- c) crane rated loads;
- d) crane ratings;
- e) allowable stresses;
- f) design authentication and testing;
- g) critical rigging components;
- h) boom, load hoist, and telescoping boom components;
- i) swing mechanism;
- j) power plant;
- k) controls;
- l) cabs and enclosures;
- m) miscellaneous requirements and equipment;
- n) welding of critically stressed components;
- o) nondestructive examination (NDE) of critical components;

7.3.1.2 Course content shall familiarize students with typical problems encounter in crane maintenance, troubleshooting and inspection for offshore pedestal mounted cranes as appropriate for the type of crane used and knowledge of the following.

- a) Mechanical and non-mechanical cranes (general):
 - 1) load charts/information charts (correct and configure to crane);
 - 2) importance of following manufacturer's recommendations;
 - 3) safety factors involved;
 - 4) hoists;
 - 5) structural aspects of offshore cranes;
 - 6) structurally critical components;
 - 7) critical inspection areas;

- 8) recognized applicable regulatory compliance;
 - 9) basic knowledge of nondestructive examination (NDE) such as (dye penetrant procedures);
 - 10) what records are to be reviewed and maintained;
 - 11) how to review completed repair records and status of any open repairs;
 - 12) knowledge and demonstration of measurement tools usage;
 - 13) safety systems;
 - 14) power plant (prime mover);
 - 15) boom inspection and repair;
 - 16) emergency load lowering procedures (as applicable).
- b) Non-mechanical (specific basic hydraulic):
- 1) physical world of hydraulic;
 - 2) hydraulic terminology;
 - 3) transmission of force and energy;
 - 4) simple hydraulic system;
 - 5) basic hydraulic symbols;
 - 6) hydraulic fluid;
 - 7) operation at the suction side of pump;
 - 8) actuators;
 - 9) luffing cylinders;
 - 10) control of hydraulic energy;
 - 11) check valves, accumulators;
 - 12) flow control values;
 - 13) directional control values;
 - 14) pressure control values;
 - 15) pilot operated pressure control valve;
 - 16) different types of pumps;
 - 17) hydraulic motors;
 - 18) reservoirs, coolers, and filters;
 - 19) hydraulic symbols and schematic drawings;
 - 20) knowledge of hoses and fittings;
 - 21) hoists;
 - 22) emergency load lowering procedures (as applicable).
- c) Non-mechanical (specific basic electric):
- 1) electrical symbols and schematic drawings;
 - 2) basic electrical terminology;

- 3) all applicable motors, controls, and panels;
 - 4) swing limit switch;
 - 5) emergency load lowering procedures (as applicable).
- d) Mechanical (specific basic friction):
- 1) mechanical terminology;
 - 2) swing lock and brake;
 - 3) vertical and horizontal swing shaft and bevel gear boxes;
 - 4) applicable hook roller assemblies;
 - 5) upper and lower reduction gear cases;
 - 6) all hoist planetary brakes and clutches;
 - 7) clutch assemblies;
 - 8) all applicable drum brakes;
 - 9) boom hoist pawl;
 - 10) boom hoist brake;
 - 11) chain case and pump;
 - 12) applicable operational function controls and systems;
 - 13) bearing–gear–shaft and housing inspection;
 - 14) emergency load lowering procedures (as applicable).

7.3.2 Practical Exercises and Simulations

7.3.2.1 General

A pedestal-mounted crane shall be used for practical exercises and testing.

Practical exercises shall include the instructions on the proper usage of measuring and testing tools, as specified in relevant recommended practices

Practical exercises shall include identification of stress, corrosion, and inspection practices.

The training provider shall maintain a documented requirement for all the practical exercises conducted in each course.

The practical exercises shall include a requirement for covering any failed portions of the examination immediately after exam completion.

7.3.2.2 Practical Evaluation

The training provider shall maintain a documented procedure requiring a practical examination with all exercises in crane maintenance, troubleshooting and inspection centered on critical components for offshore pedestal mounted cranes as appropriate for the type of crane used.

- a) Mechanical and non-mechanical cranes (basic general):

- 1) types of swing assemblies typically used on pedestal-mounted cranes;
 - 2) crane safety systems;
 - 3) wire rope;
 - 4) power plant (prime mover);
 - 5) boom inspection;
 - 6) sheave;
 - 7) load and pull test procedures;
 - 8) emergency load lowering.
- b) Non-mechanical (specific basic hydraulic):
- 1) hoist tear down and troubleshooting;
 - 2) hoist brake test;
 - 3) emergency load lowering.
- c) Non-Mechanical (specific basic electric):
- 1) hook and swing board/panel voltage measurements;
 - 2) emergency load lowering.
- d) Mechanical (specific basic friction):
- 1) hoist and swing clutches disassemble/reassemble, and adjustments made;
 - 2) boom band brake adjustments;
 - 3) control lever adjustments;
 - 4) master clutch adjustment;
 - 5) emergency load lowering procedures (as applicable).

Bibliography

- [1] API Recommended Practice 9B, *Application, Care and Use of Wire Rope for Oil Field Service*
- [2] API Specification 9A, *Wire Rope*
- [3] ASME ¹, B30.9, *Slings*
- [4] AWS ², D1.1, *Structural Welding Code—Steel*
- [5] WRTB ³, *Wire Rope Sling User's Manual*
- [6] WRTB, *Wire Rope User's Manual*
- [7] WSTDA RS-1 ⁴, *Recommended Standard for Synthetic Polyester Roundslings*
- [8] WSTDA WS-1, *Recommended Standard for Synthetic Web Slings*

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.