International Association of Oil & Gas Producers

SPECIFICATION
IOGP S-618

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Version 1.1

Supplementary Specification to API Specification 2C for Offshore Pedestal-mounted Cranes

JIP33
JOINT INDUSTRY PROGRAMME

Revision history

VERSION	DATE	PURPOSE
1.1	September 2023	Issued for Public Review
1.0	December 2018	First Edition

Acknowledgements

This IOGP Specification was prepared by a Joint Industry Programme 33 Standardization of Equipment Specifications for Procurement organized by IOGP with support by the World Economic Forum (WEF).

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Foreword

This specification was prepared under Joint Industry Programme 33 (JIP33) "Standardization of Equipment Specifications for Procurement" organized by the International Oil & Gas Producers Association (IOGP) with the support from the World Economic Forum (WEF). Companies from the IOGP membership participated in developing this specification to leverage and improve industry level standardization globally in the oil and gas sector. The work has developed a minimized set of supplementary requirements for procurement, with life cycle cost in mind, resulting in a common and jointly agreed specification, building on recognized industry and international standards.

Recent trends in oil and gas projects have demonstrated substantial budget and schedule overruns. The Oil and Gas Community within the World Economic Forum (WEF) has implemented a Capital Project Complexity (CPC) initiative which seeks to drive a structural reduction in upstream project costs with a focus on industry-wide, non-competitive collaboration and standardization. The CPC vision is to standardize specifications for global procurement for equipment and packages. JIP33 provides the oil and gas sector with the opportunity to move from internally to externally focused standardization initiatives and provide step change benefits in the sector's capital projects performance.

This specification has been developed in consultation with a broad user and supplier base to realize benefits from standardization and achieve significant project and schedule cost reductions.

The JIP33 work groups performed their activities in accordance with IOGP's Competition Law Guidelines (November 2020).

This second edition will cancel and replace the first edition published in December 2018.

Due to technical writing requirements leading to extensive changes, this second edition should be treated as a new document.

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Introduction

The purpose of the IOGP S-618 specification documents is to define a minimum common set of requirements for the procurement of offshore pedestal-mounted cranes in accordance with API Specification 2C, 8th Edition, Errata 1, published June 2021, Offshore Pedestal-mounted Cranes, for application in the petroleum and natural gas industries.

The IOGP S-618 specification documents follow a common structure (as shown below) comprising a specification, also known as a technical requirements specification (TRS), a procurement data sheet (PDS), an information requirements specification (IRS) and a quality requirements specification (QRS). These four specification documents, together with the purchase order, define the overall technical specification for procurement.

JIP33 Specification for Procurement Documents
Supplementary Technical Requirements Specification (TRS)

This specification is to be applied in conjunction with the supporting PDS, IRS and QRS as follows.

IOGP S-618: Supplementary Specification to API Specification 2C for Offshore Pedestal-mounted Cranes

This specification defines technical requirements for the supply of the equipment and is written as an overlay to API Specification 2C, following the API Specification 2C clause structure. Clauses from API Specification 2C not amended by this specification apply as written. Modifications to API Specification 2C defined in this specification are introduced by a description that includes the type of modification (i.e. *Add*, *Replace* or *Delete*) and the position of the modification within the clause.

NOTE Lists, notes, tables, figures, equations, examples and warnings are not counted as paragraphs.

IOGP S-618D: Procurement Data Sheet for Offshore Pedestal-mounted Cranes (API)

The PDS defines application-specific requirements. The PDS is applied during the procurement cycle only and does not replace the equipment data sheet. The PDS may also include fields for supplier-provided information required as part of the purchaser's technical evaluation. Additional purchaser-supplied documents may also be incorporated or referenced in the PDS to define scope and technical requirements for enquiry and purchase of the equipment.

IOGP S-618L: Information Requirements for Offshore Pedestal-mounted Cranes (API)

The IRS defines information requirements for the scope of supply. The IRS includes information content, format, timing and purpose to be provided by the supplier, and may also define specific conditions that invoke the information requirements.

IOGP S-618Q: Quality Requirements for Offshore Pedestal-mounted Cranes (API)

The QRS defines quality management system requirements and the proposed extent of purchaser conformity assessment activities for the scope of supply. Purchaser conformity assessment activities are defined through the selection of one of four generic conformity assessment system (CAS) levels on the basis of evaluation of the associated service and supply chain risks. The applicable CAS level is specified by the purchaser in the PDS or in the purchase order.

The specification documents follow the editorial format of API Specification 2C and, where appropriate, the drafting principles and rules of ISO/IEC Directives Part 2.

The PDS and IRS are published as editable documents for the purchaser to specify application-specific requirements. The TRS and QRS are fixed documents.

The order of precedence of documents applicable to the supply of the equipment, with the highest authority listed first, shall be as follows:

a) regulatory requirements;

b) contract documentation (e.g. purchase order);

c) purchaser-defined requirements (e.g. PDS, IRS and QRS);

d) this specification;

e) API Specification 2C.

2 Normative References

Add to first paragraph

The following publications are referred to in this document, the PDS (IOGP S-618D) or the IRS (IOGP S-618L) in such a way that some or all of their content constitutes requirements of this specification.

Add to section

Dropped Object Prevention Scheme Recommended Practice:2020

IEC 31010, *Risk management – Risk assessment techniques*

ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

NFPA 70, *National Electrical Code*

3 Terms, Definitions, Acronyms, Abbreviations, Units, and Symbols

3.2 Acronyms and Abbreviations

CAS conformity assessment system

CIS component identification system

CSV comma-separated values

CTS constant tension system

EOS emergency operating system

FAT factory acceptance test

FMEA failure mode effects analysis

HVAC heating, ventilation and air conditioning

IRS information requirements specification

LED light emitting diode

MBL minimum breaking load

MOPS manual overload protection system

NDT non-destructive testing

OEM original equipment manufacturer

PDS procurement data sheet

PLC programmable logic controller

PLr required performance level

QRS quality requirements specification

SAT site acceptance test

TRS technical requirements specification

4 Documentation

4.2 Purchaser-supplied Information Prior to Purchase

Add new list item m)

m) any applicable regulatory requirements.

4.4 References to Annexes

Add to section

— Hydraulic systems and pneumatic lines; see Annex G (informative).

— Factory acceptance test (FAT) guidance; see Annex H (informative).

— Site acceptance test (SAT) guidance; see Annex I (informative).

5 Loads

5.2 Critical Components

In first sentence, replace "whose failure shall result in an uncontrolled descent of the load or uncontrolled rotation of the upper structure" with

whose failure results in an uncontrolled movement of the crane or load

Add to section

Critical components shall have a risk assessment performed using a technique recognized by IEC 31010.

Risk assessment of critical components shall contain determination of the limits of the machinery.

NOTE The risk assessment should be performed in accordance with ISO 12100 for European locations. For all other locations, the manufacturer may propose the risk assessment method.

5.4 In-service Loads

5.4.4 Legacy Method

5.4.4.1

In list section b) of second paragraph (offboard ratings), replace "restrained relative to the crane-supporting structure" with

maintained constant to the crane-supporting structure

5.4.6 Horizontal Loads

5.4.6.3 Loads due to Crane Inclinations (CI Forces) and Crane Motions (CM Forces)

Add to section

A minimum additional 0.5° offlead and 0.5° sidelead shall be added to the crane motions.

When the crane base angle is 45°, the additional offlead and sidelead shall be combined at 100 % full value.

6 Structure

6.1 General

Add to section

The crane shall have an installation tolerance of 1° out of true in any direction about the axis.

The performance and operation of the crane shall not be impacted within the installation tolerance of 1°.

6.4 Pedestal, Kingpost, and Crane-supporting Foundation

Add to section

The pedestal adaptor shall have lifting points for use during installation.

Add new section

6.7 Pedestal Adapter and/or Kingpost Fabrication

The pedestal adapter and/or kingpost and transition sections shall have section properties greater than or equal to the section properties of the main structures pedestal at the point of transition.

The outside diameter to wall thickness ratio of the pedestal adapter and/or kingpost shall not exceed 60.

The out-of-roundness tolerance of the pedestal adapter and/or kingpost shall not exceed ± $^{1}/_{8}$ in. (3 mm).

The circumference of the pedestal adapter and/or kingpost shall be within ± $^{1}/_{8}$ in. (3 mm) of the nominal circumference.

The straightness deviation of the pedestal adapter and/or kingpost shall not exceed $^{1}/_{8}$ in. (3 mm) for any 10 ft (3 m) section.

If the pedestal adapter and/or kingpost has a tapered angle, the tapered angle shall not have a change in the angle throughout the tapered length.

The pedestal adapter and/or kingpost shall have no changes in wall thickness at offshore field welds.

The pedestal adapter and/or kingpost shall have an outside diameter that allows access for maintenance of the swing bearing bolts.

The pedestal or pedestal adapter shall be equipped with a manway that is at least 18 in. (460 mm) wide.

7 Mechanical

7.2 Critical Rigging Components

7.2.2 Wire Rope

Add new section

7.2.2.8 Hoist Wire Rope Wear Protectors on Booms

Booms shall be protected from running wire rope.

Wire rope boom protectors shall not create a snag point with the running rope.

7.2.3 Wire Rope End Terminations

7.2.3.2 Eye Splice

Replace section with

U-bolt or eye splice terminations shall not be permitted.

Poured spelter or swaged sockets shall be used for pendant line and non-running wire rope end termination.

7.2.4 Sheaves

7.2.4.2

In first sentence, replace "18" with

20

Delete second sentence

7.3 Hoisting, Boom Luffing, Telescoping, and Folding

7.3.2 Hoisting

7.3.2.5 Drums

Replace list section a) with

a) Drums shall provide a first layer rope pitch diameter of not less than 20 multiplied by the nominal rope diameter (Figure 7).

Add to section

The crane operator shall have the ability to check the rotation of drums by direct sight or by a warning indicator that checks for rotation.

Drums shall be radially striped black and yellow with high visibility, reflective paint along the flange.

To increase the crane operator's visibility of drums, lights shall be directed on drums.

7.4 Swing Mechanism

7.4.1 Swing Rotation Mechanism

7.4.1.3 Swing Rotating

Add to section

Swing drive mechanisms shall not be the SWLH limiting component.

7.4.1.5 Dynamic Friction Brake

In first sentence, replace "may" with

shall

Delete "When provided," from second sentence

7.4.2 Swing-circle Assembly

7.4.2.1 General

Add to section

A minimum of two swing drives shall be provided.

Swing drives shall have a means of adjusting backlash on site.

Crane design shall require a means to install a slew bearing replacement system.

The soft spot location on the swing bearing ring shall be clearly and permanently marked.

The soft spot on the swing bearing shall be positioned to avoid highly loaded areas.

The crane swing shall be designed for unrestricted and continuous rotation in clockwise and counter-clockwise directions.

Crane design shall be suitable for the maintenance requirements specified in API 2D.

7.4.2.4 Mounting

Replace section 7.4.2.4.2 title with

7.4.2.4.2 Pedestal and Swing-Circle Assembly Deflection

Add to section

The crane pedestal lateral deflection shall not exceed the unsupported extended length (L) divided by 180 (i.e. $L/180$) where L is the distance from the centerline of the boom fit of the pin to the upper deck connection (see Figure 14).

The crane pedestal lateral deflection shall not exceed the limits specified by the swing bearing manufacturer/supplier.

The swing circle assembly of pedestal mounted cranes and the swing drives of king post type cranes shall be designed for a lateral crane pedestal deflection of $L/120$.

Add new Figure 14

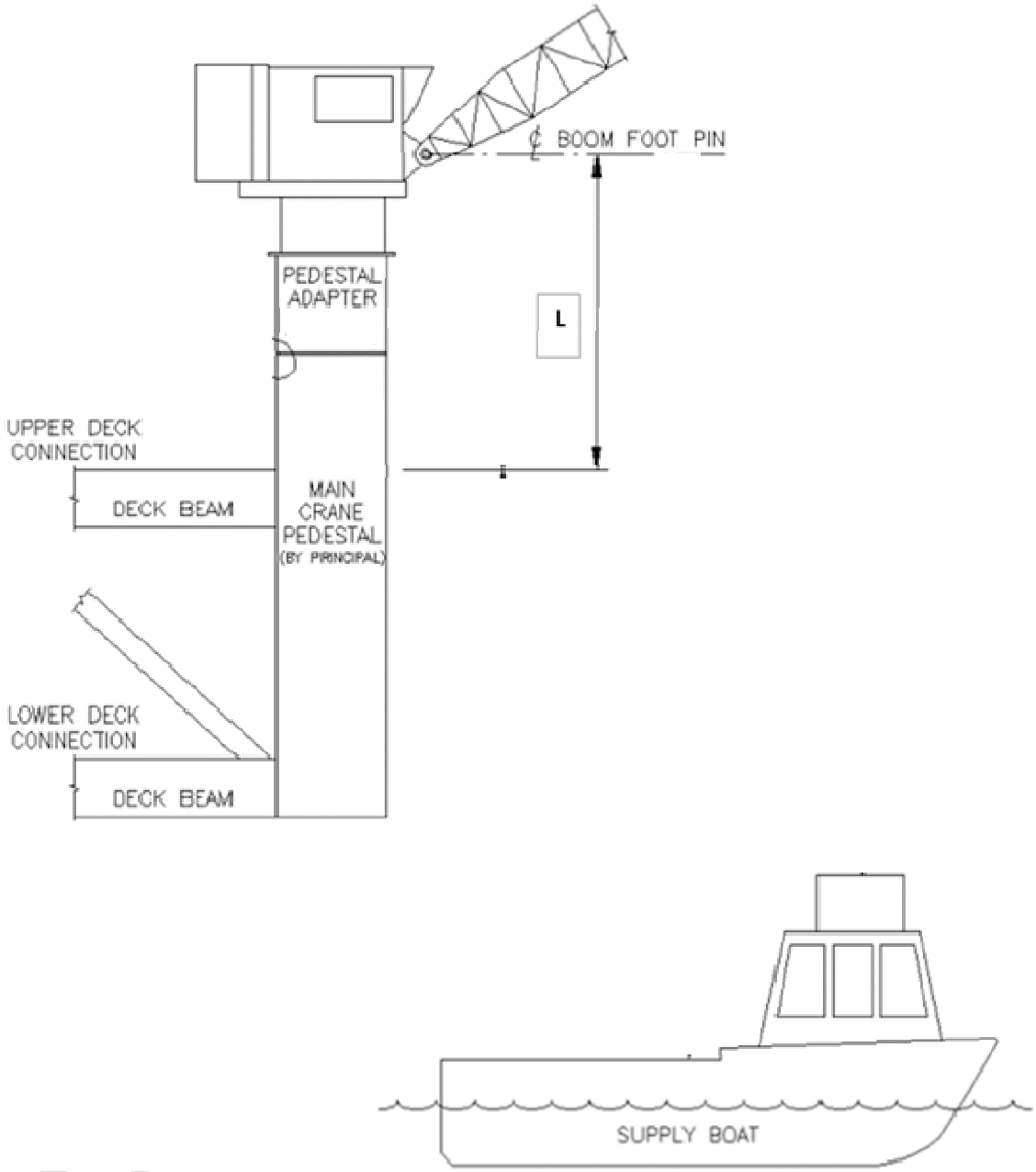

Figure 1—Crane Pedestal Lateral Deflection Unsupported Length

7.4.2.5 Threaded Fasteners

7.4.2.5.3 Fatigue Life

Add to section

Bolts subjected to tension and fatigue shall be pre-tensioned to AISC or ABMA (as applicable).

7.5 Power Plant

7.5.1 General

7.5.1.2 Power Plant Sizing

Add to section

The main power supply, power transmission and power control elements shall be sized for full power demands in any combination of load, speed and motion.

The prime mover shall not overspeed, overheat, trip, stall or fall below the nominal speed of the prime mover at the rated load of the crane.

If an external power source is used, the external power source shall not overload, overheat, trip or stall below the nominal speed of the external power source at the rated load of the crane.

The installed power shall be sized for 100 % hoisting speed, 50 % luffing speed and 50 % swing speed simultaneously.

Hoisting motions shall have priority.

Remaining motions shall not fall below 50 % speed when operated simultaneously with hoisting motion.

7.5.2 Exhaust Systems of Internal Combustion Prime Movers

Add new section

7.5.2.4 Cooling Systems

If the temperature of exhaust manifolds and mufflers systems exceeds 660 °F (350 °C), a cooling system shall be included.

7.5.3 Fuel Tanks

7.5.3.2 Fuel Tank Drains

Add to section

The tank drain shall be placed at a location that allows the contents of the tank to be removed.

Add new section

7.5.3.3 Fuel Tanks Capacity

The fuel tank shall be sized to accommodate one day's worth of fuel without the need for refilling.

On cranes subject to motions, the fuel tank shall have baffles or a mechanism to reduce fluid sloshing effects.

The fuel tank shall be manufactured from 316L stainless steel.

A handhole or manway for internal cleaning shall be sized as specified.

7.5.5 Isolation of Ignition Sources and Heated Surfaces

Add new section

7.5.5.3 Fire and Gas Detection

The crane shall be equipped with fire and gas detectors and a shutdown system in compliance with the site/project fire and gas ignition source control philosophy.

9 Gross Overload Conditions

9.5 Gross Overload Protection System (GOPS)

Add new section

9.5.2 Requirements for Manual Overload Protection System (MOPS)

9.5.2.1 General

If a manual overload protection system (MOPS) is specified, the requirements of 9.5.2.2 through 9.5.2.4 shall apply.

9.5.2.2 System Criteria

The MOPS shall be arranged for manual activation only, for all reeving configurations.

The MOPS shall be capable of activation when overloads due to entanglement and relative motions occur.

The MOPS shall be capable of activation during operation, normal stop and emergency stop.

The MOPS shall be capable of activation in the event of main power supply failure or shutdown of the crane during an offboard lift.

On cranes rated for personnel lifting and fitted with a personnel lifting mode, the MOPS shall be overridden (i.e. activation of the MOPS prevented) when personnel lifting mode is selected.

In any circumstances, the MOPS shall have the ability to be deactivated.

The hoisting brakes shall disengage upon activation of the MOPS when entering the offboard lift zone.

If activated, the MOPS shall maintain a retaining force in the hoisting system of 10 % to 20 % of the maximum rated capacity for an onboard lift, allowing the wire rope to be spooled completely off the drum, without causing significant damage to the crane.

The MOPS shall continue to operate in the event of a prime mover failure or loss of hydraulics.

In the event of a prime mover failure or loss of hydraulics, the MOPS stored capacity shall allow activation and/or reset at least three times in succession over a period of 5 min.

When the MOPS is activated, the motion limiters for the low hook shall be automatically overridden.

9.5.2.3 Manual Overload Protection System (MOPS) Activation Mechanism Location and Marking

The MOPS activation mechanism shall be located in the control station.

The location of the MOPS activation mechanism shall be at the left-hand side of the crane operator.

The MOPS activation mechanism shall be permanently marked with yellow color against a contrast background.

The MOPS activation mechanism shall be protected against inadvertent use (e.g. a flip cover or pull-push button).

9.5.2.4 Manual Overload Protection System (MOPS) Control System Indicators and Alarms

The MOPS shall have control system indicators as per 9.5.2.4.

MOPS control system indicators shall be located at the control station.

MOPS control system indicators shall indicate when the system is operational by means of a continuous visual signal (i.e. no visual signal when system is not in operation).

MOPS control system indicators shall indicate when the MOPS is activated by means of a distinguishable continuous visual and an audible signal.

MOPS control system indicators shall indicate when the MOPS is activated with an external audible alarm giving a sound level of approximately 110 dB(A) measured at 3.28 ft (1 m) from the alarm.

10 Human Factors—Health, Safety, and Environment

10.1 Controls

10.1.1 General

10.1.1.2 Automatic Return

Add to section

The controls shall have the ability to be deactivated when not in use.

10.1.1.4 Emergency Stop

Add to section

The emergency stop shall semi-instantaneously suspend hydraulic functions with the control levers in any position and set the emergency brakes.

The emergency stop shall not shut down the power plant.

The emergency stop button shall have a manual reset function only (i.e. not have an automatic reset).

The emergency stop button shall be positioned away from controls to prevent unintentional activation.

Add new section

10.1.1.7 Control System Response

CMs shall be proportional to the control system lever signal.

The maximum response time to reach required speed for the main motions shall be as follows:

— 2 s for hoisting;

— 3 s for luffing, folding and telescoping;

— 4 s for swinging.

The response time for the main functions (e.g. hoisting, swinging, luffing, folding and telescoping) shall be the time from control lever activation at standstill to the achievement of the required motion velocities at 100 % lever actuation.

Single fault or common cause failures shall not result in uncontrolled movements.

The control system shall be designed for simultaneous hook movements in vertical, radial and lateral (i.e. hoist, boom and swing).

Add new section

10.1.1.8 Controls for Personnel Rated Cranes

Add to section

Cranes rated to lift personnel shall have a lockable mode selector at the control station.

When personnel lift mode is selected, the activation of the GOPS or MOPS shall be prevented.

When personnel lift mode is selected, motion compensators and constant tension systems (CTSs) shall be deactivated.

10.2 Cabs and Enclosures

10.2.1 General

Add to section

Crane operators' cabins that are on the rotating portion of the crane shall be enclosed and weatherproof.

Cabin enclosures shall be constructed of fire-resistant insulated welded metal.

Room dimensions of enclosed cabins shall be at least 71 in. (1.8 m) wide x 71 in. (1.8 m) deep x 87 in. (2.2 m) headroom.

Roof of enclosed cabins shall withstand a uniform static load of 1.43 psi (1 t/m^2).

Enclosed cabins shall have a secondary means of escape (e.g. pop-up window).

The crane operator's seat shall have arm supports.

The crane operator's seat shall be fully adjustable in the up/down and forward/backward directions of movement.

A foldable seat attached to the cabin shall be provided for an instructor behind the operator's seat.

The cabin shall have a dedicated space for a life jacket and a fire extinguisher.

10.2.2 Windows

10.2.2.1 General

Replace first sentence with

Windows shall be of shatterproof glass or of the safety laminated type.

Windows glass or laminate shall be at least 0.25 in. (6 mm) thick.

Replace second and third sentence with

Windows shall be sized and located to provide an unobstructed line of sight from the crane operator's seat to the boom, hooks and the load in all of the crane's operating positions.

Add to section

Windows shall be provided with adjustable sun blinds positioned to shade the crane operator from sunlight from any direction.

The interior and exterior sides of the windows shall be accessible from inside the cabin for cleaning.

Protection bars shall not obstruct the crane operator's view.

When open, operable windows shall remain secured in position.

10.2.2.2 Window Wipers and Washers

Add to section

Window wipers shall clear at least 80 % of the screen area.

Access for window wipers and wiper motor exchange or repair shall be provided.

10.2.3 Doors

Add to section

Doors of enclosed cabins shall be the self-closing type.

Doors of enclosed cabins shall have a window.

Doors dimensions of enclosed cabins shall be at least 71 in. (1.8 m) high and 31.5 in. (0.8 m) wide.

10.2.5 Platforms and Walkways

Add to section

Permanently installed platforms shall be provided to facilitate wire rope replacements.

10.2.7 Noise Level

Add to section

Noise levels shall not exceed the maximum allowable noise level at the testing conditions and locations shown in Table 29.

Add new Table 29

Table 29—Noise Level Testing

Test Number	Testing Condition	Maximum Allowable Noise Level	Measurement Location
1	Prime mover running at idle while the crane controls are in the neutral position	70 dB(A)	At the crane operator's normal position with the cabin door closed
2		85 dB(A)	3 ft (1 m) from the outside of the machine house/hood
3		85 dB(A)	From any engine exhaust
4	Prime mover running at full throttle with maximum rated loads	70 dB(A)	At the crane operator's normal position with the cabin door closed
5		85 dB(A)	3 ft (1 m) from the outside of the machine house/hood
6		85 dB(A)	From any engine exhaust
7	Prime mover running at full throttle without maximum rated loads	70 dB(A)	At the crane operator's normal position with the cabin door closed
8		85 dB(A)	3 ft (1 m) from the outside of the machine house/hood
9		85 dB(A)	From any engine exhaust

Add new section

10.2.8 Heating, Ventilation, and Air Conditioning (HVAC) Unit

Enclosed cabins shall be equipped with a heating, ventilation and air conditioning (HVAC) unit.

HVAC units shall have adjustable ventilation.

HVAC units shall control the internal temperature between 60 °F and 80 °F (15 °C and 25 °C) for highest and lowest 30-day temperature average.

If specified, the design temperature of the HVAC unit shall account for impacts from external heat sources of nearby operating equipment.

HVAC units shall defrost and demist windows for the highest and lowest 30-day average temperature and humidity.

10.3 Miscellaneous Requirements and Equipment

10.3.1 Indicators, Alarms, and Limits

Replace Table 23 with

Table 23—Indicators, Alarms, and Limits

Indicators, Alarms, and Limits	Ind	Trip	AA	VA
Hydraulic system pump pressure	X	PO	PO	X
Hydraulic oil temperature	X	PO	PO	X
Hydraulic control system pressure (if applicable)	X	PO	X	X
Engine start system pressure (if applicable)	X	PO	PO	PO
Hydraulic fluid level (required on reservoir)	X	PO	PO	X
Engine lube oil pressure (if applicable)	X	PO	X	X
Engine coolant temperature (if applicable)	X	PO	PO	X
Engine tachometer (if applicable)	X	PO	PO	PO
Engine overspeed (if applicable)	PO	X	X	X
Fuel level (required on reservoir)	X	PO	PO	PO
Hoist slack rope	PO	PO	PO	PO
Hoist low hook limit	PO *	PO *	PO *	PO *
Wind speed	PO	PO	PO	PO
Hook position	PO *	PO	PO	PO
Motion compensator parameters	PO *	PO	PO	PO
Hook speed and direction	X	PO	PO	PO
Engine fire and smoke	X	X	X	X
Crane slew limits	PO	PO	PO	PO
LMIS	NR	NR	X	X
MOPS (if applicable)	NR	NR	X	X
Motion limit overrides (A2B)	PO	NR	PO	PO
Motion limit overrides (HAKO)	PO	NR	PO	PO

Key
Ind = indicator, AA = audible alarm, X = mandatory, Trip = function limit, VA = visual alarm, PO = purchaser option (indicated in the data sheet), NR = not required.
* = changes from PO to X for crane with subsea ratings.

10.3.2 Boom Equipment

10.3.2.2 Boom Angle Limiters and Shut-off Devices

Replace second sentence with

For cranes fitted with boom winches, a low-angle limiter shall be provided.

Add to section

The high-angle limiter shall be configured such that upon activation, the load hoists and swing mechanisms remain operable.

If specified, a high-angle limiter override device shall be provided.

If a high-angle limiter override device is specified, the override device shall be installed external to the cabin.

If a high-angle limiter override device is specified, the override device shall automatically return to its "off" function when its actuator is not manually held in the override position.

The boom hoist speed shall be automatically reduced by 50 % of its normal operating speed within a 10 ft (3.48 m) radius of the boom hoist limiting device engagement.

If specified, manual override of motion limiters shall be by a hold-to-run device.

10.3.2.5 Boom and Load Indicators

Replace list section c) with

c) a load-moment indicator system (LMIS) shall be provided.

Delete Table 24

Table 24—Boom and Load Indicators

Add to section

The LMIS shall have a continuous visual display.

For offboard lifts, the continuous visual display of the LMIS shall show the selected wave height, actual hook load, load radius and rated capacity for the selected wave height.

For platform lifts, the continuous visual display of the LMIS shall show the actual hook load, load radius and rated capacity at the radius.

The accuracy of hook load values shown on the LMIS display shall be within ± 2.5 % of full scale reading at an agreed height and boom angle.

NOTE Full scale reading is the maximum capacity of the crane for the different hoists.

When the actual hook load exceeds 90 % of the rated capacity for any lift conditions, the LMIS shall emit a visual warning.

When the actual hook load exceeds 95 % of the rated capacity for any lift conditions, the LMIS shall emit a continuous audible and visual warning inside and outside the cabin.

Reverse motions that reduce the overload or over-moment shall not be prevented.

Add new section

10.3.2.6 Tension Load Cells

Tension load cells shall maintain a ratio of 5:1 of the minimum breaking load (MBL) to the SWLH at all times.

The tension load cell ratio for load cells shall be in pure tension.

Tension load cell design shall account for the offboard dynamic loading, sidelead and offlead forces of the crane in accordance with API 2C.

Tension load cells shall not be side loaded.

Where the tension load cell is attached to a rigid body dead end (see Figure 15) and where side-loading the tension load cell is likely due to long hook drops (i.e. 1.25 times the boom length), a mechanical device shall be used to eliminate out-of-plane bending in the tension load cell.

NOTE 1 Examples of mechanical devices used to eliminate out-of-plane bending in the tension load cell includes two shackles joined together (see Figure 15) in a bow-to-bow configuration at the dead-end or specially made link plates that serve as a universal joint (i.e. U-joint) (see Figure 16).

NOTE 2 Tension load cells used just above the headache ball on a single part auxiliary line (see Figure 17) do not have the same restraints as multi-part load lines that are attached to a rigid body dead end and do not require a mechanical device to remove side loading. For cranes with the dead end mounted above the boom and sheave cluster, the side loading at the sheave is removed without the need of a mechanical device.

Add new Figure 15

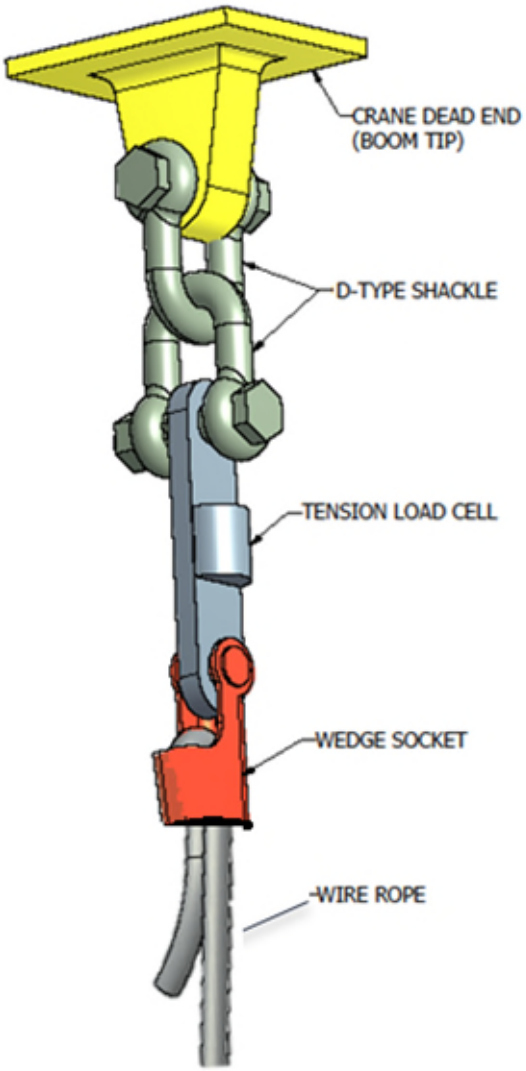

Figure 15—Tension Load Cells Type 1

Add new Figure 16

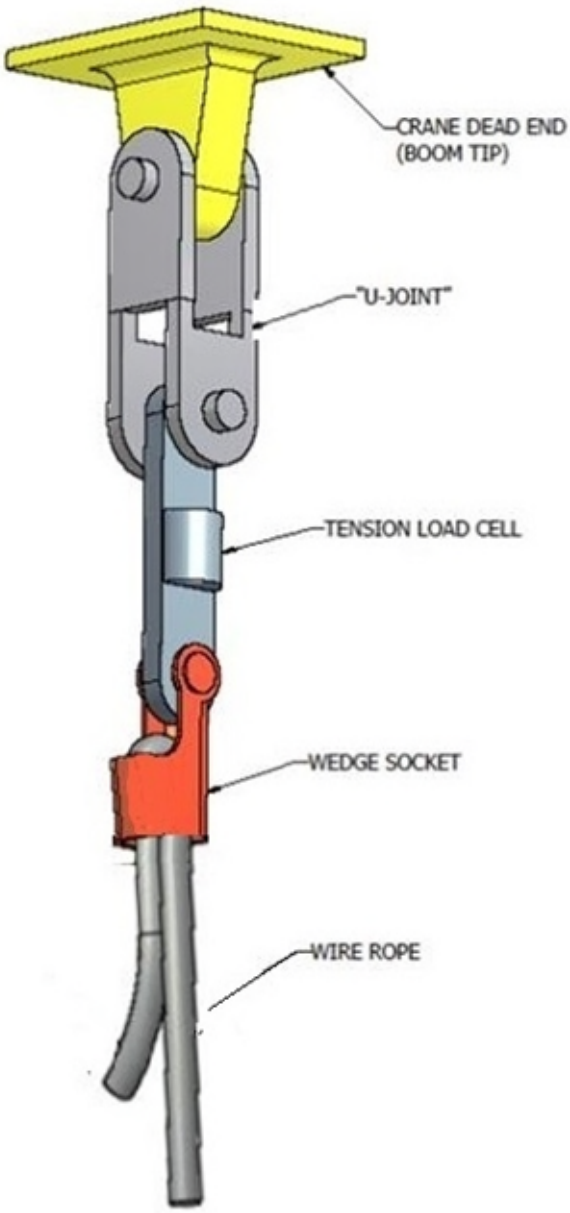

Figure 16—Tension Load Cells Type 2

Add new Figure 17

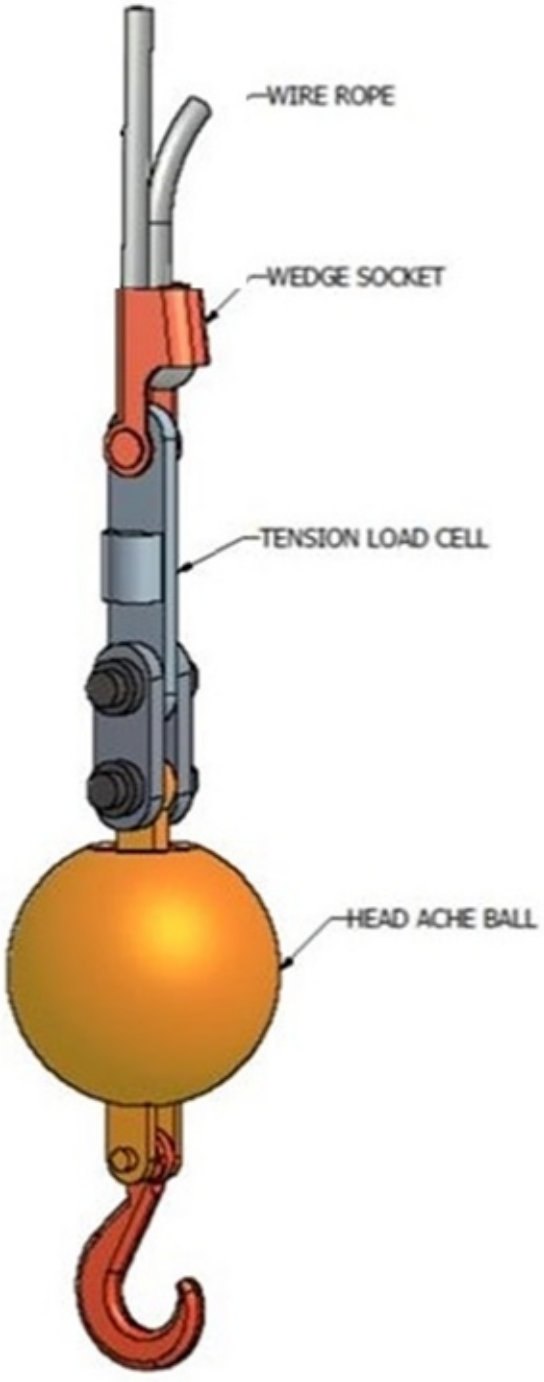

Figure 17—Tension Load Cells Type 3

Tension load cells subject to a saltwater environment and made from 17-4PH stainless steel material shall have a minimum heat-treating using an H1150 process.

If used in a marine environment, carbon / low-alloy steel materials used for tension load cells shall have a Rockwell-C hardness value of 35 HRC or less.

Tension load cells made from 17-4PH stainless steel that have been heat-treated using an H900 process shall not be used on offshore or coastal onshore sites (i.e. on sites with a saltwater environment).

Add new section

10.3.2.7 Boom Structure

The boom sections shall not exceed a length of 40 ft (12.19 m).

There shall be no weld splices in boom chords.

Boom inserts shall be interchangeable.

Boom foot pins shall have a means of preventing rotation.

Boom foot pins shall have a means of lubricating the entire outside of the pin.

Boom foot pin holes shall be line bored.

A means for replacing the boom foot pin bushings shall be provided.

The boom shall be supplied with bearing plates on the bottom chords in the location of the boom rest.

10.3.3 Guards for Moving Parts

10.3.3.2 Components to Guard

Add to section

Fans, fan belts and slew drive pinions shall be guarded.

NOTE Fans, fan belts and slew drive pinions are considered to be exposed moving parts that constitute a hazard.

10.3.3.4 Warning Signs Instead of Guards

Replace section with

Warning signs instead of guards on moving parts shall not be allowed.

10.3.6 Anti Two-block

Add to section

The anti two-block system shall prevent further upward movement of the load hoists and downward movement of the boom.

Movements in the opposite direction for hoists shall be available for use without override intervention.

Replace section 10.3.7 title with

10.3.7 Emergency Operating System (EOS)

Replace first and second sentence of first paragraph with

The emergency operating system (EOS) shall enable operation of the crane, i.e. lowering the boom, lowering the hoist and slewing the crane, for all load conditions in the event of the following emergencies:

— single point failure or interruption of the main power supply;

— single point failure in the main power unit;

— single point failure in the control system.

NOTE See Figure 13 for EOS schematic.

Add new Figure 13

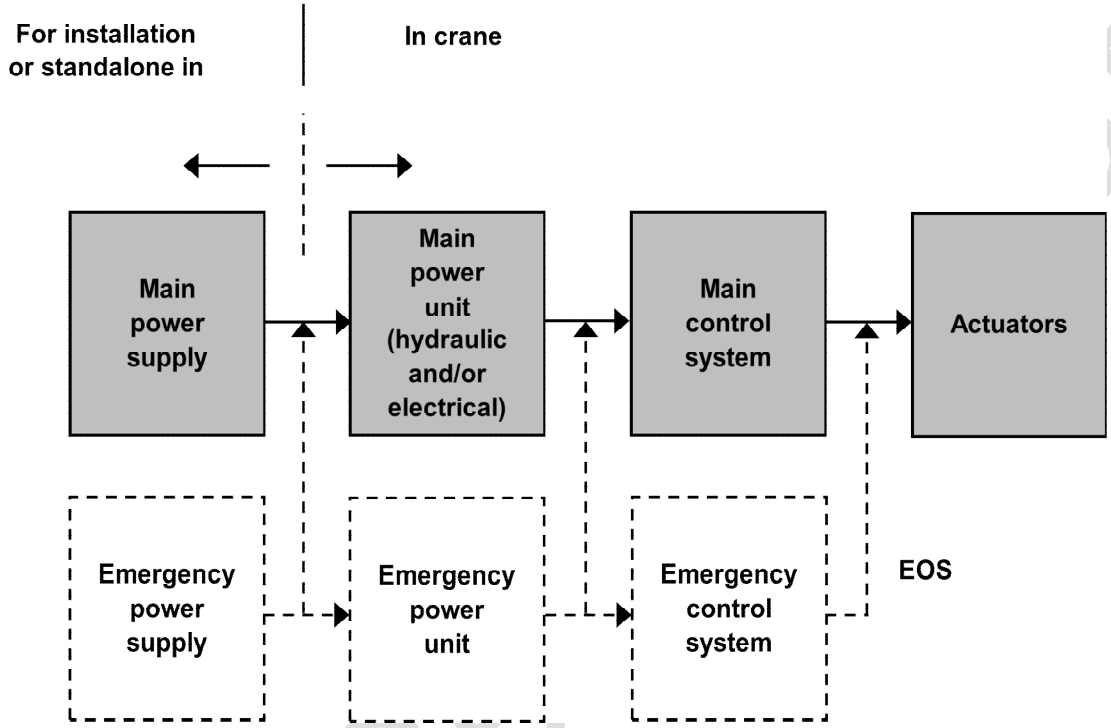

Figure 13—Emergency Operating System (EOS) Schematic

Replace last sentence of first paragraph with

Boom luffing mechanisms shall require emergency load lowering capacity.

Manual lowering of loads and release of slew brakes shall remain possible in the event of loss or unavailability of the main control system of the crane.

10.3.8 Miscellaneous Equipment

Add new section

10.3.8.7 Aviation Warning Lights

Cranes shall be fitted with permanent aviation warning lights in accordance with statutory civil aviation regulations.

If required by the purchaser's aviation authorities, aviation warning lights shall be supplied at the A-Frame apex, boom tip and along the boom at 33 ft (10 m) spacing.

Aviation warning lights shall be powered from the uninterruptible power supply of the platform

Add new section

10.3.8.8 Maintenance Access

A permanent means of access shall be provided for crane components that require routine inspection and maintenance as defined by OEM practices or the site maintenance plan.

The permanent means of access shall be on the crane itself.

Maintenance access shall not require special scaffolding, rope access or special equipment.

Ram-luffing, telescoping and knuckle-boom cranes shall be provided with a deliberate and planned means to remove luffing cylinders without damage.

Maintenance davits, lifting beams and/or padeyes shall be provided to enable the replacement of major components without using additional cranes.

NOTE 1 Major components include all components in the machinery house (such as the prime mover, gearbox, cabinets and pumps), winches, sheaves and slew drive components.

Major structural components shall have lifting points or an approved lifting means for the individual lifting of the major structural components.

NOTE 2 Major structural components include the pedestal adaptor, machinery deck, cabin and machinery house.

Procedures and instructions for the use of the lifting points shall be provided in the installation, operation and maintenance manual.

Lifting points, davits, lifting beams and padeyes for operations and maintenance shall be permanently and legibly marked with a unique identification number and the SWL.

The boom design shall incorporate a cross-over walking surface at chords splices from the main boom walkway to provide access for inspection and maintenance of connector fasteners on the top, bottom and sides of the boom.

Permanent maintenance access to the boom hoist dead end connection shall be provided.

Grease nipples shall be accessible from permanently installed walkways and platforms with the crane boom stowed in the boom rest.

Add new section

10.3.8.9 Communication Equipment

If communication equipment is provided by the manufacturer, the communication equipment shall provide the crane operator with a means to directly communicate with the platform, supply vessels and additional units involved in the lifting operations.

If communication equipment is provided by the manufacturer, the radio communication system shall be operable by a microphone speaker / headset system, without the crane operator's hands moving from the main control levers.

If communication equipment is provided by the manufacturer, the communication equipment shall incorporate a public-address system.

Add new section

10.3.8.10 Camera and Monitors

A boom tip camera shall be provided unless otherwise specified.

The boom tip camera shall be specified as either the manufacturer's system or IOGP S-618 boom tip camera system.

If IOGP S-618 boom tip camera system is specified, the camera system shall consist of a color camera located at the boom tip and a color monitor located in the crane operator's cabin.

If IOGP S-618 boom tip camera system is specified, the camera system shall have remote controls for camera zoom, focus and iris.

If IOGP S-618 boom tip camera system is specified, the camera system shall be mounted in a location that is reachable and operable by a seated crane operator.

Add new section

10.3.8.11 Data and Video Recorder

10.3.8.11.1 Data Recorder

A data recorder shall be provided unless otherwise specified.

The data recorder shall record CMs, loads and lifetime load cycle history.

The recorded data shall be reviewable.

While the crane is operating, the data recorder shall record as a minimum the following information:

— date (using dd/mm/yyyy format);

— time (using hh/mm/ss format);

— duration(s);

— rated load at hook position for all hoists;

— actual load at hook position for all hoists;

— boom radius and angle;

— peak dynamic load at hook position for all hoists;

— load chart;

— alarm activation;

— overrides or bypass activated or alarms acknowledged;

— if specified, the crane operator's unique identification.

The data recorder shall be automatic (i.e. and not require manual activation).

The memory capacity of the data recorder shall be specified in the operating manual.

The data stored in the memory of the data recorder shall be downloadable by the purchaser.

The output data file shall be in a comma-separated values (CSV) format or equivalent.

Software or hardware required to download the data shall be supplied with the crane.

Passwords that are required to access the data recorder shall be in the installation, operation and maintenance manual.

There shall not be a means to deactivate the data recorder.

10.3.8.11.2 Video Recorder

Cameras shall have video recording functionality.

Add new section

10.3.9 Miscellaneous Requirements

10.3.9.1 Dropped Objects

An assessment of the crane for the risk of dropped objects shall be performed in accordance with a recognized code or guideline (e.g. Dropped Object Recognized Scheme:2020).

10.3.9.2 Functional Control Systems

Safety-related parts of control systems performance levels shall be in accordance with an oil and gas industry recognized code.

Recognized codes include ISO 13849-1 and IEC 61508-1.

If ISO 13849-1 is specified, the minimum required performance level (PLr) for safety related parts of the control system for hoisting, luffing, slewing, telescoping or folding shall be "c".

If ISO 13849-1 is specified, the minimum PLr for cranes designed for personnel lifting, shall be "d".

If ISO 13849-1 is specified, the minimum PLr for emergency stops shall be "d".

A failure mode effects analysis (FMEA) shall be performed.

The FMEA shall identify the risks with single technical failures and common cause failure of non-redundant components.

FMEA results shall be used in the development of the manufacturer's recommended maintenance strategy.

FMEA results shall be utilized to assess the reliability of the proposed equipment.

Add new section

10.3.10 Hydraulic and Pneumatic Line Protection

The hydraulic and pneumatic line system shall be the manufacturer’s standard system or, if specified, in accordance with Annex G.

Add new section

10.4 Lighting

Lighting with an intensity of 30 foot-candles (323 lux) shall be provided in the machinery house and the control cabin for use during operation and maintenance activities.

General lighting for walkways and other means of access shall be 13.9 foot-candles (150 lux) or greater in the horizontal plane.

Emergency lighting covering escape routes from the control cabin and machinery house shall be light emitting diode (LED) technology.

Emergency light fixtures shall be connected to an integral charger and backup battery that lasts at least 90 min duration or a platform emergency lighting supply.

LED lighting technology certified for NFPA 70 Class I Division 1 or Zone 1 shall be provided below the revolving superstructure to provide visibility on the crane walk-around.

11 Manufacturing Requirements

11.1 Material Requirements of Critical Components

11.1.5 Structural Steels, Castings and Forgings

11.1.5.3 Additional Requirements for Castings

11.1.5.3.1 Prototype Castings

Add to section

Prototype castings shall not be part of the final product.

Add new section

11.4 Surface Protection

Exposed carbon steel surfaces shall be protected by a surface protection system.

The surface protection system shall be specified by the purchaser.

Walkways, platforms, work areas and floors that require painting shall be coated with non-skid paint.

Faying surfaces shall have a continuous seal weld to prevent ingress of water and corrosion.

Add new section

11.5 Spare Parts and Interchangeability

A list of recommended spare parts shall be identified for commissioning and operational spares.

Each spare part item shall be referenced by its original manufacturer's name and part number.

The spare part item shall be identified and described such that the necessary spare, whether whole item or parts can be obtained.

Equipment and components in equivalent service shall be interchangeable to the extent that is feasible for the purpose of reducing spare parts.

NOTE Equipment and components includes valves, filters, fittings, bearings, seals and consumables that are in equivalent service.

12 Design Validation by Testing

12.3 Operational Tests

Add to section

Cranes shall undergo initial factory acceptance testing prior to delivery.

The factory acceptance test (FAT) shall be on a fully assembled crane or functional sub-assemblies, as specified.

Cranes shall undergo fully assembled site acceptance testing.

FAT and SAT guidance is provided in Annex H and Annex I, respectively.

Add new section

15 Component Traceability and Component Identification System (CIS)

Add new section

15.1 Component Traceability

All components shall be traceable to original equipment manufacturer (OEM) information.

If the crane manufacturer adds identification details or markings, this shall not interfere with or detract from OEM information.

OEM parts information shall be evident and identifiable in the crane documentation including drawings and spare parts records.

OEM parts information shall not be replaced by the crane manufacturer's information.

Add new section

15.2 Component Identification System (CIS)

15.2.1 General

The specified component identification systems (CIS) shall be used to identify components in accordance with one of the following:

— manufacturer's CIS (see 14.3.1);

— integrated manufacturer-purchaser's CIS (see 14.3.2);

— purchaser's CIS (see 14.3.3).

The same CIS number shall be used to identify the equipment, components and sub-assemblies in the crane's documentation (e.g. installation, operation and maintenance manual, drawings, equipment list).

NOTE The CIS number is used for multiple purposes including the management of spare parts and maintenance. A CIS is sometimes referred to as tag numbering.

The documentation shall include the specified overall crane assembly tag number.

15.2.2 Manufacturer's Component Identification System (CIS)

If a manufacturer's CIS is specified, the manufacturer's standard system shall be provided without purchaser modifications.

15.2.3 Integrated Manufacturer-Purchaser's Component Identification System (CIS)

If an integrated manufacturer-purchaser's CIS is specified, the CIS shall be the manufacturer's standard system with the exceptions listed in this section.

Systems and components detailed in Table 30 shall be identified with the purchaser's CIS.

Components that are part of another end-user facility system shall be identified with the purchaser's CIS.

NOTE The purchaser specifies the components that are part of another end-user facility system.

Table 30—Purchaser's CIS—Identification Items

System	Typical Components
Fire and gas	Fire and gas detectors, cables, junction boxes
Facility-connected lighting	Lights, cables, junction boxes
Aircraft warning lights	Lights, cables, junction boxes
Telecommunications	Radios, telephone, cables, junction boxes
Power supply	Slipring, starter cabinet, distribution panel, junction boxes

The sub-assemblies detailed in Table 31 shall be assigned a single end-user identification.

The individual components within the sub-assembly shall be identified by the manufacturer's CIS unless the individual components are part of another end-user facility system (see Table 30).

Table 31—Manufacturer's Sub-assembly—Identification Items

Sub-assembly	Identification
Winches	One identification for each winch unit (e.g. main hoist, auxiliary hoist, luff)
Slewing drives	One identification for slew drive system
Ram-luffing system	One identification for ram-luffing cylinder system
Knuckle system	One identification for knuckle cylinder system
Telescoping system	One identification for telescoping system
Crane cabin	One identification for crane cabin
Prime mover	One identification for prime mover assembly, including gearbox and pumps
EOS	One identification for EOS
Pedestal adaptor	One identification for pedestal adaptor

15.2.4 Purchaser's Component Identification System (CIS)

If a purchaser's CIS is specified, the CIS details shall be provided by the purchaser.

Annex B
(informative)

Commentary

B.5.4 In-service Loads

B.5.4.5 Vertical Factored Loads

B.5.4.5.1 General

Replace last sentence of third paragraph with

The stiffness calculations shall be based on the actual modulus of elasticity and the actual surface area of the wire ropes used on the crane.

Add new Annex G

Annex G
(informative)

Hydraulic Systems and Pneumatic Lines

G.1 General

When a hydraulic and pneumatic line system is specified as an IOGP S-618 Annex G system, the requirements of this section shall apply.

If specific sections (i.e. not the entirety) of Annex G are required, these sections shall be specified.

G.2 Design Standard

The hydraulic system shall comply with the international standard ISO 4413.

G.3 Oil Grade and Cleanliness

The hydraulic oil grade and cleanliness shall be provided for all operating, FAT and SAT conditions and operating locations.

G.4 Corrosion Protection

Hydraulic components shall be resistant to corrosion from exposure to marine environments.

G.5 Material Requirements for Flanges, Split Flanges, and Hose Ends

Flanges, split flanges and hose ends that are not AISI 316L material shall be chromated and protected with a grease band (i.e. petroleum impregnated tape or equivalent).

G.6 Oil Tank

The hydraulic tank shall have the means to be fully drained and cleaned.

G.7 Hose Ends

Hose ends shall allow the fitting of plugs or caps for maintenance.

G.8 Hydraulic Hoses Pressure Testing

Hydraulic hoses shall be pressure tested to 1.5 times the maximum working pressure.

G.9 Identification and Labelling

Hydraulic lines shall have permanent identification, traceable to the hydraulic schematic, hose register and certificates.

G.10 Suction Lines

G.10.1

Suction lines, from the tank to the pumps, shall have isolation valves to accommodate pump and hose replacement without the need for draining the oil tank.

G.10.2

Isolation valves shall be permanently and clearly labelled.

G.10.3

Isolation valves shall be secured in open position.

G.11 Circulation System

G.11.1

The hydraulic system shall have provisions for adding a circulation system for continuous flushing, filtration and removal of water from the hydraulic oil.

G.11.2

If specified, the circulation system shall be provided.

G.11.3

The circulation system shall consist of a separate circulation pump and necessary filters.

G.12 Accumulators

Accumulators shall be equipped with a pressure gauge and permanent means for draining to verify the pre-charge pressure.

G.13 Test Points

G.13.1

Test points shall be provided on the main pressure lines, return lines and on any pilot and boost lines in the hydraulic system.

G.13.2

Test points shall be clearly labelled.

G.14 Cleanliness Testing and Certification

G.14.1

Prior to the FAT, the cleanliness of the hydraulic system shall be tested.

G.14.2

After completion of cleanliness testing, a cleanliness certification shall be provided.

Add new Annex H

Annex H
(informative)

Factory Acceptance Test (FAT) Guidance

H.1 Factory Acceptance Test (FAT) Scope

H.1.1

The basic elements of the FAT process and procedure are provided in this annex.

H.1.2

The scope of the FAT typically includes the following:

a) manufacturer's preparation:

   1) crane assembly, preparation and function test crane;

   2) prepare test site, test equipment and information preparation.

b) information review:

   1) operating and maintenance information to be readily available;

   2) material certificate review.

c) assembly checks:

   1) visual inspection of the assembled crane;

   2) check crane and component identification checks.

d) running tests:

   1) check all start and stop devices all functions, checks including speeds and responsiveness;

   2) load, speed and continuous running tests.

e) results review:

   1) assessment of results against IOGP S-618 specification;

   2) agreement of actions before shipping and the SAT.

H.2 Factory Acceptance Test (FAT) Procedure and Records

H.2.1

The FAT procedure and records shall be submitted for the specific crane tested and the specific test location.

H.2.2

Typical FAT records are provided in Table H.2 through Table H.10.

H.3 Manufacturer's Factory Acceptance Test (FAT) Preparation

H.3.1

FAT preparation shall follow the guidance of H.3 and Table H.3.

H.3.2

The crane shall be assembled (or sub-assemblies if specified) and inspected prior to the FAT.

H.3.3

The lubrication of mechanical components (including prime mover, bearings, winch and swing drive components, ropes, gear teeth, etc.) shall be made ready for use.

H.3.4

The crane (or sub-assemblies if specified) shall be function tested including selected load lifting.

H.3.5

Test loads shall be ready at the test area prior to the start of the FAT.

H.3.6

Written confirmation that the crane is ready for the FAT shall be provided to purchaser.

H.4 Factory Acceptance Test (FAT) Conditions

Testing conditions shall mimic anticipated operating and environmental conditions as much as possible.

H.5 Factory Acceptance Test (FAT) Equipment

H.5.1

Equipment required to complete the FAT shall be supplied by the manufacturer.

NOTE This includes equipment to measure speed, distance, pressure, voltage, current and noise.

H.5.2

Equipment shall be certified and calibrated in accordance with the manufacturer's quality management system.

H.5.3

Calibration certificates shall be available for review during the FAT.

H.6 Operating and Maintenance Information

H.6.1

Typical operating and maintenance information shall be readily available to purchaser during the FAT.

NOTE This includes all installation, operating, maintenance, and parts manuals, general arrangements drawings, circuit diagrams, FMEA and other typical information required for operating and maintenance of the crane.

H.7 Conformance Records and Certificates

H.7.1

Before conducting performance testing, conformance records and certificates shall be available to the purchaser.

H.7.2

This information includes material certificates as per IOGP S-618Q, Annex B, non-destructive testing (NDT) certificates, bolt torque and tension records, pressure test certificates, area classification certificates, key design calculations and hydraulic oil cleanliness certificates.

H.7.3

The documentation is to inspect the documentation to confirm that all necessary quality activities have been completed and that there are no non-conformances.

H.8 Acceptance Criteria

Acceptance criteria in accordance with Table H.1 shall be used during the FAT.

Add new Table H.1

Table H.1—Factory Acceptance Test (FAT) Acceptance Criteria

Code	Meaning	Explanation
P	Pass	Meets specification criteria.
A	Acceptable	Does not meet specification criteria but is acceptable. Documentation to be updated as appropriate.
N	Not acceptable	Does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to shipping or the SAT, as agreed.
F	Fail	Does not meet specification criteria. Corrective action is to be completed before proceeding further with the FAT.

H.9 Factory Acceptance Test (FAT) Assembly Checks

H.9.1

A visual inspection of the assembled crane (or sub-assemblies if specified) shall be performed.

H.9.2

The visual inspection shall include component identification and nameplates, access systems, leak identification, hydraulic and electric workmanship and fitting of machinery guards.

H.9.3

All items shall be described in detail in the checklist.

H.10 Factory Acceptance Test (FAT) Measurements

H.10.1

Baseline measurements of critical components and equipment performance shall be recorded during the FAT.

NOTE This includes measurements such as speed, distance, dimensions, pressure, voltage, current and noise.

H.10.2

Critical dimensional check of the assembled crane's geometry and interface pieces shall be required during FAT.

H.10.3

If the manufacturer submits selected verified measurement readings in other formats, the measurement readings shall be provided in an appendix to the FAT.

NOTE This may include programmable logic controller (PLC) readings, printouts or electronic records from calibrated instruments. Where values from other calibrated systems are provided, they must be included as an appendix to the FAT, to form a complete record of all results in one document.

H.10.4

The manufacturer shall include items in the checklist based on the specific crane type and design.

H.11 Factory Acceptance Test (FAT) Running Tests

H.11.1

Running tests shall be performed in accordance with Table H.7.

NOTE The items listed do not need to be performed in the order listed. Many checks can be performed in a sequence preferred by the manufacturer, to suit conditions, if the requirements are met.

H.11.2

If crane is fitted with a GOPS and / or CTS, the manufacturer shall propose a procedure for testing of the GOPS and CTS.

H.11.3

Where the system is based on a previously validated design, the test procedure may be based on simulation, the results shall validate the correct operation of the system.

If the procedure is based on a simulation, it shall allow the purchaser to verify that the system complies with the site-specific requirements.

H.12 Factory Acceptance Test (FAT) Continuous Running Test Guideline

H.12.1

Minor changes may be made to suit different crane types.

H.12.2

Load should be approximately 50 % of maximum rated onboard capacity at maximum radius.

H.12.3

Luff in radius is a mid-radius, approximately 30 % of maximum radius.

H.12.4

Each hour the test should be paused for five minutes for the crane operator and test team to take a break.

H.12.5

If the continuous running test is suspended once underway, due to technical issues, then the test may have to be restarted, at the discretion of the purchaser.

H.12.6

The manufacturer is to ensure that all test personnel are appropriately qualified and competent.

Add new Figure H.1

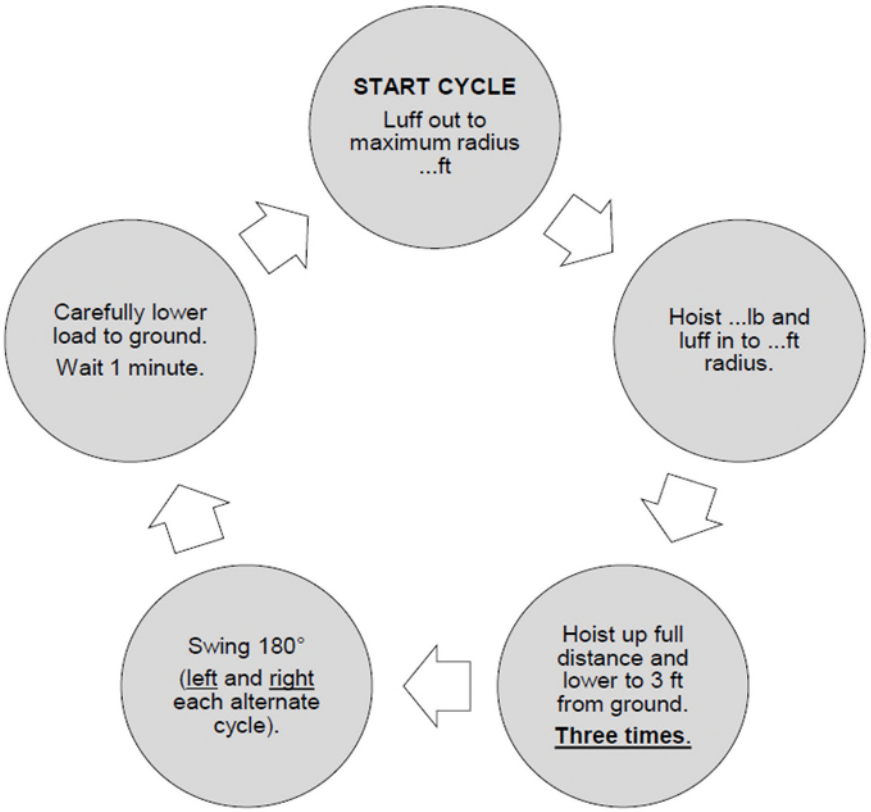

Figure H.1—Steps

H.13 Factory Acceptance Test (FAT) Record Templates

Add new Table H.2

Table H.2—Factory Acceptance Test (FAT) Cover Sheet

Project and Test Details			
Manufacturer		**Purchaser**	
Project name		**Project number**	
End client			
Crane model		**Crane serial number**	
Test location		**FAT dates**	
Personnel in attendance			
Name / Company		**Name / Company**	
Name / Company		**Name / Company**	
Name / Company		**Name / Company**	
Name / Company		**Name / Company**	
Other project information			

Add new Table H.3

Table H.3—Factory Acceptance Test (FAT) Preparation Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	H.3	Crane assembled and full inspection complete				
2	H.3	Required lubrication complete. tanks at correct level				
3	H.3	Crane commissioned and function testing complete				
4	H.3	Limits set: all motions				
5	H.3	Test loads ready at test area				
6	H.3	Crane ready for FAT				
7	H.4	Test conditions are suitable				
8	H.4	Test area ready, including barriers and signage				
9	H.5	Test equipment suitable and ready				

KEY

P=pass, meets specification criteria.

A=acceptable, does not meet specification criteria but is acceptable. Documentation to be updated as appropriate.

N=not acceptable, does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to shipping or the SAT, as agreed.

F=fail, does not meet specification criteria. Corrective action is to be completed before proceeding further with the FAT.

NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table H.4

Table H.4—Factory Acceptance Test (FAT) Information Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	H.6	Installation, operation and maintenance manual is available and complete				
2	H.6	Hydraulic and electric circuit diagrams available				
3	H.6	General arrangement, assembly drawings and parts manuals available				
4	H.6	Recommended maintenance checklists and procedures available				
5	H.6	FMEA available				

KEY

P=pass, meets specification criteria.

A=acceptable, does not meet specification criteria but is acceptable. Documentation to be updated as appropriate.

N=not acceptable, does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to shipping or the SAT, as agreed.

F=fail, does not meet specification criteria. Corrective action is to be completed before proceeding further with the FAT.

NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table H.5

Table H.5—Conformance Records and Certificates Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	H.7	Material, wire rope and NDT certificates				
2	H.7	Bolt torque and tension records				
3	H.7	Pressure test certificates (pressure vessels, hydraulic hoses and tubing)				
4	H.7	Area classification certificates				
5	H.7	Function speed and prime mover power records				
6	H.7	Hydraulic oil cleanliness certificates				

KEY

P=pass, meets specification criteria.

A=acceptable, does not meet specification criteria but is acceptable. Documentation to be updated as appropriate.

N=not acceptable, does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to shipping or the SAT, as agreed.

F=fail, does not meet specification criteria. Corrective action is to be completed before proceeding further with the FAT.

NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table H.6

Table H.6—Factory Acceptance Test (FAT) Assembly Checks Template

Item [1]	Ref.[2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	H.9	Components correctly tagged and labelled.				
2	H.9	Walkways, ladders, handrails and machinery guards are in place and secure.				
3	H.9	Machine surrounds are clean and free from oil and grease. No evidence of leaks.				
4	H.9	All lubrication points and all components requiring inspection and maintenance do not require special means to access.				
5	H.9	No potential dropped objects. Secondary retention systems secure.				
6	H.9	Adjustable swing backlash system fitted.				
7	H.9	Lifting points permanently marked with identification and SWL.				
8	H.9	Hydraulic hoses protected, including end fittings.				
9	H.9	Electrical cables, wiring, junction boxes and glands fitted correctly.				
10	H.9	All machinery guards are fitted.				
11	H.9	Operator cabin meets specification requirements. Fully enclosed and weatherproof, correct minimum dimensions. Secondary means of escape. HVAC unit. Adjustable operator seat and trainer seat. Correct windows, wipers and washers.				
12	H.9	Crane and pedestal adaptor (if applicable) includes brackets for swing bearing jacking				

Table H.6—Factory Acceptance Test (FAT) Assembly Checks Template *(continued)*

Item [1]	Ref.[2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
13	H.9	No water collection areas, potential corrosion.				
14	H.9	Demonstration of data download procedure.				

KEY

P=pass, meets specification criteria.

A=acceptable, does not meet specification criteria but is acceptable. Documentation to be updated as appropriate.

N=not acceptable, does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to shipping or the SAT, as agreed.

F=fail, does not meet specification criteria. Corrective action is to be completed before proceeding further with the FAT.

NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table H.7

Table H.7—Factory Acceptance Test (FAT) Measurements Template

Item [1]	Ref. [2]	Description	Values (include units)		Code (P, A, N, or F)		Notes
			Design	Measured	Manufacturer	Purchaser	
1	H.10	Pinion/gear backlash: hoist winch drive 1	in. (mm)				
2	H.10	Pinion/gear backlash: hoist winch drive 2	in. (mm)				
3	H.10	Pinion/gear backlash: swing drive 1	in. (mm)				
4	H.10	Pinion/gear backlash: swing drive 2	in. (mm)				
5	H.10	Pinion/gear backlash: luff drive 1	in. (mm)				
6	H.10	Pinion/gear backlash: luff drive 2	in. (mm)				
7	H.10	Main hoist up speed, maximum number of falls, no load. 30 ft.	s				
8	H.10	Main hoist up speed, maximum number of falls, maximum load. 30 ft.	s				
9	H.10	Main hoist down speed, maximum number of falls, maximum load. 30 ft.	s				
10	H.10	Main hoist up speed, minimum number of falls. 30 ft.	s				
11	H.10	Aux hoist up speed, single fall, no load. 30 ft.	s				
12	H.10	Aux hoist up speed, single fall, maximum load. 30 ft.	s				
13	H.10	Aux hoist down speed, single fall, maximum load. 30 ft.	s				
14	H.10	Luff in, no load, maximum to minimum radius.	s				
15	H.10	Luff out, no load, minimum to maximum radius.	s				
16	H.10	Luff in, max hoist load on hook, maximum radius to ~36 ft. radius.	s				
17	H.10	Swing, 1 revolution - right	s				

Table H.7—Factory Acceptance Test (FAT) Measurements Template *(continued)*

Item [1]	Ref. [2]	Description	Values (include units)		Code (P, A, N, or F)		Notes
			Design	Measured	Manufacturer	Purchaser	
18	H.10	Swing, 1 revolution – left	s				
19	H.10	Knuckle maximum to minimum extension, no load.	s				
20	H.10	Knuckle minimum to maximum extension, no load.	s				
21	H.10	Noise level, in cabin, prime mover running, no motions. HVAC operating.	dB(A)				
22	H.10	Noise level, in cabin, full speed luff up, full speed main hoist up with maximum load. HVAC operating.	70 dB(A)				
23	H.10	Noise level, 3 ft. from machinery house, full speed luff up, full speed main hoist up with maximum load.	85 dB(A)				
24	H.10	Maximum load (main hoist).	lb. (kg)				
25	H.10	Maximum load (auxiliary hoist).	lb. (kg)				
26	H.10	Record ambient temperature during continuous running test.	°F (°C)				

KEY

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A=acceptable, does not meet specification criteria but is acceptable. Documentation to be updated as appropriate.

N=not acceptable, does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to shipping or the SAT, as agreed.

F=fail, does not meet specification criteria. Corrective action is to be completed before proceeding further with the FAT.

NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.
3. Backlash measurements on winches apply to open pinion / gear winch designs only, not internal components.

Add new Table H.8

Table H.8—Factory Acceptance Test (FAT) Running Tests Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	H.11	Prime mover start and stop devices function correctly, including all emergency stops.				
2	H.11	PLC/LMIS: all load charts and alarms function correctly.				
3	H.11	PLC/LMIS: operator interfaces function correctly.				
4	H.11	Check correct operation of personnel lifting mode, when selected.				
5	H.11	All motion limits function correctly (up/down, in/out, left/right).				
6	H.11	LMIS calibrated correctly, all hoists. Record values in Table H.7.				
7	H.11	CMs are smooth, progressive, predictable and proportional to control lever movements.				
8	H.11	Confirm that maximum response times comply with Table 29.				
9	H.11	Wire rope spooling is correct for all operating variations: no-load and loads, all speeds.				
10	H.11	Hook block storage and impact protection adequate. No fouling of hooks and ropes.				
11	H.11	GOPS functions correctly (manufacturer to define testing procedure)				
12	H.11	CTS functions correctly (manufacturer to define testing procedure)				

Table H.8—Factory Acceptance Test (FAT) Running Tests Template *(continued)*

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
13	H.11	Stall test (brake hold): main hoist winch				
14	H.11	Stall test (brake hold): aux hoist winch				
15	H.11	Stall test (brake hold): luff winch				
16	H.11	Stall test (brake hold): swing				
17	H.11	All lights are fitted and working: access lights, flood lights, aviation lights.				
18	H.11	Main hoist up and down maximum load (maximum falls), full hoist speed. Record values in Table H.7.				
19	H.11	Aux hoist up and down maximum load (maximum falls), full hoist speed. Record values in Table H.7.				
20	H.11	Luff in and out full speed with max radius rated capacity on hook, full range. Record values in Table H.7.				
21	H.11	Combined hoisting, luffing and swinging under full load, to demonstrate specification power compliance and control responsiveness.				
22	H.11	All emergency functions operate as per this specification and purchaser documentation.				
23	H.11	Overload tests to be proposed, as per this specification and purchaser's documentation.				

Table H.8—Factory Acceptance Test (FAT) Running Tests Template *(continued)*

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
24	H.12	4 h continuous running test, following guideline described in H.12. Ensure that there is no leaks, abnormal temperatures or unacceptable functions.				
25	H.12	2 h continuous running test, following guideline described in H.12. Ensure that there is no leaks, abnormal temperatures or unacceptable functions.				
26	H.12	1 h continuous running test, following guideline described in H.12. Ensure that there is no leaks, abnormal temperatures or unacceptable functions.				

KEY

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N=not acceptable, does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to shipping or the SAT, as agreed.

F=fail, does not meet specification criteria. Corrective action is to be completed before proceeding further with the FAT.

NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table H.9

Table H.9—Factory Acceptance Test (FAT) Notes Template

Item	Reference	Notes	Comments	Punch List (Yes, No or Not applicable)

Add new Table H.10

Table H.10— Factory Acceptance Test (FAT) Punch List Template

Item	Notes	Action	Action By	Agreed Date

Add new Annex I

Annex I
(informative)

Site Acceptance Test (SAT) Guidance

I.1 Site Acceptance Test (SAT) Scope

I.1.1

The basic elements of the SAT process and procedure are provided in this annex.

I.1.2

The scope of the SAT typically includes the following:

a) site preparation:

   1) prepare pedestal;

   2) install crane.

b) information review:

   1) operating and maintenance information to be readily available;

c) assembly checks:

   1) visual inspection of assembled crane.

   2) final check of marking, tags and labels.

d) running tests:

   1) check all functions;

   2) final installed overload tests.

e) review results:

   1) assessment of results against IOGP S-618 specification;

   2) resolve any outstanding issues.

I.2 Site Acceptance Test (SAT) Procedure and Records

I.2.1

The SAT procedure and records shall be submitted for the specific crane being tested and the specific site location.

I.2.2

Typical SAT records are provided in Table I.2 through Table I.10.

I.3 Purchaser's Site Acceptance Test (SAT) Preparation

I.3.1

SAT preparation at the platform is by the purchaser and should follow the guidance of I.3 and Table I.3.

I.3.2

The purchaser is to ensure that the crane is installed on the crane pedestal using the manufacturer's recommendations.

I.3.3

Test loads shall be ready at the test area prior to the start of the SAT.

I.3.4

Shipping materials is to be removed (e.g. packing) from the crane and test site.

I.3.5

Crane shall be inspected to ensure that no deterioration or damage has occurred to the crane from transport to site.

I.3.6

Purchaser is to confirm in writing that the crane is ready for the SAT.

I.4 Site Acceptance Test (SAT) Equipment

I.4.1

Equipment required to complete the SAT is to be supplied by the manufacturer as much as feasibly possible.

NOTE This includes equipment to measure speed, distance, pressure, voltage and current.

I.4.2

The manufacturer should notify the purchaser of equipment that will be required to be provided by the site team.

I.4.3

Equipment shall be certified and calibrated in the accordance with the manufacturer's quality management system.

I.4.4

Calibration certificates shall be available for review during the SAT.

I.5 Operating and Maintenance Information

I.5.1

Operator and maintenance information shall be readily available to purchaser during the SAT.

NOTE This includes all installation operating, maintenance and parts manuals, general arrangements drawings, circuit diagrams, FMEA and other typical information required for operating and maintenance of the crane.

I.6 Conformance Records and Certificates

I.6.1

Copies of all conformance records and certificates shall be available to the purchaser during the SAT.

I.6.2

The documentation shall have been reviewed and accepted prior to the SAT.

I.7 Site Acceptance Test (SAT) Criteria

I.7.1

Acceptance criteria in accordance with Table I.1 shall be used during the SAT.

Add new Table I.1

Table I.1—Site Acceptance Test (SAT) Acceptance Criteria

Code	Meaning	Explanation
P	Pass	Meets specification criteria.
A	Acceptable	Does not meet specification criteria but is acceptable. Documentation to be updated as appropriate.
N	Not acceptable	Does not meet specification criteria but testing can proceed. Corrective action is to be taken prior to finalizing the SAT, as agreed.
F	Fail	Does not meet specification criteria. Corrective action is to be completed before proceeding further with the SAT.

I.8 Site Acceptance Test (SAT) Assembly Checks

I.8.1

A visual inspection of the assembled crane shall be performed.

I.8.2

The visual inspection shall verify that there are no transport damages and no leaks are identified.

I.8.3

All items shall be described in detail in the checklist.

I.9 Site Acceptance Test (SAT) Measurements

I.9.1

Baseline measurements and equipment performance shall be recorded during the SAT.

I.9.2

Measurements shall apply to running and stationary situations.

I.9.3

The manufacturer shall include items in the checklist based on the specific crane type and design.

I.10 Site Acceptance Test (SAT) Running Tests

I.10.1

Running tests shall be performed in accordance with Table I.8.

I.10.2

The items listed in Table I.8 can be performed in a sequence preferred by the manufacturer, to suit conditions, as long as the intent of the check is met.

I.11 Site Acceptance Test (SAT) Continuous Running Test Guideline

I.11.1

Continuous running test shall follow the steps of Figure I.1.

I.11.2

Minor changes may be made to suit different crane types and site conflicting activities or restrictions.

I.11.3

Load should be 25 % to 50 % of maximum rated on-board capacity at maximum radius.

I.11.4

Luff in radius is a mid-radius, approximately 30 % of maximum radius.

I.11.5

If the continuous running test is suspended once underway, due to technical issues, then the test may have to be restarted, at the discretion of the purchaser.

Add new Figure I.1

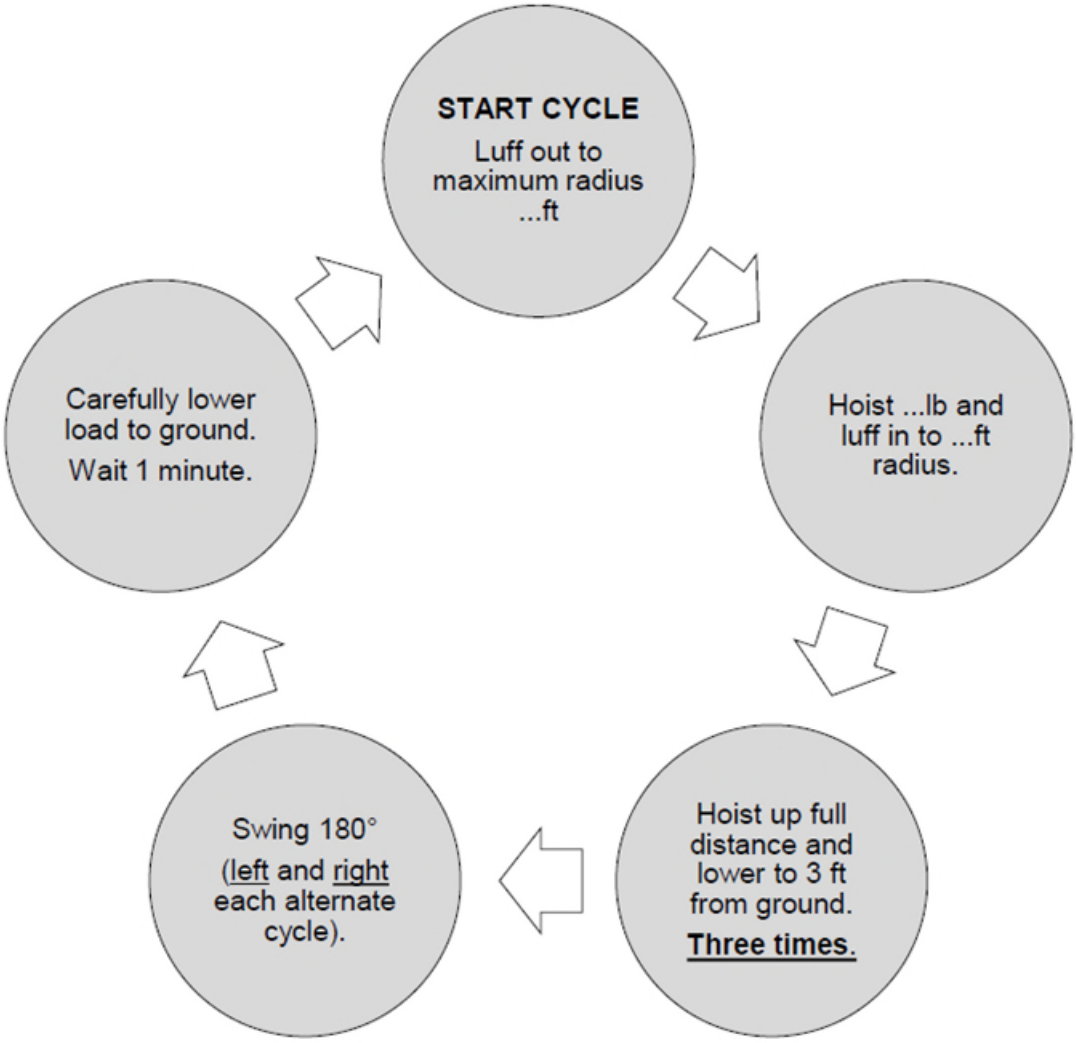

Figure I.1—Steps

I.12 Site Acceptance Test (SAT) Record Templates

Add new Table I.2

Table I.2—Site Acceptance Test (SAT) Cover Sheet

Project and Test Details			
Manufacturer		**Purchaser**	
Project name		**Project number**	
End client		**Facility name**	
Crane model		**Crane serial number**	
Test location		**SAT dates**	
Personnel in attendance			
Name / Company		**Name / Company**	
Name / Company		**Name / Company**	
Name / Company		**Name / Company**	
Name / Company		**Name / Company**	
Other project information			

Add new Table I.3

Table I.3—Site Acceptance Test (SAT) Preparation Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	I.3	Crane assembled and full inspection complete				
2	I.3	Required lubrication complete. Tanks at correct level				
3	I.3	Crane commissioned and function testing complete				
4	I.3	Limits set: all motions				
5	I.3	Test loads ready at test area				
6	I.3	Crane ready for SAT				
7	I.4	Test conditions are suitable				
8	I.4	Test area ready, including barriers and signage				
9	I.5	Test equipment suitable and ready				

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F=fail, does not meet specification criteria. Corrective action is to be completed before proceeding further with the SAT.

NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table I.4

Table I.4—Site Acceptance Test (SAT) Information Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	I.5	Installation, operation and maintenance manual is available and complete				
2	I.5	Hydraulic and electric circuit diagrams available				
3	I.5	General arrangement, assembly drawings and parts manuals available				
4	I.5	Recommended maintenance checklists and procedures available				

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NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table I.5

Table I.5—Conformance Records and Certificates Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	I.6	All information available from the completed FAT				
2	I.6	Bolt torque and tension records for site installation				

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NOTES

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2. Reference to the relevant annex section.

Add new Table I.6

Table I.6—Site Acceptance Test (SAT) Assembly Checks Template

Item [1]	Ref.[2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	I.8	Components correctly tagged and labelled				
2	I.8	Walkways, ladders, handrails and machinery guards are in place and secure				
3	I.8	Machine surrounds are clean and free from oil and grease No evidence of leaks				
4	I.8	No potential dropped objects Secondary retention systems secure				
5	I.8	Inspect major load path structural components				
6	I.8	Check hoist and luff ropes, and / or boom cylinders and hook blocks				
7	I.8	Hydraulic hoses protected, including end fittings				
8	I.8	Electrical cables, wiring, junction boxes and glands fitted correctly				
9	I.8	All machinery guards are fitted				
10	I.8	Demonstration of PLC data download procedure				

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NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table I.7

Table I.7—Site Acceptance Test (SAT) Measurements Template

Item [1]	Ref. [2]	Description	Values (include units)		Code (P, A, N, or F)		Notes
			Design	Measured	Manufacturer	Purchaser	
1	I.9	Swing bearing clearance measurements (4 points North, South, East, West, boom max / min)	in. (mm)				
2	I.9	Overload test (max rated capacity + overload at maximum radius)	lb. (kg)				
3	I.9	Overload test main hoist (max rated capacity)	lb. (kg)				
4	I.9	Overload test aux hoist (max rated capacity)	lb. (kg)				
5	I.9	Record ambient temperature during continuous running test	°F (°C)				

KEY

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NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.
3. Backlash measurements on winches apply to open pinion / gear winch designs only, not internal components.

Add new Table I.8

Table I.8—Site Acceptance Test (SAT) Running Tests Template

Item [1]	Ref. [2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
1	I.10	Prime mover start and stop devices function correctly, including all emergency stops.				
2	I.10	PLC / LMIS: All load charts and alarms function correctly.				
3	I.10	PLC / LMIS: Operator interfaces function correctly.				
4	I.10	Check correct operation of personnel lifting mode, when selected.				
5	I.10	All motion limits function correctly (up / down, in / out, left / right).				
6	I.10	Rope layers confirmed correctly tensioned prior to lifting of loads.				
7	I.10	LMIS calibrated correctly, all hoists. Record values in Table I.7.				
8	I.10	CMs are smooth, progressive, predictable and proportional to control lever movements.				
9	I.10	Confirm that maximum response times comply with Table 29.				
10	I.10	Wire rope spooling is correct for all operating variations: no-load and loads, all speeds.				
11	I.10	All lights are fitted and working: access lights, flood lights, aviation lights.				

Table I.8—Site Acceptance Test (SAT) Running Tests Template *(continued)*

Item [1]	Ref.[2]	Description	Date	Code (P, A, N, or F)		Notes
				Manufacturer	Purchaser	
12	I.10	Combined hoisting, luffing and swinging under full load, to demonstrate specification and purchaser order power compliance, control responsiveness and site power supply (electric prime mover/electric cranes).				
13	I.10	All emergency functions operate as per this specification and purchaser order requirements				
14	I.10	30 min. continuous running test, following guideline described in I.11 and Figure I.1. Ensure that there is no leaks, abnormal temperatures, or unacceptable functions.				

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NOTES

1. Insert or delete items and rows as necessary, depending on crane design.
2. Reference to the relevant annex section.

Add new Table I.9

Table I.9—Site Acceptance Test (SAT) Notes Template

Item	Reference	Notes	Comments	Punch List (Yes, No or Not applicable)

Add new Table I.10

Table I.10—Site Acceptance Test (SAT) Punch List Template

Item	Notes	Action	Action By	Agreed Date

Bibliography

Add to start of Bibliography

The following documents are informatively cited in the text of this document, API 2C, the PDS (IOGP S-618D) or the IRS (IOGP S-618L).

Add to section

[30] ISO 9001, *Quality management systems — Requirements*

[31] ISO 10005, *Quality management — Guidelines for quality plans*

[32] ISO/IEC Directives, Part 2, *Principles and rules for the structure and drafting of ISO and IEC documents*

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