TECHNICAL SPECIFICATION

PEDESTAL CRANES
(AMENDMENTS/SUPPLEMENTS TO API SPEC 2C)

DEP 37.92.10.30-Gen.

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DESIGN AND ENGINEERING PRACTICE

USED BY

COMPANIES OF THE ROYAL DUTCH/SHELL GROUP

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PART I INTRODUCTION

1.1 SCOPE

This new DEP gives the minimum requirements for pedestal cranes on fixed offshore platforms when API Spec 2C is specified as the applicable external standard. It is intended that API Spec 2C shall be used together with this DEP for the design, procurement, manufacture, test and inspection of pedestal cranes for offshore production and drilling platforms for Group company operations.

NOTE: The scope of this DEP does not cover cranes for floating structures nor those for handling manned submersibles in offshore conditions.

DEP 37.92.10.31-Gen. gives the minimum requirements for pedestal cranes when Lloyd's Register of Shipping "Code for Lifting Appliances in a Marine Environment" and BS 2573 are specified as the applicable external standards.

A-1 The choice of external standard shall be determined by the Principal depending upon national/local regulations and will be defined in the project specifications.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by SIPM, the distribution of this DEP is confined to companies forming part of the Royal Dutch/Shell Group or managed by a Group company, and to Contractors and Manufacturers/Suppliers nominated by them (i.e. the distribution code is "F" as defined in DEP 00.00.05.05-Gen.).

This DEP is intended for use in oil and gas production facilities.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this DEP the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party which carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party which manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party which initiates the project and ultimately pays for its design and construction. The Principal will generally specify the technical requirements. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Certifying authority The party appointed by the Principal to ensure design authenticity, compliance with national/local regulations and that the equipment is fit for purpose.

Data/requisition sheets Except where explicitly stated otherwise, this term shall mean data/requisition sheets DEP 37.92.10.93-Gen., DEP 37.92.10.94-Gen., DEP 37.92.10.95-Gen. and DEP 37.92.10.96-Gen., as applicable for the crane in question.

Inspection authority The party appointed by the Principal to ensure that the equipment supplied conforms to the requirements of this DEP. In some instances the inspection authority may be the same as certifying authority.

Load path The area encompassing equipment and structure or parts thereof between hook and pedestal which provide the reaction to resist forces and moments generated during the operation of the crane.

Miscellaneous steel comprises all those steel parts, such as walkways, platforms, handrails, cable trays and brackets which are not primary or secondary steel.

Primary steel Any steel part or member that transmits forces or moments and is essential in maintaining the structural integrity or operational safety of the crane.

Secondary steel Any steel part or member which is not essential in maintaining the structural integrity or operational safety of the crane.

1.4 ABBREVIATIONS

MPI Magnetic particle inspection
NDT Non-destructive testing
RT Radiographic testing
SLI Safe load indicator
SWL Safe working load
UT Ultrasonic testing

1.5 ACTION ITEMS

A list of action items which need to be resolved when using this DEP are given in Appendix 1. The action items are cross-referenced to the appropriate section of this DEP by the letter "A" and a number which appears in the left hand margin of the page concerned.

1.6 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets. Other documents referenced in this DEP are listed in (Part III).

1.7 ORDER OF PRECEDENCE

The following descending order of precedence shall apply:

- Local regulations
- The enquiry/order document
- This DEP
- Other DEPs and standards referenced herein
- Other standards or codes as appropriate.

Any conflict between this DEP and other referenced documents shall be referred to the Principal for resolution:

PART II AMENDMENTS/SUPPLEMENTS TO API SPEC 2C

GENERAL

The numbering and headings of these amendments/supplements correspond to API Spec 2C fourth edition, March 1, 1988.

The Manufacturer shall complete those sections of the data/requisition sheets and minimum purchase information sheets (Appendix 2) not completed by the Principal and shall return them with the Manufacturer's proposal. All provisional information shall be stated as such.

Manufacturers should comply with and be certified to ISO 9001 or equivalent standard.

Where the Manufacturer's standard practice exceeds the requirements of this DEP the Manufacturer's standard practice shall not be reduced to comply with this DEP.

SECTION 1 SCOPE

1.1 COVERAGE

Add to this section:

The crane shall be suitable to perform the duties specified by the Principal on the minimum purchase information sheets and the data/requisition sheets (DEP 37.92.10.93-Gen.).

The crane assembly type shall be as defined by the Principal on the data/requisition sheets DEP 37.92.10.94-Gen., DEP 37.92.10.95-Gen. and DEP 37.92.10.96-Gen.

SECTION 2 CRANE RATING

2.2.1 Bottom Supported Structures

Add to clause a):

V_d shall be determined from table C1 in Appendix C based on wave data specified by the Principal in the minimum purchase information sheets.

Delete clause b) and replace with the following:

To avoid possible load re-contact with the supply vessel the crane shall be equipped to provide the minimum available Hook Speeds shown in Table 2 for the supply vessel duties specified in the minimum purchase information sheets.

Table 2 Minimum Available Hook Speeds

Sea state Number	Beaufort Number	Minimum Available Hook Speeds m/min
1	2	12
2-3	4	20
5-6	6	28
7	8	39

2.3 LOAD RATING CHART

Add new clause:

e) Load rating charts shall incorporate operating criteria for a uniform thickness of ice over the crane structure if specified by the Principal in the minimum purchase information sheets.

SECTION 3 STRUCTURAL COMPETENCE ESTABLISHED BY STRESS ANALYSIS

3.1 ANALYSIS

3.1.1 Application of Loads

Add to this section:

The Manufacturer shall advise in his proposal the maximum construction/installation tolerances for the erection of the crane, within which the crane performance will be assured. The crane shall operate without loss of performance when installed about an axis which is one degree out of true in any direction.

Offlead and sidelead forces due to non-vertical lifting from supply boats shall be calculated using the most critical of the following combinations related to the maximum sea state data specified in the minimum purchase information sheets:

1. a = 8 degrees, b = 4 degrees
2. a = 4 degrees, b = 8 degrees

where "a" is the offlead angle of the hoist line from the vertical, in the plane of the boom, and "b" is the sidelead angle of the hoist line from the vertical, lateral to the plane of the boom.

3.1.2 Design Load

Add to this section:

The wind speed shall be taken as 20 m/s. The wind force acting on the suspended load shall be taken as 300 N per tonne, but not less than 1000 N.

For stowed (non-operational) conditions the crane shall be able to tolerate a wind speed of 63 m/s without detriment.

3.1.4 Fatigue

Add to this section:

A fatigue analysis with fatigue curves for all critical items, based upon a recognised standard and the expected life and duty cycle information supplied by the Principal in the minimum purchase information sheets, shall be provided by the Manufacturer. The basis for the analysis and the cycle of operation shall be agreed with the Principal.

The fatigue life of those parts of the pedestal within the scope of supply of the Manufacturer shall be at least 50% higher than that of the crane structure above the swing mechanism.

SECTION 4 DESIGN AUTHENTICATION AND TESTING

Add to this section:

4.3 PROVEN DESIGN

Cranes and their associated equipment should be of proven design and usage. However, prototypes offering increased safety will be considered. Documentation/ certification shall be submitted, adequate to confirm the design authenticity of the equipment offered. It is the Manufacturer's responsibility to satisfy the Certifying Authority to allow a Fitness for Purpose certificate to be issued. The Principal reserves the right to audit and review all aspects of the design and supply of equipment described within this DEP. Full access shall be afforded to the Principal.

SECTION 5 WIRE ROPE, SHEAVES AND DRUMS

5.2 WIRE ROPE CONSTRUCTION

Add to this section:

In addition to API Spec 9A, wire ropes may also be constructed to meet ISO 2408 or equivalent standard. Load hoist ropes shall be of the low rotational, multi strand, dyform or compacted type. For multi layer drum spooling applications (Section 6.0) an Independent Wire Rope Core construction shall be supplied.

All wire ropes for use on cranes in offshore duty shall be drawn galvanised to minimise the effects of saline corrosion.

All wire ropes shall be of a size and type of construction readily available from Manufacturer's standard ranges. Unique sizes shall not be used.

A certificate of test, fully authenticated and identifiable with each wire rope supplied with the crane, shall be provided.

5.7 WIRE ROPE FITTINGS AND END TREATMENT

Add to clause d):

All end fittings/terminations design specifications shall be submitted by the Manufacturer to the Principal.

NOTE: For additional requirements relative to drum design refer to (Section 6).

5.8 LOAD HOOK, BALL ASSEMBLIES AND LOAD BLOCKS

Add to this section:

The hooks shall be manufactured and tested to a recognised standard.

SECTION 6 BOOM HOIST, LOAD HOIST AND TELESCOPING BOOM MECHANISMS

6.1.1 Brakes

Add clauses:

6.1.1.5 Brake systems shall be fail safe in operation and progressive in application, without inducing excessive shock loads to the crane. Load hoist and boom hoist shall have both dynamic and static braking systems.

6.1.1.6 Ram derricking cranes shall be provided with two double acting hydraulic cylinders, with safeguards to prevent boom drop in the event of hydraulic pressure failure.

6.1.2 Drums

In clause a) replace the third sentence by:

The flange shall extend a minimum of 2.5 times the rope diameter over the top layer of rope at all times.

Add to clause a):

The derricking winch drum should be sized for a single layer of rope. The hoist winch drums should be sized for a maximum of three layers of rope.

All drums shall be fully grooved to facilitate spooling. Drums with no more than two layers may have helical grooves. Drums with 3 (or more) layers of rope shall have Lebus type grooves.

Replace clause c) by:

c) No less than two full wraps of rope shall remain on the derricking drum in any operating conditions. No less than three full wraps of rope shall remain on the hoist winch drums.

Hoist drum rope anchorages shall be either light tail rope or rope clamp. Details of all anchorages shall be subject to approval by the Principal. The break out load shall not exceed 10 percent of the breaking strength of the rope. Rope anchors shall be external to the drum.

SECTION 7 SWING MECHANISM

7.1 SWING MECHANISM

Add to the first paragraph:

A minimum of two swing drive units shall be supplied, with safe, reduced operation, should one unit fail, to allow the crane to be made safe.

The maximum swing speed for normal operation shall be between 0.5 and 1.5 r/min.

c) Dynamic Friction Brake

Replace first sentence by:

A brake to stop, hold or retard the rotation motion of the upper structure shall be provided.

7.3 SWING CIRCLE ASSEMBLY

Add to this section:

The crane shall be capable of 360 degrees continuous rotation unless specified otherwise by the Principal on the minimum purchase information sheets.

Adjustable swing limits shall be fitted if specified on the data/requisition sheets.

The design of the slew bearing assembly shall permit the inspection, removal and replacement of the bearing without dismantling major crane components. The method of achieving this, any restrictions on the structure necessary and the maximum wind speed for stability during the changeout activity shall be documented. Details of all hoists, frames, jacks etc. required for this procedure shall be included. This equipment shall be offered in the Manufacturer's proposal as an optional extra.

The fastener arrangement shall permit the use of hydraulic pre-tensioning equipment for both inner and outer tracks and shall incorporate a system of strain indication. The system shall be approved by the Certifying Authority.

7.3.1 b) Swing Circle Life

Add to this clause:

The swing bearing assembly shall have a design life of at least 30 000 hours unless otherwise indicated by the Principal in the minimum purchase information sheets.

The swing bearing shall be subject to Certifying Authority survey during manufacture. The swing bearing manufacturer shall be subject to approval by the Principal.

7.3.2 c) Fracture Toughness - Bearing Raceways

Add to this clause:

The Charpy impact tests shall be conducted and documented to the satisfaction of the Principal and the Certifying Authority.

7.3.3 a) Surface Flatness and Finish

Add to this clause:

The tolerances for flatness, taper and surface finish to which the swing bearing mountings are manufactured shall not exceed 75 percent of those required by the swing bearing Manufacturer.

7.3.5 Swing Circle Assembly Retainer

Replace the first sentence of this section by:

The swing circle assembly shall be supplied with an auxiliary device to restrain the upper frame against separation from the pedestal in the event of failure of the swing circle assembly mechanism.

Add new section:

7.3.6 Pedestal Adaptor

The pedestal adaptor shall be included in the scope of supply of the Manufacturer.

The steel grade, thickness, length, diameter and the weld preparation for attachment to the main structure together with tolerances shall be subject to the approval of the Principal.

SECTION 8 POWER PLANT

8.1 GENERAL

Add to this section:

c) The type of prime mover shall be specified by the Principal on the minimum purchase information sheets. The engine Manufacturer shall be selected from preferred suppliers listed by the Principal.

d) 90 percent of the prime mover rated power shall be sufficient to hoist the maximum load at the maximum hoist speed and simultaneously either raise the boom at the maximum derricking speed or swing at the maximum speed, whichever condition requires the greater power.

8.2 EXHAUST SYSTEMS

Add to this section:

d) Exhaust manifold shall be water jacketed if required to comply with the surface temperature limitations specified by the Principal on the minimum purchase information sheets. The exhaust gas systems shall be fabricated from stainless steel.

8.3 FUEL TANKS

Add to this section:

c) The diesel storage day tank shall be sized for 12 hours continuous operation of the crane. The tank shall be fitted with a drain, located to allow all the contents of the tank to be removed. A handhole/manway shall be provided to allow internal cleaning.

8.4 HAZARDOUS AREA CLASSIFICATION

Add to this section:

The crane drive systems shall meet the requirements of (11.8.c).

Add new sections:

8.5 HYDRAULIC TRANSMISSION

The power from the prime mover shall be transmitted hydraulically to each system. Independent closed loop systems are preferred. Open loop systems, if offered, shall be subject to approval by the Principal. The systems shall demonstrate adequate cooling of the hydraulic oil under all operating conditions.

There shall be no interconnection between the hydrostatic transmission of the boom derricking, swing and load hoist systems. Main hoist winch and whip hoist winch systems may have one common pump but shall be inhibited from simultaneous operation.

Boom or load drop shall not be possible during either inching operations or power failure. Isolation valves and break flanges shall be provided for maintenance purposes.

Flexible hydraulic hoses should only be used for the following:

- to cater for movement between different elements of the crane
- to facilitate the change-out of hydraulic equipment
- to suppress the transmission of mechanical vibration and/or noise.

Pressure gauges shall be fitted in all hydraulic circuits to facilitate condition monitoring. The minimum instrumentation requirements shall be included by the Principal on the data/requisition sheets. Each hydraulic system shall include a pressure relief valve. The hydraulic reservoir atmospheric vent shall be fitted with an air filter and a flame arrestor. The hydraulic tank, external pipe and fittings shall be manufactured from 316L (or equivalent) stainless steel.

8.6 MINIMUM PROTECTION

All equipment and instrumentation shall be suitably protected. The minimum protection shall be IP 56 in accordance with IEC 529 for equipment installed unprotected outdoors, and IP 41 for equipment installed protected against the weather.

8.7 DETECTION EQUIPMENT

Gas and smoke detection equipment if required will be supplied by the Principal. If specified by the Principal on the minimum purchase information sheets, the Manufacturer shall supply suitable fixing arrangements in the machinery house and/or control cabin.

8.8 DRIVE COUPLING

Couplings installed between driver and driven equipment shall be of the non-lubricated metallic flexible element spacer type.

8.9 ELECTRIC DRIVE

If electric motor drive is specified, the motor shall comply with DEP 33.66.05.31-Gen. unless specified otherwise by the Principal on the minimum purchase information sheets. Requisition DEP 33.66.05.93-Gen. sheets 1 and 2 shall be completed by the Manufacturer and returned with his proposal. Electric motor starters shall be supplied by others unless otherwise stated by the Principal on the minimum purchase information sheets.

8.10 DIESEL DRIVE

If a diesel engine is required, data/requisition DEP 31.29.80.93-Gen. sheets 1 and 2 shall be completed and returned by the Manufacturer with his proposal and the following shall apply.

8.10.1 Pressure Vessels

If hydraulic or air-start systems are proposed, air receivers, hydraulic accumulators etc. shall be fabricated and tested to a recognized standard (BS 5500, ASME VIII or equivalent). The Supplier's choice of code, NDT standards and quality assurance methods shall be fully detailed in his proposal.

8.10.2 Start System Capacity

Start systems shall be sized to give a minimum of 6 start attempts per system, each start attempt to consist of 7 revolutions of the crankshaft at minimum cranking speed. A suitable back-up shall be provided.

8.10.3 External Air Supply

When an air-start system is proposed by the Manufacturer, a quick connect coupling shall be furnished on the air receiver for Principal's external air supply. The quantity, quality and supply conditions required shall be stated on the data/requisition sheets by the Manufacturer in his proposal.

8.10.4 Fans and Belt Drives

Cooling fans shall be of non-sparking construction and belt drives shall be anti-static and oil resistant. They shall be adequately guarded as per section 11.2. Aluminium shall not be used for guards or fans.

8.10.5 Fuel Shut Off Valve

A manually operated, quick action, shut off valve shall be provided in the fuel line between the day tank and the engine. It shall be located outside the machinery house (if supplied) on the driver's normal escape route from the control cabin and clearly marked "fuel-shut-off".

8.10.6 Air Intake

Air intakes shall be provided with a drain facility to minimise the effects of condensation during crane shutdowns. Filters of the replaceable element type shall be included, suitable for the environment specified by the Principal on the minimum purchase information sheets.

8.10.7 Engine Overspeed

A "rig-saver" type air intake closure system shall be fitted, automatically activated on engine overspeed with manual reset.

8.10.8 Rotation

The direction of rotation shall be clearly indicated on the engine. The design of the diesel engine shall prohibit running in the reverse direction.

8.10.9 Emission Controls

Diesel engine emissions shall comply with the legislation applicable to the location and as

specified by the Principal in the minimum purchase information sheets.

SECTION 9 CONTROLS

9.1 GENERAL

Add to clause b):

When control levers are returned to the central (neutral) position, brakes shall be automatically and progressively applied so as not to cause a shock load to the crane. Brakes shall be fail safe in operation, that is, held off by hydraulic pressure and shall be spring loaded.

Add to clause d):

This emergency stop button shall be prominently labelled, and to avoid confusion it shall be significantly different in colour from the background. It shall be suitably protected from inadvertent operation.

Add to this section:

f) All motions shall be smoothly variable from zero to maximum speed.

g) A-2 The Principal shall select one of the lever operating control arrangements described in sections 9.6, 9.7 and 9.8.

The arrangement selected shall depend upon the local/national regulations governing the operation of the equipment, and the type of control(s) existing on other installations in the vicinity, in order to avoid operator confusion and ensure safe operation.

Add new sections:

9.8 ALTERNATIVE CONTROL LEVER ARRANGEMENT

Two levers shall control the crane movements
Left hand : Boom derricking and swing
Right hand : Load raise and lower

9.8.1 Telescopic boom control

Where a telescopic boom is specified the additional lever for left hand operation shall be supplied.

9.8.2 Auxiliary hoist lever

Where an auxiliary hoist is specified control shall be supplied for right hand operation.

9.8.3 Lever movement

All control levers shall be operated in the direction of movement required.

SECTION 10 CABS AND ENCLOSURES

10.1 GENERAL

Add to this section:

Cranes with the power pack mounted on the revolving structure should be provided with a machinery house. For remote mounted power packs and on smaller cranes where a machinery house would be impractical, an easily removable weather proof enclosure with suitable louvres shall be supplied.

10.1.1 Location

The location of the operator's cab shall be as specified by the Principal on the minimum purchase information sheets. The Manufacturer shall ensure that the operator has a clear view of the hook(s) for all operating positions of the crane.

10.1.2 Layout

An operator's cab layout drawing, indicating positions of controls, indicators and equipment, shall be included with the Manufacturer's proposal. Wash and wiper systems, de-mist and heating, tinted safety glass, sunblinds and a fully adjustable operator's chair shall be provided.

Space shall be provided behind the operator's chair to allow an instructor to stand and supervise the operator while he is working the crane. Space shall also be provided to accommodate life jackets and a fire extinguisher and shall be identified on the layout drawing.

The minimum headroom in the operator's cab shall be 2000 mm.

10.1.3 Materials

All enclosure and cab materials shall be fire resistant and shall not release toxic fumes when subjected to flame and/or excessive heat.

10.2 WINDOWS

Add to this section:

Windows shall allow the operator a clear view 120 degrees either side of the load line. The front window shall be of a type suitable for opening, able to be secured in any position, shall be of one piece construction, and, in the main field of vision, not obstructed by transoms. A single, horizontal, detachable safety bar shall be fitted internally. All windows shall be accessible for cleaning, either from inside the cab or else access shall be provided for external cleaning.

10.3 DOORS

Add to this section:

The minimum door access width shall be 750 mm. The door shall be provided with a window and a knock-out panel (500 mm square), be lockable and have a retention device to hold it in the open position.

10.4 CAB ACCESS

Replace this section by:

Access to and exit from the operator's cab via the machinery deck shall be by vertical ladder to be provided by the Manufacturer to the machinery deck from a fixed platform supplied by others. Location of the ladder shall be at a minimum radius to the pedestal and orientated to ensure maximum operator safety.

10.5 PLATFORMS AND WALKWAYS

Add to this section:

All carbon steel walkways, ladders, handrails etc. shall be hot dip galvanised. All fasteners shall be corrosion resistant.

10.7 NOISE LEVEL

Replace the first sentence and clauses a) and b) by:

Noise levels shall satisfy the following requirements:

a) The response, measured at one metre from the surface of the machinery or its enclosure, shall not exceed 88 dB(A) at full load conditions.

b) In the operator's cab the noise level shall be reduced to 75 dB(A) at full load conditions.

The acoustic treatment necessary to achieve this shall be included in the Manufacturer's scope of supply.

Add new section:

10.8 VIBRATION

Vibration levels shall be agreed with the Principal.

SECTION 11 MISCELLANEOUS REQUIREMENTS AND EQUIPMENT

11.1 BOOM EQUIPMENT

Replace the last sentence of clause a) by:

A boom low angle limiting device shall be provided.

Add to clause b):

A shock absorbing type of boom stop is preferred.

Add to clause e):

The boom angle indicator shall be calibrated in graduations not exceeding 5 degrees.

Replace clause f) by:

f) A boom length indicator shall be supplied for all telescopic booms regardless of boom rating.

Replace clause g) by:

g) A safe load and moment indicator shall be provided. A visual alarm shall be activated at 90 to 95 percent of the SWL. Visual and audible alarms shall be activated when the load exceeds 100 to 110 percent of the SWL and an inhibitor shall prevent any increase in moment. This inhibitor shall have an operator over-ride facility. The visual and audible alarms shall be adjustable within the above ranges by qualified authorised personnel only. Operator selection of sea state on the SLI shall be from the cabin. Incorrect operation of the SLI shall not inhibit the use of the crane, except as defined above.

Add new clauses:

h) A data recording system suitable for a minimum of 2000 cycles shall be included in the
A-3 Manufacturer's proposal as an optional extra. The system shall record actual loads, radii, moments, crane configuration, actual load as a percentage of SWL and the date/time of the cycle, with adequate means of downloading and data processing.

j) An automatic impact limiting system of proven design shall be offered as an option in the Manufacturer's proposal.

k) The hoist winch(es) shall have a constant tension device to prevent the occurrence of slack wire. Activation of the device shall be selectable by the crane operator.

l) The Manufacturer's proposed method of protecting the crane in the event of gross overload such as the hook fouling a supply boat shall be included in the Manufacturer's supply. The system shall be retrievable by the operator on removal of the overload condition.

m) All equipment proposed shall be of a type approved by the Certifying Authority.

NOTE: The impact limiting, constant tension and gross overload protection systems (j, k and l above) may be combined provided that there is full compliance with requirements.

11.2 GUARDS FOR MOVING PARTS

Add to clause a):

Fans, fan-belts and slew drive pinions shall be included.

11.4 LUBRICATION POINTS AND FLUID FILLS

Add to clause b):

The Manufacturer shall supply a full lubrication schedule indicating lubricant type and quantity, replenishment and replacement periods.

11.7 EMERGENCY LOAD LOWERING

Add to this section:

On system failure, engine shutdown, loss of hydraulic pressure, etc., brakes shall be automatically applied and the load safely suspended.

All hoists and boom derricking shall be provided with a means of lowering in the event of power or control system failures.

A means to safely slew the crane on power or system failure shall also be provided.

11.8 MISCELLANEOUS EQUIPMENT

a) Tool Box

Replace this clause by:

Special tools, lubricating equipment and a tool box shall be provided.

c) Hazardous Area Classification

Add to this clause:

The electrical installation shall meet the requirements of the hazardous area classification as specified by the Principal in the minimum purchase information sheets.

d) Audible Warning Device

Delete the words "When specified by the purchaser" from this clause and replace with "To alert personnel of imminent crane activities,".

e) Spillage Containment

Add to this clause:

All surfaces of the crane shall be self-draining. In addition to liquid spills, drainage for washdown and rainfall shall be collected and drain connections provided.

Add new clauses:

f) Maintenance

Access and means shall be provided to fully maintain, service and replace the equipment on the crane.

The design shall allow sufficient space for the withdrawal of the splitter gear box, swing units, shafts etc. Withdrawal distances shall be indicated in drawings submitted with the Manufacturer's proposal.

Booms 1500 mm in depth or greater shall be provided with a walkway, those less than 1500 mm in depth shall be fitted with a foot rail and safety harness system.

g) Paint and Surface Preparation

A-4 Painting, surface preparation and finish shall be to DEP 30.48.00.10-Gen. The Manufacturer's offshore paint specification, if equivalent or superior, may be applied if agreed by the Principal. Finish colours and striping if required shall be defined by the Principal in the data/requisition sheets.

h) Documentation

A-5 Documents and data as required by the "Requisition for Engineering Documents" (RED Form DEP 40.10.01.93-Gen.) included with the enquiry shall be submitted in the quantities and timescale indicated. The Manufacturer's attention is directed to the conditions listed under "Remarks" on this form applicable to such submissions.

Add new sections:

11.9 ELECTRICAL EQUIPMENT

11.9.1 General

The complete electrical installation shall be designed and manufactured in accordance with DEP 33.64.10.10-Gen.

The generation of radio frequency interference voltages shall not exceed the value of suppression grade "N" as defined in EN 55014, or equivalent.

11.9.2 Cable

Low voltage power and control cables shall have 600/1000 volt insulation. Power cables shall have stranded conductors with a minimum of 2.5 mm^2 cross section area.

Cables shall be run in heavy duty stainless steel cable trays with a minimum 25 percent spare tray capacity. Power cables shall be segregated from instrument cable to prevent electromagnetic interference. Cables shall be identified at each end with a cable number in accordance with the wiring diagrams provided by the Manufacturer.

11.9.3 Principal/Crane manufacturer interface

Suitable terminal boxes with minimum protection of IP 56 in accordance with IEC 529 shall be provided for connection of external power supplies to the crane. Interface details shall be agreed with the Principal. The pedestal adaptor fabricator shall provide suitable entries through the wall of the adaptor for supply cables.

11.9.4 Collector Column

For cranes with a continuous 360 degrees rotation requirement, a collector column suitable for the hazardous area classification specified shall be fitted. If a limited degree of rotation is specified, a festoon or spider arrangement may be applied.

Collector rings shall be provided for the platform status indicator, platform public address system, radio equipment, equipotential bonding and electric motor drives, if specified on the minimum purchase information sheets. At least eight spare rings shall be installed.

Collector column rings shall be rated a minimum of 110 percent of the maximum current.

Spare rings shall be rated for 50 amperes.

11.9.5 Lighting

11.9.5.1 General

General lighting for walkways, access etc. shall be not less than 150 lux in the horizontal plane. 300 lux shall be provided in the machinery house and the control cab for use during maintenance activities.

11.9.5.2 Cab Lights

Operator's cab and instrument lighting shall have adjustable intensity for night operations.

11.9.5.3 Emergency Lighting

Emergency light fittings covering the escape routes from control cab and machinery house shall be provided. Units shall be 40 watts twin type with integral charger and battery and a minimum of 90 minutes duration. Alternatively the light fittings may be connected to a platform emergency lighting supply.

11.9.5.4 Aircraft Warning Lights

Red aircraft warning lights shall be fitted to the A-frame apex, to the boom tip and, if the boom is longer than 15 metres, at 10 metre intervals along the boom. They shall comply with the requirements of the civil aviation authority. They shall be powered from the platform uninterruptible power supply and have a minimum intensity of 10 candela. The lights shall

comply with national/international regulations and standards.

11.9.5.5 Floodlights

Floodlights to illuminate the hook(s) in all positions, laydown areas etc. shall be fitted to the boom and main frame as specified by the Principal in the minimum purchase information sheets. They shall be self-levelling and in the 400-600 watt range.

11.9.6 Power Outlets

Power outlet sockets as specified by the Principal in the minimum purchase information sheets shall be provided in the machinery enclosure and operator's cabin.

11.10 INSTRUMENTATION

Full details of the Manufacturer's range of instrumentation shall be included in his proposal.

All instruments shall be tagged by number and service, fully certified as required to meet the duties as specified by the Principal in the data/requisition sheets.

Minimum indication, alarms and trips are specified by the Principal in the data/requisition sheets. The Manufacturer shall include additional instrumentation as required for safe operation and maintenance of the crane.

Test facilities to prove the correct operation of each system shall be provided.

11.11 TESTING

11.11.1 Performance Test

The test shall be completed prior to release of crane for shipment to site. All equipment, control systems and safety devices shall be demonstrated to the satisfaction of the Principal and the certifying authority.

Operation of the crane in all rigging modes, with the SWL at the minimum, maximum and an intermediate radius shall be demonstrated. Operation of the SLI shall be demonstrated.

A continuous endurance test of the crane shall be performed for a duration of 12 hours. The Principal reserves the right to request the full test to be repeated should any fault develop or repair be required.

11.11.2 Site Test

In addition to the test described in (11.11.1) a site test shall be performed in the module yard or offshore, with the crane mounted on its pedestal adaptor. This test shall demonstrate the satisfactory operation of the complete crane and shall include an overload test with certified weights. The test shall be performed to the satisfaction of the Certifying Authority.

The test loads shall be as follows:

SWL of crane (tonnes)	Test Load (tonnes)
Up to 20 t	1.25 x SWL
Exceeding 20 t but not exceeding 50 t	SWL + 5
Exceeding 50 t	1.1 x SWL

NOTE: For both the performance test and the site test a fully detailed programme shall be agreed with the Principal.

SECTION 12 MATERIAL REQUIREMENTS FOR STRUCTURAL COMPONENTS

12.1 MATERIALS

a) Metals

Add this clause:

All steels used in the manufacture and fabrication of components in the primary load path shall be produced by open hearth, electric or basic oxygen process, to fine grain practice.

The carbon content for plate material shall be maximum 0.23%, and for forgings and castings maximum 0.25%.

The carbon equivalent (Ceq) shall be maximum 0.45%, established as follows:

$$Ceq = C + \frac{Mn}{6} + \frac{Cr + Mo + V}{5} + \frac{Ni + Cu}{15}$$

12.3 FRACTURE TOUGHNESS

Add to this section:

Mechanical Properties

Impact values shall comply with the following:

Thickness (mm)		Charpy Test Temperature (°C)	Maximum tensile strength (N/mm^2)		
Primary Structure	Secondary Structure		540	590	630
			Charpy V-notch energy (J)		
$t \leq 10$	$t \leq 20$	room temp.*	27	31	34
$10 < t \leq 15$	$20 < t \leq 30$	0	27	31	34
$15 < t \leq 20$	$30 < t \leq 40$	-10	27	31	34
$20 < t \leq 25$	$40 < t \leq 50$	-20	27	31	34
$25 < t \leq 60$	$50 < t \leq 60$	-40	27	31	34

NOTE: * Test may be omitted provided manganese content is not less than 2.5 times the carbon content.

All primary and secondary steels shall be fully traceable. An inspection certificate in accordance with ISO 10474 type 3.1.C shall be provided for primary steels, endorsed by an approved third party inspector acceptable to the Principal and the Certifying Authority. An inspection certificate in accordance with ISO 10474 type 3.1.B shall be provided for secondary steels.

Swing bearing ring steel shall have Charpy V-notch impact values, at minus 20 degrees, of 42 J minimum average of three with the lowest single value not less than 27 J, with an ultimate tensile strength between 820 and 1100 N/mm^2 and an elongation of not less than 15 percent based on a gauge length of five diameters.

The swing bearing ring and associated fasteners, retainers etc. shall be manufactured under survey by the Certifying Authority for the crane.

12.4 CASTINGS

Add to this section:

Standard grades of grey cast iron or malleable iron shall not be used for any application in the primary load path. The minimum grade of cast iron for these applications shall be nodular irons with certified strength and impact values.

SECTION 13 WELDING OF CRITICALLY STRESSED COMPONENTS

13.2 WELDING PROCEDURES

Add to this section:

Welders and welding procedures (including repairs) shall be qualified in accordance with ANSI/AWS D1.1 or equivalent for all welding positions that are intended to be used in the fabrication.

SECTION 14 NON DESTRUCTIVE EXAMINATION, COMPONENTS

14.4 EXAMPLES OF WORKMANSHIP STANDARDS

Add to this section:

Acceptance levels for NDT shall meet the requirements of the following or equivalent:

- Magnetic particle to ASME VIII Division 1 Appendix 6
- Radiographic examination to ASME VIII Division 1 Article UW 51
- Ultrasonic examination to ASME VIII Division 1 Appendix 12

Add new sections:

14.5 NON DESTRUCTIVE EXAMINATION

All welds shall be 100 percent visually examined. Welds on primary steel shall be 100 percent MPI and 100 percent UT or RT. Welds on secondary steel shall be spot checked by 20 percent MPI and 20 percent UT or RT.

The Manufacturer shall include details of NDT to be performed upon load hooks to ensure that they are free from material defects. The methods and acceptance criteria are subject to the approval of the Principal.

14.6 ATTACHMENTS

All lifting eye attachments shall be considered as primary structure. The area of material where such attachments are welded shall be tested ultrasonically to confirm the absence of laminations prior to welding.

SECTION 15 MARKING

Add new section:

15.3 LOAD/RADIUS CHARTS

Load/radius charts, both in the cabin and in the documentation (manuals etc.), shall show the SWL of the crane as rigged. The weight of the hook shall not be included in the charts, and a note to this effect may be included. Rigging attached to the load shall be included in the load.

APPENDIX B EXAMPLE LIST OF CRITICAL COMPONENTS

Replace the second sentence of the first paragraph by:

A critical component list shall be developed by the Manufacturer and submitted for approval by the Principal. The Manufacturer shall demonstrate in graphical form that, in the event of the crane being subjected to a sustained gross overload, sequential failure of these critical items will ensure that the swing bearing and its fasteners will be the last to fail such that the operator's cabin and escape route shall be retained to the last.

APPENDIX D MINIMUM PURCHASE REQUIREMENTS

Delete the contents of this appendix and replace by the contents of Appendix 2 of this DEP.

PART III REFERENCES

In this DEP, reference is made to the following publications:

NOTE: Unless specifically designated by date, the latest edition of each publication shall be used, together with any amendments/supplements/revisions thereto.

SHELL STANDARDS

Index to DEP publications and standard specifications	DEP 00.00.05.05-Gen.
Painting and coating	DEP 30.48.00.10-Gen.
Data/requisition sheet for internal combustion engines	DEP 31.29.80.93-Gen.
Electrical engineering guidelines	DEP 33.64.10.10-Gen.
Electric motors, cage induction and synchronous type	DEP 33.66.05.31-Gen.
Requisition sheet for electric motors	DEP 33.66.05.93-Gen.
Pedestal cranes (Amendments/supplements to LLoyd's code and BS 2573)	DEP 37.92.10.31-Gen.
*Data/requisition sheets for pedestal cranes:	
General	DEP 37.92.10.93-Gen.
Ram derricking type	DEP 37.92.10.94-Gen.
Telescopic boom type	DEP 37.92.10.95-Gen.
A-Frame type	DEP 37.92.10.96-Gen.
*Requisition for engineering documents	DEP 40.10.01.93-Gen.

*NOTE: The latest version of data/requisition and requisition sheets can be found in the Requisitioning Binder, DEP 30.10.01.10-Gen.

AMERICAN STANDARDS

Structural welding code - steel	ANSI/AWS D1.1

Issued by:
American Welding Society
550 N.W. LeJeune Road
PO Box 351040 Miami
Florida 33135
USA.

Specification for offshore cranes	API Spec 2C (fourth edition, March 1, 1988)
Specification for Wire Rope	API Spec 9A

Issued by:
American Petroleum Institute
1220 L Street, Northwest
Washington DC 20005
USA.

Boiler and pressure vessel code, section VIII - rules for construction of pressure vessels	ASME VIII

Issued by:
American Society of Mechanical Engineers
345 East 47th Street
New York NY 10017
USA.

BRITISH STANDARDS

Rules for the design of cranes	BS 2573
Unfired fusion welded pressure vessels	BS 5500

Issued by:
British Standards Institution
2 Park Street
London W1A 2BS
United Kingdom.

The Institute of Petroleum, model code of safe practice in the petroleum industry; Part 15: Area classification code	IP Code Part 15

Issued by:
Lloyd Register of Shipping
71 Fenchurch Street
London EC3N 4BS
United Kingdom.

Lloyd's Code for Lifting Appliances in a Marine Environment	January 1987

Issued by:
Lloyd Register of Shipping
71 Fenchurch Street
London EC3N 4BS
United Kingdom.

EUROPEAN STANDARDS

Limits and methods of measurement of radio interference characteristics of household electrical appliances, portable tools and similar electrical apparatus	EN 55014

Issued by:
Committé Européen de Normalisation
Secrétariat Central
Rue de Stassart 36
B-1050 Brussels
Belgium.

NOTE: Copies can also be obtained from national standards organizations.

INTERNATIONAL STANDARDS

Degrees of protection provided by enclosures (IP code)	IEC 529

Issued by:
International Electrotechnical Commission
3, Rue de Varembé
CH-1211 Geneva 20
Switzerland.

NOTE: Copies can also be obtained from national standards organizations.

Steel wire ropes for general purposes - Characteristics	ISO 2408
Quality systems - Model for quality assurance in design/development production, installation and servicing	ISO 9001
Steel and steel products - Inspection documents	ISO 10474

Issued by:
International Organisation for Standardisation
1, Rue de Varembé
CH-1211 Geneva 20
Switzerland.

NOTE: Copies can also be obtained from national standards organizations.

APPENDIX 1 ACTION ITEMS

Action Item	Place in DEP		Subject
A-1	PART I	Section 1.1	Choice of external standard
A-2	PART II	Section 9.1.g)	Operating control levers
A-3		Section 11.1.h)	Data recording system
A-4		Section 11.8.g)	Paint finish
A-5		Section 11.8.h)	Documentation

APPENDIX 2 MINIMUM PURCHASE INFORMATION SHEETS

These sheets shall be entered by the Principal. All fields not entered by the Principal shall be entered by the Manufacturer and returned with the proposal. Provisional information shall be stated as such.

1. CRANE CONFIGURATION

Crane type	A-frame / ram luffing / telescopic / king post
Boom type	closed box / lattice boom
Boom length	m
Auxiliary hoist required	Yes/No
Prime mover	diesel / electric motor
Preferred suppliers	
Transmission	hydraulic
Rotation	continuous 360°/
Machinery house	Yes/No weather / sound proof enclosure
Control cabin / location	Yes/No crane / remote If crane : left / right side (looking towards boom tip)
Floodlights (Total number, location)	
Gas / smoke detector fixing arrangements required	Yes/No
Power outlet sockets	type: spec:
Collector rings Total number (for status lights, telephone etc.)	
Anti-condensation heaters required	Yes / No / Manufacturer to propose

2. PERFORMANCE CRITERIA (Minimum Requirements)

Max. dynamic lift (at conditions given in Appendix 2 section 3)	kg at	m. minimum working radius
Max. static lift	kg at	m. minimum working radius
Max. auxiliary lift	kg at	m. minimum working radius
Main hook speed (minimum)	m/min	
Auxiliary hook speed (minimum)	m/min	
Personnel lift required	Yes/No	kg
Installed platform design life	Years	
Total duty cycles		
Surface temperature limitation	°C	

3. ENVIRONMENTAL CRITERIA

Ambient temperature max./min.	°C/ °C
Design temperature max./min.	°C/ °C
Humidity	% relative/absolute
Atmosphere	Saline /
Location	
Surface wind maximum instantaneous gust	m/s m/s
Wave height (significant)	m
Wave period	seconds
Excessive temperature exposure	flue gas exhaust °C flare °C boom °C upperstructure °C
Snow and ice conditions Operating - thickness Stowed - thickness	Yes/No mm mm
Hazardous area classification As per IP Model Code of Safe Practice, Part 15	boom: cab: power unit: crane:
Diesel exhaust emission control standard	

4. UTILITIES AVAILABLE

Diesel fuel	Yes/No	Grade:
Electricity AC (power)	V	ϕ Hz
AC (control)	V	ϕ Hz
DC	V	A
Emergency / uninterrupted	Yes/No	AC/DC
	V	ϕ Hz
Air supply (instrument quality)	bar (ga)	m^3/min
Air supply (plant quality)	bar (ga)	m^3/min
Potable water (limited to top-up use only)	Yes/No	