

DEP SPECIFICATION

**OFFSHORE PEDESTAL-MOUNTED CRANES
(AMENDMENTS/SUPPLEMENTS TO API SPEC 2C)**

DEP 37.92.10.30-Gen.

September 2010

DESIGN AND ENGINEERING PRACTICE



© 2010 Shell Group of companies
All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, published or transmitted, in any form or by any means, without the prior written permission of the copyright owner or Shell Global Solutions International BV.

PREFACE

DEP (Design and Engineering Practice) publications reflect the views, at the time of publication, of Shell Global Solutions International B.V. (Shell GSI) and, in some cases, of other Shell Companies.

These views are based on the experience acquired during involvement with the design, construction, operation and maintenance of processing units and facilities. Where deemed appropriate DEPs are based on, or reference international, regional, national and industry standards.

The objective is to set the recommended standard for good design and engineering practice to be applied by Shell companies in oil and gas production, oil refining, gas handling, gasification, chemical processing, or any other such facility, and thereby to help achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to Shell companies for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual Operating Units to adapt the information set forth in DEPs to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use DEPs, they shall be solely responsible for such use, including the quality of their work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will typically expect them to follow those design and engineering practices that will achieve at least the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal.

The right to obtain and to use DEPs is restricted, and is granted by Shell GSI (and, in some cases, of other Shell Companies) in most cases, under a Service Agreement or a License Agreement. This right is granted primarily to Shell companies and other companies receiving technical advice and services from Shell GSI or another Shell Company. Consequently, three categories of users of DEPs can be distinguished:

- 1) Operating Units having a Service Agreement with Shell GSI or another Shell Company. The use of DEPs by these Operating Units is subject in all respects to the terms and conditions of the relevant Service Agreement.
- 2) Other parties who are authorised to use DEPs subject to appropriate contractual arrangements (whether as part of a Service Agreement or otherwise).
- 3) Contractors/subcontractors and Manufacturers/Suppliers under a contract with users referred to under 1) or 2) which requires that tenders for projects, materials supplied or - generally - work performed on behalf of the said users comply with the relevant standards.

Subject to any particular terms and conditions as may be set forth in specific agreements with users, Shell GSI disclaims any liability of whatsoever nature for any damage (including injury or death) suffered by any company or person whomsoever as a result of or in connection with the use, application or implementation of any DEP, combination of DEPs or any part thereof, even if it is wholly or partly caused by negligence on the part of Shell GSI or other Shell Company. The benefit of this disclaimer shall inure in all respects to Shell GSI and/or any Shell Company, or companies affiliated to these companies, that may issue DEPs or advise or require the use of DEPs.

Without prejudice to any specific terms in respect of confidentiality under relevant contractual arrangements, DEPs shall not, without the prior written consent of Shell GSI, be disclosed by users to any company or person whomsoever and the DEPs shall be used exclusively for the purpose for which they have been provided to the user. They shall be returned after use, including any copies which shall only be made by users with the express prior written consent of Shell GSI. The copyright of DEPs vests in Shell Group of companies. Users shall arrange for DEPs to be held in safe custody and Shell GSI may at any time require information satisfactory to them in order to ascertain how users implement this requirement.

All administrative queries should be directed to the DEP Administrator in Shell GSI.

TABLE OF CONTENTS

PART I	INTRODUCTION	4
1.1	SCOPE	4
1.2	DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS	4
1.3	DEFINITIONS	4
1.4	CROSS-REFERENCES	4
1.5	ORDER OF PRECEDENCE	5
1.5	COMMENTS ON THIS DEP	5
1.6	SUMMARY OF MAIN CHANGES	5
PART II	AMENDMENTS/SUPPLEMENTS TO API SPEC 2C	6
1.	SCOPE	6
2.	REFERENCES	6
3.	DEFINITIONS, ABBREVIATIONS and UNITS	6
4.	CRANE RATINGS	7
5.	ALLOWABLE STRESSES	8
6.	DESIGN AUTHENTICATION AND TESTING	9
7.	CRITICAL RIGGING COMPONENTS	10
8.	BOOM HOIST, LOAD HOIST AND TELESCOPIC BOOM MECHANISMS	12
9.	SWING MECHANISM	14
9.3	PEDESTAL ADAPTER / KINGPOST	16
10.	POWER PLANT	16
11.	CONTROLS	20
12.	CABS AND ENCLOSURES	20
13.	MISCELLANEOUS REQUIREMENTS AND EQUIPMENT	22
14.	MATERIAL REQUIREMENTS FOR STRUCTURAL COMPONENTS	27
15.	WELDING OF CRITICALLY STRESSED COMPONENTS	34
16.	NON-DESTRUCTIVE EXAMINATION OF COMPONENTS	37
17.	MARKING	37
18.	PERFORMANCE TEST	38
19.	TRAINING	38
20.	SPARE PARTS	39
APPENDIX A	EXAMPLE LIST OF CRITICAL COMPONENTS	39
PART III	REFERENCES	40

PART I INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design, procurement, manufacture, testing and inspection of pedestal and king-post mounted cranes on fixed offshore structures and/or floating platform structures used in drilling and production operations.

This DEP is based on API Spec 2C, 6th edition, 2004. Part II of this DEP is written as amendments and supplements to API Spec 2C.

Any project-specific requirements shall be specified by the Principal in the requisition (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.) or in the Specific Project Requirements (SPR), see the definition in Part II, 3.1.

This is a revision of the DEP of the same number dated June 2007; see (1.6) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

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

When DEPs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could 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 with regards to the 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, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

The **Contractor** is the party that holds the contract to carry out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Contractor is responsible for delivery of a completed crane unit. The Principal may undertake all or part of the duties of the Contractor.

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

The **Principal** is the party that 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.

1.4 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).

1.5 ORDER OF PRECEDENCE

The following descending order of precedence shall apply:

- National and local regulations
- Purchase order/contract document
- Requisition
- This DEP
- API Spec 2C

Any conflict between this DEP and other referenced documents shall be referred to the Principal for resolution prior to contract award.

1.5 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the DEP Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of "DEPs on the Web", available through the Global Technical Standards web portal <http://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

1.6 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated June 2007. This has been a complete revision and it is not practical to list the changes herein.

PART II AMENDMENTS/SUPPLEMENTS TO API SPEC 2C

The numbering and headings in this Part correspond to those in API Spec 2C, sixth edition, 2004. They include supplemental information, clarifications, modifications and additional requirements to API Spec 2C. Only those sections with clarifications, modifications and additions are included; any sections of API Spec 2C that are not mentioned shall remain valid as written.

The Manufacturer's proposal shall address all items requested throughout this DEP and the Manufacturer shall complete the requisition where required (e.g. diesel exhaust emission control, maximum vibration levels, instrument duties, etc.). All provisional information shall be stated as such.

The Manufacturer's quality management system shall comply with and be certified to ISO 9001. The Manufacturer shall be authorized to use the API monogram on this product and shall provide it as part of the product name plate.

Where the Manufacturer has standard practices that exceed the requirements of this DEP, they shall apply.

1. SCOPE

1.1 GENERAL

Add to this section:

This specification shall also apply to cranes mounted on ship-shape FPSO hulls.

The crane shall be suitable to perform the duties specified by the Principal in this DEP and the requisition.

1.4 COMMENTARY

Add to this section:

Appendix B of API Spec 2C shall apply.

1.5 RECORD RETENTION

Add to this section:

In addition to maintaining the original inspection and testing records, the Manufacturer shall furnish a complete set of inspection and testing records to the Principal with the Crane Manufacturer's Data Books furnished to the Principal prior to crane delivery. Additionally, the Crane plans and information specified in the applicable regulations (e.g. 46 CFR subpart 107.309 in the USA) shall be furnished to the Principal as it is completed during the design and fabrication phases. The Principal shall provide necessary information to all regulatory agencies.

1.6 MANUFACTURERS SUPPLIED DOCUMENTATION

Modify item 5 as follows:

5. Failure mode assessment for gross unintended overloads.

2. REFERENCES

Add to this section:

Documents referenced in this DEP are listed in (Part III)

3. DEFINITIONS, ABBREVIATIONS and UNITS

3.1 DEFINITIONS

Add to this section:

certifying authority	Third party which may be appointed by the Principal to ensure design authenticity, compliance with national/local regulations and that the equipment is fit for purpose.
inspection authority	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	All structural and equipment components or parts inclusive of and between hook and pedestal, which provide the reactions to resist forces and moments generated during the operation of the crane.
miscellaneous steel	All those steel parts, such as walkways, platforms, handrails, cable trays and brackets that are not primary or secondary steel.
primary steel	Any steel part or member of a critical component that transmits forces or moments and is essential in maintaining the structural integrity or operational safety of the crane.
requisition	Except where explicitly stated otherwise, 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 to the crane in question. NOTE: Instead of the data/requisition sheets cited above, the Principal may choose to communicate the specific project requirements (SPR) in a separate document. This document shall have the same number as this DEP but with a project-specific suffix instead of "-Gen." Example: 37.92.10.30 – "Project".
secondary steel	Any steel part or member that is not essential in maintaining the structural integrity or operational safety of the crane

3.2 ABBREVIATIONS

Add to this section:

MPI	Magnetic Particle Inspection
NDE	Non-Destructive Examination
RT	Radiographic Testing
SWL	Safe working load
UT	Ultrasonic testing
SPR	Specific Project Requirements

3.3 UNITS

Add to this section:

Once a system of units has been selected for use, then the Contractor shall consistently use that system throughout the design.

4. CRANE RATINGS

4.1 GENERAL

Replace the second paragraph with:

For cranes on floating platforms and vessels, the Contractor shall use "The Vessel Specific Method" of establishing crane ratings. The details for platform and supply vessel motions shall be specified in the requisition.

For fixed platform cranes the Contractor shall use "The Default Dynamic Method" of establishing crane ratings. The crane minimum lift capacities shall be as specified in the requisition.

4.2.1 Load Rating Charts

Add to this section:

Contractor load charts shall reflect the number of parts of line as specified in the requisition. Additionally, Contractor load charts shall reflect all boom length configurations possible using the boom length(s) as specified in the requisition.

4.3.1. a Off board Lifts

Add to this section:

The main load hoist winch at maximum reeving shall be capable of sustaining a minimum line speed as specified in Appendix B, Table B.4.3.3 with the wire rope operating on the lowest layer of the winch drum.

The auxiliary load hoist winch shall be capable of sustaining a minimum line speed of 60 m/min, regardless of sea state, with a single line configuration and with the wire rope operating on the highest layer of the winch drum.

If specified in the requisition, both the main and the auxiliary load winches shall have slow- and high-speed capabilities.

The modulus of elasticity and surface area of the wire rope used in stiffness calculations shall be supplied by the wire rope Manufacturer.

4.3.2. b Loads Due to Crane Inclinations (CI Forces) and Crane Motions (CM Forces)

Add to this section:

A minimum additional 0.5° off lead and 0.5° side lead shall be added to the crane motions. This additional off lead and side lead shall be combined and taken at full value (100 % of each) when the crane base angle is 45°.

4.4 OUT OF SERVICE LOADS

Add to this section:

The non-stowed and stowed out of service conditions shall be as specified in the requisition.

4.5 WIND, ICE AND SEISMIC LOADS

Add to this section:

Environmental loads including wave criteria, and wind, ice and seismic loads shall be specified in the requisition.

4.6 GROSS OVERLOAD CONDITIONS

Add to this section:

Failure mode assessments shall be performed by the Contractor and submitted to the Principal for review.

5. ALLOWABLE STRESSES

5.1 GENERAL

Add to this section:

The crane shall operate without loss of performance when installed about an axis that is one degree out of true in any direction.

All padeyes for offshore handling shall be designed for three times the dead weight of the

item being lifted.

5.2 PEDESTAL, KING POST, AND PLATFORM CONNECTION

Add to this section:

The crane lateral deflection shall not exceed the unsupported extended length (L) divided by 180 (i.e. $L/180$) measured from the heel pin of the boom. However, this shall not exceed limits specified by the swing bearing Manufacturer.

Additionally, the maximum lateral deflection at the boom heel pin shall not exceed 45 mm (1.75 in.) noting this deflection is a combination of the pedestal deflection and the support structure deflection for the crane operating loads only.

5.4 FATIGUE

Add to this section:

To calculate the maximum stresses and stress cycles of the pedestal, kingpost and other critical structural components for use in the fatigue analysis, the dead weight of the boom and the API recommended side loads shall be accounted for in addition to the prescribed load (i.e. $C_v \times SWL$). The API quantity of fatigue stress cycles (i.e. 25,000) shall be considered at this prescribed load. In the fatigue life calculation, an additional 75,000 cycles shall be included with the boom dead weight and SWL load of the auxiliary hoist at maximum operating radius. Stress ranges shall include the full stress range between tensile and compressive stresses, assuming the crane rotates 360 degrees. A factor of safety of 5 shall be applied to the aforementioned cycles. The computed fatigue life shall be life shall be reported to the Principal.

5.5 CERTIFICATION

Add to this section:

The Manufacturer shall provide that written certification in the final documentation package.

6. DESIGN AUTHENTICATION AND TESTING

6.1 DESIGN AUTHENTICATION AND TESTING

Delete the second sentence. Add to this section:

The Contractor shall inform the Principal, with the crane proposal, if the crane being proposed is 1) a prototype, 2) a major structural revision or 3) an earlier model crane in which case the load testing may not be repeated for this serial. If the crane is a prototype or a major structural revision the Contractor shall also inform the Principal of the 'Design Authentication' selected test method (e.g. Resistance Type Strain Gauge or Heavy Lift Load Test).

6.1.2 HEAVY LIFT LOAD TEST

Add to the section:

If the offboard C_v exceeds 2.0 then the offboard C_v shall be used for the heavy lift test. If the calculated sidelead exceeds 4 % then the calculated value shall be used for the side load used in the testing.

6.2 CERTIFICATION

Delete the first sentence. Add to this section:

The Manufacturer shall provide this written certification in the final documentation package. The final documentation package shall include the following, stamped by a Registered Professional (or Chartered) Engineer:

1) a design certification letter that the crane meets or exceeds the requirements of the latest revision of API Spec 2C;

- 2) design basis summary; and
- 3) final load charts.

With respect to the design life of the crane mechanisms, e.g. drive components, winches, slew bearing, etc., the Contractor shall specify in the bid the failure mode assessment calculations that will be performed and shall also specify the design service life for the main components.

6.3 OPERATIONAL TESTS

Add to this section:

The Contractor shall provide operational tests in accordance with this section. The Contractor shall provide in the proposal a description of the scope of testing and this shall contain a system performance test with simultaneous lifting, luffing and slewing operation. This is to ensure that individual systems perform as specified by the Principal during simultaneous operations.

If the overload test specified in API Spec 2C, Section 6.3.4, and further specified in the requisition, exceeds 1.1 times the rated capacity, then the Principal may elect to perform NDE of the critical connections and components, in accordance with the Principal approved procedure, to ensure that the connections and/or components were not damaged during the overload test. The Contractor, at the Contractor's expense, shall perform any repairs needed following the NDE.

7. CRITICAL RIGGING COMPONENTS

7.2 WIRE ROPE

7.2.1 Construction

Add to this section:

In addition to API Spec 9A, wire ropes may also be constructed to meet ISO 2408 or another Principal approved equivalent standard. Load hoist wire ropes shall be Dyform, low rotational, multi strand Independent Wire Rope Core (IWRC) construction.

Boom hoist wire rope shall be Dyform, multi strand Independent Wire Rope Core (IWRC) construction. All pendant 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 the Manufacturer's standard ranges. Unique sizes shall not be used. The Contractor shall provide a fully authenticated and identifiable certificate of test with each wire rope supplied with the crane.

7.2.4 Design Factors

Add to this section:

Reeving (sheave) inefficiencies shall be included when calculating the wire rope breaking strength. Load ratings shall not exceed 90 % of the SWL of the wire rope including sheave losses.

7.2.4.2 Suspension Systems

Add to this section:

The Contractor shall notify the Principal, in the proposal, if a bridle and pendant assembly will be utilized. If so, details of the suspension system shall also be provided. Pendant lines shall not exceed 51 mm diameter. If additional strength is required the number of pendant lines shall be increased but the diameter shall not exceed 51 mm. Pendants shall be as short as practical to minimise fatigue in the live wire rope system. If a pendant system is used to facilitate boom length modifications the following shall apply:

- 1) space shall be made available of the boom hoist drum to accommodate these changes;

- 2) bridle and tip geometry shall allow such changes; and
- 3) gantry sheave cluster and support plate geometry shall also allow such changes.

7.3 WIRE ROPE END TERMINATIONS

Add to this section:

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

For wire rope end termination, only wedge sockets for running ropes and poured spelter or swaged sockets (Crosby or Principal approved equivalent) for pendant lines shall be used (i.e. no U-bolt or eye splice terminations are permitted).

The dead end on the auxiliary line shall be looped back or terminated so that it does not become entangled in the anti-two block weight; this can be achieved by means of a loop on the wire or a carpenter's stop above the wedge socket.

7.3.3 Wedge Sockets

Add to this section:

Wedge socket efficiency shall be no greater than 80 % to 90 % of the wire rope capacity. Spelter socket and swaged-sleeve socket efficiencies may be assumed to be 100 %. Wire rope ends shall be formed into a loop to prevent the end of the wire rope from snagging on appurtenances such as anti-two block weights.

7.3.4 Termination efficiency

Add to this section:

Tied loop splices, with or without thimbles, shall not be used, as termination efficiency can be below 80 %.

7.4 SHEAVES

7.4.1 Requirements

Add to this section:

The Contractor shall provide the sheave material specification in the proposal. Steel sheaves are preferred in order to increase wire rope life and efficiency.

Fleet angles from the farthest wrap on the winch drum to the lead sheave shall be less than 1.5°.

7.4.1.1 *Add to this section:*

The sheave diameter to wire rope diameter ratio shall be at least 20. This applies to all sheaves. For cranes/crane lines that are used regularly, the ratio of sheave diameter to wire rope diameter shall be at least 30. The required ratio shall be specified in the requisition.

7.4.1.5 *Add to this section:*

All grease lubrication points, including sheave bearings that are not directly accessible, shall be equipped with remote grease fittings. All sheaves shall be of the roller bearing type in order to minimise sheave losses.

7.5 LOAD BLOCK ASSEMBLIES

Add to this section:

The Contractor shall notify the Principal, in the proposal, as to the Manufacturer, model number, size, weight and number of sheaves for each type of hook block and overhaul ball assembly.

Hook blocks and overhaul balls shall be of sufficient weight to prevent unravelling of wire rope on the hoist drum during zero load lowering operations. In addition, hook blocks and

overhaul balls shall be sized so that the rope stays on the boom, and spooling on the drum is effective, even during high cross-winds.

The Contractor shall verify with the wire rope Manufacturer that rotational resistant wire rope is acceptable for use with hook blocks and overhaul balls equipped with a swivel.

All hook blocks and overhead balls shall be striped black and yellow with high visibility, reflective paint to improve their visibility at night.

The Contractor shall perform NDE to check for cracks on all hook blocks and overhead balls. Any surface indications found will require the hook block or the overhead ball to be replaced.

On Spars, FPSOs, Drillships, or floating vessels with large horizontal accelerations and crane inclinations, hook blocks and overhead balls shall be capable of being "parked" into a boom stop so that they do not swing freely when not in use.

7.5.1 Hook Block

Add to this section:

The hook block shall be a swivel safety lock type capable of supporting odd part reeving (e.g. three parts of line requires a dead-end on the hook block).

7.5.4. Load Hook

7.5.4.2 Add to this section:

The lowest design service temperature shall be 0 °C unless specified otherwise in the requisition.

7.5.6 Design Verification

Replace this section with:

The Contractor shall inform the Principal, with the proposal, if the load block being proposed is a prototype. If the load block is a prototype the Contractor shall also inform the Principal of the non-destructive examination techniques that will be performed subsequent to the proof load test.

8. BOOM HOIST, LOAD HOIST AND TELESCOPIC BOOM MECHANISMS

8.1 Hoists

All hoists shall be fitted with padeyes to assist installation and removal and shall have direct overhead access for installation and removal.

8.1.1 Brakes

Add to this section:

Brakes shall be fail safe in operation, that is, held off by hydraulic pressure and shall be spring-loaded.

All winches shall be equipped with an external auxiliary disc or band brake.

The sequencing of the application of the main brake, auxiliary brake and ratchet and pawl shall be designed so that overall winch performance is not adversely affected. Pressure traces shall be produced during the load testing to demonstrate the signal to engagement timing of the brakes and other components.

8.1.2 Drums

Add to this section:

The crane operator shall have either direct sight or a warning indicator to check for rotation of all drums. Drums shall be striped black and yellow with high visibility, reflective paint along the flange to detect rotation. Lights shall be provided at all drums to help in seeing rotation during night operations.

In addition to API minimum flange clearance, keeper plates and/or safety guards shall be provided.

The boom hoist drums shall have Lebus type grooves, or a Principal-approved equivalent, to facilitate spooling. Other hoists (main and auxiliary) may use Lebus grooving provided the grooving is allowed for the type of wire rope used (some wire rope Manufacturer's do not recommend Lebus grooving with rotation-resistant rope). The Lebus grooving shall be designed for the size, type and brand of wire rope used. Specifically, the grooving shall match the pitch of the wire rope selected. Lebus grooving cast into the drum is preferred to Lebus grooving shells welded to the exterior of the drum; however both types are acceptable.

The boom hoist shall be configured for power lowering and lifting the boom from the minimum operating radius to the horizontal within 150 s.

For Load hoist speed performance refer to (4.3.1.a).

8.1.2.3 *Add to this section:*

Hoist drum rope anchorages shall be either light tail rope or rope clamp. Details of all anchorages shall be in accordance with the Manufacturer's recommendations and are subject to approval by the Principal.

The break out load shall be established through analysis in the Failure Mode Assessment in section 1.6.5. However, it shall be strong enough to hold or resist the SWL but shall not be stronger than other critical components. The clamping system shall be designed so that it is one of the first components to fail.

8.1.4 Mounting

8.1.4.3 *Add to this section:*

The Manufacturer shall inform the Principal if the mounted hoist assembly is considered a prototype and shall be load/distortion tested. The Contractor shall include a description of the non-destructive examination techniques that will be performed subsequent to the load/distortion test.

Winch surfaces and the adjoining crane mounting surface shall be match-machined so that they do not exceed 75 % of the Manufacturer's specifications for mounting surface flatness. The Contractor shall submit documentation confirming that this has been achieved.

8.2 BOOM CONTROL

8.2.1.1 *Replace this section with:*

Elevating the boom from a minimum boom angle of 0 degrees to the maximum recommended boom angle. A lattice boom shall be capable of elevating from a minimum boom angle 10 degrees below horizontal, to the maximum recommended boom angle.

8.2.2 Boom Control Cylinder

Add to this section:

Cranes with boom lift cylinders (i.e. API Type A & B) shall be provided with at least two double acting hydraulic cylinders.

8.2.2.4 *Add to this section:*

The boom cylinders shall be designed with a 4:1 design factor (ASME Section VIII burst pressure/pressure required to support and raise the boom plus SWL x Cv).

8.2.3 Auxiliary Holding Device

8.2.3.1 *Replace this section with:*

a) Boom hoist winch

The boom hoist winch shall be provided with a manually operated ratchet and pawl