GL Noble Denton

TECHNICAL POLICY BOARD

GUIDELINES FOR LOADOUTS

0013/ND

31 Mar 10	5	GPB	Technical Policy Board
19 Jan 09	4	GPB	Technical Policy Board
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01 Apr 02	2	JR	Technical Policy Board
07 Jul 93	1	JR	Technical Policy Board
16 Oct 86	0	JR	Technical Policy Board
DATE	REVISION	PREPARED BY	AUTHORISED BY

PREFACE

This document has been drawn with care to address what are likely to be the main concerns based on the experience of the GL Noble Denton organisation. This should not, however, be taken to mean that this document deals comprehensively with all of the concerns which will need to be addressed or even, where a particular matter is addressed, that this document sets out the definitive view of the organisation for all situations. In using this document, it should be treated as giving guidelines for sound and prudent practice on which our advice should be based, but guidelines should be reviewed in each particular case by the responsible person in each project to ensure that the particular circumstances of that project are addressed in a way which is adequate and appropriate to ensure that the overall advice given is sound and comprehensive.

Whilst great care and reasonable precaution has been taken in the preparation of this document to ensure that the content is correct and error free, no responsibility or liability can be accepted by GL Noble Denton for any damage or loss incurred resulting from the use of the information contained herein.

CONTENTS

1 SUMMARY

1.1 These Guidelines have been developed for the loadout of items including offshore jackets, SPAR sections, modules, bridges and components from the shore onto floating or grounded barges and ships.

1.2 The principles of these Guidelines can also be applied to the load-in of structures onto the shore from a floating vessel/barge.

1.3 This document supersedes the previous revision, document no 0013/NDI Rev 4 dated 19 Jan 2009. A summary of the principal changes is given in Section 2.2.4. 5

1.4 These Guidelines are intended to lead to an approval by GL Noble Denton, which may be sought where an operation is the subject of an insurance warranty, or where an independent third party review is required.

1.5 A description of the Approval Process is included, for those projects which are the subject of an insurance warranty.

1.6 This document includes the requirements for consideration, intended to represent sound practice, for the structure to be loaded, loadout site, link beams and skidways, trailers, pumping and ballasting, jacking systems and winches, grounded loadouts, transverse loadouts, moorings, seafastenings, tugs and weather forecasts.

1.7 Methods for lifted loadouts are derived from GL Noble Denton's lifting Guideline document – Guidelines for Marine Lifting Operations [Ref. 1].

1.8 Check lists are appended, to act as a guide to information required.

2 INTRODUCTION

2.1 SCOPE

2.1.1 This document refers to the transfer of a cargo onto a barge or vessel by horizontal movement or by lifting. including structures such as jackets, SPAR sections, modules, topside components and bridges. It contains general recommendations and checklists of information required to allow approval of such operations by GL Noble Denton.

2.1.2 The guidelines and calculation methods set out in this document represent the views of GL Noble Denton and are considered sound and in accordance with offshore industry practice. Operators should also consider national and local regulations, which may be more stringent.

2.1.3 Due to the wide range of loadout and loadin methods, this document cannot cover all aspects of every loadout or loadin scheme. Alternative proposals and methods will be considered on their own merits, and can be approved if they are shown to be in accordance with safe practice.

2.1.4 This document applies particularly to skidded and trailer transported floating loadouts, in tidal waters. The varying requirements for grounded loadouts, or loadouts accomplished by lifting are also included. Reference to a 'barge' includes a 'ship' or a 'vessel' as applicable.

2.1.5 For lifted loadouts, the factors to be applied to rigging arrangements, lift points and structure may be derived from the latest revision of GL Noble Denton document 0027/ND - Guidelines for Marine Lifting Operations [Ref. 1]. It should be noted that Ref. [1], although aimed primarily at offshore lifting operations, also includes methods and factors for lifts by floating cranes inshore, and for loadouts by shore-mounted cranes.

2.1.6 These guidelines are intended to lead to an approval by GL Noble Denton. Such approval does not imply that approval by designers, regulatory bodies and/or any other party would be given.

2.2 REVISIONS

2.2.1 Revision 2 dated 1 April 2002 superseded and replaced the previous Revision 1 dated 7 July 1993. Changes introduced in Revision 2 included:

- The inclusion of a Definitions Section
- Expansion of the Section on Limitation of Approval
- The introduction of the concept of classes of loadout, depending primarily on the tidal conditions
- Reference to the Draft ISO Standard on Weight Control
- Relaxation of under-keel clearance requirements.
- Expansion of the Section on Moorings
- Relationship of pumping requirements to the loadout class
- Relationship of propulsion, braking and pull-back system requirements to the loadout class
- Limited allowance of friction for temporary seafastenings
- Reformatting and Section renumbering as necessary.

2.2.2 Revision 3 superseded and replaced Revision 2. Changes included:

- Classes of loadout reduced from 6 classes to 5 (Sections 5, 12 and 14.7)
- Reference to the ISO weight control standard, to reflect the change from a Draft to a published Standard (Section 6.2)
- Introduction of stability considerations for floating barges (Section 8.2)
- Reference to GL Noble Denton's transportation guideline, for post-loadout stability (Section 8.2.2)
- Consideration of stability of hydraulic trailer systems (Section 13.2.2)
- Introduction of a new section on transverse loadouts (Section 16)
- Modifications to the loading definition and stress levels for barge movements following loadout (Section 17.2 and 17.4)
- Minor changes to the checklist of information required for approval (Appendix A)
- Deletion of the previous flow chart for lifted loadouts (previous Appendix B), which can be obtained from GL Noble Denton's Lifting guideline [Ref. 1].

2.2.3 Revision 4 superseded and replaced Revision 3. Changes included:

- Addition of Sections 1.2, 4.4.4, 4.5, 6.2.6 to 6.2.8, 10.9, 11.10 to 11.12, 13.1.4, 13.3, 14.11, 15.5, 16.6 and 16.7.
- Additions and revision to some Definitions.
- Minor text revisions (Sections 4.3.4, 6.1.2, 6.2.4, 7.1.1, 7.2.1, 8.2, 10.1, 10.6, 10.7, 13.2.3, 14.7 and 17.3).
- Change in the one third overload allowance in Sections 6.1.7 to 6.1.9.
- Addition of requirements for site moves and trailer path grading (Section 7.3).
- Skidway line and level documentation (Section 9.7) and Sections 9.8 and 9.9 added.
- Additional safety factor included for single line failure mooring cases (Sections 10.4 and 10.5).
- Additional requirements for lifted loadouts (Sections 15.2, 15.3, and 15.4).
- Addition of tug inspection (Section 18.3).
- Removal of Section 12.9 and the addition of an example for pumping system requirements in Section 12.9.

2.2.4 This Revision 5 supersedes and replaces Revision 4. Significant changes (indicated by a line in the right hand margin) include:

- Text in Sections 2.1.1 and 2.1.2 amended
- Definitions (Barge, Insurance Warranty, IACS, Loadout, NDT, Survey, Surveyor, Vessel, Weather Restricted Operation, and Weather Un-restricted Operations) in Section 3 revised.
- Text in Section 4.2.2 revised to state loadout.
- Link beam adequacy in Section 4.4.3.included.
- Skidway tolerances included in Section 6.1.5.
- 1% load cell accuracy deleted from Section 6.2.5.
- Class reinstatement added in Section 8.1.4 and Section 17.7 included.
- Grounding pad area and depth added to Section 11.1. 5
- Text added to Section 13.2.2 for stability of 3-point support.
- Text in Section 14.3 and Table 14-1 for Class 2 skidded loadout pull-back and braking, requirements changed from “Required” to “Recommended”. Slope changed to gradient.
- Weight and CoG tolerances included in Section 16.7.
- Requirements for weight reports and weighing enhanced in Section A.1.2.
- Link beam construction reports added in Section A.2.8.
- Reference to IACS for rigging added in Section A.8.4 and Section A.9.4.

2.3 DOWNLOADS

2.3.1 All GL Noble Denton Guidelines can be downloaded from www.gl-nobledenton.com.

3 DEFINITIONS

3.1 Referenced definitions are underlined.

Term or Acronym	Definition
Approval	The act, by the designated GL Noble Denton representative, of issuing a Certificate of Approval.
Barge	A non-propelled vessel commonly used to carry cargo or equipment. (For the purposes of this document, the term Barge can be considered to include Vessel or Ship where appropriate).
Certificate of Approval	The formal document issued by GL Noble Denton when, in its judgement and opinion, all reasonable checks, preparations and precautions have been taken, and an operation may proceed.
GL Noble Denton	Any company within the GL Noble Denton Group including any associated company which carries out the scope of work and issues a Certificate of Approval, or provides advice, recommendations or designs as a consultancy service.
Gradient	The maximum angle over the distance between supports that the loadout skidway, barge deck and/or trailer loadout path makes with the horizontal plane.
IACS	International Association of Classification Societies
Insurance Warranty	A clause in the insurance policy for a particular venture, requiring the assured to seek approval of a marine operation by a specified independent survey house.
Link beam/ linkspan	The connecting beam between the quay and the barge or vessel. It may provide a structural connection, or be intended solely to provide a smooth path for skidshoes or trailers /SPMTs.
Loadin	The transfer of a structure from a barge or vessel onto land by horizontal movement or by lifting.
Loadout	The transfer of a structure ~~from land~~ onto a barge or vessel by horizontal movement or by lifting.
Loadout, floating	A Loadout onto a floating barge or vessel.
Loadout Frame	A structural frame that supports the structure during fabrication and loadout and may support the structure on a barge/vessel to the site. May also be called a Module Support Frame (MSF).
Loadout, grounded	A Loadout onto a grounded barge or vessel.
Loadout, lifted	A Loadout performed by crane.
Loadout, skidded	A Loadout where the Structure is skidded, using a combination of skidways, skidshoes or runners, propelled by jacks or winches.
Loadout, trailer	A Loadout where the Structure is wheeled onto the barge or vessel using Trailers or SPMTs.
LRFD	Load Resistance Factor Design.
MHWS	Mean High Water on Spring Tides.
MLWS	Mean Low Water on Spring Tides.
MSF	Module Support Frame
NDT	Non Destructive Testing

Term or Acronym	Definition
Operational reference period	The planned duration of the operation, including a contingency period.
Seafastenings	The means of preventing movement of the loaded Structure on or within the barge, for in-harbour moves or offshore transport.
Site Move	An operation to move a structure or partially assembled structure in the yard from one location to another. The site move may precede a loadout if carried out as a separate operation or may form part of a loadout. The site move may be subject to approval if so desired.
Skidshoe	A bearing pad attached to the Structure which engages in the Skidway and carries a share of the vertical load.
Skidway	The lower continuous rails, either on the quay or on the barge, on which the Structure is loaded out, via the Skidshoes.
SLS	A design condition defined as a normal Serviceability Limit State / normal operating case.
SPMT	Self-Propelled Modular Transporter – a trailer system having its own integral propulsion, steering, jacking, control and power systems.
Structure	The object to be loaded out
Surge	A change in water level caused by meteorological conditions
Survey	Attendance and inspection by a GL Noble Denton representative.
Surveyor	The GL Noble Denton representative carrying out a Survey. An employee of the fabrication or loadout contractor or Classification Society performing, for instance, a dimensional, structural or Class survey.
Tidal Range	Where practicable, the tidal range referred to in this document is the predicted tidal range corrected by location specific tide readings obtained for a period of not less than one lunar cycle before the loadout operation.
Trailer	A system of steerable wheels, connected to a central spine beam by hydraulic suspension which can be raised or lowered. Trailer modules can be connected together and controlled as a single unit. Trailers generally have no integral propulsion system, and are propelled by tractors or winches. See also SPMT.
ULS	A design condition defined as Ultimate Limit State / survival storm case.
Vessel	A marine craft designed for the purpose of transportation by sea.
Weather restricted operation	A marine operation which can be completed within the limits of an operational reference period with a favourable weather forecast (generally less than 72 hours), taking contingencies into account. The design environmental condition need not reflect the statistical extremes for the area and season. A suitable factor should be applied between the design weather conditions and the operational weather limits.
Weather un-restricted operation	An operation with an operational reference period generally greater than 72 hours. The design environmental condition for such an operation shall be set in accordance with extreme statistical data.

4 THE APPROVAL PROCESS

4.1 GL NOBLE DENTON APPROVAL

4.1.1 GL Noble Denton means any company within the GL Noble Denton Group including any associated company which carries out the scope of work and issues a Certificate of Approval.

4.1.2 GL Noble Denton approval may be sought where an operation is the subject of an Insurance Warranty, or where an independent third party review is required.

4.1.3 An Insurance Warranty is a clause in the insurance policy for a particular venture, requiring the approval of a marine operation by a specified independent surveyor. The requirement is normally satisfied by the issue of a Certificate of Approval. Responsibility for interpreting the terms of the Warranty so that an appropriate Scope of Work can be defined rests with the Client.

4.2 CERTIFICATE OF APPROVAL

4.2.1 The deliverable of the approval process will generally be a Certificate of Approval.

4.2.2 The Certificate of Approval is the formal document issued by GL Noble Denton when, in its judgement and opinion, all reasonable checks, preparations and precautions have been taken, and the loadout/loadin operation may proceed. 5

4.2.3 The Certificate confirming adequate preparation for an operation will normally be issued immediately prior to the start of the operation, by the attending surveyor.

4.3 SCOPE OF WORK LEADING TO AN APPROVAL

4.3.1 In order to issue a Certificate of Approval for a loadout, GL Noble Denton will typically consider the topics and information listed in Appendix A.

4.3.2 Technical studies leading up to the issue of a Certificate of Approval may consist of reviews of procedures and calculations submitted by the client or his contractors, or independent analyses carried out by GL Noble Denton to verify the feasibility of the proposals, or a combination of third party reviews and independent analyses.

4.3.3 Surveys required typically include preliminary surveys of the barge, structure and site; attendance at loadout meetings; surveys of readiness to start loadout and witnessing of loadout operation.

4.3.4 Review of analyses and loadout manuals/procedures as required encompassing the items listed in Appendix A.

4.4 LIMITATION OF APPROVAL

4.4.1 A Certificate of Approval is issued for a particular loadout only.

4.4.2 A Certificate of Approval is issued based on external conditions observed by the attending surveyor of hull, machinery and equipment, without removal, exposure or testing of parts.

4.4.3 A Certificate of Approval for a loadout covers the marine operations involved in the loadout only. Loadout is normally deemed to start at the time when the structure is either moved from its construction support(s) or the structure first crosses the edge of the quay or linkbeam. It is normally deemed to be completed at the end of the marine operations forming part of the loadout, including set down on the barge, completion of required initial seafastening to turn the barge, and turning the barge back to the quay if carried out on the same tide as loadout. 5

4.4.4 A Certificate of Approval for a loadin covers the marine operations involved in the loadin only. Loadin is normally deemed to start at the time when the structure is moved from its barge grillage support(s), and all barge ballasting and mooring activities are complete. It is normally deemed to be completed at the end of the operations forming part of the loadin procedure, including set down on the shore supports.

4.4.5 Unless specifically included, a Certificate of Approval for loadout does not include any moorings of the barge or vessel following completion of loadout or loadin. If approval of moorings is required, other than for the loadout or loadin operation itself, then specific approval should be requested.

4.4.6 Any alterations to the surveyed items or agreed procedures after issue of the Certificate of Approval may render the Certificate invalid unless the changes are approved by GL Noble Denton in writing.

4.5 SAFETY DURING LOADOUT

4.5.1 During the loadout there will be a number of construction activities ongoing and hazards present for operations that will be carried out in a relatively short period of time. The Surveyor, and all others involved in loadout operations, should be aware of these hazards and participate in the fabrication yard safety culture that prevails. Some hazards are, but not limited to those listed below:

- Wires under tension
- Trip hazards, grease on decks and hydraulic oil leaks
- Openings in the barge deck
- High pressure hoses/equipment
- Temporary access bridges /scaffolding /wire hand railing
- Hot works
- Overside working
- Other shipping operations in the vicinity.

5 CLASSES OF LOADOUT

The loadout operation will be classed according to the tidal conditions. Requirements for design, reserves and redundancy of mechanical systems will vary according to the class of loadout.

Table 5-1 Loadout classes

Class	Tidal limitations
1	The tidal range is such that regardless of the pumping capacity provided, it is not possible to maintain the barge level with the quay throughout the full tidal cycle, and the loadout must be completed within a defined tidal window, generally on a rising tide.
2	The tidal range is such that whilst significant pumping capacity is required, it is possible to maintain the barge level with the quay during the full spring tidal cycle, and for at least 24 hours thereafter.
3	Tidal range is negligible or zero, and there are no tidal constraints on loadout. Pumping is required only to compensate for weight changes as the loadout proceeds.
4	Grounded loadout, with tidal range requiring pumping to maintain ground reaction and/or barge loading within acceptable limits.
5	Grounded loadout requiring no pumping to maintain ground reaction and/or barge loading within acceptable limits.

6 STRUCTURE TO BE LOADED

6.1 DESIGN

6.1.1 The item to be loaded, hereafter called the 'structure', shall be designed taking into account static and dynamic loads, support conditions, environmental loads and loads due to misalignment of the barge and shore skidways or uneven ballasting.

6.1.2 For skidded loadouts, analyses which account for the structure and skidway should be presented which consider the elasticity, alignment and as-built dimensions of the shore and barge skidways for each stage of loadout. In the absence of detailed information, a 75/25 percent distribution of load across either diagonal may be considered as appropriate.

6.1.3 For trailer or SPMT loadouts, the reactions imposed by the trailer configuration shall be considered.

6.1.4 For lifted loadouts, the structure, including the padeyes, shall be analysed for the loads and reactions imposed during the lift, as set out in Ref. [1].

6.1.5 The structure and supports shall be demonstrated as being capable of withstanding the subsidence of any single support with respect to the others by at least 25mm. 5

6.1.6 Consideration shall also be given to lifting off construction supports or onto seafastening supports where these operations form an integral part of the loadout operation.

6.1.7 The structural strength of high quality structural steelwork with full material certification and NDT certificates showing appropriate levels of inspection shall be assessed using the methodology of a recognised and applicable offshore design code including the associated load and resistance factors for LRFD codes or safety factors for ASD/WSD codes. Traditionally AISC has also been considered a reference code - see the Note in Section 6.1.9 below regarding its applicability.

6.1.8 Except as allowed by Section 17.4, all load cases shall be treated as a normal serviceability limit state (SLS) / Normal operating case.

6.1.9 The infrequent load cases covered by Section 17.4 may be treated as an ultimate limit state (ULS) / Survival storm case. This does not apply to:

- Steelwork subject to deterioration and/or limited initial NDT unless the condition of the entire loadpath has been verified, for example the underdeck members of a barge or ship.
- Steelwork subject to NDT prior to elapse of the recommended cooling and waiting time as defined by the Welding Procedure Specification (WPS) and NDT procedures. In cases where this cannot be avoided by means of a suitable WPS, it may be necessary to impose a reduction on the design/permissible seastate.
- Steelwork supporting sacrificial bumpers and guides.
- Spreader bars, lift points and primary steelwork of lifted items.
- Structures during a load-out.

Note:

If the AISC 13th Edition is used, the allowables shall be compared against member stresses determined using a load factor on both dead and live loads of no less than:

	WSD option	LRFD Option
SLS:	1.0	1.60
ULS:	0.75	1.20

6.2 WEIGHT CONTROL

6.2.1 Weight control shall be performed by means of a well defined, documented system, in accordance with current good practice, such as International Standard ISO 19901-5 – Petroleum and natural gas industries – specific requirements for offshore structures – Part 5: Weight control during engineering and construction [Ref 2].

6.2.2 Ref. [2] states (inter alia) that:

- "Class A (weight control) will apply if the project is weight- or CoG- sensitive for lifting and marine operations or during operation (with the addition of temporaries), or has many contractors with which to interface. Projects may also require this high definition if risk gives cause for concern".
- "Class B (weight control) shall apply to projects where the focus on weight and CoG is less critical for lifting and marine operations than for projects where Class A is applicable".
- "Class C (weight control) shall apply to projects where the requirements for weight and CoG data are not critical".

6.2.3 Unless it can be shown that a particular structure and specific loadout operation is not weight or CoG sensitive, then Class A weight control definition will be needed, as shown in Ref. [2], Section 4.2. If the 50/50 weight estimate as defined in Ref.. [2] is derived, then a reserve of not less than 5% shall be applied. The extremes of the CoG envelope shall be used.

6.2.4 A reserve of not less than 3% shall be applied to the final weighed weight.

6.2.5 If weighing takes place shortly before loadout, the effect on the loadout procedures of any weight changes shall be assessed, and the procedures modified if necessary. 5

6.2.6 Prior to any structure being weighed, a predicted weight and CoG report shall be issued, so that the weighed weight and CoG can immediately be compared with the predicted results.

6.2.7 Any items added after weighing shall be carefully monitored for weight and position to facilitate accurate calculation of a final loadout weight and centre of gravity.

6.2.8 A responsible engineer shall provide a statement verifying the adequacy of existing calculations and analyses following reconciliation with the weight and CoG values used in those analyses and the final derived weight values following weighing.

7 SITE AND QUAY

7.1 SITE CAPACITY

7.1.1 A statement shall be submitted showing the adequacy for the loadout of the quay, quay approaches, wall and foundations. This can be in the form of historical data.

7.1.2 A statement shall be submitted showing the capacity of all mooring bollards, winches and other attachments to be used for the loadout.

7.1.3 Compatibility between quay strength and elasticity, and the support conditions used for analysis of the structure, shall be demonstrated where appropriate.

7.2 MARINE ASPECTS

7.2.1 Bathymetric information for the area covered or crossed by the barge during loadout, post-loadout operations and sailaway shall be supplied. Underkeel clearance shall not normally be less than 1.0 m during the period for which the barge is in position for loadout. This may be relaxed to 0.5 m, subject to confidence in the lowest predicted water levels, and provided a check of the loadout area has been made by bar sweep, divers' inspection or side-scan survey sufficiently recently to represent actual conditions at the time of loadout. Where there is a risk of debris reducing underkeel clearance, a sweep shall be made immediately prior to the barge berthing to ensure that no debris exists that could damage the barge keel plating. The results of the sweep shall be confirmed by further soundings check around the barge perimeter after barge berthing.

7.2.2 For tidal loadouts, an easily readable tide gauge shall be provided adjacent to the loadout quay in such a location that it will not be obscured during any stage of the loadout operation. Where the tide level is critical, the correct datum should be established.

7.2.3 Port authority approval for the operation should be obtained, and control of marine traffic instituted, as required.

7.3 LOADOUT PATH

7.3.1 The loadout path shall be freshly graded prior to loadout, pot holes filled and compacted, debris removed and obstructions to the loadout path identified and removed.

7.3.2 Where a structure cannot be loaded out directly onto a barge or vessel without turning, turning radii shall be maximised where possible. For small turning radii, lateral supports /restraints shall be installed between the trailer and the structure /loadout frame /cribbage. It is possible that a site move may be part of the loadout operation.

8 BARGE

8.1 CLASS

8.1.1 The barge shall be classed by a recognised IACS Member. Alternatively, structural drawings and results of structural analyses shall be supplied to GL Noble Denton for review. Additional surveys may be required by GL Noble Denton.

8.1.2 The loads induced during loadout, including longitudinal bending, loads on internal structure and local loads, shall be checked to be within the approved design capabilities.

8.1.3 Mooring attachments and all attachments for jacking or winching shall be demonstrated to be adequate for the loads anticipated during or after loadout. See also Section 10.

8.1.4 Some loadout operations may temporarily invalidate the class or loadline certificate, and it will be necessary for any items temporarily removed for loadout be reinstated after loadout. This may apply if,
for instance, holes have been cut in the deck for ballasting, if towing connections have been removed 5
or, in some instances, after grounding on a pad. In such cases the vessel must be brought back into class prior to sailaway.

8.2 STABILITY

8.2.1 Barge stability shall be shown to be adequate throughout the loadout operation. Particular attention should be paid to:

- A loadout onto a barge with a small metacentric height, where an offset centre of gravity may induce a heel or trim as the structure transfer is completed – i.e. when any transverse moment ceases to be restrained by the shore skidways or trailers.
- A loadout where there is a significant friction force between the barge and the quay wall, contributed to by the reaction from the pull on system and the moorings. The friction may cause “hang-up” by resisting the heel or trim, until the pull-on reaction is released, or the friction force is overcome, whereupon a sudden change of heel or trim may result. (See also Section 14.5).
- Cases where a change of wind velocity may cause a significant change of heel or trim during the operation.

8.2.2 After the structure is fully on the barge, then stability should comply with the requirements of Ref. [3] and those of the flag state.

9 LINK BEAMS, SKIDWAYS AND SKIDSHOES

9.1 Documentation including a statement showing the strength of the skidways, link beams and skid shoes shall be submitted, demonstrating compatibility with the statements made and assumptions used for the structural analysis.

9.2 Link beams shall be checked for loads induced by barge moorings, barge movements and pull on/pull back forces.

9.3 Tolerances on link beam movement shall be shown to be suitable for anticipated movements of the barge during the operation.

9.4 Where a barge, because of tidal limitations, has to be turned within the loadout tidal window the design of the link beams shall be such that when the loaded unit is in its final position they are not trapped, i.e. they are free for removal.

9.5 Suitable lateral guides shall be provided along the full length of skidways.

9.6 Sufficient articulation or flexibility of skid shoes shall be provided to compensate for level and slope changes when crossing from shore to barge.

9.7 The line and level of the skidways and skidshoes shall be documented by dimensional control surveys and reports. The line and level shall be within the tolerances defined for the loadout operation and skidway/skidshoe design.

9.8 For floating loadouts care shall be taken to ensure that minimum friction exists between the barge and quay face. Where the quay has a rendered face, steel plates shall be installed in way of the barge fendering system.

9.9 The interface between the barge and barge fendering shall be liberally lubricated with a grease or other substitute which complies with local environmental rules.

10 MOORINGS

10.1 A loadout may normally be considered a weather restricted operation. Limiting weather conditions for the loadout operation shall be defined, taking into account:

- the forecast reliability for the area
- the duration of the operation including a suitable contingency period
- the exposure of the site
- the time required for any operations before or after the loadout operation including barge movements and moorings, ballasting, system testing, final positioning and initial seafastening
- currents during and following the operation, including blockage effects if applicable
- the wind area of the cargo and the barge/vessel.

10.2 For weather restricted operations, the maximum forecast operational criteria should be lower than the design criteria. As a guideline, a ratio of 0.8 for wind and 0.75 for wave height may be used to derive the operational criteria from the design criteria.

10.3 Moorings for the loadout operation shall be designed for the limiting weather as defined in Sections 10.1 and 10.2 above.

10.4 Wires, shackles, mooring furniture including bollards, chocks, cleats, clench plates, winch to deck anchoring arrangements and other steel components shall be designed to the certified safe working load where applicable, or to give a factor of safety of not less than 3.0 on the breaking load for moorings that do not consider a single mooring line failure scenario, and 2.2 where a single line mooring failure is considered. Where a safe working load cannot be determined (e.g. for bollards, chocks etc), then its adequacy shall be documented by calculations to either WSD of LRFD design principles based on the maximum expected loads.

10.5 Synthetic lines are generally not preferred for loadouts, being too elastic. If used, the factor of safety on breaking should be not less than 5.0 for moorings that do not consider a single mooring line failure scenario, and 4.5 where a single line mooring failure is considered. New ropes should be pre-stretched.

10.6 Mooring winches should be adequately designed, with structural capacity not less than that required by Section 10.4. If the mooring load is to be held on the winch brake, then the brake capacity, with the outer wrap on the drum, should exceed the mooring design load times by a minimum factor of 1.3. Where winches are used, tension monitoring devices/meters shall be used.

10.7 In cases where existing yard loadout mooring equipment is being used, wires and winches may sometimes be offered which have a breaking load greater than the barge equipment to which they are connected. Great care is needed in such situations, and the wire loadings should be controlled and monitored.

10.8 Mooring prior to and after loadout shall normally be considered an unrestricted operation. If approval is required for such moorings, they shall normally be designed to the 10 year return period storm for the area and season.

10.9 Safety factors in Sections 10.4 and 10.5 may be reduced on a case by case basis on the submission of risk mitigation measures, provision of standby tugs, restricted operations or rigorous mooring design calculations.

11 GROUNDED LOADOUTS

11.1 The plan area of the grounding pad with respect to the barge keel shall be of sufficient extent to ensure stability of the edges of the grounding pad. Geotechnical site investigation data shall be submitted together with geotechnical calculations demonstrating the capacity of the grounding pad. 5

11.2 A survey of levels over an area including the grounding pad shall be submitted, showing suitable support conditions for the barge.

11.3 A bar sweep or side-scan survey, supported by divers' inspection if appropriate, shall be made just before positioning the barge, to ensure that no debris exists which could damage the barge bottom plating.

11.4 If even support over the barge bottom plating cannot be achieved, then calculations shall be submitted showing that no overstress will occur.

11.5 The barge shall be ballasted to provide sufficient ground reaction to withstand the 10 year return period storm loadings, in both pre and post-loadout conditions, at mean high water spring tide and 10 year storm surge condition.

11.6 The barge should be positioned and ballasted onto the pad several tides before the loadout operation, to allow for consolidation and settlement. Barge levels should be monitored during this time.

11.7 Final skidway levels shall be compatible with assumptions used for structural analysis as in Sections 6.1.1 and 6.1.2.

11.8 The ballast shall be adjusted during loadout, if required, to avoid barge settlement or overstress.

11.9 A plan shall be prepared for the initial seafastening and float-off operation following completion of loadout.

11.10 Even when the barge is on the grounding pad, mooring lines between the barge and quayside shall be maintained.

11.11 Between loadout and sailaway, the barge keel shall be inspected, either by diver survey or internal tank inspection, in order to maintain the barge in class. Class surveyor attendance will be required.

11.12 The grounding pad elevation shall be defined based on the actual depth of the barge and not the moulded barge depth.

12 PUMPING AND BALLASTING

12.1 Pumping capacity shall be provided as follows, depending on the Class of loadout as defined in Section 5, and to satisfy each Condition as defined below:

Condition A: The nominal maximum pump capacity computed for the loadout as planned, to compensate for tidal changes and weight transfer, with no contingencies.

Condition B: The computed capacity required, as a contingency, to hold the barge level with the quay, at the maximum rate of a rising or falling tide, assuming horizontal movement of the structure is halted.

Condition C: The computed capacity required, as a contingency, to provide the requirements of either Condition A or Condition B, whichever is the greater, in the event of the failure of any one pump, component or pumping system. Where two or more pumps are supplied from a common power source, this shall count as a single system.

Table 12-1 Required Pump Capacity

Loadout Class	Condition	Pump capacity required, as a percentage of computed capacity
1 (Tidal window)	A	150%
	B	150%
	C	120%
2 (Constant deck level >24hrs)	A	150%
	B	120%
	C	100%
3 (Little tide)	A	100%
	B	No requirements
	C	75%
4 (Grounded + pumping)	A	120%
	B	120%
	C	100%
5 (Grounded)	All	No requirements

12.2 Pump capacity shall be based on the published pump performance curves, taking account of the maximum head for the operation, and pipeline losses.

12.3 If the barge pumping system is used as part of the main or back-up pump capacity, then a barge engineer familiar with the system shall be in attendance throughout the operation. The loadout communication system should include the pumproom.

12.4 All pumps and systems shall be tested and shown to be operational within 24 hours of the start of loadout. At the discretion of the GL Noble Denton surveyor, a verification of pump capacity may be required.

12.5 Pumps which require to be reversed in order to be considered as part of the back-up capacity shall be capable of such reversal within 10 minutes, and adequate resources shall be available to perform this operation.

12.6 Pumps which require to be moved around the barge in order to be considered as part of the back-up capacity, shall be easily transportable, and may only be so considered if free access is provided at all stages of loadout between the stations at which they may be required. Adequate resources shall be available to perform this operation.

12.7 Ballast and barge levels shall be monitored during loadout, and shown to be within the limits of movements of any link beams and the structural limitations of the barge and structure.

12.8 Where a barge, vessel or ship has a compressed air ballast/de-ballast system the time lag needed to pressurise or de-pressurise a tank should be taken into account, as should any limitations on differential pressure across a bulkhead.

12.9 The following table gives an example for a Class 2 Loadout that assumes that the worst single system failure reduces the pumping capacity to 80% of the full capacity (with any consistent units).

Table 12-2 Example of required pumping capacity calculation

Condition	Nominal capacity	Factor	Required capacity
A	1,000	150%	1,500
B	1,100	120%	1,320
C	1,100 (Condition B) / 80% = 1,375	100%	1,375
Required			1,500 (Condition A)

13 LOADOUTS BY TRAILERS, SPMTS OR HYDRAULIC SKID-SHOES

13.1 STRUCTURAL CAPACITY

13.1.1 Maximum axle loading shall be shown to be within the trailer manufacturer's recommended limits.

13.1.2 "Footprint" pressure on the quayside, linkbeam and barge deck shall be shown to be within the allowable values.

13.1.3 Shear force and bending moment curves shall be prepared for the trailer spine structure, and maximum values shall be shown to be within the manufacturer's allowable figures.

13.1.4 Linkspan bridge capacity shall be demonstrated by calculation and these calculations shall form part of the loadout procedure.

13.2 LOAD EQUALISATION & STABILITY

13.2.1 In general, hydraulic systems should be linked or balanced as a three point hydraulically linked system to provide a statically determinate support system thus minimising torsion on the structure. In any event the arrangement shall be compatible with the support assumptions considered for structural analysis of the structure being loaded out. A contingency plan shall be presented to cover potential hydraulic leakage or power pack failure.

13.2.2 Stability of the hydraulic system to resist overturning shall be shown to be adequate, particularly when a 3-point hydraulic linkage system is proposed. The centre of action of the structure CoG shall remain within the middle quarter of the trailer support base, taking into account any uncertainty in:

- the horizontal and vertical centre of gravity,
- the design wind,
- any inclination of the structure/trailer assembly on shore,
- the predicted inclination of the barge under the design wind,
- possible change of heel or trim due to release of hang-up between the barge and the quay, and
- any free surface liquids within the structure.

Note: Whilst a 3-point linkage system results in a determinate support system, a 3-point support system is generally less stable than a 4-point support system. Stability for both 3 point and 4 point support systems shall be documented. 5

13.2.3 Loadouts with high slender structures on narrow support bases, or offset from the barge centreline, shall be subject to special attention in terms of the effects of uncertainties in ballasting and de-ballasting.

13.3 VERTICAL ALIGNMENT

13.3.1 Vertical alignment of barge, linkbeam and quay, including the effects of any change of slope and any movement of the barge due to wave or swell action, should generally be within approximately one third of the maximum travel of the axles relative to the trailer spine.

13.4 SKIDSHOES

13.4.1 As appropriate, the requirements for trailers and SPMTs shall also apply to hydraulically operated skidshoes. The stability of hydraulic skidshoes transverse to their line of action shall be demonstrated to be adequate. Attention should be paid to the effects listed in Section 13.2.2.

14 PROPULSION SYSTEM DESIGN, REDUNDANCY AND BACK-UP

14.1 The propulsion system, including back-up and contingency systems shall be designed according to the Class of loadout as defined in Table 5-1, and as shown in Table 14-1 below. Requirements for skidded loadouts include propulsion by wire and winch, hydraulic jacks or stand jacks. Requirements for non-propelled trailer loadouts include propulsion by wire and winch or tractors.

14.2 "System redundancy" means that adequate back-up systems shall be provided such that the loadout can still proceed in the event of failure of any one mechanical component, hydraulic system, control system, prime mover or power source.

14.3 Where Table 14-1 states that a requirement is "recommended" and it is not planned to provide that requirement, a risk assessment shall be carried out, and the risks shown to be acceptable to the approving office. "Recommended" shall be taken to read "required" if a foreseeable failure could extend the operation outside the planned window. 5

14.4 Where a requirement is assumed to be "built-in", including reversibility of motion, it shall be demonstrated that this is indeed the case.

14.5 Where the propulsion method induces a reaction between the barge and the quay, then the possible effects of this reaction shall be considered, including "hang-up" and sudden release. (See also Sections 8.2.1 and 13.2.2). Mooring line tensions may also contribute to the reaction.

14.6 Where a pull back system is required, and is achieved by de-rigging and re-rigging the pull on system, then the time taken to achieve this shall be defined, taking into account the Class of loadout.

14.7 Propulsion system design shall be in accordance with the following table:

Table 14-1 Propulsion System Design

Class	Propulsion System Design Requirement	Skidded loadouts	Trailer loadouts		
			Non-propelled	SPMT	
1	Propulsion capacity	Actual Gradient +3%	Actual Gradient +3%	Actual Gradient +3%	
	System redundancy	Required	Required	Required	
	Braking system	Required	Built-in	Built-in	
	Pull back system	Required	Required	Built-in	
2	Propulsion capacity	Actual Gradient +2%	Actual Gradient +2%	Actual Gradient +2%	
	System redundancy	Recommended	Recommended	Recommended	
	Braking system	Required	Built-in	Built-in	5
	Pull back system	Recommended	Built in	Built-in	
3	Propulsion capacity	Actual Gradient +1%	Actual Gradient +1%	Actual Gradient +1%	
	System redundancy	Not required	Not required	Not required	
	Braking system	Required	Built-in	Built-in	
	Pull back system	Not required	Not required	Built-in	
4	Propulsion capacity	Actual Gradient	Actual Gradient	Actual Gradient	
	System redundancy	Not required	Not required	Not required	
	Braking system	Not required	Built-in	Built-in	
	Pull back system	Not required	Not required	Built-in	
5	Propulsion capacity	Actual Gradient	Actual Gradient	Actual Gradient	
	System redundancy	Not required	Not required	Not required	
	Braking system	Not required	Built-in	Built-in	
	Pull back system	Not required	Not required	Built-in	

Note: Where “recommended” is stated, and it is not planned to provide that requirement, a risk assessment shall be carried out, and the risks shown to be acceptable to the approving office. 5
“Recommended” shall be taken to read “required” if a foreseeable failure could extend the operation outside the planned window.

14.8 The coefficients of friction used for design of propulsion systems shall not be less than the "maximum" values shown in the following table, unless justification can be provided for a lower value. The "typical" values shown are for information only, and should be justified if used.

Table 14-2 Typical Friction Coefficients

Level surfaces	Static		Moving	
	Typical	Maximum	Typical	Maximum
Sliding				
Steel /steel	0.15	0.30	0.12	0.20
Steel /Teflon	0.12	0.25	0.05	0.10
Stainless steel /Teflon	0.10	0.20	0.05	0.07
Teflon /wood	0.14	0.25	0.06	0.08
Steel /waxed wood	0.10	0.20	0.06	0.12
Rolling				
Steel wheels /steel	0.01	0.02	0.01	0.02
Rubber tyres /steel	-	0.02	-	0.02
Rubber tyres /asphalt	-	0.03	-	0.03
Rubber tyres /gravel	0.03	0.04	0.03	0.04

14.9 The nominal computed load on winching systems shall not exceed the certified safe working load (SWL), after taking into account the requirements of Sections 14.7 and 14.8 and after allowance for splices, bending, sheave losses, wear and corrosion. If no certified SWL is available, the nominal computed load shall not exceed one third of the breaking load of any part of the system.

14.10 The winching system should normally be capable of moving the structure from fully on the shore to fully on the barge without re-rigging. If re-rigging cannot be avoided, then this should be included in the operational procedures, and adequate resources should be available.

14.11 For skidded loadouts the structure may be moved closer to the quay edge prior to the commencement of loadout.

15 LIFTED LOADOUTS

15.1 Where the structure is lifted onto the barge by shore-based or floating crane, the requirements of Ref [1] shall apply, as appropriate.

15.2 Loads imposed by shore-based mobile cranes on the quay shall be shown to be within allowable values, either by calculation or historical data.

15.3 Floating cranes shall be moored as required by Section 10. Thruster assistance may be used if available to augment the mooring arrangement following successful DP tests carried out immediately prior to loadout.

15.4 Where the offshore lifting padeyes are used for loadout, then a programme for inspection of the lift points after loadout shall be presented. As a minimum, inspection of the padeyes and their connection into the structure shall be carried out by a qualified NDT inspector in accordance with the original fabrication drawings. Access for this (including the possible de-rigging of the lift point) shall be provided as required. At the discretion of the attending surveyor, additional NDT inspections may be required.

15.5 If the offshore lift rigging is used for loadout then the rigging shall be inspected by a competent person prior to departure of the structure.

16 TRANSVERSE LOADOUTS

16.1 Loadouts where the Structure is moved transversely onto the barge require special consideration and care, for various, but not limited to, the following reasons:

- In nearly all cases the ballast plan must take account of additional parameters. Structure weight transfer, transverse heel, longitudinal trim and tidal level must all be considered.
- Friction between the side of the barge and the quay may be more critical than for an end-on loadout, as there may be a smaller righting moment available in heel than in trim to overcome this force. Snagging or hang-up can lead to the ballast operator getting out of synchronisation with the structure travel. Release of the snagging load has led to instability and failures.
- Stability may be more critical than for an end-on loadout and changes of heel may be significant. The moment to change the barge heel 1 degree should be computed and understood for all stages of loadout.

16.2 A risk assessment should be made of the effects of potential errors in ballasting, and of friction between the barge and the quay.

16.3 Calculations should be carried out for the full range of probable GM values, module weight and centre of gravity predicted during loadout.

16.4 Ideally, discrete ballast programmes should be prepared for tidal level, weight on barge, trim and heel corrections.

16.5 Where a winch or strand jack system is used to pull the structure onto the barge, the effects of the pulling force on the friction on the fenders should be considered.

16.6 For sliding surfaces between the barge and the quay, particular attention should be paid to lubrication and use of low friction or rolling fenders.

16.7 Ballasting calculations for transverse loadouts shall be based on the weighed weight and CoG and include load combinations addressing weight and CoG contingencies. 5

17 BARGE REINSTATEMENT AND SEAFASTENINGS

17.1 Seafastening work shall be started as soon as possible after positioning the structure on the barge.

17.2 No movement of the barge shall take place until sufficient seafastening is completed to withstand the greatest of:

a. an inclination equivalent to a horizontal force of 0.1 x structure weight, or

b. the inclination caused by damage to any one compartment of the barge, or

c. the direct wind loading, and inclination due to the design wind.

Inclination loadings shall be applied at the structure centre of gravity; direct wind load shall be applied at the structure centre of area.

17.3 In specific circumstances where very limited barge movements may be required, e.g. turning from end-on to alongside the quay before it is practical to install seafastenings fully in accordance with Section 17.2, then friction may be allowed to contribute to the seafastenings, provided that it forms part of a design loadcase. Design and condition of the actual supporting structure, and potential sliding surfaces, at the time of movement, must be taken into account. The possibility of contaminants such as grease, water or sand, which may reduce the friction between the sliding surfaces, should be assessed.

17.4 The greatest of the loadings shown in Section 17.2 may be considered to be an extreme loading, and the seafastening strength assessed as an ultimate limit state ULS / Survival storm case, as described in Sections 6.1.7 to 6.1.9.

17.5 Approval of barge movements in any case shall be subject to the specific approval of the attending surveyor, after consideration of the procedures for moving the barge, the state of completion of the seafastenings and the weather and tidal conditions for the movement.

17.6 All manhole covers shall be replaced as soon as practical after loadout.

17.7 Any holes cut for ballasting purposes shall be closed as soon as practical and the barge certification and class reinstated before sailaway. 5

17.8 Final seafastening connections should be made with the barge ballast condition as close as practical to the transport condition.

18 TUGS

18.1 Approved tugs shall be available or in attendance as required, for barge movements, removal of the barge from the loadout berth in the event of deteriorating weather, or tug back-up to the moorings.

18.2 Towing operations following loadout should generally be in accordance with GL Noble Denton document 0030/ND - Guidelines for Marine Transportations Ref. [3].

18.3 If tugs are used as part of the loadout, inspections shall be carried out as part of the approval, i.e. for communications and adequacy. Tug inspections shall be carried out at least 12 hours prior to the start of operations.

19 MANAGEMENT AND ORGANISATION

19.1 Sufficient management and resources shall be provided to carry out the operation efficiently and safely.

19.2 Quality, safety and environmental hazards shall be managed by a formal Quality Management System.

19.3 The management structure, including reporting and communication systems, and links to safety and emergency services should be demonstrated.

19.4 Shift changes shall be avoided at critical stages of loadout.

19.5 A readiness meeting should be held shortly before the start of loadout, attended by all involved parties.

19.6 A weather forecast from an approved source, predicting that conditions will be within the prescribed limits, shall be received not less that 48 hours prior to the start of the operation, and at 12 hourly intervals thereafter, or more frequently if appropriate, until the barge is moored in accordance with Section 10.8 and the seafastening is completed in accordance with Section 17.2.

19.7 Fit-for-purpose safety procedures shall be in effect.

REFERENCES

[1] GL Noble Denton Report No. 0027/ND – Guidelines for Marine Lifting Operations.

[2] ISO International Standard ISO 19901-5 – Petroleum and natural gas industries – specific requirements for offshore structures – Part 5: Weight control during engineering and construction.

[3] GL Noble Denton Report No. 0030/ND – Guidelines for Marine Transportations.

All GL Noble Denton Guidelines can be downloaded from www.gl-nobledenton.com

APPENDIX A - CHECK LIST OF INFORMATION REQUIRED FOR APPROVAL

A.1 STRUCTURE

A.1.1 Structural analysis report, including:

- Structural drawings including any additional loadout steelwork
- Description of analyses programs used
- Structural model
- Description of support conditions
- Loadcases including derivation of weights and contingencies
- Unity checks greater than 0.8
- Justification of over-stressed members
- Detailed checks on structure support points, padeyes, winch connection points
- Proposals for reinforcements if required.

A.1.2 Weight report for structure (including results of weighing operation and load cell calibration certificates). 5

A.2 SITE

A.2.1 Site plan, showing loadout quay, position of structure, route to quay edge if applicable, position of all mooring bollards and winches and any reinforced areas with allowable bearing capacities.

A.2.2 Section through quay wall.

A.2.3 Drawing showing heights above datum of quay approaches, structure support points, barge, linkbeams, pad (if applicable) and water levels. The differential between civil and bathymetric datums shall be clearly shown.

A.2.4 Statement of maximum allowable loadings on quay, quay approaches, wall, grounding pads and foundations.

A.2.5 Specification and capacity of all mooring bollards and other attachment points proposed.

A.2.6 Bathymetric survey report of area adjacent to the quay and passage to deep water, related to same datum as item A.2.3.

A.2.7 Bathymetric survey of pad, for grounded loadouts, related to the same datum as item A.2.3.

A.2.8 Structural drawings of skidways and link beams, with statement of structural capacity, construction (material and NDT reports) and supporting calculations. 5

A.2.9 Method of fendering between barge and quay, showing any sliding or rolling surfaces and their lubrication.

A.3 BARGE

A.3.1 General arrangement and compartmentation drawings.

A.3.2 Hydrostatic tables and tank tables.

A.3.3 Details of class.

A.3.4 Static stability at all stages of loadout.

A.3.5 Allowable deck loadings and skidway loadings if applicable.

A.3.6 Specification and capacity of all mooring bollards.

A.3.7 Details of any additional steelwork such as grillages or winch attachments.

A.3.8 Details of barge pumping system.

A.4 TRAILERS

A.4.1 Trailer specification and configuration.

A.4.2 Details of any additional supporting steelwork, including linkspan bridges and attachments.

A.4.3 Allowable and actual axle loadings.

A.4.4 Allowable and actual spine bending moments and shear forces.

A.4.5 Schematic of hydraulic interconnections.

A.4.6 Statement of hydraulic stability of trailer or SPMT system, with supporting calculations.

A.4.7 For SPMTs, details of propulsion axles and justification of propulsion capacity.

A.4.8 Specifications of tractors if used.

A.5 PUMPS

A.5.1 Specification and layout of all pumps, including back-up pumps.

A.5.2 Pipe schematic, and details of manifolds and valves where applicable.

A.5.3 Pump performance curves.

A.6 JACKING AND/OR WINCHING

A.6.1 Jack/winch specification.

A.6.2 Layout of pull-on system.

A.6.3 Layout of pull-back and braking systems.

A.6.4 Details of power sources and back-up equipment.

A.6.5 Calculations showing friction coefficient, allowances for bending and sheaves, loads on attachment points and safety factors.

A.6.6 Reactions induced between barge and quay.

A.7 BALLAST CALCULATIONS

A.7.1 Planned date, time and duration of loadout, with alternative dates, tidal limitations and windows.

A.7.2 Ballast calculations for each stage showing:

- Time
- Tidal level
- Structure position
- Weight on quay, linkbeam and barge
- Ballast distribution
- Barge draft, trim and heel
- Pumps in use, and pump rates required
- Moment to change heel and trim.

A.7.3 Stages to be considered should include as a minimum:

- Start condition with structure entirely on shore
- A suitable number of intermediate steps, e.g. 25%, 50% and 75% of travel, steps of 5 axles, or half jacket node spacing, whichever is appropriate
- 100% of weight on barge
- Any subsequent movements on barge up to the final position.

A.7.4 Any stages requiring movement or reconnection of pumps shall be defined.

A.8 LIFTED LOADOUTS

A.8.1 Crane specification, including load-radius curve.

A.8.2 Copy of crane certification.

A.8.3 Slinging arrangement.

A.8.4 Copy of certificates of slings, shackles and other equipment. This certificate shall be issued or endorsed by a body approved by an IACS member or other recognised certification body accepted by 5
GL Noble Denton.For mobile cranes, position of crane at pick-up and set-down, travel route if applicable, actual and allowable ground bearing pressures at all locations.

A.8.5 Non-destructive testing report of lifting attachments and connection into structure.

A.8.6 Mooring arrangements and thruster specification for floating cranes.

A.8.7 If the lift points and offshore lift rigging will be re-used offshore, proposals for inspection after loadout.

A.8.8 Rigging calculations.

A.9 MOORINGS

A.9.1 Limiting design and operational weather conditions for loadout.

A.9.2 Mooring arrangements for loadout operation and post-loadout condition.

A.9.3 Mooring design calculations showing environmental loads, line tensions and attachment point loads for limiting weather condition for loadout, and for post-loadout moorings if applicable.

A.9.4 Specification and certificates of all wires, ropes, shackles, fittings and chains. This certificate shall be issued or endorsed by a body approved by an IACS member or other recognised certification body 5
accepted by GL Noble Denton.

A.9.5 Specification for winches, details and design of winch foundation/securing arrangements.

A.9.6 Details of fendering including lubrication arrangements as appropriate.

A.10 TUGS

A.10.1 Details of any supporting tugs including bollard pull and towing equipment.

A.11 MANAGEMENT

A.11.1 Organogram showing management structure and responsibilities.

A.11.2 Location of key personnel.

A.11.3 Details of manning levels, showing adequate coverage for all operations and emergency procedures.

A.11.4 Times of shift changes, if applicable.

A.11.5 Weather forecast arrangements.

A.11.6 Communications.

A.11.7 Adequate lighting for all critical areas.

A.11.8 Operation bar-chart showing time and duration of all critical activities including:

- Mobilisation of equipment
- Testing of pumps and winches
- Testing of pull-on and pull-back systems
- Barge movements
- Initial ballasting
- Structure movements
- Loadout operation
- Trailer removal
- Seafastening
- Re-mooring
- Decision points.

A.11.9 Methods of monitoring barge level and trim, and ballast quantities, including consideration of hang-up between barge and quay.

A.11.10 If a computerised ballast control system is to be used, a description of the system, with back-up arrangements, should be supplied.

A.11.11 Time and place for progress and decision meetings.

A.11.12 Safety procedures.

A.11.13 HAZOPs, HAZIDs and Risk Assessments,

A.12 CONTINGENCIES

A.12.1 Contingency plans shall be presented for all eventualities, including as appropriate:

- Pump failure
- Mains power supply failure
- Jack-winch failure
- Trailer/skidshoe power pack failure
- Trailer/skidshoe hydraulics failure
- Trailer tyre failure
- Tractor failure
- Failure of any computerised control or monitoring system
- Mooring system failure
- Structural failure
- Deteriorating weather.