



Rules for the Classification of Self-Elevating Units - Jack-ups and Liftboats

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**Rule Note
NR 534 DT R01 E**

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MARINE & OFFSHORE DIVISION

GENERAL CONDITIONS

ARTICLE 1

1.1. - BUREAU VERITAS is a Society the purpose of whose Marine & Offshore Division (the "Society") is the classification ("Classification") of any ship or vessel or offshore unit or structure of any type or part of it or system therein collectively hereinafter referred to as a "Unit" whether linked to shore, river bed or sea bed or not, whether operated or located at sea or in inland waters or partly on land, including submarines, hovercrafts, drilling rigs, offshore installations of any type and of any purpose, their related and ancillary equipment, subsea or not, such as well head and pipelines, mooring legs and mooring points or otherwise as decided by the Society.

The Society:

- "prepares and publishes Rules for classification, Guidance Notes and other documents ("Rules");
- "issues Certificates, Attestations and Reports following its interventions ("Certificates");
- "publishes Registers.

1.2. - The Society also participates in the application of National and International Regulations or Standards, in particular by delegation from different Governments. Those activities are hereafter collectively referred to as "Certification".

1.3. - The Society can also provide services related to Classification and Certification such as ship and company safety management certification; ship and port security certification, training activities; all activities and duties incidental thereto such as documentation on any supporting means, software, instrumentation, measurements, tests and trials on board.

1.4. - The interventions mentioned in 1.1., 1.2. and 1.3. are referred to as "Services". The party and/or its representative requesting the services is hereinafter referred to as the "Client". The Services are prepared and carried out on the assumption that the Clients are aware of the International Maritime and/or Offshore Industry (the "Industry") practices.

1.5. - The Society is neither and may not be considered as an Underwriter, Broker in ship's sale or chartering, Expert in Unit's valuation, Consulting Engineer, Controller, Naval Architect, Manufacturer, Ship-builder, Repair yard, Charterer or Shipowner who are not relieved of any of their expressed or implied obligations by the interventions of the Society.

ARTICLE 2

2.1. - Classification is the appraisal given by the Society for its Client, at a certain date, following surveys by its Surveyors along the lines specified in Articles 3 and 4 hereafter on the level of compliance of a Unit to its Rules or part of them. This appraisal is represented by a class entered on the Certificates and periodically transcribed in the Society's Register.

2.2. - Certification is carried out by the Society along the same lines as set out in Articles 3 and 4 hereafter and with reference to the applicable National and International Regulations or Standards.

2.3. - It is incumbent upon the Client to maintain the condition of the Unit after surveys, to present the Unit for surveys and to inform the Society without delay of circumstances which may affect the given appraisal or cause to modify its scope.

2.4. - The Client is to give to the Society all access and information necessary for the safe and efficient performance of the requested Services. The Client is the sole responsible for the conditions of presentation of the Unit for tests, trials and surveys and the conditions under which tests and trials are carried out.

ARTICLE 3

3.1. - The Rules, procedures and instructions of the Society take into account at the date of their preparation the state of currently available and proven technical knowledge of the Industry. They are a collection of minimum requirements but not a standard or a code of construction neither a guide for maintenance, a safety handbook or a guide of professional practices, all of which are assumed to be known in detail and carefully followed at all times by the Client.

Committees consisting of personalities from the Industry contribute to the development of those documents.

3.2. - The Society only is qualified to apply its Rules and to interpret them. Any reference to them has no effect unless it involves the Society's intervention.

3.3. - The Services of the Society are carried out by professional Surveyors according to the applicable Rules and to the Code of Ethics of the Society. Surveyors have authority to decide locally on matters related to classification and certification of the Units, unless the Rules provide otherwise.

3.4. - The operations of the Society in providing its Services are exclusively conducted by way of random inspections and do not in any circumstances involve monitoring or exhaustive verification.

ARTICLE 4

4.1. - The Society, acting by reference to its Rules:

- "reviews the construction arrangements of the Units as shown on the documents presented by the Client;
- "conducts surveys at the place of their construction;
- "classes Units and enters their class in its Register;
- "surveys periodically the Units in service to note that the requirements for the maintenance of class are met.

The Client is to inform the Society without delay of circumstances which may cause the date or the extent of the surveys to be changed.

ARTICLE 5

5.1. - The Society acts as a provider of services. This cannot be construed as an obligation bearing on the Society to obtain a result or as a warranty.

5.2. - The certificates issued by the Society pursuant to 5.1. here above are a statement on the level of compliance of the Unit to its Rules or to the documents of reference for the Services provided for. In particular, the Society does not engage in any work relating to the design, building, production or repair checks, neither in the operation of the Units or in their trade, neither in any advisory services, and cannot be held liable on those accounts. Its certificates cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or of its value for sale, insurance or chartering.

5.3. - The Society does not declare the acceptance or commissioning of a Unit, nor of its construction in conformity with its design, that being the exclusive responsibility of its owner or builder.

5.4. - The Services of the Society cannot create any obligation bearing on the Society or constitute any warranty of proper operation, beyond any representation set forth in the Rules, of any Unit, equipment or machinery, computer software of any sort or other comparable concepts that has been subject to any survey by the Society.

ARTICLE 6

6.1. - The Society accepts no responsibility for the use of information related to its Services which was not provided for the purpose by the Society or with its assistance.

6.2. - If the Services of the Society or their omission cause to the Client a damage which is proved to be the direct and reasonably foreseeable consequence of an error or omission of the Society, its liability towards the Client is limited to ten times the amount of fee paid for the Service having caused the damage, provided however that this limit shall be subject to a minimum of eight thousand (8,000) Euro, and to a maximum which is the greater of eight hundred thousand (800,000) Euro and one and a half times the above mentioned fee. These limits apply regardless of fault including breach of contract, breach of warranty, tort, strict liability, breach of statute, etc.

The Society bears no liability for indirect or consequential loss whether arising naturally or not as a consequence of the Services or their omission such as loss of revenue, loss of profit, loss of production, loss relative to other contracts and indemnities for termination of other agreements.

6.3. - All claims are to be presented to the Society in writing within three months of the date when the Services were supplied or (if later) the date when the events which are relied on were first known to the Client, and any claim which is not so presented shall be deemed waived and absolutely barred. Time is to be interrupted thereafter with the same periodicity.

ARTICLE 7

7.1. - Requests for Services are to be in writing.

7.2. - Either the Client or the Society can terminate as of right the requested Services after giving the other party thirty days' written notice, for convenience, and without prejudice to the provisions in Article 8 hereunder.

7.3. - The class granted to the concerned Units and the previously issued certificates remain valid until the date of effect of the notice issued according to 7.2. here above subject to compliance with 2.3. here above and Article 8 hereunder.

7.4. - The contract for classification and/or certification of a Unit cannot be transferred neither assigned.

ARTICLE 8

8.1. - The Services of the Society, whether completed or not, involve, for the part carried out, the payment of fee upon receipt of the invoice and the reimbursement of the expenses incurred.

8.2. - Overdue amounts are increased as of right by interest in accordance with the applicable legislation.

8.3. - The class of a Unit may be suspended in the event of non-payment of fee after a first unfruitful notification to pay.

ARTICLE 9

9.1. - The documents and data provided to or prepared by the Society for its Services, and the information available to the Society, are treated as confidential. However:

- "Clients have access to the data they have provided to the Society and, during the period of classification of the Unit for them, to the classification file consisting of survey reports and certificates which have been prepared at any time by the Society for the classification of the Unit ;
- "copy of the documents made available for the classification of the Unit and of available survey reports can be handed over to another Classification Society, where appropriate, in case of the Unit's transfer of class;
- "the data relative to the evolution of the Register, to the class suspension and to the survey status of the Units, as well as general technical information related to hull and equipment damages, may be passed on to IACS (International Association of Classification Societies) according to the association working rules;
- "the certificates, documents and information relative to the Units classed with the Society may be reviewed during certifying bodies audits and are disclosed upon order of the concerned governmental or inter-governmental authorities or of a Court having jurisdiction.

The documents and data are subject to a file management plan.

ARTICLE 10

10.1. - Any delay or shortcoming in the performance of its Services by the Society arising from an event not reasonably foreseeable by or beyond the control of the Society shall be deemed not to be a breach of contract.

ARTICLE 11

11.1. - In case of diverging opinions during surveys between the Client and the Society's surveyor, the Society may designate another of its surveyors at the request of the Client.

11.2. - Disagreements of a technical nature between the Client and the Society can be submitted by the Society to the advice of its Marine Advisory Committee.

ARTICLE 12

12.1. - Disputes over the Services carried out by delegation of Governments are assessed within the framework of the applicable agreements with the States, international Conventions and national rules.

12.2. - Disputes arising out of the payment of the Society's invoices by the Client are submitted to the Court of Nanterre, France, or to another Court as deemed fit by the Society.

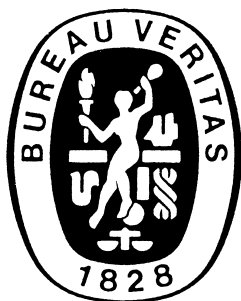
12.3. - Other disputes over the present General Conditions or over the Services of the Society are exclusively submitted to arbitration, by three arbitrators, in London according to the Arbitration Act 1996 or any statutory modification or re-enactment thereof. The contract between the Society and the Client shall be governed by English law.

ARTICLE 13

13.1. - These General Conditions constitute the sole contractual obligations binding together the Society and the Client, to the exclusion of all other representation, statements, terms, conditions whether express or implied. They may be varied in writing by mutual agreement. They are not varied by any purchase order or other document of the Client serving similar purpose.

13.2. - The invalidity of one or more stipulations of the present General Conditions does not affect the validity of the remaining provisions.

13.3. - The definitions herein take precedence over any definitions serving the same purpose which may appear in other documents issued by the Society.



RULE NOTE NR 534

NR 534

Rules for the Classification of Self-Elevating Units - Jack-ups and Liftboats

SECTION 1	GENERAL
SECTION 2	STRUCTURE DESIGN PRINCIPLES
SECTION 3	DESIGN CONDITIONS
SECTION 4	ENVIRONMENTAL CONDITIONS
SECTION 5	ANALYSIS IN ELEVATED POSITION
SECTION 6	ANALYSIS IN TRANSIT AND INSTALLATION CONDITIONS
SECTION 7	STRENGTH OF LEGS
SECTION 8	EQUIPMENT, APPURTENANCES AND OUTFITTINGS
SECTION 9	CONSTRUCTION SURVEY - WELDING - TESTS AND TRIALS
SECTION 10	JACKING SYSTEM
APPENDIX 1	HYDRODYNAMIC ANALYSIS OF SELF-ELEVATING UNITS IN FLOATING CONDITION

Section 1 **General**

1	General	9
1.1	Application	
1.2	Scope	
1.3	Class notations	
2	Classification principles	10
2.1	General provision	
2.2	Scope of classification	
2.3	Classification limits	
2.4	Classification restrictions	
2.5	Design Criteria Statement	
2.6	Design life	
2.7	Operating Manual	
3	Statutory requirements	11
3.1	General	
3.2	Project specification	
3.3	Conflict of Rules	
4	Definitions	11
4.1	Referenced documents	
4.2	Self-elevating unit	
4.3	Modes of operation	
4.4	Water levels, crest elevation and water depth	
4.5	Configuration of a self-elevating unit in elevated position	
4.6	Configuration of a self-elevating unit in floating position	
5	Documents to be submitted	13
5.1	General	
5.2	Additional information for plan review purposes	
6	Applicable rules	15
6.1	General	
7	Reference co-ordinate system	15
7.1	Hull	

Section 2 **Structure Design Principles**

1	Steel grade and structural categories	16
1.1	Material strength	
1.2	Steel grade selection	
1.3	Structural categories	
1.4	Steels with specified through-thickness properties	
1.5	Corrosion allowances	
2	Structural principles	18
2.1	Accessibility for inspection during service	
2.2	General construction	
2.3	Plating	

- 2.4 Ordinary stiffeners
- 2.5 Primary supporting members
- 2.6 Leghouse
- 2.7 Legs
- 2.8 Spudcans and bottom mat
- 2.9 Superstructures and deckhouses
- 2.10 Reinforcements in way of supporting structures for hull attachments

Section 3 Design Conditions

1	General	22
	1.1 Definition	
	1.2 Modes of operation and accidental conditions	
2	Self-elevating unit in elevated position	23
	2.1 Calculation methodology	
	2.2 Loading conditions	
3	Self-elevating unit in transit conditions	23
	3.1 Design considerations for hull structure	
	3.2 Design considerations for legs and leg/hull connection	
	3.3 Dry tow transit	
4	Installation / retrieval design conditions	24
	4.1 Leg impact	
	4.2 Preloading condition	

Section 4 Environmental Conditions

1	General	25
	1.1 Application	
	1.2 References	
	1.3 Environmental data	
	1.4 Environmental load	
	1.5 Documentation to be submitted	
2	Waves	25
	2.1 General	
	2.2 Design wave approach	
	2.3 Random/stochastic wave approach	
3	Wind	26
	3.1 Wind specification	
4	Current	27
	4.1 Current specification	
5	Water depth and tides	27
	5.1 Water depth and tide specification	
6	Design temperatures	27
	6.1 Air temperature	
	6.2 Water temperature	

7	Marine growth	27
7.1	Marine growth specification	
8	Soil	27
8.1	General	

Section 5 Analysis in Elevated Position

1	General	28
1.1	Application	
1.2	Reference	
1.3	Calculation procedures	
1.4	Definitions	
2	Structural modelling	28
2.1	General	
2.2	Hull modelling	
2.3	Leg modelling	
2.4	Leg/hull connection modelling	
2.5	Boundary conditions	
3	Hydrodynamic modelling	30
3.1	Marine growth	
3.2	Drag and inertia coefficients	
4	Loads and load effects	30
4.1	Fixed and operational loads	
4.2	Leg inclination	
4.3	Wind loads	
4.4	Hydrodynamic loads	
4.5	Dynamic amplification loads	
4.6	$P - \Delta$ and Euler effect	
5	Loading conditions and load combinations	35
5.1	Loading conditions	
5.2	Load cases	
5.3	Load combinations	
6	Resistance assessment	36
6.1	Air gap	
6.2	Leg length reserve	
6.3	Overturning stability	
6.4	Structural strength in elevated position	
6.5	Fatigue analysis	

Section 6 Analysis in Transit and Installation Conditions

1	General	41
1.1	Application	
1.2	Material	

2	Stability	42
2.1	General	
3	Structure elements to be checked	42
3.1	General	
3.2	Leg structure	
3.3	Leg/hull connections	
3.4	Hull structure	
4	Application of the loads in transit condition	43
4.1	General	
4.2	Forces and moments for leg examination	
4.3	Forces and moments for leg/hull connection examination	
4.4	Sea and internal pressure loads for small and non-rectangular units	
4.5	Sea pressure loads for spudcan and bottom mat in transit condition	
5	Application of the loads in installation condition	46
5.1	General	
5.2	Forces and moments for leg examination	
5.3	Forces and moments for leg/hull connection examination	
6	Hull scantlings for small units	47
6.1	General	
6.2	Plating	
6.3	Ordinary stiffeners	
6.4	Primary supporting members	
6.5	Reinforcement of the flat bottom forward area	
7	Other structures	48
7.1	Superstructures and deckhouses	
7.2	Spudcan and bottom mat scantlings	

Section 7 Strength of Legs

1	General	49
1.1	Purpose	
1.2	References	
1.3	Stress factor	
1.4	Convention	
2	Cylindrical and rectangular hollow section legs	50
2.1	General	
2.2	Yielding	
2.3	Overall buckling	
2.4	Curved shell plating of cylindrical legs	
2.5	Straight shell plating of rectangular hollow section legs	
2.6	Ordinary stiffeners subjected to lateral pressure and axial compressive stress	
2.7	Horizontal ring stringers of cylindrical legs	
3	Lattice legs	53
3.1	Methodology	
3.2	Actual stresses for chords and bracings	
3.3	Allowable stresses for chords and bracings	
3.4	Checking criteria for chords and bracings	

4	Additional local analysis	56
4.1	General	
4.2	Stress criteria	
4.3	Fatigue	
4.4	Spudcans and bottom mat	
4.5	Local punching	

Section 8 Equipment, Appurtenances and Outfittings

1	Supports for hull attachments and appurtenances	58
1.1	General	
1.2	Structural strength	
1.3	Calculations	
2	Crane connections	58
2.1	Rules to be applied	
3	Superstructures and deckhouses	58
3.1	General	
4	Helicopter deck	59
4.1	Reference standards	
4.2	Structure	
5	Hull outfitting	59
5.1	Bulwarks and guardrails	
5.2	Shipboard fittings	
5.3	Towing equipment	
6	Launching appliances	59
6.1	Launching appliances used for survival craft or rescue boat	

Section 9 Construction Survey - Welding - Tests and Trials

1	Construction survey	60
1.1	General	
2	Welding and weld connections	60
2.1	Reference	
2.2	General	
2.3	Weld category	
2.4	Weld types	
2.5	Post welded treatment	
2.6	Hull	
2.7	Other structures	
3	Tests and trials	61
3.1	Strength and watertightness testing	
3.2	Jacking systems	
3.3	Preloading test	

Section 10 Jacking System

1	General	62
1.1	Scope	
1.2	Application	
1.3	Documentation to be submitted	
1.4	Design and construction	
1.5	Holding capacity	
2	Piping systems	63
2.1	Definition	
2.2	Symbols and units	
2.3	Design and construction	
2.4	Welding of steel piping	
2.5	Arrangement and installation of piping systems	
2.6	Certification, inspection and testing of piping systems	
3	Hydraulic systems	67
3.1	General	
3.2	Documentation to be submitted	
3.3	General design	
3.4	Design of hydraulic pumps and accessories	
3.5	Design of hydraulic tanks and other components	
3.6	Hydraulic cylinders	
3.7	Control and monitoring	
3.8	Inspection and testing	
4	Electrical systems	70
4.1	Generality	
4.2	Jacking gear motors and motor controller	
4.3	Testing on board	

Appendix 1 Hydrodynamic Analysis of Self-Elevating Units in Floating Condition

1	General	71
1.1	Principle	
2	Modelling principles	71
2.1	Environmental data	
2.2	Hydrodynamic model	
2.3	Loading conditions	
2.4	Sensitivity analysis	
3	Floating unit responses	71
3.1	Response amplitude operators (RAOs)	
3.2	Hull girder loads, motions and accelerations	

Symbols

E	: Young modulus, in N/mm ² , to be taken equal to 2,06 10 ⁵ N/mm ² for steel	A	: Cross-sectional area of the leg, in cm ² . Formulae given in Sec 2, Tab 2 may be applied if relevant
R _f	: Reference stress of the material, in N/mm ² , as defined in Sec 2, [1.1.1]	I	: Minimum moment of inertia of the leg, in cm ⁴ , about its principal axis. Formulae given in Sec 2, Tab 2 may be applied if relevant
ℓ	: Span of the leg, in m, defined as follows: • hull in elevated position: length of the leg between the bottom of the spudcan / footing mat and either the lower guide or the center of the locking mechanism if any • transit condition: length of the leg between the upper guide and the top of the leg • installation condition (leg impact): length of the leg from the bottom of the spudcan / footing mat to the lower guide	s	: Spacing of ordinary stiffeners or length of the shorter side of the plate panel, in m
		ℓ _s	: Span, in m, of ordinary stiffeners, measured between the primary supporting members
		H _{max}	: Maximum wave height, in m
		T _{ass}	: Associated period to H _{max} , in s
		g	: Gravity acceleration taken equal to 9,81 m/s ² .

SECTION 1GENERAL

1 General

1.1 Application

1.1.1 The present Rule Note provides requirements for the classification of the self-elevating units, such as jack-up units or liftboats, as defined in [4.2].

1.1.2 The requirements of the present Rule Note apply to units intended to be granted the structural type notation specified in [1.3.1].

1.2 Scope

1.2.1 The present Rule Note applies to both small structures operating in shallow water and large structures operating in deep water.

1.2.2 The present Rule Note provides requirements for the design, construction and testing of self-elevating units.

1.3 Class notations

1.3.1 Structural type notation

The present Rule Note applies to floating units intended to be granted the structural type notation **self-elevating unit**, as defined in Pt A, Ch 1, Sec 2 of the Offshore Rules (see [4.1.1]).

This structural type notation lays down that the jacking mechanism for the self-elevating units are to be approved by the Society as detailed in Sec 10.

1.3.2 Service notations

The units covered by the present Rule Note may be granted the relevant service notation(s) defined in Pt A, Ch 1, Sec 2 of the Offshore Rules (see [4.1.1]). The usual service notations for a self-elevating unit are described in Tab 1.

1.3.3 Site notation

A site notation, specifying the name of the field and/or the geographical area where the unit is to operate, is to be assigned. When the self-elevating unit is not intended to operate in a specific geographical area, the site notation is to be characterized by the most unfavourable sea conditions for the unit.

Whatever the site notation, the Party applying for classification is to provide the most unfavourable environmental conditions for which the self-elevating unit is designed, as stipulated in Sec 3. These conditions are to be reported in the Design Criteria Statement defined in [2.5].

All changes of the geographical area or the stipulated environmental conditions are to be submitted to the examination of the Society and the site notation may be modified accordingly after approval of the design for the new conditions and, if applicable, execution of the necessary reinforcements.

1.3.4 Transit notation

The transit notation is to be completed as follows:

- The navigation notation **unrestricted navigation** is, by default, to complete the **transit** notation and to be considered for the design of the hull (such as hull scantlings, etc.) of the unit. This navigation notation is to be stated in the Design Criteria Statement (see [2.5])
- In case specified environmental conditions for transit are provided by the Party applying for classification, the transit notation **transit - specific criteria** may be assigned to the unit for which the transit is restricted to these specified environmental conditions. These conditions are to be stated in the Design Criteria Statement (see [2.5]).

1.3.5 Additional class notations

Additional class notations, optional or mandatory, are defined in Pt A, Ch 1, Sec 2 of the Offshore Rules (see [4.1.1]).

Table 1 : Usual service notations for self-elevating units

Service notation	Description
production	For units intended to oil production and fitted with production plant
gas production	For units intended to gas production and fitted with gas production plant
drilling (geotechnical) drilling (workover) drilling assistance	For units intended to drilling activities and fitted with drilling equipment
accommodation	For units intended to accommodate offshore personnel
lifting	For units intended to perform lifting operations at sea
Wind Turbine IMR Vessel	For units designed for installation and maintenance of offshore wind turbines

2 Classification principles

2.1 General provision

2.1.1 Unless otherwise stated, the general provisions of Part A, Chapter 1 of the Rules for the Classification of Offshore Units (NR445), where the principal conditions and other aspects of the classification process are defined, are applicable.

2.2 Scope of classification

2.2.1 The scope of classification is based on an appraisal of the integrated unit, covering in general:

- a) Hull, hull attachments and appurtenances including:
 - foundations for the support of topside equipment and the hull mounted equipment
 - support structure for life saving appliances
 - passive fire protection
 - cathodic protection
- b) Intact and damage stability
- c) Accommodation quarters
- d) Equipment and systems installed in the hull, the failure of which may jeopardise the safety of the floating unit
- e) Fire and gas detection system for the hull as well as the definition of the hazardous areas of the hull
- f) Fire-fighting systems for the protection of the hull
- g) Drilling equipment and installations (in case of additional class notation **DRILL**)
- h) Process plant and components (in case of additional class notation **PROC**)
- i) Helideck (in case of additional class notation **HEL**)
- j) Lifting appliances (in case of additional class notation **ALM**).

2.3 Classification limits

2.3.1 Site conditions

It is incumbent to the owners/operators:

- to perform the necessary investigations, including environmental and geotechnical surveys, prior to operating the unit at a given site
- to ascertain that the actual conditions met at the contemplated operating site remain on the safety side when compared to the design data and assumptions (particularly those listed in the Design Criteria Statement, as defined in [2.5]). Such site assessment is not part of the classification.

Classification does not cover the following items:

- assessment of sea bottom conditions and geotechnical investigations
- prediction of footing penetration during preloading
- self-elevating unit foundation stability after preloading
- assessment of the possible sea floor movement.

2.3.2 Operating procedures

Classification does not cover the procedures to be used for the unit positioning, leg jacking (lowering or elevating), preloading, jetting and other procedures related to operations.

It is the responsibility of the Owner, or the Operator if distinct from the Owner, to ascertain that the said procedures and their implementation satisfy the design criteria of the unit and the design of the related equipment.

For other classification limits applicable to operating procedures, refer to Part B, Chapter 2 of the Offshore Rules (see [4.1.1]).

2.3.3 Hull attachments and appurtenances

The class limit for the review of the supports of appurtenances is defined as follows:

- for classed equipment, the whole structure supporting the equipment is included in the scope of the classification and subject to the requirements in Sec 8, [1]
- for non-classed equipment, the scope of the review is limited, in principle, to the review of the hull attachment and the affected supporting structure to any non-welded connection of the equipment (pinned, bolted connection, sliding support, etc.). For appurtenances welded on the hull, the scope of the classification is defined on a case-by-case basis but is limited to the connection with the hull only.

2.4 Classification restrictions

2.4.1 When the design data and assumptions specified by the Party applying for classification do not comply with the requirements of the applicable Rules, restrictions may be placed upon the unit class.

2.4.2 When deemed necessary, restrictions may be placed on the duration of the service life of the unit.

2.4.3 Class restrictions, if any, are to be entered as a Memorandum on the unit Certificates of Classification and are to be incorporated in the Operating Manual prescribed in [2.7].

2.5 Design Criteria Statement

2.5.1 General

Classification is based upon the design data or assumptions specified by the Party applying for classification.

A Design Criteria Statement is to list the service(s) performed by the unit and the design conditions and other assumptions on the basis of which class is assigned to the unit.

The Design Criteria Statement is issued by the Society, based on the information provided by the Party applying for classification.

The Design Criteria Statement is to be referred to on the Classification Certificates of the unit.

The Design Criteria Statement is to be incorporated in the Operating Manual as prescribed in Pt A, Ch 1, Sec 1, [3.4] of the Offshore Rules (see [4.1.1]).

2.5.2 Unit services

The Design Criteria Statement is to list the main services for which the unit is designed, as well as the service notation and other notations assigned to the unit.

The nature of the unit activity is to be duly accounted for in the application of the Offshore Rules (see [4.1.1]), as far as classification is concerned.

2.5.3 Structural design criteria

The Design Criteria Statement is to list the necessary data pertaining to the structural design of the unit for its different conditions of operation, according to the provisions of Part B, Chapter 2 of the Offshore Rules (see [4.1.1]).

2.5.4 Machinery, electrical and other system design conditions

The Party applying for classification is to submit the necessary description, diagrammatic plans and design data of all the systems, including those used solely for the service (drilling, lifting, etc.) performed by the unit and, where applicable, their cross connections with the other systems. The submitted data are to incorporate all information necessary to the assessment of the unit for the purpose of the assignment of class or for the assignment of additional class notations.

In accordance with Pt A, Ch 1, Sec 1, [4.8.1] of the Offshore Rules (see [4.1.1]), the Party applying for classification is to give an electric balance estimation for the different conditions of operation of the unit. The specifications are to list all the important equipment and apparatus, their rating and the power factors, as applicable.

2.6 Design life

2.6.1 The requirements about design life, unit modification and unit re-assessment are given in Pt A, Ch 1, Sec 1, [1.7] of the Offshore Rules (see [4.1.1]).

2.7 Operating Manual

2.7.1 An Operating Manual, including instructions regarding the safe operation of the unit and of the systems and equipment fitted on the unit, is to be placed on board the unit.

The Operating Manual is to be, at all times, made available to all concerned. A copy of the Operating Manual is to be retained ashore by the Owner of the unit or by his representatives.

The Operating Manual is to incorporate a dedicated section containing all the information relating to classification, particularly the environmental, loading and other design criteria, as well as the classification restrictions. The Operating Manual of a self-elevating unit is also to stipulate the instructions related to the transit conditions, the preloading and the emergency procedures in case of punch through.

It is the responsibility of the Party applying for classification to prepare the contents of the Operating Manual.

2.7.2 The Operating Manual is to be submitted to the Society for review, this review being limited to check that the classification related material as mentioned above is consistent with the data given in the Design Criteria Statement defined in [2.5].

The minimum requirements about the content in the Operating Manual are given in [5.1.3].

3 Statutory requirements

3.1 General

3.1.1 The classification of a unit does not relieve Owners, Designers, Builders and other Interested Parties from compliance with any requirements issued by the administration (international conventions, national laws and regulations, and other instruments).

3.1.2 When authorized by the administration concerned, the Society is to act on its behalf within the limits of such authorization. In this respect, the Society is to take into account the relevant national requirements, survey the unit, report and issue or contribute to the issue of the corresponding certificates (see Pt A, Ch 1, Sec 1, [3.1.3] of the Offshore Rules).

3.2 Project specification

3.2.1 Prior to the design of the unit, a complete list of the Rules, Codes and statutory requirements to be complied with is to be established and submitted, detailing the:

- International conventions
- Flag State requirements
- Coastal State requirements
- Owner standards and procedures
- Industry standards.

3.2.2 The project specification is also to specify the list of the Owner requested certificates.

3.3 Conflict of Rules

3.3.1 In case of conflict between the present Rule Note and any statutory requirement as given by the Flag State or the Coastal State, the latter ones are to take precedence over the requirement of the present Rule Note.

3.3.2 In case of conflict between the Owner or industry standards and the present Rule Note, the latter one is normally to take precedence.

4 Definitions

4.1 Referenced documents

4.1.1 Offshore Rules

When reference is made to the Offshore Rules, the latest version of NR445 "Rules for the Classification of Offshore Units" is applicable.

4.1.2 Ship Rules

When reference is made to the Ship Rules, the latest version of NR467 “Rules for the Classification of Steel Ships” is applicable.

4.1.3 NR216

When reference is made to NR216, the latest version of the “Rules on Materials and Welding for the Classification of Marine Units” is applicable.

4.1.4 NR426

When reference is made to NR426, the latest version of the “Construction Survey of Steel Structures of Offshore Units and Installations” is applicable.

4.2 Self-elevating unit

4.2.1 A self-elevating unit is a unit with a floating hull fitted with legs capable of being lowered to the sea bed and of raising the hull above the sea level (see Fig 1).

The legs may be:

- of a shell or truss type

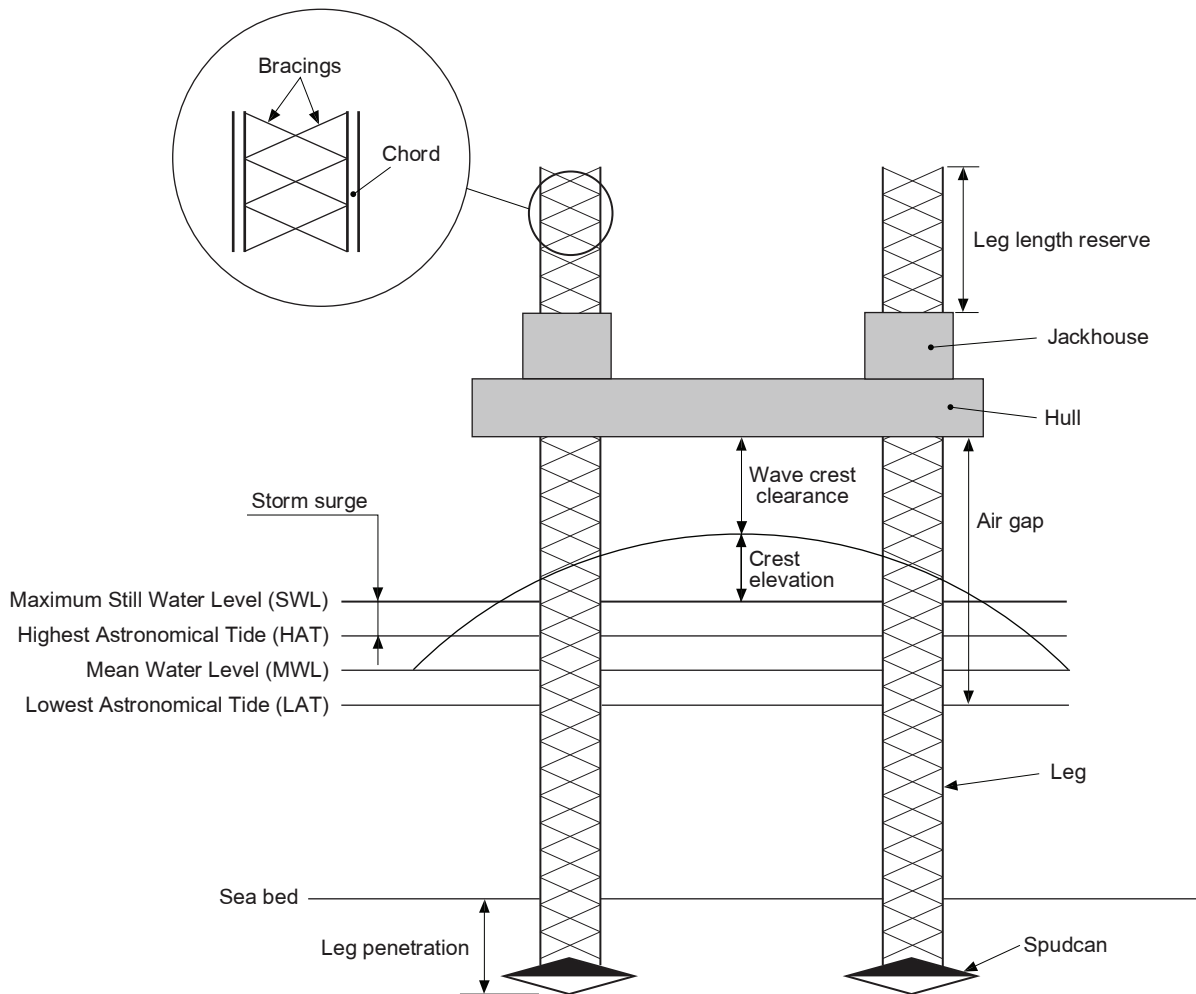
- equipped with a lower mat, a spudcan, a gravity-based structure or with footings designed to penetrate the sea bed
- vertical or slanted.

4.3 Modes of operation

4.3.1 A self-elevating unit is to be designed to resist to the loads occurring during all stages of the life-cycle of the unit such as working, survival, transit, installation and retrieval modes:

- a) Working mode
The unit is on location, supported on the sea bed to operate, and combined environmental and operational loading are within the appropriate design limits established for such operations.
- b) Survival mode
The unit is on location, supported on the sea bed and may be subjected to the most severe environmental loading for which the unit is designed. The operations for which the unit has been designed, such as drilling, well servicing, installation, may have been interrupted due to the severity of the environmental loadings.

Figure 1 : Definition of sea levels, air gap and clearance



c) Transit mode

The unit moves from one location to another within the appropriate design limits established for such operations.

The transit mode includes short-duration field moves between locations in close proximity and ocean transit for which a specific preparation of the unit is generally needed.

The unit may be self-floating or supported by a transportation unit during the ocean tow.

d) Installation mode

Period when the unit is firstly lowering legs to the sea bed, secondly elevating hull at the required elevation above the sea level, and then preloading the legs to the extreme loading.

e) Retrieval mode

Period when the unit is lowering the hull and then elevating legs to be ready for transit mode.

4.4 Water levels, crest elevation and water depth

4.4.1 The reference water levels and crest elevation are defined as follows in the present Rule Note (see Fig 1):

- mean water level (MWL): mean level between the highest astronomical tide (HAT) and the lowest astronomical tide (LAT)
- astronomical tidal range: range between the highest astronomical tide (HAT) and the lowest astronomical tide (LAT)
- maximum still water level (SWL): level at the highest astronomical tide (HAT) including storm surge
- crest elevation: height of wave crest above the SWL.

4.4.2 Except otherwise specified, the reference water depth to be considered is the distance between the sea bed and the SWL.

4.5 Configuration of a self-elevating unit in elevated position

4.5.1 The configuration of a self-elevating unit in elevated position is to be defined based on the site data associated with the unit service(s) (such as geotechnical drilling, production, workover, assistance, lifting, accommodation).

4.5.2 The configuration is defined with the following parameters (see Fig 1):

a) Leg penetration length

The leg penetration length is the maximum leg penetration into the sea bed, including the spudcan if any.

b) Leg length reserve

The leg length reserve is the reserve above the upper guide to avoid any soil settlement or punch through and to provide a contingency in case the penetration exceeds the predicted one.

c) Air gap

The air gap is defined as the distance between the underside of the hull and the LAT.

d) Wave crest clearance

The wave crest clearance is defined as the distance between the highest wave crest and the underside of the hull.

4.6 Configuration of a self-elevating unit in floating position

4.6.1 In floating position, the legs are usually elevated and supported by the hull.

The draught of the unit is defined as the distance from the lowest point of the hull to the waterline.

5 Documents to be submitted

5.1 General

5.1.1 The required documentation is listed in Part A, Chapter 1 of the Offshore Rules.

5.1.2 The required documentation is to clearly show all the essential features, arrangements and scantlings of the structure, machinery, boilers, auxiliaries and other equipment covered by the classification.

5.1.3 In addition to [5.1.1], the documentation is to include the information listed in [5.2] for plan review purposes.

5.2 Additional information for plan review purposes

5.2.1 Design criteria and data

The design criteria and data, as stipulated in Sec 3, include environmental data (see Sec 4).

The data are to be as comprehensive as possible and to clearly give evidence of all the applicable environmental restrictions:

- maximum loading for all deck areas
- results of model basin tests, when performed
- results of wind tunnel tests, when performed
- for equipment liable to induce, when in use, significant loads within the structure of the unit, all information on these loads, such as:
 - drilling loads
 - crane loads on pedestal and on boom and hook rests (lifting)
 - other loads from lifting and handling equipment.

5.2.2 Structural, stability and hydrodynamic calculations

- calculations of the environmental loadings including forces and moments from wind, waves, currents, ice, snow, earthquakes, as applicable
- calculations of loads induced by equipment
- stability calculations for the intact and damaged conditions including detailed computation of wind exposed areas and, if applicable, ice formation effects
- global analysis of the unit in elevated position
- calculations of the unit resistance against overturning while resting on the sea bed in elevated position
- hydrodynamic calculations in floating condition, if relevant
- hull calculations in floating condition
- leg strength calculation in floating condition
- local strength calculations of:
 - legs
 - leg/hull connection
 - spudcans or bottom mat, if relevant
 - leg/spudcan or leg/mat connection, if relevant
 - cantilever/hull connection, if relevant
 - other hull attachments and appurtenances, if any
- fatigue calculations of structural details
- calculations of jacking systems and, if any, fixation systems
- calculations of segregation of loads between jacking and fixation systems, if relevant
- calculations of cathodic protection system.

5.2.3 General and structural drawings

- a) general arrangement plan (in elevating and transit conditions)
- b) capacity plan indicating the volumes, overflows and positions of the centres of gravity of the various compartments, together with their locations
- c) deck loading plans
- d) main structural drawings showing structural arrangements, scantlings, grades of steel, welded connections and structural details. These drawings are to include, as applicable:
 - transverse and longitudinal sections of the hull
 - decks, including the helicopter deck and its support frame
 - shell plating and framing
 - bulkheads and flats

- legs including:
 - for lattice legs: racks, chords, bracings and their connections
 - for shell type legs: shell plating, stiffeners, stringers, struts, connections of racks with shell plating and supporting leg rack members, potential openings, where relevant
 - detailed drawings of the racks, if any, including their arrangement in transit and elevating conditions
 - footings (spudcans) or mats
 - leghouses
 - superstructures and deckhouses.
- e) detailed structural drawings in the areas of connections between main structural members in way of:
- foundations of elevating systems
 - leghouse guides
 - drilling derrick
 - cantilever
 - anchoring equipment
 - crane foundations, and
 - all the other parts liable to be subjected to high local loadings or stress concentrations.

5.2.4 Operating Manual

In addition to Pt A, Ch 1, Sec 4 of the Offshore Rules, the Operating Manual is to include the following information, where applicable:

- design limitations:
 - during transit (leg arrangement, rig and other equipment sea fastening)
 - during installation (leg lowering, preloading)
 - on site
 - during retrieval (hull lowering, leg retrieval)
- emergency procedures in case of punch through
- preload procedure
- for normal operation, information regarding the preparation of the unit to avoid structural damage during the setting or retraction of legs on or from the seabed, or during extreme weather conditions while in transit, including the positioning and securing of legs, cantilever drill floor structures and drilling equipment or materials which might shift position
- jacking gear main loading capacity in operating conditions
- maximum loading capacity in case of engaged fixation system
- Design Criteria Statement issued by the Society, including the classification restrictions, if any
- classification certificates, continuous survey lists and other certificates issued by the Society.

5.2.5 Jacking systems

The documents to be submitted for the jacking systems are given in Sec 10.

6 Applicable rules

6.1 General

6.1.1 The rules applicable for the classification of self-elevating units are summarized in Tab 2.

Table 2 : Applicable requirements

Item	Rules, Section, Article or Table
General arrangement	Sec 2 and Offshore Rules, Part B
Stability and subdivision	Sec 6, [2] and Offshore Rules, Part B
Structural assessment	See Tab 3
Machinery and systems	Sec 10 and Offshore Rules, Part C
Electrical installations and automation	Offshore Rules, Part C
Safety features	Offshore Rules, Part C
Materials and welding	NR216
Construction survey	Sec 9 and NR426
In-service surveys	Offshore Rules, Part A, Chapter 2

Table 3 : Applicable Sections and Articles for the scantling of unit items

Item	Section / Article
Hull and legs structure	Sec 2
	Sec 5
	Sec 6
	Sec 7
Hull attachment and appurtenances	Sec 2 Sec 8, [1]
Superstructures and deckhouses	Sec 8, [3]
Crane	Sec 8, [2]
Helicopter decks	Sec 8, [4]
Hull outfitting	Sec 8, [5]
Launching appliances	Sec 8, [6]
Jacking system	Sec 10

7 Reference co-ordinate system

7.1 Hull

7.1.1 Except otherwise specified, the unit geometry and loads are defined with respect to the following right-hand co-ordinate system:

- Origin: at the intersection between the longitudinal plane of symmetry of unit, the aft end and the baseline
- X axis: longitudinal axis, positive forwards
- Y axis: transverse axis, positive towards portside
- Z axis: vertical axis, positive upwards.

7.1.2 Positive rotations are oriented in anti-clockwise direction about the X, Y and Z axes.

SECTION 2

STRUCTURE DESIGN PRINCIPLES

1 Steel grade and structural categories

1.1 Material strength

1.1.1 According to the Offshore Rules, the reference stress of material R_f , in N/mm^2 , to be considered for strength calculation is defined by:

$$R_f = \text{Min} \left(R_{eH} ; \frac{R}{1,2} \right)$$

where:

R_{eH} : Specified minimum yield stress of the material, in N/mm^2

R : Tensile strength of the material, in N/mm^2 .

1.1.2 For steel having a yield stress above 690 N/mm^2 , special consideration is to be given by the Society.

1.2 Steel grade selection

1.2.1 The selected steels are to have mechanical properties satisfying the structural design of the unit and the requirements of this Article.

1.2.2 The steel grade for a structural element is to be selected in accordance with Pt B, Ch 3, Sec 2 of the Offshore Rules, on the basis of:

- the design service temperature defined in Sec 4, [6]
- the structural category set out in [1.3]
- the reference thickness of the element defined in Pt B, Ch 3, Sec 2 of the Offshore Rules.

The design air temperature is to be considered for the structural elements located above the minimum water depth (i.e. LAT).

The design water temperature is to be considered for the structural elements located below the minimum water depth (refer to Sec 4, [6] for additional information).

1.3 Structural categories

1.3.1 Categories to be considered

Structural elements in welded steel constructions are classed into three categories, as listed hereafter:

- Second category: the second category elements are structural elements of minor importance, the failure of which might induce only localized effects
- First category: the first category elements are main load-carrying elements essential to the overall structural integrity of the unit

- Special category: the special category elements are parts of the first category elements located in way, or at the vicinity, of critical load transmission areas and of stress concentration locations.

1.3.2 Categories of the structural members

The structural members of self-elevating units are to be categorized as indicated in Tab 1.

The structural categories are to be indicated on the drawings submitted to the Society for approval.

The Society may, where deemed necessary, upgrade any structural element to account for particular considerations, such as novel design features, or for restrictions regarding access for quality control and in-service inspections.

1.4 Steels with specified through-thickness properties

1.4.1 The designer is to evaluate the risk of any lamellar tearing.

1.4.2 The steels with specified through-thickness properties are to comply with the requirements in Pt B, Ch 3, Sec 2, [4] of the Offshore Rules.

1.5 Corrosion allowances

1.5.1 The scantlings obtained by applying the criteria specified in the present Rule Note are gross scantlings, i.e. those providing the strength characteristics required to sustain the loads including corrosion margin. The strength criteria take into account a moderate and progressive corrosion up to an amount of 4% in 20 years.

1.5.2 For the particular case of legs without cathodic protection, a corrosion rate of $0,4 \text{ mm}$ per year is to be considered in the splash zone (i.e. in the area limited by the LAT minus the trough of wave, and the SWL plus the crest of wave). This value is to be deduced from the as-built thickness minus the Owner margin, as specified in [1.5.3]. The corrosion rate applies on both the external shell and the internal one, if relevant.

1.5.3 Any additional thickness increment, as may be provided in accordance with the provisions of Pt B, Ch 3, Sec 5 of the Offshore Rules, is to be deduced from the actual nominal thicknesses prior to application of strength criteria.

1.5.4 When the unit is converted from an existing unit, the assessment of strength is to be based on the actual measured thicknesses reduced by any specified corrosion prediction or corrosion allowance.

Table 1 : Application of structural categories

Structural member category
SECOND CATEGORY: • Second category elements are structural elements which are classed neither in the special nor in the first categories
FIRST CATEGORY: a) Hull and other appurtenances: • bottom plating • strength deck plating, excluding that belonging to the special category • side shell plating • bulkhead plating belonging to main structure of the hull • legwell recess • heavily loaded elements forming main truss or frames of integrated decks, support frames or heavy modules • structure supporting crane pedestals, large flare towers or long span bridges • helideck frames • cantilever beams and substructure of drill floor (legs and main beams) • appurtenances connections to hull when used for essential operations, excluding those belonging to the special category b) Leghouses: • shell plates of boxed jackhouses and main girders of truss jackhouses • tubular intersections in the truss of jackhouses c) Legs: • vertical members of cylindrical and rectangular hollow section legs (external shell plating including vertical stiffeners if any, racks if any, etc.) • chords, racks and main bracings of lattice legs d) Spudcans and mat: • top plating, bottom plating, side shell plating and bulkheads in spudcans • spudcan round bar • spudcan tip • deck plating, shell plating and bulkheads in mat structure
SPECIAL CATEGORY: a) General: • cast steel structural members b) Hull and other appurtenances: • sheer strake at strength deck (1) • stringer plate in strength deck (1) • deck strakes in way of bulkheads participating to overall bending moment (1) • strength deck and bottom plating at outboard corners of large hatch openings (moonpool) • bilge strake (1) • highly stressed area of appurtenance connections to the hull (including padeyes if any), when used for essential operations c) Leghouses: • structure in way of jacking or other elevating arrangements including padeyes or bearing members • structure in way of leg fixation systems including padeyes or bearing members • leghouse guides for load transferring from legs to the hull • connections of leghouses to the hull d) Legs, spudcans and mat: • tubular intersections for lattice legs • connection of legs to spudcans or mat structure (1) Single strakes are required to be of special category or of grade E/EH and are to have breadths not less than $(800 + 5 L)$ mm, where L is the rule length of the hull, as defined in Sec 6. Note 1: Any welded attachment of loaded equipment on hull plating is not to have a grade lower than the grade used for the hull plating.

2 Structural principles

2.1 Accessibility for inspection during service

2.1.1 Principle

Accessibility for inspection, and also for maintenance, is required with respect to the durability and integrity of the structure.

2.1.2 Means of access

The means of access in a self-elevating unit are to allow inspection of the critical structure connections identified during the drawing review by the Society and/or the designer.

The number of inaccessible areas is to be limited and clearly identified on the structure drawings. The Society reserves the right to require additional corrosion allowances for these areas. Special attention is to be paid to fatigue strength.

Web frame numbers are to be attached to the structure or the walkway inside the tanks, to the satisfaction of the attending Surveyor.

Equipment on deck is to be arranged to allow inspections of the deck plating and to avoid permanent concentration of dust and remaining water.

For permanent means of access, refer to Pt B, Ch 3, Sec 1 of the Offshore Rules.

2.2 General construction

2.2.1 Structural continuity

Attention is to be paid to the structural continuity:

- of the leg structure
- in way of the connections of the leghouse ends (jack-house ends, spudhouse ends) with the hull
- of the leg connections with the spudcans or the mat structure
- in way of the changes in the framing system
- at the connections of the primary or ordinary stiffeners
- in way of the deck equipment connections.

The framing system of the hull is to consider the global stress flow in both elevated and floating positions. In principle, several framing types are adopted for triangular hulls, to ensure a better hull strength continuity between leghouses. Rectangular hulls are, usually, longitudinally framed.

Where stress concentrations may occur in way of structural discontinuities, adequate compensations and/or reinforcements are to be provided.

Openings are to be avoided, as far as practicable, in way of highly stressed areas.

Where necessary, the shape of openings is to be specially designed to reduce the stress concentration factors. Particular attention is to be paid to the passage of secondary stiffeners through web plating in the stress vicinity of heavy loads.

Openings are generally to be well rounded, with smooth edges.

Primary supporting members are to be arranged in such a way that they ensure adequate continuity of strength. Abrupt changes in height or in cross-section are to be avoided.

2.2.2 Sniped ends

In principle, sniped ends of primary and secondary stiffeners are not to be greater than 30 degrees.

2.3 Plating

2.3.1 A local increase in plating thickness is generally to be achieved through insert plates.

Insert plates are to be made of materials of a quality at least equal to that of the plates on which they are welded.

Plating under heavy concentrated loads may be reinforced with doublers (allowed under compression loads only) and/or stiffeners, where necessary. Doublers in way of equipment are to be limited in size and avoided in the deck areas with high stresses.

Doublers having a width, in mm, greater than:

- 20 times their thickness, for thicknesses ≤ 15 mm
- 25 times their thickness, for thicknesses > 15 mm,

are to be fitted with slot welds, according to Pt B, Ch 11, Sec 1 of the Ship Rules.

2.4 Ordinary stiffeners

2.4.1 The strength principle requirements for the ordinary stiffeners are those given in Pt B, Ch 4, Sec 3, [3] of the Ship Rules.

2.5 Primary supporting members

2.5.1 The strength principle requirements for the primary supporting members are those given in Pt B, Ch 4, Sec 3, [4] of the Ship Rules.

Additional strength principle requirements for bottom, side, deck and bulkhead structures are given respectively in the Sections from Pt B, Ch 4, Sec 4 to Pt B, Ch 4, Sec 7 of the Ship Rules.

2.6 Leghouse

2.6.1 The leghouse includes all the structural elements of the hull allowing the load transfer between legs and hull. The horizontal guides (hull structural members in contact with the legs), the elevating and locking systems with their supporting structure are also part of the leghouse.

The leghouse is usually formed by spudhouse and jack-house.

2.6.2 Load carrying members of the leghouses are to be:

- designed for the maximum design loads, and
- so arranged that loads transmitted from the legs are properly diffused into the hull structure.

Table 2 : Equivalent strength properties for shell type legs

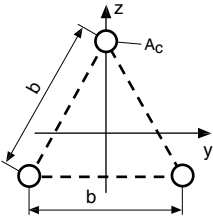
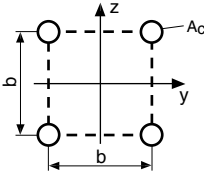
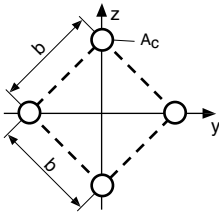
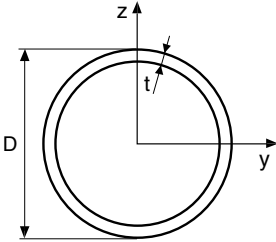
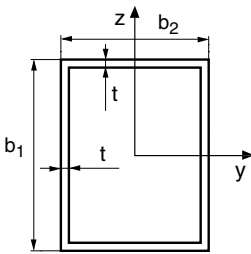
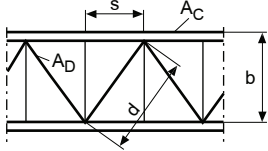
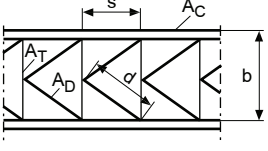
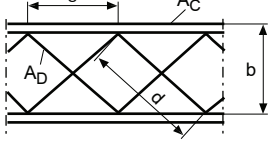
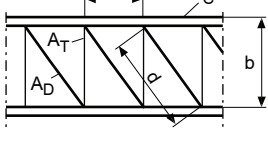
Leg type		Equivalent properties	
1		$A = 3 A_C$ $A_{Shy} = A_{Shz} = \frac{3}{2} A_{Sh}$	$I_y = I_z = \frac{1}{2} A_C b^2 10^{-4}$ $I_T = \frac{1}{4} A_{Sh} b^2 10^{-4}$
2		$A = 4 A_C$ $A_{Shy} = A_{Shz} = 2 A_{Sh}$	$I_y = I_z = A_C b^2 10^{-4}$ $I_T = A_{Sh} b^2 10^{-4}$
3		$A = 4 A_C$ $A_{Shy} = A_{Shz} = 2 A_{Sh}$	$I_y = I_z = A_C b^2 10^{-4}$ $I_T = A_{Sh} b^2 10^{-4}$
4		$A = \pi (D - t) t 10^{-2}$ $A_{Shy} = A_{Shz} = \frac{A}{2}$	$I_y = I_z = \frac{\pi t (D - t)^3}{8} 10^{-4}$ $I_T = \frac{\pi t (D - t)^3}{4} 10^{-4}$
5		$A = 2 t (b_1 + b_2) 10^{-2}$ $A_{Shy} = 2 t b_2 10^{-2}$ $A_{Shz} = 2 t b_1 10^{-2}$	$I_y = \frac{1}{12} [b_2 b_1^3 - (b_2 - 2t)(b_1 - 2t)^3] 10^{-4}$ $I_z = \frac{1}{12} [b_1 b_2^3 - (b_1 - 2t)(b_2 - 2t)^3] 10^{-4}$
A : Cross-sectional area of the leg, in cm² A_C : Cross-sectional area of the chords, in cm², including racks as stipulated in Sec 5, [2.3.1] A_{Shy} : Shear area with respect to y-axis of the leg, in cm² A_{Shz} : Shear area with respect to z-axis of the leg, in cm² A_{Sh} : Shear area of one leg side, in cm², as defined in Tab 3 I_y : Moment of inertia about the y-axis of the leg, in cm⁴ I_z : Moment of inertia about the z-axis of the leg, in cm⁴ I_T : Torsional moment of inertia of the leg, in cm⁴ b : Distance between the chords, in m D : Outer diameter of the cylindrical shell type leg, in mm b₁, b₂ : Depth and breadth of the rectangular hollow section leg, in mm t : Thickness of the leg shell, in mm.			

Table 3 : Equivalent shear area of one leg side for lattice type legs

Structure		Equivalent shear area A_{sh} of one leg side, in cm^2
1		$A_{sh} = \frac{(1 + \nu)sb^2}{\frac{d^3}{2A_D} + \frac{s^3}{6A_C}}$
2		$A_{sh} = \frac{(1 + \nu)sb^2}{\frac{d^3}{A_D} + \frac{b^3}{8A_T}}$
3		$A_{sh} = \frac{(1 + \nu)sb^2}{\frac{d^3}{4A_D}}$
4		$A_{sh} = \frac{(1 + \nu)sb^2}{\frac{d^3}{2A_D} + \frac{b^3}{2A_T} + \frac{s^3}{6A_C}}$
A_C : Cross-sectional area of the chords, in cm^2, including racks as stipulated in Sec 5, [2.3.1] A_D : Cross-sectional area of the diagonal bracings, in cm^2 A_T : Cross-sectional area of the transverse bracings, in cm^2 b : Distance between the chords, in m d : Length of the diagonal bracings, in m s : Spacing of the bays, in m ν : Poisson's ratio. Unless otherwise specified, a value of 0,3 is to be taken into account.		

2.6.3 For the purposes of better contact and gap reduction between the legs and guides, doubling plates may be fitted. The contact area is to be as large as possible and the extent of doublers is to cover the whole contact area.

In case several doubling plates are fitted for shell to shell contact, the contact area is not to be interrupted because of the presence of doublers. The welded connections of the doublers between them are to be as flush as possible.

In addition to the normal loads due to leg-guide contact (analysed according to Sec 5 and Sec 6), the welds between the doublers and the guide structure are also to withstand the tangential friction forces provided by the leg displacements against the guide ones.

2.7 Legs

2.7.1 Legs may be either of shell type or of lattice type (truss leg type). Individual footings (spudcans) may be fitted or legs may be permanently attached to a bottom mat.

2.7.2 Shell type legs (with cylindrical or rectangular hollow section) may be designed as either stiffened or unstiffened shells.

All structural elements participating to the global strength of the legs (shell, ordinary stiffeners if any) are to be continuous when crossing primary members.

2.7.3 Lattice type legs are usually made of tubular members. Particular attention is to be paid to the tubular connections which are highly stressed areas subject to fatigue. Eccentricities are generally to be minimized.

The bracing system of lattice type legs is to be so arranged as to ensure structural redundancy.

2.7.4 The cross-sectional properties of shell type legs and lattice type legs may be obtained from the formulae given in Tab 2 and Tab 3.

2.8 Spudcans and bottom mat

2.8.1 When spudcans are fitted, particular attention is to be paid to the connection with the legs which may be subject to fatigue. Suitable reinforcements are normally to be provided inside the spudcans. Suitable overlapping of the legs is to be fitted so as to properly transfer the loads from the legs to the spudcans.

When internal vertical plating is fitted inside the spudcan, its upper end is to be smoothly connected (with rounded edge) to the leg outer shell or leg chord. For shell type legs, the upper end is also to be connected to the ring stiffeners of the leg shell (or other ring structural members), in order to avoid hard point on the leg shell.

2.8.2 When the bottoms of the legs are attached to a mat, particular attention is to be given to the attachment, the framing and bracing of the mat, in order that the loads resulting from the legs are properly distributed.

2.9 Superstructures and deckhouses

2.9.1 The superstructures and deckhouses are to have sufficient strength for their sizes, functions and locations, with due consideration given to the environmental conditions the

unit may be exposed to. Their scantlings are to be designed in transit conditions for sustaining green water pressure on unprotected front bulkheads, as defined in Sec 8, [3].

2.10 Reinforcements in way of supporting structures for hull attachments

2.10.1 Generally, the supports for attachments and appurtenances are to be fitted in way of longitudinal and transverse bulkheads or in way of deck beams. The other supports are to be fitted in way of large primary supporting members.

The main structure may be locally reinforced by means of insert plates.

Cut-outs in local structures in way of hull attachments are to be closed by full collar plates.

Particular attention is to be paid to the buckling effect below the supports.