Certification of Offshore Access Systems

May 2016

Guidance Note
NI 629 DT R00 E

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BUREAU VERITAS

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, Shipbuilder, 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 appraisement 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 appraisement 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 appraisement 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 of 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 certificating 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.

BV Mod. Ad. ME 545 L - 7 January 2013

GUIDANCE NOTE NI 629

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May 2016

Section 1 General

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Appendix 1 Calculation of Forces due to Wind

SECTION 1 GENERAL

1 General

1.1 Application

1.1.1 This Guidance Note provides guidelines for the certification of offshore access systems, based on gangways, and used for the transfer of persons from ships to offshore facilities or from ship to ship.

1.1.2 The principles and requirements developed in this Guidance Note are applicable to active and passive offshore access systems, as defined in [4.2].

1.1.3 This Guidance Note also provides requirements for classification of the offshore access system, i.e its integration on the supporting ship on which it is fitted.

1.2 Scope

1.2.1 Certification

This Guidance Note addresses the requirements regarding the certification of the Offshore Access System (OAS), including:

- safety principles
- design requirements
- structural assessment
- machinery systems
- electrical installations
- control systems
- inspection and testing at Manufacturer's workshop

The certification of the OAS is irrespective of the supporting ship on which it is installed.

The certification principles are indicated in Article [2].

1.2.2 Classification

The classification concerns the integration of the Offshore Access System (OAS) on the supporting ship on which it is fitted.

This Guidance Note addresses the requirements for the supporting ship and for its interface with the OAS, including:

- characteristics of the supporting ship
- integration on-board
- inspection and testing on-board
- in-service surveys

The classification principles are indicated in Article [3]

2 Certification principles

2.1 Applicable rules and standards

2.1.1 General

The rules applicable for the certification of the offshore access system are listed in Tab 1.

These applicable rules may be extended to conformity assessment in accordance with proprietary specifications or recognized standards as listed in [4.4], upon request made to and agreed by the Society.

Table 1 : Applicable rules

Scope	Description	Applicable requirements
Design assessment	Safety principles	Sec 2
	Design requirements	Sec 3
	Structural assessment	Sec 4 and Offshore Rules **(1)**, NR561 **(1)** **(2)**
	Machinery	Sec 5 and NR526 **(1)**
	Electrical installations and control systems	Sec 6 and NR526 **(1)**
Construction survey	Materials and welding	NR216 **(1)**
	Components certification	Sec 1 and NR266 **(1)**
	Inspection and Non Destructive Testing	NR426 **(1)**
Testing	Testing at Manufacturer's workshop	Sec 7
	On-board testing	Sec 7 **(3)**
Integration on-board	Integration and interface with the supporting ship	Sec 8 **(3)**
In-service inspection	Annual surveys and class renewal surveys	Sec 9 **(3)**

(1) As applicable, see [4.3].
(2) For aluminium structure.
(3) Under the scope of classification.

2.1.2 Project specifications

Prior to commencement of the review of drawings, the complete list of Rules, Codes and Statutory Requirements to be complied with are to be submitted for information. The following list is to detail the requirements to be complied with:

- International rules
- Flag state requirements
- Coastal state requirements
- Owner standards and procedures
- Industry standards.

2.1.3 Conflict of Rules

In case of conflict between the Rules stated in [2.1] and any statutory requirement as given by Flag state or Coastal State, the latter one is to take precedence over the requirements of the Rules.

2.2 Risk assessment

2.2.1 General

A general risk assessment is to be conducted in accordance with Sec 2, [3].

2.2.2 New technologies

When the OAS presents a novel feature, it is required to conduct a risk assessment in order to assess the new technology in accordance with NI525 (see [4.3]).

2.3 Certification of material and components

2.3.1 The certification procedure and requirements specified in Tab 2 are to be completed by the manufacturer within the scope of the certification of the OAS.

2.3.2 Reference is made to NR266 (see [4.3]) for general requirements on material and component certification.

2.3.3 The Society reserves the right to modify the requirements given in this Guidance Note to formulate new ones or to change their application in order to take into account the particulars of a given construction, as well as local circumstances.

2.3.4 The particular conditions and requirements expressed by National Flag Authorities, owners, shipyards or manufacturers may lead to additional surveys or other services to be specified and agreed in each case by the concerned parties.

2.3.5 Explanatory notes, symbols and abbreviations

The symbols used in Tab 2 have the following meaning:

"C" indicates that a BV product certificate is required with invitation of the Surveyor to attend the tests unless otherwise agreed, in addition to the manufacturer's document stating the results of the tests performed and/or compliance with the approved type as applicable.

"W" indicates that a manufacturer's document is required, stating the results of the tests performed and/or stating compliance with the approved type (as applicable).

"X" indicates that examinations and tests are required.

Where fitted, each additional index (h, ndt) indicates a specific type of test:

h : Hydraulic pressure test (or equivalent)

ndt : Non-destructive tests as per Rules.

Note 1: Symbols used in Tab 2 are consistent with the definitions of NR266.

- Column 1 (item code)

  Column 1 contains an alpha-numeric code for ease of reference equipment or component.

- Column 2 (item name)

  Column 2 contains the name of the equipment or component with, eventually, its sub-systems.

- Column 3 (design assessment / approval index)

  Column 3 contains the design assessment / approval index.

  The meaning of letters TA and DA is the following:

  TA : Type Approval is required

  TA_{HBV} : Type Approval is required with work's recognition (HBV scheme as per NR320 (see [4.3]))

  DA : Design assessment / Appraisal of the product is required; this one may be carried out as applicable:

  - either for a specific unit, or
  - using the Type Approval procedure.

Note 2: Where nothing is mentioned in column 3, a design assessment / approval of the specific unit is not required.

- Column 4 (raw material certificate)

  Column 4 indicates the nature of the document that is to be submitted by the manufacturer or supplier of the concerned raw material. Consistent with the Rules or agreed specifications, this document includes data such as material tests (chemical composition and mechanical properties), non-destructive tests and surface hardness (if hardened).

- Column 5 (examination and testing)

  Column 5 indicates that examination and/or testing are required and are to be carried out by the manufacturer. For the type of examination and/or testing required, reference is to be made to the relevant provisions of this Guidance Note.

Note 3: As a general rule, even if a cross "X" is not fitted in a cell under column 5, examination and tests during fabrication may be required with invitation/attendance of the Society's Surveyor.

- Column 6 (product certificate)

  Column 6 indicates the nature of the document to be supplied by the manufacturer of the concerned product.

- Column 7 (remarks)

  Column 7 indicates the remarks (if any) associated to the concerned equipment or component.

Table 2 : Certification of material and components

No.	Item	Design assessment	Raw material certificate	Examination & testing	Product certificate	Remarks
1.1	Main load bearing structure	DA	C	X ndt	C	
2.1	Mechanical gears		C	X	C	
2.2	Bearings		W	X	W	
2.3	Slewing ring		C	X	C	
2.4	Connection/disconnection device		W	X	W	
2.5	Bolts and nuts				W	
3.1	Hydraulic system components of class I		(1)	X h ndt	C (1)	(1): As per relevant requirements of the Ship Rules, Part C (see [4.3])
3.2	Hydraulic cylinders		C (1)	X h ndt	C	(1): Cylinder shell and piston rod only
3.3	Winches		C	X	C	
4.1	Electric system components	As per relevant requirements of the Ship Rules, Part C, and NR266 (see [4.3])				
4.2	Control and monitoring system	As per relevant requirements of the Ship Rules, Part C, and NR266 (see [4.3])				
4.3	Motion reference unit			X (1)	W / C (2)	(1): Calibration test report, in accordance with an agreed program (2): Product certificate required for active OAS
5.1	Wire ropes			X (1)	C	(1): As per NR216 (see [4.3]) or in compliance with an international standard
5.2	Loose gear and accessories			X (1)	C	(1): Proof load as per NR526 (see [4.3])

3 Classification principles

3.1 Applicable rules

3.1.1 Rules applicable for the classification of the OAS are listed in Tab 1.

3.2 Additional class notation

3.2.1 Ships fitted with an offshore access system certified in accordance with this Guidance Note may be granted the additional class notation **OAS**.

3.3 Construction marks

3.3.1 In accordance with the provisions of Part A, Chapter 1 of the Offshore Rules (see [4.3]) or Part A of the Ship Rules (see [4.3]), and considering the provisions of [3.3.2] to [3.3.4], the construction marks ✠, ✠ and • are associated with the class notation **OAS**.

3.3.2 The construction mark ✠ is assigned when the access system is surveyed by the Society during its construction and the following requirements are fulfilled:

- approval of drawings and examination of documents required in Article [5]
- survey of materials and components
- survey of construction
- survey of testing.

3.3.3 The construction mark ✠ is assigned when the access system has been surveyed by another IACS Society during construction and is admitted to class after construction, subject to the following requirements being fulfilled:

- examination of drawings and documents required in Article [5]

Note 1: As a rule, the documents are to be marked with the stamps of the organization by which they were approved upon construction.

- examination of materials inspection certificates, construction survey attestations and components test certificates
- survey of the access system.

Note 2: The extent of this survey depends on the existing conditions of certification, on the general maintenance conditions and on the age of the equipment. As a rule, general tests are not required if the existing certification for these tests (tests prior to first use and/or five -ear renewal of tests) is valid.

3.3.4 The construction mark • is assigned to the access system when the procedure for the assignment of classification is other than those detailed in [3.3.2] and [3.3.3], but however deemed acceptable and in compliance with the following requirements:

- approval of drawings and examination of documents required in Article [5]

Note 1: Upon agreement of the Society, the approval of the documents may not be required if proof is given that these documents have been previously approved by a recognized organization. In such a case, the hereabove mentioned drawings and documents are to be submitted for information.

When some drawings and documents are not available, the Society is to appreciate whether it is possible to grant the requested class notation. Particular measurements or controls carried out on-board, and witnessed by a Surveyor of the Society, may be required.

- examination of the certificates delivered after testing at works
- survey of the handling system.

Note 2: The extent of this survey depends on the existing conditions of certification, on the general maintenance conditions and on the age of the handling system. As a rule, general tests are not required if the existing certification for these tests (tests prior to first use and/or five-year renewal of tests) is valid. Checking of thicknesses of structural elements is to be carried out on the handling system the age of which is greater than, or equal to, 12 years.

3.4 Maintenance of the classification

3.4.1 The maintenance of the additional class notation **OAS** on the class certificate is subject to completion of the in-service surveys described in Sec 9, performed by the Society.

3.4.2 The Owner shall inform the Society in case of modifications or repair. Recertification may be necessary with relevant inspection and the original certificate is to be completed with a description of the modifications.

4 References

4.1 Acronyms

4.1.1 The following acronyms are used within this Note:

DP : Dynamic Positioning
FMEA : Failure Modes and Effects Analysis
MRU : Motion Reference Unit
OAS : Offshore Access System
SWL : Safe Working Load.

4.2 Definitions

4.2.1 Offshore Access System

An OAS is a system intended for the safe transfer of personnel and cargo between a ship and an offshore facility.

OAS usually includes a pedestal and a gangway which can be motion compensated, and a connection system at the gangway tip to be secured on the offshore facility.

4.2.2 Motion compensated system

Motion compensated systems used on OAS are intended to compensate the ship motions while the OAS is in connection phase or in personnel transfer phase.

4.2.3 Active Offshore Access System

An active OAS is a system on which motion compensation remains active in personnel transfer phase.

Active OAS can be:

- Fully active, i.e. 6 degrees of freedom are compensated during transfer
- Semi-active, i.e. between 1 and 5 degrees of freedom are compensated during transfer

The active OAS needs power and control all the time, from connecting to a facility, transferring personnel to disconnecting. Redundancy of the systems during all phases is critical and subject to review.

4.2.4 Passive Offshore Access System

A passive OAS is a system on which there is no power driven motion compensation once it is connected to the offshore facility.

The OAS may be motion compensated during the connection phase.

The passive OAS does not need power and control during transfer of personnel. Once connected to the platform, the power motion control system is switched off and the gangway let in free-flow mode, whereby the gangway is allowed to follow the relative motions between the vessel and the offshore facility (within design limits).

4.2.5 OAS category

The OAS category is an indication of the level of control exercised over the number of persons simultaneously present on the gangway. See Sec 3, [1.2].

4.2.6 Safe position

The safe position of the gangway is a position in which it cannot cause damage to the personnel on-board the support vessel, the support vessel itself or the offshore facility.

4.2.7 Effective width

The effective width of a gangway is the smallest width of the walking surface.

4.2.8 Handrail height

The vertical height of the upper surface of the handrail, measured from the highest point of the standing surface presented by the steps when the gangway is horizontal.

4.2.9 Nominal length (L)

The nominal length of a gangway is the distance from the centre of the pin (horizontal axis of the luffing motion) on the ship end to the centre of the support on the facility end, when the gangway is at mid position of its telescoping amplitude, the gangway being horizontal.

4.2.10 Extended length (L_{ext})

The extended length of a telescoping gangway is the distance from the centre of the pin on the ship end to the centre of the support on the facility end, when the gangway is fully extended to its mechanical limits.

4.2.11 Walking surface

The walking surface of a gangway is the path being taken by the personnel.

4.3 Referenced Bureau Veritas Rules, Rule Notes and Guidance Notes

4.3.1 Offshore Rules

Offshore Rules means the Rules for the Classification of Offshore Units (NR445). When reference is made to the Offshore Rules, the latest version of these is applicable.

4.3.2 Ship Rules

Ship Rules means the Rules for the Classification of Steel Ships (NR467). When reference is made to the Ship Rules, the latest version of these is applicable.

4.3.3 Other documents

Other referenced Bureau Veritas Rules, Rule Notes and Guidance Notes are listed in Tab 3. when reference is made to these documents, the latest version of these is applicable.

Table 3 : Other Bureau Veritas documents

NR216	Rules on Materials and Welding for the Classification of Marine Units
NR266	Requirements for Survey of Materials and Equipment for the Classification of Ships and Offshore Units
NR320	Certification Scheme of Materials and Equipment for the Classification of Marine Units
NI425	Software Assessment for Shipboard Computer based System
NR426	Construction Survey of Steel Structures of Offshore Units and Installations
NI525	Risk based Qualification of New Technology - Methodological Guidelines
NR526	Rules for the Classification of Lifting Appliances onboard Ships and Offshore units
NR561	Hull in Aluminium Alloys, Design Principles, Construction and Survey
NR608	Classification of Lifting Units
NR632	Hardware-in-the-Loop Testing

4.4 Recognized standards

4.4.1 The following standards are recognized for the purpose of this Guidance Note:

- EN 13852-1: Cranes - Offshore cranes - General-purpose offshore crane
- FEM 1.001: Rules for the Design of Hoisting Appliances
- ISO 5488: Shipbuilding - Accommodation ladders
- ISO 7061: Shipbuilding - Aluminium shore gangways for seagoing vessels
- EUROCODE 3 - EN 1993: Design of steel structures
- EUROCODE 9 - EN 1999: Design of aluminium structures
- ANSI/AISC 360-10: Specification for Structural Steel Buildings

5 Documentation to be submitted

5.1 General

5.1.1 The documents listed in Tab 4 are to be provided, as a minimum.

Relevant additional drawings and calculation notes may be requested by the Society in complement to the hereafter mentioned documents.

Table 4 : Documentation to be submitted

Item No.	Documents	I / A **(1)**
1.1	Design basis	I
1.2	Technical specification	I
1.3	FMEA report	I
1.4	Testing program	I
1.5	Operating manual	I
1.6	Planned Maintenance System	I
2.1	General arrangement	I
2.2	Drawing of the assembly details	A
3.1	Drawings of the structural parts	A
3.2	Structure calculation notes	I
3.3	Data sheets of the wire ropes	I
3.4	Welding booklet	A
3.5	Construction testing instructions	A
4.1	Data sheets of the mechanical elements	I
4.2	Specification and structural drawings of the hydraulic cylinders	A
4.3	Description of the hydraulic/pneumatic installations, failure scenario, redundancy principles, emergency arrangement, list of components etc.	A
4.4	Hydraulic and pneumatic systems single line diagrams	A
5.1	Description of the electrical installation and control systems, failure scenario, redundancy principles, emergency arrangement, etc.	A
5.2	Electrical single line diagram	A
5.3	Description of the control system, bloc diagram, interface, software documentation etc. **(2)**	A
5.4	Description of the safety devices and components	A

(1) To be submitted: A = for approval; I = for information.

(2) Additional documentation may be needed for active OAS.

5.2 Failure modes and effects analysis

5.2.1 A FMEA is to be conducted at an early stage of the project.

5.2.2 It is required to update the FMEA for each modification of the access system.

5.3 General documents

5.3.1 Design basis

A design basis including the following is to be submitted:

- the allowable load on the gangway, in kN, and the maximum number of persons on the gangway
- the geometrical limitations and amplitudes
- the limiting accelerations and speeds of the OAS
- the minimum and maximum sea and air temperatures
- the category of the OAS
- the design life
- the description of the safety concept.

5.3.2 Technical specification

The characteristics of the access system are to be submitted for information in the form of a detailed technical specification including, in particular:

- the description of the system
- the list of components with reference and name of the manufacturers
- the safety device specification
- the list of all items of loose gear, marked in accordance with the relevant drawings and specifying the SWL and the test load of each item.

5.4 Documents for commissioning

5.4.1 Testing program

The description of the test program for the complete access system and for each sub-system is to be provided.

5.5 Documents for service and maintenance

5.5.1 Operating manual

The Manufacturer of the OAS is to provide an operating manual with detailed information on the method to use the system:

- the user instructions to operate the system
- the operational limitations
- the evacuation procedure.

5.5.2 Planned Maintenance System (PMS)

The PMS should include the requirements for the periodic examinations, testing and routine replacement of the components.

The PMS should ensure the traceability of the maintenance works and repairs carried out.

SECTION 2 SAFETY PRINCIPLES

1 General

1.1 Application

1.1.1 As a rule, the safety principles and features listed in this Section are to be met and addressed in a FMEA as required in [3]

1.2 Functional requirements

1.2.1 Operating envelope

The maximum motion capacity of an OAS, i.e. its operating envelope, is to allow for the ship motions foreseen in the intended most severe sea states.

Means for preventing gangway motions beyond the operating envelope are to be provided (alarm and disconnection).

1.2.2 Dynamic positioning (DP)

As a rule, the safety level of the access system is to be consistent with the safety level of the DP system when fitted.

In particular, the amplitude capacity of the OAS is to allow for the ship maximum offset under DP.

1.2.3 Connection

The description of the connection system (see Sec 3, [1.3]) and the connection and disconnection procedures are to be submitted to the Society.

1.2.4 Emergency stop

For active OAS, after an emergency stop of the motion compensation system, the static inclining angle of passageways where personnel may stand should not lead to a dangerous situation to the personnel.

1.2.5 Emergency disconnection

An emergency disconnection procedure should be submitted to the Society.

In case of emergency disconnection, the OAS shall be retrieved back to the safe position.

A quick disconnection device is to be provided as defined in Sec 6.

1.2.6 Protection

Any moving part of the OAS which may present a risk of injury for the personnel should be adequately protected.

1.2.7 Inclination

The static inclination of the gangway should not be more than +/-15°. Anti-slip means are to be provided.

Note 1: In no case the inclination is to be more than +/- 20°.

1.2.8 Trolley

When a trolley is used on the gangway, means to prevent uncontrolled sliding are to be provided.

1.3 Mechanical and machinery systems

1.3.1 Any single failure on a critical mechanical or machinery component should not lead to a dangerous situation for the personnel, the offshore facility or the access system.

Note 1: Critical component means active components or systems (eg. generators, pumps, switchboards, remote controlled valves, etc.) and also normally static components (cables, pipelines, manual valves, etc.) that cannot be shown to have adequate protection from damage or have proven reliability.

1.3.2 Any failure on the mechanical or machinery system is to be detected and give rise to an alarm at the operator's position.

1.3.3 In case of main power failure, the active OAS should return to the safe position.

1.3.4 The gangway is to be removed and returned to the safe position when contact with the platform is lost to avoid damage to the personnel or the offshore platform.

1.3.5 The emergency disconnection function is not to be affected by the loss of main power.

2 Safety features

2.1 Control and monitoring systems

2.1.1 Any single failure on a critical component of the control system or its power source should not lead to a dangerous situation for the personnel, the offshore facility or the access system.

Note 1: Critical component means active components (eg. switchboards, programmable logic controllers, sensors etc.) and also normally static components (cables) that cannot be shown to have adequate protection from damage or have proven reliability.

2.1.2 The control system is to be operating in case of main power failure.

2.1.3 Any failure on the control system is to be detected and give rise to an alarm at the operator's position and at the DP control station.

2.2 Alarms

2.2.1 General

An alarm system with traffic lights shall be fitted for the personal using the gangway (see Sec 3, [2.4]).

2.2.2 Green light

A visible signal (green light) should be provided to indicate when the transfer of personnel through the OAS is allowed.

2.2.3 Alarms

As guidance, amber and red lights should indicate respectively whether the personnel must evacuate the gangway or the OAS must be disconnected.

Note 1: Guidance on alarms is given in Sec 3.

2.3 Ranking of safety features

2.3.1 Tab 1 provides guidance in the ranking of the safety features.

3 Failure modes and effects analysis

3.1 General

3.1.1 Compliance with the safety principles given in the present Section is to be demonstrated by a FMEA.

3.1.2 A method to conduct the FMEA is defined in the Ship Rules, Pt E, Ch 2, App 1.

Note 1: Reference is also made to IMCA M166.

Table 1 : Ranking of the safety features

Order of precedence	Safety feature	
1st	Emergency stop	Manual disconnection system
2nd	Automatic disconnection system	
3rd	Other limiters	
4th	Indicators	

SECTION 3 DESIGN REQUIREMENTS

1 General

1.1 OAS type

1.1.1 The requirements of this Section apply to the active and passive types of OAS, as defined in Sec 1, unless otherwise specified.

1.2 OAS category

1.2.1 The offshore access systems fall within the two following categories, depending on the level of control exercised over the number of persons simultaneously present on the gangway:

- OAS category 1: NON-ROUTINE

  Non-routine transfer with control of the number of persons on the gangway and permanent presence of a gangway operator.
- OAS category 2: ROUTINE

  Routine transfer with limited control of the number of persons on the gangway.

1.3 Connection type

1.3.1 In general, the connection of the gangway to the platform fall within one of the following types:

- Mechanical connection
- Pushing connection.

1.3.2 Pushing connection

The design reaction forces at the gangway tip are to be defined and submitted to the Society. It should include:

- design reaction force with allowance, for normal operation
- warning level reaction force, see Tab 2
- emergency level reaction force, see Tab 2.

1.3.3 Motion tolerance of active OAS

The motion tolerance at the gangway tip of an active OAS shall not lead to a dangerous situation for the personnel.

The tolerance of the system is to be documented and submitted to the Society.

1.4 Marking

1.4.1 A marking plate is to be provided on the OAS with the following information:

- manufacturer name and address
- maximum allowable number of persons on the gangway

Note 1: This allowable number of persons should correspond to the design normal operating load.

- nominal length of the gangway.

1.4.2 In addition, the maximum allowable number of persons on the gangway is to be marked with easily legible letters on each end of the gangway.

2 Operating envelope

2.1 Definitions

2.1.1 Operating envelope

The operating envelope of the OAS is defined as the volume in which the gangway tip can move within the operational limits.

An example of operating envelope for an OAS with a fixed pedestal is given in Figure 1.

2.1.2 Telescoping amplitude

The telescoping amplitude is the translation allowance in the gangway longitudinal axis.

2.1.3 Luffing amplitude

The luffing amplitude is the rotation allowance in the gangway transverse axis.

2.1.4 Slewing amplitude

The slewing amplitude is the rotation allowance in the pedestal vertical axis.

2.1.5 Mechanical limits

The mechanical limits are the boundary values of the OAS motions defined above.

2.2 OAS motions

2.2.1 Ship motions

The operating envelope is to be defined in order to allow the OAS to follow the supporting ship's motions.

2.2.2 Telescoping motions

As a rule, the telescoping velocity of the gangway is not to be more than 1.0 m/s while the personnel is crossing the gangway.

2.3 Mechanical limits

2.3.1 The accidental situation where the passive OAS is not disconnected and the mechanical limits are reached should be assessed and should not result in a dangerous situation for the personnel and/or the supporting ship.

2.4 Alarms

2.4.1 General

As a guidance, a 2 levels alarm should indicate whether the personnel must evacuate the gangway or the OAS must be disconnected (see Tab 1 and Fig 1).

2.4.2 Alarm triggering conditions

The alarm triggering conditions are given in Tab 2 for guidance purpose.

Table 1 : Guidance for gangway working limits

Working limits	Alarm		Consequence
	Visual	Audible	
Warning status	amber light	level 1	No transfer. Personnel on gangway must evacuate
Emergency status	red light	level 2	Disconnection

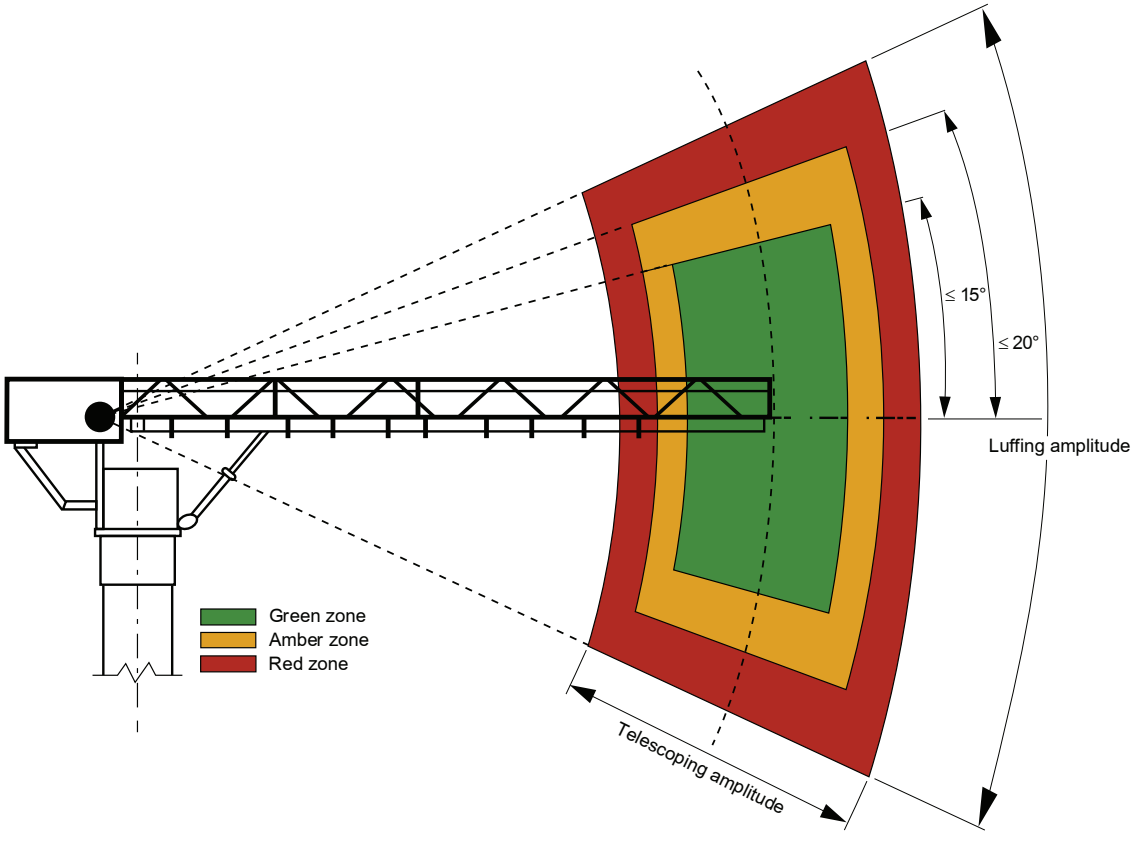
Table 2 : Guidance for alarm triggering conditions

Alarm	Trigger conditions	Consequence

Level 1
Amber zone
	The level 1 alarm is triggered when one of the following situations occurs:
	• for active OAS, a failure in the motion compensated system is detected
	• a failure in the station keeping system of the supporting ship is detected
	• loss of power is detected
	• for pushing connection, the reaction force at gangway tip is reduced to the warning level
	• the amplitude capacity of the OAS reaches its warning limits:
	  • gangway motion reaches 75% of the mechanical limits, or remaining amplitude is equal or less than 1.0 m on telescoping motion
	  • gangway inclination reaches +/- 15°
		Evacuation

Level 2
Red zone
	The level 2 alarm is triggered when one of the following situations occurs:
	• for passive OAS, a failure in the connection system occurs
	• overload detected
	• for pushing connection, the reaction force at gangway tip is reduced to the emergency level
	• the amplitude capacity of the OAS reaches its ultimate limits:
	  • gangway motion reaches 90% of the mechanical limit
	  • gangway inclination reaches +/- 20°
		Disconnection

Figure 1 : Example of an operating envelope and alarm system for a fixed pedestal OAS



3 Gangway design

3.1 General

3.1.1 The gangway design and arrangement should comply with the relevant requirements of a recognized standard such as the ISO 5488 (Shipbuilding - Accommodation ladders) or the ISO 7061 (Shipbuilding - Aluminium shore gangways for seagoing vessels).

3.2 Effective width

3.2.1 The effective width of the walking surface of the gangway should not be less than:

- OAS category 1 - non-routine transfer: 600 mm
- OAS category 2 - routine transfer: 1200 mm.

3.3 Handrail

3.3.1 Handrail arrangements are to be made in order to prevent people from falling from the gangway.

3.3.2 Handrails are to fitted on both sides of the gangway and are to comply with the following, as a minimum:

- a handrail height of at least 1 m from the walking surface
- at least three course
- provided with a foot-stop on each side
- to be supported by stanchions spaced not more than 1.5 m apart
- the opening below the lowest course of the handrail is not to exceed 230 mm
- the other courses are to be not more than 380 mm apart.

3.3.3 Requirements for the structural assessment of the handrails are provided in Sec 4, [6.2].

4 Operator control station

4.1 General

4.1.1 Offshore access systems are to be provided with an operator control station, as defined in Sec 5, from which the operator can see the gangway.

The control station is to provide an effective protection against cold, damp, heat, rain, wind or other threats.

SECTION 4 STRUCTURAL ASSESSMENT

Symbols

CoG : Centre of Gravity.

1 General

1.1 Application

1.1.1 The present Section provides requirements for the global structural assessment as well as the local scantlings of the gangway structure.

2 Material

2.1 Structural category

2.1.1 Structural elements in welded constructions are classed into three categories: second category, first category and special category:

- Second category elements are structural elements of minor importance, the failure of which might induce only localized effects
- First category elements are main load carrying elements essential to the overall structural integrity of the unit or installation
- Special category elements are parts of first category elements located in way or at the vicinity of critical load transmission areas and of stress concentration locations.

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

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

2.1.4 As a rule, the load bearing structural item of the OAS and its foundations are to be considered at least as first category elements.

2.1.5 As a rule, the following items are to be considered as special category elements:

- Pad-eyes and surrounding structures when used for OAS connection or personnel transfer operations
- Connecting part of pedestals to the ship structure

2.2 Steel grades

2.2.1 The steel grade selection, based on the design temperature and the structural category of the item, is to be in accordance with the Offshore Rules, Part B.

2.3 Aluminium grades

2.3.1 For aluminium structures, reference is made to NR561.

2.4 Bearings and rings

2.4.1 The material selection of slew bearings and other mechanical parts are to comply with a recognized standard.

3 Design loads

3.1 General

3.1.1 This Article provides guidance for the determination of the design loads for the global structural assessment of the OAS.

3.1.2 The following design loads are to be assessed and submitted to the Society:

- Dead weights:
  - self-weight of the OAS elements
- Dynamic loads:
  - accelerations on the gangway due to the OAS self-motions
- Operating loads:
  - normal working load (eg: personnel being transferred, cargo on trolley, transfer of fluids)
  - evacuation working load
- Environmental loads:
  - wind loads
  - ice and snow accretions
  - motions and accelerations of the supporting ship
- Accidental loads:
  - impact of the gangway on the offshore facility.

3.2 Self-weight of the OAS elements

3.2.1 The Manufacturer is to state the OAS mass to be considered in the calculations.

3.3 Influence of the OAS self-motions

3.3.1 When relevant, the OAS accelerations due to self-motions are to be considered for the connection and disconnection phases.

In this case, the accelerations on the gangway are to be assessed, based on the effects of:

- the horizontal tangential accelerations due to slewing motion (starting and braking)
- the vertical accelerations due to luffing motion (starting and braking).

Note 1: Radial (centrifugal) accelerations due to slewing motion may be disregarded.

3.3.2 Accelerations γ_S and γ_L

The acceleration γ_S and γ_L , in m/s^2, at the gangway centre of gravity (CoG) and due, respectively, to the slewing and luffing motions may be assessed using the following formulae:

$$\gamma_S = \frac{2\pi}{60} \cdot \frac{N_S X_S}{t_S}$$

$$\gamma_L = \frac{2\pi}{60} \cdot \frac{N_L X_L}{t_L}$$

where:

N_S : Maximum slewing speed, in rad/min

N_L : Maximum luffing speed, in rad/min

X_S : Radius, in m, of the gangway CoG with respect to the slewing rotation axis (see Fig 1)

X_L : Radius, in m, of the gangway CoG with respect to the luffing rotation axis (see Fig 1)

t_S : Braking time, in s, of the slewing motion

t_L : Braking time, in s, of the luffing motion.

3.4 Working loads

3.4.1 On the gangway

The design working loads are to be submitted to the Society and supported by the design basis. As a guidance, the typical design working loads on gangway are given in Tab 1.

The working loads depend on the OAS category (see Sec 3) defining the level of control exercised over the number of persons on the gangway at the same time.

3.4.2 On platforms

The working loads on platforms or decks adjacent to the gangway are given in Tab 1.

Figure 1 : Description of the radii of rotation

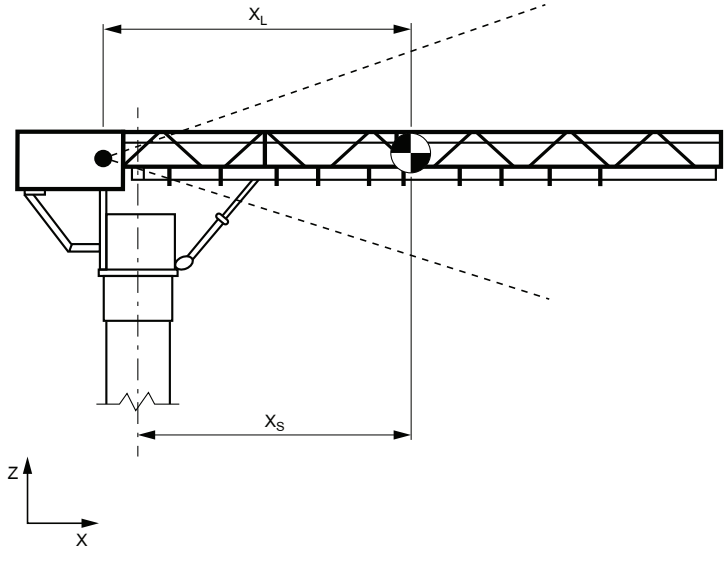


Table 1 : Guidance for working loads

Working loads	On gangway		On platforms or decks adjacent to the gangway
	OAS category 1 - Non-routine transfer	OAS category 2 - Routine transfer	
Normal load	Maximum number of persons and mass of goods for normal operation	4,0 kN/m^2	4,0 kN/m^2
Evacuation load	Maximum number of persons in case of evacuation with one person in a stretcher	4,8 kN/m^2	4,8 kN/m^2
Load application	Mass for a person: 100 kg, including personal protecting equipment (PPE) Footprint of a person: 0,50 m x 0,50 m The mass of the person in stretcher is supported by the stretcher bearers	Load distributed over the walking surface: effective width x nominal length	Load distributed over the walking surface: effective width x nominal length

3.5 Wind loads

3.5.1 The wind velocities to consider for the structural assessment of the OAS and its foundations are given in Tab 2.

Note 1: The design wind velocity corresponds to an average velocity over 1 minute and taken at 10 m above sea level.

Table 2 : Wind velocity

Condition of operation	Wind velocity
Transit	51,5 m/s
Extreme operating conditions	20 m/s or from operating manual, whichever is the greatest

3.6 Ice and snow accretions

3.6.1 When relevant, the design loads due to ice and snow accretions are to be taken into account and supported by the design basis.

3.7 Motions and accelerations of the supporting ship

3.7.1 Environmental conditions

The assumptions of the maximum ship motions and local accelerations at the OAS CoG are to be submitted to the Society.

3.7.2 Transit

The assumptions of the maximum accelerations on the OAS during transit phase are to be submitted to the Society.

3.8 Accidental loads

3.8.1 Impact of the gangway on the offshore facility

Impact loads are to be assessed considering the following:

a) minor impact situation, considered exceptional but substantially probable. As a guidance, the gangway tip relative speed should be taken not less than 1,0 m/s at the time of impact or the impact acceleration should be taken not less than 0,25 g.

b) major impact situation, considered accidental (low probability) and which requires a verification of the structure before the OAS is put back into service.

   The determination of the impact velocity is to be supported by the design basis.

Note 1: Should a major impact occur, the OAS shall not be used before a complete verification and NDT of critical elements have been performed and a report has been submitted to the Society.

4 Loading conditions

4.1 Load cases

4.1.1 The loading conditions are brought together in five load cases as per Tab 3.

Table 3 : Load cases

I	Normal operation with no environmental loads
II	Normal operation with environmental conditions
III	Exceptional conditions
IV	Testing conditions
V	Accidental conditions

4.2 Loading conditions

4.2.1 The loading conditions are to be defined based on the FMEA and submitted to the Society for approval.

As a minimum, the loading conditions shall cover:

- transit conditions
- connection/disconnection conditions
- normal operations
- exceptional situations.

As a guidance, the loading conditions defined in Tab 4 should be considered.

4.2.2 Active OAS

For active OAS, the loads on the foundations are to be calculated with and without the compensation system activated.

5 Structural assessment

5.1 Allowable stresses

5.1.1 Steel structures

The allowable normal stresses σ_{all} for steel structures are defined in Tab 5, depending on the load cases (see definitions in Tab 3).

5.1.2 Aluminium structures

For aluminium structures, the allowable stresses defined in NR561 are to be considered.

5.2 Buckling

5.2.1 Buckling is to be assessed as per NR526, Sec 4, [1.3] and Sec 4, [1.4].

Table 4 : Guidance for loading conditions

Loading condition	System condition	Load case	OAS category **(2)**	Operating load	Wind load	Other loads **(3)**
Transit	Stowed	NA **(4)**	1 / 2	None	Transit	Transit
Normal connection/disconnection	Disconnected	II	1 / 2	None	Max	OAS self-motions
Operating conditions	Connected	I	1	2x Normal	None	None
			2	Normal		
Extreme environmental conditions	Connected	II	1	2x Normal	Max	Max
			2	Normal		
Emergency evacuation connected	Connected	III	1	2 x Evacuation	Max	Max
			2	Evacuation		
Emergency evacuation disconnected	Disconnected	III	1	2 x Evacuation	Max	Max
			2	Evacuation		
Failure in compensation system **(1)**	No compensation system	III	1	2x Normal	Max	Max
Failure in connection system	Disconnected	III	1	2x Normal	Max	Max
Testing	As per Sec 6	IV	1 / 2	As per Sec 6	None	None
Minor impact	Disconnected	III	1 / 2	None	None	Minor impact
Major impact	Disconnected	V	1 / 2	None	None	Major impact

(1) Active OAS only
(2) 1 = Non-routine transfer ; 2 = Routine transfer.
(3) Ice accretion is to be considered, when relevant.
(4) NA = Not applicable.

Table 5 : Allowable stresses

Load case	σ_{all} **(1)**
I	0,67 R_e
II	0,75 R_e
III	0,90 R_e
IV	0,90 R_e
V	1,00 R_e

(1) R_e : Yield strength, in N/mm^2, taken equal to:
- if $R_{e\,0,2} < 0,7\ R_r$: $R_e = R_{e\,0,2}$
- if $R_{e\,0,2} \geq 0,7\ R_r$: $R_e = 0,417\ (R_{e\,0,2}+R_r)$

$R_{e\,0,2}$: Yield stress at 0,2% strain, in N/mm^2
R_r : Tensile strength, in N/mm^2.

5.3 Fatigue

5.3.1 A fatigue assessment is to be conducted in accordance with a recognized standard (such as FEM 1.001).

A fatigue analysis report is to be submitted to the Society. The report should contain:

- the description of the transit, connection/disconnection and operating loading conditions, taking into account the influence of self-weight, operating loads and dynamic loads due to self motions and ship motions on waves
- for each loading condition, the description of the operating profile through the design life
- the description of the structural details selected and their mean stress and stress range distribution, for each loading condition
- the calculation of the cumulative damage ratio D for each structural detail
- the design life.

5.3.2 Checking criteria

The cumulative damage ratio is to be not more than 0,5.

6 Gangway local scantlings

6.1 General

6.1.1 Independently of the global structural assessment described in Articles [4] and [5], the gangway scantlings is to comply with the criteria of this Article.

Note 1: Subject to the Society's approval, compliance with another recognized standard may be accepted.

6.1.2 For OAS category 1 (non-routine transfer), the design loads may be reduced, subject to the Society approval.

6.2 Design loads

6.2.1 Gangway

The gangway is to sustain a distributed load not less than 4,0 kN/m^2 applied all over the walking surface.

The load should be applied on the simply supported gangway in fully extended position.

6.2.2 Handrail

Handrails and supports are to be designed for a side loading at the upper handrail of 500 N/m.

6.3 Allowable stresses

6.3.1 The allowable stresses for the gangway scantlings are to be such that:

$\sigma \leq 0,50\ R_e$

$\tau \leq 0,25\ R_e$

where:

R_e : Yield strength for steel and 0,2% proof stress for aluminium.

6.4 Deflection

6.4.1 The deflection of the gangway is to be limited to the allowable values given in Sec 7, [2.2].

7 Special components

7.1 Connection system

7.1.1 The load bearing parts of the connection system are to be verified in normal and exceptional situations in order not to accidentally disconnect.

7.2 Structural axles and hinges

7.2.1 Structural axles and hinges are to be assessed in accordance with NR526, Sec 4.

7.3 Bolts and nuts

7.3.1 Bolts and nuts are to comply with an international recognized standard.

7.4 Bearings and slewing rings

7.4.1 The slewing ring and the bearings are to sustain the overturning moment and the compressive force in working conditions.

7.4.2 The maximum permissible values for overturning moment and vertical forces on bearings are to be submitted to the Society.

The maximum permissible slewing torque is also to be specified.

7.5 Wire ropes

7.5.1 Wire ropes are to be selected in accordance with NR526, Sec 4 and Sec 6, as applicable for man-ridding applications.

7.6 Loose gears

7.6.1 Loose gears are to be selected in accordance with NR526, Sec 5.

SECTION 5 MACHINERY

1 General

1.1 Application

1.1.1 The requirements of this Section are to be satisfied in addition to those of NR526.

1.1.2 Reference is made to NR526 for the assessment of the following pieces of equipment:

- winches
- cylinders
- piping
- sheaves
- loose gear.

1.2 Slack rope prevention

1.2.1 When wire ropes are used, a slack rope prevention device should be fitted.

2 Hydraulic and pneumatic systems

2.1 General

2.1.1 The adequate safety of the hydraulic and pneumatic equipment shall be demonstrated by means of construction drawings, calculations, the relevant circuit diagrams and a functional description of the plant.

2.1.2 The system shall be designed such that, in the event of hydraulic leakage, no dangerous situation may occur.

In case of failure, the OAS shall take the intrinsically safe position.

2.1.3 For motion compensated systems directly operated by cylinders, valves shall be fitted to prevent uncontrolled lowering in case of pipe or hose failure.

2.1.4 Rams and cylinders shall be mounted so that they are subjected to axial loads only.

2.1.5 Mounting of the piping and the equipment shall be performed in such a way as to allow inspection along its whole length.

2.2 Travelling limits

2.2.1 Effective means shall be provided to prevent rams from travelling beyond the limits of the cylinder.

2.3 Piping

2.3.1 Piping shall be supported so that undue stresses are eliminated. Particular attention shall be paid to joints, bends and fittings, and at any section of the system subject to vibration.

2.4 Hoses

2.4.1 Pressure hoses shall be able to withstand five times the maximum permissible working pressure. Hydraulic hoses shall be suitable for the type of hydraulic fluid used in the system.

Hoses shall be installed so as to prevent sharp bends and chafing or trapping due to moving parts of the machine.

The manufacturer shall specify the intervals at which the hoses should be replaced.

2.5 Reservoir

2.5.1 General

Reservoirs for hydraulic fluid shall be of rigid construction, having adequate and effective venting to the atmosphere. The inner covering of the reservoir shall withstand the chemical characteristics and temperature range of the fluid.

An air filter, a fluid strainer and a level indicator shall be provided. The reservoir for normal operation shall have at least 10% more capacity than that necessary to guarantee an uninterrupted flow of the fluid to the pump.

2.5.2 Alarms

Low and high level alarms and a temperature alarm shall be provided.

2.6 Venting

2.6.1 The hydraulic circuits shall be fitted with a purging system to permit the release of air.

2.7 Pressure gauge

2.7.1 Each hydraulic power unit is to be fitted with a permanent pressure gauge.

2.7.2 Provisions shall be made in the hydraulic system for the fitting of a pressure gauge to facilitate checking of the working pressure and the setting of the pressure relief valve.

2.8 Pressure limits

2.8.1 The hydraulic or pneumatic system shall incorporate a pressure relief valve fitted between the pump and the non-return valve. The relief valve shall be set to a pressure of not more than 10% (pneumatic) or 20% (hydraulic) higher than the highest normal working pressure but at a pressure higher than that required to prevent the relief valve blowing off during normal working conditions.

2.9 Stability

2.9.1 The stability of the cylinders shall be calculated using 1,4 times the working load.

2.10 Fail safe

2.10.1 If due to the failure of piping or hoses a dangerous situation can occur, a non-return valve, a flow control valve or a pipe break valve shall be fitted directly to the cylinder.

2.11 Inert gas storage

2.11.1 The storage and handling of gases used for the compensation system is to comply with the Ship Rules, Pt C, Ch 1, Sec 3 and Pt C, Ch 1, Sec 10, as applicable, for pressure vessels.

SECTION 6 ELECTRICAL INSTALLATIONS AND CONTROL SYSTEMS

1 General

1.1 Application

1.1.1 The requirements of this Section are to be satisfied in addition to those of NR526.

2 Electrical installations

2.1 Lighting

2.1.1 Adequate lighting along the gangway and the platform is to be provided.

3 Control and monitoring systems

3.1 General

3.1.1 As a rule, the control system is to comply with the safety principles defined in Sec 2.

3.2 Alarms

3.2.1 The level 1 and level 2 alarms, as defined in Sec 3, are to be audible and visible for:

- the operator of the OAS
- the personnel about to cross the gangway and on the gangway, in both directions
- the dynamic positioning operator (DP operator), through a repeater when necessary.

A light signal system in accordance with Sec 2 and Sec 3 is to be provided.

3.3 Logic controller

3.3.1 Assessment

The logic controllers of the control system are to comply with the Ship Rules, Pt C, Ch 3, Sec 6 and NI425, as applicable for Category III systems.

3.3.2 Testing

For active OAS, the control system of the motion compensated system is to comply with the requirements of NR632.

3.4 Quick disconnection device

3.4.1 When fitted, the design and setting of the quick disconnection device at the gangway tip is to be documented.

3.4.2 The quick disconnection device is to be operated manually by the operator or automatically when the level 2 alarm is reached.

3.4.3 The device is to be operative in case of loss of the main power source.

3.5 CCTV

3.5.1 It is recommended to provide a closed-circuit television (CCTV) at gangway tip with a control screen at the OAS operator control station.

4 Operator control

4.1 OAS control station

4.1.1 General

The OAS control station is to be provided with the following:

- level 1 and level 2 alarms as defined in Sec 3
- alarm in case of loss of power
- commands for the connection of the OAS
- indication of the gangway position (telescoping length, slewing angle, luffing angle) and the remaining margins regarding the operating envelope
- emergency disconnection command
- a 2-way communication system should be provided between the OAS operator and:
  - the bridge
  - the DP operator.

4.1.2 Active OAS commands

The operator of an active OAS is to have the adequate commands in order to override the OAS automatic compensate motions.

4.1.3 OAS category 1 - Non-routine transfer

The permanent presence of an operator is mandatory for the deployment and use of a non-routine OAS.

OAS category 1 shall not be operational without an operator.

4.2 DP control station

4.2.1 The DP control station is to be provided with the following:

- a 2-way communication system with the OAS operator
- indication of the wind speed

SECTION 7 INSPECTION AND TESTING

1 General

1.1 Application

1.1.1 The present Section covers the inspection and testing at the manufacturer's workshop and after installation on-board.

1.2 Inspection during construction

1.2.1 During construction, non destructive testing (NDT) may be required as per NR426.

1.3 Testing

1.3.1 Alternatives to the proposed testing procedures may be accepted on a case-by-case basis, if an equivalent level of safety is provided.

1.3.2 Attendance of a Society's Surveyor is required for each test, unless otherwise agreed.

1.3.3 After completion of each test, a thorough visual examination of the equipment is to be performed and a test report including load record and inspection results is to be produced by the party applying for classification and submitted to the Society.

1.3.4 The testing program is to be submitted as required in Sec 1, [5].

2 Component and material testing

2.1 General

2.1.1 Procedural requirements for the certification and testing of the components and material are described in Sec 1.

2.2 Gangway structure

2.2.1 In addition to the OAS testing, the gangway structure is to be tested as an individual structural item.

Under the testing conditions described in [2.2.2] and [2.2.3], the deflection criteria given in [2.2.4] shall be satisfied.

2.2.2 OAS category 1 - Non-routine transfer

The test is to be conducted with the gangway in cantilever position, i.e. fixed at one end and in fully extended length.

The test load is to be not less than twice the evacuation working load applied at the gangway tip.

2.2.3 OAS category 2 - Routine transfer

The test is to be conducted with the gangway in horizontal position and simply supported at each ends in the fully extended length with a distributed load equal to 125% of the evacuation working load.

2.2.4 Allowable deflection

The deflection measured should not be higher than:

- 1,00% of the extended length for steel, and
- 0,75% of the extended length for aluminium.

2.2.5 Inspection after testing

The gangway is to be thoroughly inspected after testing.

2.3 Machinery systems

2.3.1 Testing of the machinery systems is to be performed in accordance with the Ship Rules, Part C, Chapter 1.

2.3.2 Hydraulic system

A pressure test at 1,5 times the design pressure for 30 minutes is to be conducted for every part of the hydraulic system.

2.4 Electrical and control systems

2.4.1 Testing of the electrical installations and control systems is to be performed in accordance with the Ship Rules, Part C, Chapter 1, Part C, Chapter 2 and Part C, Chapter 3.

2.4.2 Motion reference unit (MRU)

The MRU is to be tested in accordance with the Manufacturer's procedure, approved by the Society.

3 OAS testing at the Manufacturer's workshop

3.1 General

3.1.1 The tests described in this Article are to be performed under the surveillance of the Society.

3.1.2 Testing weights

The testing weights are to be calibrated and certified with a tolerance on mass of +/– 2,0% accuracy.

3.2 Functional test with no load

3.2.1 Deployment of OAS

The functional test with no load, in connection phase, is carried out at maximum speed and in continuous operation for 5 minutes in each direction of the allowed OAS motions.

The braking system and emergency stop command are to be tested.

During testing, good operation of control device and oil tightness are checked.

3.2.2 Alarms

The alarms are to be tested under simulated conditions.

3.3 Functional test under load

3.3.1 The functional tests described in this Article are to be conducted under a load mass equivalent to the evacuation working load.

3.3.2 Active OAS

A simulation of transfer phase, with a moving support and under normal working load for 30 min, is to be performed.

This test is to be conducted up to the maximum motion amplitude of the system.

Note 1: As an alternative, the moving support may be replaced by a software simulation.

3.3.3 Passive OAS

The following tests are to be performed:

- deployment of OAS
- test of the connection device
- test of emergency disconnection

  When an automatic disconnection system is provided, it shall be tested under simulated conditions.
- simulation of transfer phase with a lateral load equal to the wind load.

3.4 Overload test

3.4.1 OAS category 1 - Non-routine transfer

A test mass of twice the evacuation working load is to be hung at the gangway tip meanwhile the gangway motions are tested up to the limits.

The gangway is to be in its fully extended length.

Note 1: For instance, if the exceptional operating load is 3 persons x 100kg, the testing load is 600 kg at the gangway tip end and the gangway motion is tested at normal speed. Typically, slewing port to starboard at 90° each side, and up and down to the luffing system limits.

Note 2: A lower value of overload may be allowed if an equivalent level of safety, as applicable for man ridding cranes, can be demonstrated. The self-weight of the gangway is to be considered in the justification.

3.4.2 OAS category 2 - Routine transfer

A test mass of 125% of the evacuation working load is to be distributed along the walking surface of the gangway meanwhile the gangway motions are tested up to the limits.

The gangway is to be in its fully extended length.

3.4.3 Inspection during testing

During testing, good operation of control device and oil tightness are checked.

3.4.4 Inspection after testing

The gangway is to be thoroughly inspected after testing. Permanent deformation is not allowed.

The final setting of the safety valves or other overload protection system is to be performed after overload test.

4 On-board testing

4.1 General

4.1.1 The testing on-board is to include the:

- deployment of the OAS
- functioning of the MRU
- functioning of the connection/disconnection system
- overload tests.

4.1.2 For the purpose of these tests, a testing weight equal to the evacuation working load is to be used.

Table 1 : Testing of OAS

Equipment	Tests to be carried out at the Manufacturer's workshop	Test to be carried out on-board
Active OAS	• Functional test with no load • Functional test under load • Overload test	• Functional test under load • Overload test
Passive OAS category 1 - Non-routine transfer	• Functional test with no load • Functional test under load • Overload test	• Functional test under load • Overload test
Passive OAS category 2 - Routine transfer	• Functional test with no load • Functional test under load • Overload test	• Functional test under load • Overload test

SECTION 8 INTEGRATION ON THE SUPPORTING SHIP

1 General

1.1 Application

1.1.1 This Section provides requirements for the integration of the OAS on-board when the class notation **OAS** is granted.

1.2 Documentation to be submitted

1.2.1 General

The following documentation is to be submitted for information:

- The environmental conditions:
  - maximum significant wave height and peak period
  - maximum wind speed
  - minimum and maximum ambient temperatures.
- ship motions and accelerations under the most severe environmental conditions
- Utilization diagrams indicating the limiting sea states with respect to the ship's heading and the significant wave height and period

1.2.2 Failure Modes and Effect Analysis

The FMEA is to be updated with the ship's data and the utilization diagrams of the OAS.

2 Characteristics of the supporting ship

2.1 Station keeping

2.1.1 As a rule, when dynamic positioning is used as means of station keeping for transfer of personnel, it should comply with IMO Class 2 minimum.

Note 1: Reference is made to IMO MSC/circ. 645.

2.1.2 For small vessels which do not comply with the above requirement, justification of the station keeping performance and availability is to be provided.

3 Integration on the supporting ship

3.1 Motions and accelerations of the supporting ship

3.1.1 Operating conditions

The ship motions and local accelerations at the OAS centre of gravity corresponding to the most severe environmental conditions for connection and transfer are to be provided.

The ship motions and accelerations based on the Rules applicable to the supporting ship are to be considered, unless the applicant can demonstrate other values based on direct analysis.

3.1.2 Transit

Accelerations on the OAS during transit phase are to be assessed with reference to the Rules applicable to the supporting ship.

3.2 Structural foundations

3.2.1 The structural foundations of the OAS on the supporting unit are to comply with the relevant requirements of NR608, Section 4.

3.3 Stability

3.3.1 Attention is drawn to the issues which may rise when the use of the OAS is creating substantial heeling angles.

Relevant stability criteria may have to be verified, as applicable for lifting units (see Section 3 of NR608).

3.4 Power supply

3.4.1 When the power is supplied by the supporting ship, it should be able to run simultaneously and as a minimum:

- the OAS at its maximum rated load and velocity
- the ship's essential services
- the dynamic positioning system

3.4.2 The power and availability of the power supply is to be supported by the FMEA.

4 Inspection and testing

4.1 On-board testing

4.1.1 On-board testing is defined in Sec 7, [4].

SECTION 9 IN-SERVICE SURVEY

1 General

1.1 Application

1.1.1 Requirements provided in the present Section for in-service surveys are applicable in order to maintain the additional class notation **OAS**.

1.1.2 In-service surveys are based on the provisions of Part A of the Ship Rules, including the survey periodicity.

1.1.3 Depending on the specificities of the transfer system, additional testing may be required to the satisfaction of the attending Surveyor.

1.2 Maintenance and repair

1.2.1 Before the periodic examination, the Planned Maintenance System (PMS), as defined in Sec 1, [5.5.2], and the service record booklet are to be submitted to the Society.

1.2.2 The Society is to be kept informed of any damage and repair on the OAS. Inspection and testing during under the surveillance of the Society may be required before recommissioning operations.

2 Survey of OAS

2.1 Annual survey

2.1.1 The annual survey includes, as a minimum, the following items:

a) visual examination of the foundations of the OAS including structural reinforcements

b) visual examination of the OAS structure

c) visual examination of the hydraulic power units

d) visual examination of the hydraulic components

e) visual examination of the loose gears

f) visual examination of the slewing ring and bearings

g) visual examination of the telescoping mechanical system

h) wire rope inspection as per Article [3]

i) general examination of the electrical installation

j) general examination of the control systems

k) general examination of the alarms

l) functional testing of the OAS with no load.

2.1.2 The review of the PMS or service record booklet is to be carried out. The purpose is to check:

- that the periodical testing of the equipment has been carried out in accordance with the Manufacturer's PMS
- the eventual repair, maintenance or replacement of equipment or components.

2.2 Class renewal survey

2.2.1 In addition to the items of the annual survey, the class renewal survey includes, as a minimum, the following items:

a) verification of the equipment condition, with disassembly as deemed necessary

b) thorough examination of the hinged part of the gangway, with disassembly as deemed necessary

c) thorough examination of the bolted joints onto the foundations, with disassembly as deemed necessary

d) thorough examination of the welded connection, with Non Destructive Testing as deemed necessary

e) thickness measurements of the steel structure, as deemed necessary

Note 1: As a rule, from the third Class renewal survey, the thickness measurements of steel structures are to be systematically made

f) control of the safety devices, with disassembly as deemed necessary

g) verification of the hydraulic installations, in accordance with the Ship Rules, Part A

h) verification of the diesel engine in accordance with the Ship Rules, Part A

i) verification of the electrical installations in accordance with the Ship Rules, Part A

j) verification of the slew rings and bearings, with disassembly as deemed necessary

k) verification and testing of the pressure vessels in accordance with the Ship Rules, Part A

l) overload testing of the OAS in accordance with Sec 7

m) disconnection testing of the OAS in accordance with Sec 7

3 Wire and fibre ropes

3.1 Rope inspection

3.1.1 Wire and fibre ropes are to be inspected to check or to detect:

- corrosion or chemical attacks
- wear condition, especially on curved portions
- broken wires or strands
- deformation or straining of wires and strands (wire extrusions, kinks, protrusions of core, bends, flattened portions, etc.)
- local increase or decrease in rope diameter
- condition of rope terminations inclusive of winch end fastenings.

3.1.2 The end termination of rope is to be carefully examined in order to detect corrosion due to infiltration into the rope sockets.

3.1.3 After examination, the wire rope must be suitably cleaned and lubricated according to the manufacturer specification.

3.1.4 If any defect, as defined in [3.2], is detected on the wire rope during inspection, the wire rope is to be replaced.

3.2 Rope discard criteria

3.2.1 The wire ropes are to be discarded and replaced in the following cases:

- when damages, such as wire extrusions, kinks, core protrusions, bends, flattened portions, increase or decrease in diameter, etc., are noticed
- when the sectional area of the outer wires is reduced by 40% due to wear or corrosion
- when internal corrosion is noticed
- when a strand is broken
- when the number of broken wires results in 5% reduction of the metal cross-sectional area of the rope on a rope length equal to 10 times its diameter. For application of this criterion, wires highly corroded or deformed and those which have reached the wear limit of 40% mentioned above are to be considered as broken.

3.2.2 The above criteria are given for guidance. Reference can also be made to the standard ISO 4309-2004, "Wire rope for lifting appliances - Code of practice for examination and discard", which gives detailed particulars in this respect.

Each time deemed necessary, the Surveyor may require replacement of a wire rope before the discard criteria are entirely met.

APPENDIX 1 CALCULATION OF FORCES DUE TO WIND

1 General

1.1 Application

1.1.1 This Appendix provides guidance for the assessment of the loads due to the wind on the structure.

1.2 Wind pressure

1.2.1 The design wind speed given in Sec 4 is the speed V_{10} of the wind at a height of 10 m above sea level.

The wind speed V, in m/s, prevailing at the height H, in m, above sea level may be obtained by the following formula:

$$V = V_{10}\sqrt{2,5\frac{H+66}{H+180}}$$

1.2.2 The basic aerodynamic pressure q_0, in daN/m², is given by the following formula:

$$q_0 = \frac{V^2}{16}$$

with V as defined in [1.2.1].

1.2.3 The design aerodynamic pressure q_d, in daN/m², is equal to:

$q_d = q_0 C_d$

where:

q_0 : Basic aerodynamic pressure defined in [1.2.2]

C_d : Drag coefficient depending on the shape and making-up of the elements. See Tab 1.

Regarding truss tower of square-shaped cross-section:

- when $\varphi < 0,08$: the truss may be neglected
- when $\varphi > 0,40$: the element may be considered as solid, equivalent to its envelope, and C_d may be taken equal to 1,0.

Where:

φ : Filling truss ratio, i.e. ratio of the area of the solid element to the envelope area of the truss element.

1.2.4 Shading effects of one beam with respect to another are to be considered when:

$b / h \geq 6$ or $b / (\varphi h) > 20$

where:

b : Net distance, in m, between the beams

h : Height, in m, of the shading beams

φ : Filling truss ratio.

In the other cases, the following down scaling coefficient β is applied to the shaded part of the beam:

- when $\varphi > 0,6$:
  $\beta = \beta_0$
- when $\varphi \leq 0,6$:
  $\beta = \beta_0 + (1,1 - \beta_0)(1 - 1,67\varphi)^c$

where:

$$\beta_0 = 0,1\frac{b}{h} + 5,7\left[10^{-5}\left(\frac{b}{h}\right)^5\right]$$

$$c = \left(\frac{5h}{b}\right)^{0,2}$$

1.2.5 The effect of the wind on the personnel crossing the gangway may be also evaluated according to the herebefore principles, C_d being taken as 1,0.

Table 1 : Drag coefficient C_d

Element		Drag coefficient C_d
type	made of	
Solid beams of length L and height h (I type, H type, etc).		1,16 + 0,022 L/h
Round-shaped beams		0,6
Plane truss	shaded beams	$2 - 0,8\varphi$
	pipes	$0,60(2 - 0,8\varphi)$
Truss tower of square-shaped cross-section, with wind perpendicular to one face	shaded beams	$3,2 - 2\varphi$
	pipes	$0,70(3,2 - 2\varphi)$
Truss tower of square-shaped cross-section, with wind along a diagonal	shaded beams	$1,20(3,2 - 2\varphi)$
	pipes	$0,85(3,2 - 2\varphi)$
Truss tower of triangular cross-section	shaded beams	$3,2 - 4\varphi$ with $C_d \geq 2,0$
	pipes	$0,70(3,2 - 4\varphi)$ with $C_d \geq 1,4$