

Offshore Classification

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DNV Energy

Offshore Classification - Capability & Track Record

For four decades DNV has been engaged in classification and certification of mobile offshore drilling and production units built and operated world wide. With nearly half the fleet of drilling units built during the last decade to DNV class, the Society is widely recognised by the drilling industry as the provider of cost effective and highly beneficial classification services, supported by state of the art technology.

DNV has also been involved in verification of fixed and floating production units (FPUs) for more than 30 years. Currently 35 FPUs classified/certified/verified by DNV are in operation and additional 9 FPUs are under design or construction.

Today more than 150 offshore units, about 30 percent of the world's total tonnage, are classified with DNV.

This fleet is spread around the world, and DNV utilises its own global network of resource and service centres to accommodate the customers' needs. Wherever the business is, DNV's local offices have a common understanding of the classification systematics and an understanding of the specific region, its conditions and governing regulations. DNV Offshore Classification has dedicated service centres in e.g. Rio/Brazil, Houston/US, Oslo/Norway, Singapore, China, South-Korea and Japan covering all aspects from design, construction to the in-service phase. In addition DNV has more than 300 offices in 100 countries around the world. Specially worth mentioning are our site offices in Tema/Ghana, Luanda/Angola and Lagos/Nigeria.



Offshore Classification

The purpose of this document is to provide an introduction to the system of offshore classification, how it works, conditions of validity and its interaction with maritime and coastal state control.

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1 Offshore Classification Principles

Classification is a comprehensive verification service providing assurance that a set of requirements laid down in rules and standards established by the classification society are met during design and construction, and maintained during operation of an offshore unit. The rules and standards are aimed at ensuring safety against hazards to the unit, personnel, and against hazards to the environment.

Classification implies an activity, in which a ship or an offshore unit is surveyed during construction on the basis of design approval, tested before being taken into service, and surveyed regularly during its whole operational life. The aim is to verify that the required safety standard is built in, observed and maintained.

Classification has gained world-wide recognition as representing an adequate level of safety and quality, by way of applying experience and peak technical competence in developing rules and performing approval and surveys.

DNV's objective for Offshore Classification Services is also to reduce our customer's project risk through services creating consistency and confidence for complex offshore projects. Through a proactive approach and use of extensive experience DNV Offshore Classification aims to:

- reduce financial and schedule risk by creating confidence and predictability relating to safe construction and operation
- guide customers through the tangle of international and national rules and regulations

1.1 Class Notations

Classed units will be given a class designation consisting of:

- construction symbol
- main character of class
- basic design notation
- service notation
- system and special facility notations
- special feature notations

Typically a Class designation for a drilling unit may be:

⌘1A1 Column-stabilised Drilling Unit DYNPOS-AUT DRILL CRANE HELDK

Class designation for an FPSO may be:

⌘OI Ship-Shaped Oil Production and Storage Installation POSMOOR PROD CRANE HELDK-SH COMF-V

1.1.1 Construction Symbol

The construction symbol **⌘** will be given to units built under the supervision of DNV, whereas the symbol **⌘** will be given to units built under the supervision of a recognised classification society and later assigned class with DNV.

1.1.2 Main Character of Class

Main character of class is represented by the notations **1A1** or **OI**.

The notation **1A1** will be given to mobile offshore units with hull, marine machinery and equipment found to be in compliance with the basic (common) requirements of the applicable DNV offshore standards referred to in the rules.

The notation **OI** will be given to non-selfpropelled floating offshore installations intended for long term service at one offshore location with main structure, utility and safety systems found to be in compliance with the basic (common) requirements of the applicable DNV offshore standards referred to in the rules.

1.1.3 Basic Design Notations

The basic design notation indicates the type of structure. The notations currently in use are as follows:

- **Ship-shaped Unit:** Monohull ship and barge type units having displacement hulls with or without propulsion machinery.
- **Column-stabilised Unit:** Unit dependant on the buoyancy of widely spaced columns for floatation and stability for all modes of operation
- **Self-elevating Unit:** Unit with hull of sufficient buoyancy for safe transport which is raised above sea surface on legs supported by the sea bed during operation.
- **Deep-draught Unit:** Floating structure having a relatively deep draught to obtain high heave natural period resonance responses. A DDU can have single or multi- vertical columns, with or without moonpools
- **Tension-leg Unit:** A buoyant installation connected to a fixed foundation by pre-tensioned tendons

1.1.4 Service Notations

Units constructed according to DNV Offshore Classification Rules, arranged for a particular service and found to be in accordance with the relevant requirements for such service, will be given a corresponding service notation. The service notations currently in use are:

- **Drilling:** Unit with drilling as a main function
- **Well Intervention:** Unit with well intervention as a main function
- **Accommodation:** Units primarily used for accommodation purposes
- **Crane:** Units primarily used for heavy-lift purposes
- **Offshore Support:** Units intended for offshore support functions (fitted with only parts of equipment necessary to perform main functions)
- **Oil Production:** Unit or installation with production of hydrocarbons as a main function
- **Oil Storage:** Unit or installation with storage of hydrocarbons as a main function
- **LNG/LPG Production:** Unit or installation with production of LNG/LPG as a main function
- **LNG/LPG Storage:** Unit or installation with storage of LNG/LPG as a main function

1.1.5 System and Special Facility Notations

Units having special facilities, systems or equipment found to satisfy specified class requirements will be given a corresponding system or special facility class notation. Such notations may typically be DRILL, CRANE, POSMOOR, DYNPOS etc., which means that DNV has performed initial approval, fabrication survey, testing and in-service survey of subject systems/equipment in accordance with the technical standards referred in the Rules covering these class notations.

1.2 Classification Scope

The Classification scope primarily targets the integrity of the asset through focus on safety critical elements.

Main class covers the following areas:

- Arrangement and general safety principles
- Structural strength and redundancy
- Materials and welding
- Corrosion protection
- Stability
- Watertight and weathertight integrity
- Power generation
- Propulsion (as applicable)
- Temporary and emergency mooring
- Fire detection and extinction
- Structural fire protection
- Hazardous area classification
- Ventilation
- Electrical systems and equipment

- Automation and instrumentation as related to marine systems
- Emergency shut down systems
- Fuel oil systems
- Ballast systems
- Drainage and bilge pumping
- Sounding systems
- Leak detection (as applicable)
- Equipment for towing (as applicable)
- Jacking system (as applicable)

1.3 Classification Rules and Supporting Documents



Class Rules and supporting documents give criteria for design, construction and maintenance of offshore assets. DNV Rules incorporate knowledge and experience acquired over time and provide a consistent set of standards designed to ensure fail safe design and redundancy to prevent a failure from becoming a critical accident. The Rules and supporting documents are subject to regular updating to reflect operational experience and advances in technology.

Documents for Offshore Class consists of a three level document hierarchy:

- Rules for Classification (Offshore Service Specifications); providing principles and procedures of DNV classification services
- Offshore Standards; providing technical requirements and acceptance criteria
- Recommended Practices and Class Notes; providing DNV best practices as well as guidance related to the higher level documents

Current Rules for Offshore Classification are:

- DNV-OSS-101: Rules for Classification of Offshore Drilling and Support Units
- DNV-OSS-102: Rules for Classification of Floating Production and Storage Units
- DNV-OSS-103: Rules for Classification of LNG/LPG Production and Storage Units

Current Offshore Standards applicable for Offshore Class are:

- DNV-OS-A101 Safety Principles and Arrangement
- DNV-OS-B101 Metallic Materials
- DNV-OS-C101 Design of Offshore Steel Structures, General (LRFD-method)
- DNV-OS-C102 Structural Design of Offshore Ships
- DNV-OS-C103 Structural Design of Column-stabilised Units (LRFD-method)
- DNV-OS-C104 Structural Design of Self-elevating Units (LRFD-method)
- DNV-OS-C105 Structural Design of Tension-leg Platforms (LRFD-method)
- DNV-OS-C106 Structural Design of Deep Draught Floating Units (LRFD-method)
- DNV-OS-C201 Structural Design of Offshore Units (WSD Method)
- DNV-OS-C301 Stability and Watertight Integrity
- DNV-OS-C401 Fabrication and Testing of Offshore Structures
- DNV-OS-D101 Marine & Machinery Systems & Equipment
- DNV-OS-D201 Electrical Installations
- DNV-OS-D202 Instrumentation & Telecommunication Systems
- DNV-OS-D301 Fire Protection
- DNV-OS-E101 Drilling Plant
- DNV-OS-E201 Hydrocarbon Production Plant
- DNV-OS-E301 Position Mooring
- DNV-OS-E401 Helicopter Decks

Current Recommended Practices applicable for Offshore Class are:

- DNV-RP-A201 Standard Documentation Types
- DNV-RP-A202 Documentation of Offshore Projects
- DNV-RP-C102 Ship Shaped Offshore Structures
- DNV-RP-C103 Column Stabilised Units
- DNV-RP-C201 Buckling Strength of Plated Structures
- DNV-RP-C202 Buckling Strength of Shells
- DNV-RP-C203 Fatigue Strength Analysis of Offshore Steel Structures

2 Classification Systematics

DNV Classification comprises the following main elements:

- Design approval
- Certification of materials, components and equipment
- Surveys, tests and trials during fabrication and commissioning (including pre-commissioning, sea-trials, commissioning and offshore hook-up, as relevant)
- Periodical surveys during operation

2.1 Project Execution



DNV will establish dedicated project teams for offshore newbuilding projects. The DNV project team will include a construction survey manager at the main fabrication site, an approval manager responsible for co-ordination of all approval activities at the approval centre and dedicated discipline specialists as discipline leaders and project team members. The Overall Project Manager will prepare a Project Quality Plan that will be distributed to all parties.

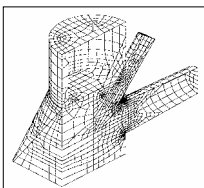
DNV encourages proactive attitudes and direct dialogue to achieve effective communication of project status, resolution of queries and comments, and prompt closeout of reviews with minimal administrative efforts and controls. This will enable effective use of resources contributing towards common project objectives. Normally a DNV surveyor will be present at the main construction yard from 1 month before steel cutting.

2.1.1 Contractual Relations

In traditional maritime classification the classification contract is entered between the yard and DNV. Delivery and payments are often linked to the issue of the classification certificate. For larger offshore development projects the certification/verification body is often a sub-contractor to the operator/licensee.

DNV has extensive experience working according to different contractual models and will act according to the project's instructions in this matter.

2.2 Design Approval



Documents for approval are given in the Class rules and form the basis for the design approval process. Design approval is based on a combination of document reviews and spot check calculations, independent analyses and technical workshops. Design approval includes initial review, issue of comments and review of next revision to confirm incorporation of DNV comments.

Deliverables from the design approval are approved drawings with approval letters containing approval comments.

2.3 Certification of Materials and Components



The scope of classification includes certification of safety critical materials, components and systems intended for the unit. The rules define the extent of the certification that is needed for classification.

The objective of the certification is to ensure that materials, components and systems used conform to the rules and referenced standards within the framework of the rules.

The certification is a conformity assessment normally including both design and production assessment. The production assessment includes inspection and testing during production and/or of the final product.

Certification of materials and components is usually covered by separate agreements between each vendor and the local DNV office.

2.4 Surveys, Tests and Trials during Construction and Commissioning



Prior to commencement of construction work, the builder's materials control, NDT program, job instructions, specifications and procedures for welding, fabrication, workmanship, installation, testing etc. will be evaluated.

The DNV surveyor's main approaches towards quality monitoring will be a combination of:

- Quality System evaluation (audit the performance of the builder's QA/QC – system).
- Product surveys (inspections, test - survey of the product itself)

The two categories complement each other and both are considered necessary to ensure sufficient evidence of compliance with project requirements.

During the initial stage of the construction work audits will be conducted to verify correct implementation of the yard's quality system.

The surveys at the main yard and sub-contractors throughout the fabrication phase will typically consist of:

- Frequent spot checks of the quality system performance, with emphasis on verifying the yard's fabrication process and quality control.
- Inspection of fit-up / edge preparation, preheating and welding procedures for important connections.
- Final structural inspections
- NDT verification of structures and systems
- Pressure / leakage testing of structures and systems
- Survey of machinery and machinery systems, including certificates, installation onboard (tolerances, alignment, supports, etc.)
- Survey of pipes and piping systems (in shop and installation onboard)
- Survey of electrical installations including cable routing and testing onboard
- Installation inspections
- Functional / operational tests
- Evaluation of fabrication deviations and minor design modifications
- Incoming inspection of non-conforming materials and components

The surveyors will keep record of all scheduled and unscheduled inspections.

2.5 Classification in the Operational Phase



Classification in the operation phase implies independent surveys to verify that the governing technical requirements associated with the actual class of the unit are maintained at a satisfactory level.

The scope of a periodical survey is aligned with the level of significance for the systems and objects surveyed, based on risk and consequence assessments combined with relevant experience. DNV develops a tailor made In-service Inspection Program (IIP) for the hull structure of each mobile

offshore unit,

highlighting:

- Areas and details to be surveyed by visual and close visual inspection as well as NDT
- Frequency of the various types of inspection
- Relevant data from previous surveys
- Experience from similar structures

The IIPs are based on design calculations as well as relevant information from the fabrication phase. In addition, qualitative consequence considerations in relation to possible failure modes are applied for determination of extent and frequency of inspection.

Reported damages such as cracks, serious corrosion, indentations etc. are logged in a central damage data base which currently holds more than 4000 entries. The data thus available is balanced against other sources of information and may be used for

- Trend analysis
- Highlighting of typical defects
- Initiation of safety alerts and corrective actions
- Modification of survey frequency and extent as defined in the IIP
- Improvement of classification rules.

Survey information, inspection program and relevant check lists are made available through the data based Nauticus production system which is available to DNV surveyors world wide and which also facilitates reporting and follow up. Survey information to owners is readily available through the web based DNV Exchange system, which is a client operated Class Management tool providing secure access to class status, survey, certificates and DNV reference information through the World Wide Web. The system accesses the data from DNV's knowledge base, and replaces the paper-based quarterly and annual listings with up-to-the-minute Class Status reports.

DNV has survey stations in more than 100 countries and may perform surveys at owners' request on short notice anywhere. A formal qualification scheme applies to all DNV technical personnel and ensures that a surveyor has appropriate competence and experience for the survey to be performed.

DNV has assigned a rig co-ordinator for each classified offshore unit who has a key role in planning the surveys in co-operation with owner. The rig co-ordinator, him/herself a qualified and experienced MOU surveyor, acts as a focal point for DNV towards the owner, and will interact with the surveyors and facilitate experience transfer through an established network.

DNV has adopted to modern maintenance techniques by allowing for alternative survey arrangements. Examples of the most common alternatives to the traditional 'open up inspection techniques' are:

- Continuous surveys allowing the complete Renewal Survey or parts thereof to be carried out on a rotational basis according to an agreed and accepted sequence
- Survey arrangements based on owner's approved planned inspection and/or maintenance systems (PMS). Such arrangement may be accepted for mechanical, electrical and instrumentation systems and components. When implemented, the unit's own PMS will be taken as basis for class surveys, provided that the owner's PMS is satisfactorily implemented.

3 Additional Class Related Services

DNV may carry out additional reviews and surveys covering coastal state and flag state requirements if requested by the client.

3.1 Statutory (Maritime Authority) Services

Depending on the flag chosen, DNV will have different degrees of authorisation to approve drawings, including stability when appropriate, survey, issue and maintain the appropriate certificates on behalf of the Flag Administration.

DNV may issue the following statutory (IMO) certificates for flagged offshore units on behalf of the Flag Administration:

- Load Line Certificate
- SOLAS Cargo Ship Safety Construction Certificate
- SOLAS Cargo Ship Safety Equipment Certificate
- SOLAS Cargo Ship Safety Radio Certificate
- MODU Code Certificate

- MARPOL 73/78 (International convention for the prevention of pollution from ships, Annex I (IOPP Certificate) and Annex 2,4 and 5 (statement of compliance))
- Tonnage Measurement Certificate
- COLREG 1972 as amended

3.2 Coastal State Compliance Services

DNV has in-depth knowledge of coastal state safety regimes undertaking offshore exploration and production, and offers additional compliance services to assist clients toward fulfilling coastal state requirements, crediting class to the extent possible.

Special Offshore Service Specifications (OSS) have been developed for North Sea compliance services building on Class. These are:

- DNV-OSS-201: Verification for Compliance with Norwegian Shelf Regulations
- DNV-OSS-202: Verification for Compliance with UK Shelf Regulations

Other relevant coastal state regimes where DNV may offer additional compliance services, include:

- US GoM
- Canada (Newfoundland and Nova Scotia),
- West Africa (Nigeria, Angola, Equatorial Guinea, South Africa)
- Australia
- China
- Denmark, Faeroe Islands
- Brazil
- Mexico
- Trinidad & Tobago

3.3 Repairs, Modifications and Renewals (RMR)

During its lifetime, an offshore unit will most likely be subjected to incurring or planned repairs, modifications and renewals (RMR), which are outside the regular maintenance activities.

DNV are able to offer expert assistance in such cases, based on detail knowledge of the unit attained from newbuilding and the service history, supplemented by general knowledge of similar units and "state-of-the-art" damage and casualty information. Possible services from DNV include:

- Risk/consequence evaluations; assessing risk factors involved and considering local/global consequences regarding integrity, reliability and safety
- Special damage or condition assessments; determining cause/effect and evaluating repair proposals
- Review of documentation for compliance with governing criteria
- Survey of RMR work

4 Concluding Remarks

DNV continuously attempts to tune its offshore classification services to serve the industry the best possible way. In doing so, we strive to be the best in terms of offering added value to the customers, by e.g.:

- Keeping the volume of key quality documentation at a required minimum
- Being a continuous service partner
- Offering a cost-effective proven and auditable quality assurance package
- Providing access to specialist competence centres and experience available within DNV
- Providing assessments and technical support related to damage and deterioration
- Providing technical support related to maintenance, inspection, modifications etc.
- Being able to offer genuinely independent assessment of significant technical aspects

Please provide us with your feed-back in order for us to further improve our services.

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