



SPECIAL SERVICE AND TYPE – ADDITIONAL CLASS

# Diving Support Vessels and Diving Systems

JULY 2011

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## FOREWORD

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The Rules lay down technical and procedural requirements related to obtaining and retaining a Class Certificate. It is used as a contractual document and includes both requirements and acceptance criteria.

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## CHANGES

### General

The present edition of the rules includes amendments and additions approved by the Executive Committee as of June 2011 and supersedes the January 2011 edition of the same chapter.

The rule changes come into force as described below.

Text affected by the main rule changes is highlighted in red colour in the electronic pdf version. However, where the changes involve a whole chapter, section or sub-section, only the title may be in red colour.

This chapter is valid until superseded by a revised chapter.

### Main changes coming into force 1 January 2012

- **Sec.1 General Requirements**
  - Corrected reference in B101.

### Corrections and Clarifications

In addition to the above stated rule requirements, a number of corrections and clarifications have been made to the existing rule text.

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## SECTION 1 GENERAL REQUIREMENTS

### A. General

#### A 100 Objectives, application and scope

101 The objectives of this section are to provide:

- a) an overview of Classification, certification and verification activities relating to diving systems
- b) information on the classification process in general.

#### A 200 Classification

201 General regulations and classification principles are given in Pt.1 Ch.1 and Ch.2.

202 Diving support vessels arranged for support of diving operations applying rope and/or umbilical connection between the submerged bell and the diving support vessel may be given the class notation:

- a) **DSV-SURFACE** or
- b) **DSV-SAT**

as applicable.

The above class notations require that the diving support vessel is equipped with a diving system classified by DNV in compliance with DNV-OSS-305 - Rules for Certification and Verification of Diving Systems.

<i>Class</i>	<b>DSV-SURFACE</b>	<b>DSV-SAT</b>
Restrictions	$d_{\max} \leq 60$ msw *) TOP $\leq 8$ hours	None, except those imposed by the rule requirements
Provisions	Open or closed bell allowed No HES required	Closed bell Dedicated HES required
*) msw = metres sea water, $d_{\max}$ = maximum operating depth		

#### Guidance note:

These requirements ensure that those given in the IMO Code of Safety for diving systems adopted 23 November 1995 as res. A.831(19), are met.

Requirements for surveying of diving systems in operation are given in the rules Pt.7 Ch.1 Sec.6.

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203 Requirements which do not specifically refer to **DSV-SURFACE** or **DSV-SAT** diving systems, or which are called minimum requirements in the rules, apply to all systems.

204 When a diving system classified by the Society has been installed on:

- a) a ship or a mobile offshore platform mobile offshore unit not covered by the Society's classification, or
- b) on a fixed offshore installation, or
- c) on an onshore site,

an arrangement will be agreed for periodical surveys in order to ensure proper maintenance of the diving system. Corresponding documents will be issued.

DNV will require that the ship or mobile offshore platform be classified in a recognized classification society. The main particulars of the diving system will be entered in the register of vessels classed with DNV.

#### A 300 Class notation

301 A DSV Class notation will be issued in the Classification Certificate for the vessel as a formal statement confirming that the diving system installation has been completed in accordance with specified requirements.

302 Accompanying documents to the class notation will contain:

- a) diving system description and item number, in a data sheet (DNV Form 20.201a) accompanying the certificates and reports

- b) operational limitations and conditions of use for which the diving system is intended
- c) codes and standards with which the diving system has been found to comply

**303** Examples of some supporting documents are shown in DNV-OSS-305 Appendix D.

#### **A 400 Verbal forms and definitions**

**401** For verbal forms and definitions, refer to DNV Rules for Classification of Ships, DNV-OSS-305 and DNV-OS-E402.

**402** “Control stand” or “Control station” is a control station in which one or more of the following control and indicator functions are centralized:

- 1) Indication and operation of all vital life support conditions, including pressure control
- 2) Visual observation, communication systems including telephones, audio-recording and microphones to public address systems
- 3) Disconnection of all electrical installations and Insulation monitoring
- 4) Provisions for calibration of and comparison between gas analysing
- 5) Indication of temperature and humidity in the inner area
- 6) Alarms for abnormal conditions of environmental control systems
- 7) Fixed fire detection and fire alarm systems
- 8) Ventilation fans
- 9) Automatic sprinkler, fire detection and fire alarm systems
- 10) Launch and recovery systems, including interlock safety functions
- 11) Operation and control of the hyperbaric evacuation system

#### **A 500 Documentation**

**501** Information, plans and particulars shall be submitted for approval or information as specified in Pt.0 Ch.3 and the respective sections of the rules.

## **B. Stability, Floatation and Position Keeping**

### **B 100 General**

**101** The diving support vessel shall comply with the requirements to Stability and Floatation given in DNV Rules for Classification of Ships Pt.5 Ch.7 Sec.5 for additional class notation **SF**.

**102** The diving support vessel shall be able to keep its position safely during diving operations. This implies a system with built in redundancy for position keeping. The position keeping system may be a mooring system with anchors or a dynamic positioning system.

**103** For diving support vessels, equipped with a dynamic positioning system, the class notation **DYNPOS-AUTR** or higher is mandatory. Alarms shall be initiated and set accordingly.

**104** For mooring systems with anchors, the notation **POSMOOR-V** or higher is mandatory.

**105** Between the operation centre for the positioning system and the dive operation centre there shall be:

- a) redundant communication systems
- b) a manually operated alarm system.

## **C. Quality Management**

### **C 100 General**

**101** A quality plan shall be submitted for the diving system installation, which shall be approved. Reference should be made to ISO 10005:2005 - “Guidelines for Quality Plans”.

## **D. Pre-Classification**

### **D 100 Concept development**

**101** Data and description of system development and general arrangement of the diving system installation shall be established and submitted to DNV for design approval preview.

**102** The data and description shall include the following, as applicable:

- a) safety objective
- b) locations, supporting structures and interface conditions
- c) diving system description with general arrangement and system limits
- d) functional requirements including system development restrictions, e.g., significant wave height, hazardous areas, fire protection
- e) installation, repair and replacement of system elements and fittings
- f) project plans and schedule, including planned period for installation
- g) design life including specification for start of design life, e.g. final commissioning, installation
- h) data of contained liquids and gases
- i) capacity and sizing data
- j) geometrical restrictions such as specifications of diameter, requirement for fittings, valves, flanges and the use of flexible hoses
- k) second and third party activities.

### **D 200 Plan for installation and operation**

**201** The design and planning for a diving system installation shall cover all development phases including manufacture, installation and operation.

#### **202 Installation**

Detailed plans, drawings and procedures shall be prepared for all installation activities. The following shall as a minimum be covered:

- a) diving system location overview (planned or existing)
- b) other vessel (or fixed location) functions and operations
- c) list of diving system installation activities
- d) alignment rectification
- e) installation of foundation structures
- f) preparation of outer area to proceed with installation of interconnecting services (e.g. pipes, cables, etc) completing welding, painting, general cleaning, etc.
- g) installation of interconnecting services
- h) installation of protective devices
- i) hook-up to support systems
- j) as-built survey
- k) final testing and preparation for operation.

## **E. Inspection and Testing**

### **E 100 General**

**101** The general scope for survey of diving systems is described in DNV-RP-E401, but shall be documented in a system specific survey planning document.

**102** When a diving system is built and installed according to these rules, surveyor shall verify that:

- a) the design and scantlings comply with the approved plans and the requirements in these rules and other specified recognized standards, codes, and national regulations
- b) that the materials and components are certified according to these rules and the terms of delivery
- c) that the work is carried out in accordance with the specified fabrication tolerances and required quality of welds etc.
- d) that piping systems conducting gas in life support systems are cleaned in accordance with an approved

cleaning procedure

- e) that gas cylinders are clean and sealed
- f) that all required tests are carried out.

**103** The inspection shall be carried out during the assembly and during installation. The extent and method of examination shall be agreed prior to the work being carried out.

**104** Additional tests may, however, be required.

## **E 200 Testing after completed installation**

### **201 Test plan**

A comprehensive test plan for the fully installed system shall be submitted for approval. This plan shall include testing details for, as a minimum:

- a) Pressure tests
- b) Purity tests Gas leakage tests
- c) Handling systems
- d) Life support systems
- e) Safety systems
- f) Electrical systems
- g) Instrumentation
- h) Environmental control systems after installation onboard
- i) Sea trials.

## **F. Marking and Signboards**

### **F 100 General**

**101** Each main component of the diving system installation shall be stamped with an official number or other distinctive identification which shall be given on the certificate.

**102** Labels (nameplates) of flame retardant material bearing clear and indelible markings shall be placed so that all equipment necessary for operation (valves, detachable connections, switches, warning lights etc.) can be easily identified. The labels shall be permanently fixed.

### **F 200 Pressure vessels, gas containers and piping systems**

**201** Pressure vessels, gas containers and piping systems shall be consistently colour coded.

**202** There shall be a chart posted in the control room explaining the colour code.

### **F 300 Handling system**

**301** The handling system shall, in an easily visible place, be fitted with a nameplate giving the following particulars:

- a) identification number
- b) static test load
- c) functional test load
- d) working weight
- e) surveyor's mark and identification.

The above loads shall be specified for each transportation system involved.

## SECTION 2 DESIGN PHILOSOPHY AND PREMISES

### A. Location and arrangement of the diving system onboard

#### A 100 General

**101** The diving system shall be so located that diving operations shall not be affected by propellers, thrusters or anchors.

**Guidance note:**

Some national regulations will limit the length of the umbilical so that the diver, or his umbilical, cannot be drawn into the propellers or thrusters. Requirements to the use of 'wet-bell' may also apply in some regions.

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**102** Where, due to the requirements of diving operations, systems are sited in hazardous areas, the electrical equipment should comply with the requirements for such equipment in hazardous areas. Diving systems should not be permitted in hazardous areas designated as zone O.

**103** The above implies that the location of a DSV-SAT diving system on a ship, mobile unit or fixed offshore structure, or land site, shall be in a safe area with respect to explosive gas-air mix.

Safe areas in this context are areas which are not defined as hazardous zones in International Electro technical Commission's Publication No.79-10, and IMO (MODU) code, chapter 6, as follows:

- a) Zone 0: in which an explosive gas-air mixture is continuously present or present for long periods.
- b) Zone I: in which an explosive gas-air mixture is likely to occur in normal operation.
- c) Zone 2: in which an explosive gas-air mixture is not likely to occur, and if it occurs it will only exist for a short time.

Upon special consideration and agreement in each case, however, DSV-SAT diving systems may be located in spaces which normally would be defined as Zone 2.

**104** When any part of the diving system is sited on deck, particular consideration should be given to providing reasonable protection from the sea, icing or any damage which may result from other activities on board the ship or floating structure. This includes the Hyperbaric Evacuation System (HES).

**105** Diving systems situated on open decks shall not be located in the vicinity of ventilation openings from machinery spaces, exhausts or ventilation outlets from galley.

**Guidance note:**

Dive systems should not be exposed to temperatures outside the range it has been certified for. This shall be specially considered when the diving system is not positioned in a temperature controlled environment (e.g. open deck).

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**106** The diving system should not be installed close to sources of noise that may expose divers to harmful noise. Personnel in the in the outer area shall have the possibility to communicate in an acceptable way where 75 dB(A) should be the noise limit.

If the diving support vessel does not carry the class notation **COMF-V**, the diver's accommodation area (inner area) shall be subject to the relevant vibration and noise measurements applicable to the remaining accommodation. The noise limit 60 dB(A) shall not be exceeded, while 55 dB(A) should be recommended.

**107** The diving system and breathing gas storage facilities should not be sited in machinery spaces if the machinery is not associated with the diving system.

### B. External and Internal Environmental Conditions

#### B 100 General

**101** Systems and components shall be designed for the environmental conditions expected at their installed location (on the diving support vessel or otherwise) and their geographic site of operation.

**102** Additional requirements for various systems and components may be given elsewhere in the Rules. Consideration shall be taken to external environment in terms of Toxic (H<sub>2</sub>S and Hydro Carbon) gas. Where diving systems are to be operated in known geographical locations where such gases exist, contingencies are to

be provided and operational response to mitigate exposed risk.

**103** The effects of environmental phenomena relevant for the particular location and operation in question shall be taken into account.

**Guidance note:**

Environmental phenomena that might impair proper functioning of the system or cause a reduction of the reliability and safety of the system shall be considered, (including fixed and land-based installations):

- temperature
- wind, tide, waves, current
- ice, earthquake, soil conditions
- marine growth and fouling.

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**B 200 External environmental conditions**

**201** Design inclinations shall be according to Table B1.

<b>Table B1 Design inclinations</b>				
<i>Location</i>	<i>Roll</i>	<i>Permanen t list</i>	<i>Pitch</i>	<i>Trim</i>
Chambers and other surface installations:				
On a ship	+/- 22.5°	+/-15°	+/- 10°	+/-5°
On a mobile offshore unit		+/-15°		+/- 15°

**202** Range of ambient temperature: -10°C to 55°C, unless otherwise specified. For greater temperature ranges, temperature protection shall be provided.

**203** Humidity: 100%.

**204** Atmosphere contaminated by salt (NaCl):

Up to 1 mg salt per 1 m<sup>3</sup> of air, at all relevant temperatures and humidity conditions.

**B 300 Corrosion**

**301** In order to assess the need for corrosion control, including corrosion allowance and provision for inspection and monitoring, the following conditions shall be defined:

- a) maximum and average operating temperature and pressure profiles of the components, and expected variations during the design life
- b) expected content of dissolved salts in fluids, residual oxygen and active chlorine in sea water)
- c) chemical additions and provisions for periodic cleaning
- d) provision for inspection of corrosion damage and expected capabilities of inspection tools (i.e. detection limits and sizing capabilities for relevant forms of corrosion damage)
- e) the possibility of wear and tear, galvanic effects and effects in still water pools shall be considered.

**C. System Design Principles**

**C 100 System integrity**

**101** Diving systems shall be operated in such a manner that they:

- a) fulfil the specified operational requirements
- b) fulfil the defined safety objective and have the required support capabilities during planned operational conditions
- c) have sufficient safety margin against accidental loads or unplanned operational conditions
- d) cater for the possibility of changes in the operating conditions and criteria during the lifetime of the system.

**102** Any re-qualification deemed necessary due to changes in the design conditions, shall take place in accordance with provisions set out in each section of the rules.

**C 200 Monitoring during operation**

**201** Parameters that could jeopardise the safety of the divers, and or violate the integrity of a diving system, shall be monitored and evaluated with a frequency that enables remedial actions to be carried out before

personal harm is done or the system is damaged.

**Guidance note:**

As a minimum the monitoring and inspection frequency should be such that the diving system, and consequently the diving operation, shall not be endangered due to any realistic degradation or deterioration that may occur between two consecutive inspection intervals.

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**202** Instrumentation may be required when visual inspection or simple measurements are not considered practical or reliable, and available design methods and previous experience are not sufficient for a reliable prediction of the performance of the system.

**203** The various pressures in a diving system shall not exceed the design pressures of the components during normal steady-state operation.

## SECTION 3 SUPPORTING STRUCTURES

### A. General

#### A 100 General

**101** Provisions should be made to ensure that the diving system installations and auxiliary equipment are securely fastened to the ship or floating structure and that adjacent equipment is similarly secured. Consideration should be given to the relative movement between the components of the system. In addition, the fastening arrangements should be able to meet any required survival conditions of the ship or floating structure.

When the diving system is taken onboard and mobilised for use, the equipment related to the diving system shall be permanently attached to the hull structure (e.g. by welding, bolted connection or similar). Fitting by means of lashing is not considered as permanent fitting.

All supporting structure(s) shall be according to DNV Rules for Classification of Ships Pt.3 with additional requirements as given below.

**Guidance note:**

Foundations are generally understood to be part of the diving system, whereas the supporting structures structural supports are generally understood to be part of the ship's structure/hull.

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**102** In addition to 101 above, foundation supporting structures supporting diving system equipment shall have scantlings based on the supported mass. The design loads shall not be less than:

- a)  $P_v = 16 M$  (kN), for  $L < 100$  m
- b)  $P_v = (g_0 + a_v) M$  (kN), for  $L \geq 100$  m
- c)  $P_L$  (forward dir.) =  $0.5 g_0 M$  (kN)
- d)  $P_L$  (aft dir.) =  $0.25 g_0 M$  (kN)
- e)  $P_T$  (transverse dir.) =  $0.5 g_0 M$  (ref. A202).

Where:

$M$  = mass of equipment, heavy components, etc. in tonnes

$a_v$  = combined vertical acceleration as given in Pt.3 Ch.1 Sec.4 B600.

For definitions, see Pt.3 Ch.1 Sec.4 C500.

**103** Acceptable stress levels for the girders are:

- $\sigma_b = 160 f_1$  (N/mm<sup>2</sup>)
- $\tau = 90 f_1$  (N/mm<sup>2</sup>)
- $\sigma_e = (\sigma_b^2 + 3 \tau^2)^{1/2} = 200 f_1$  (N/mm<sup>2</sup>)
- $f_1$  = material factor as defined in Pt.3 Ch.1 Sec.2.

**104** The supporting structures and foundations shall be calculated for values of accelerations determined as shown in DNV Rules for Classification of Ships Pt.3 Ch.1 Sec.4 or other acceptable standards. Design loads for external sea pressure on deck mounted diving system modules essential to the diving operations, shall be calculated according to Pt.3 rules for deck housing sides and ends, including supporting structures.

**105** The supporting structures of other equipment, not categorised under A200 or A300, shall be considered. Drawings showing the deck structure below the foundation shall be submitted for approval when the static forces exceed 50 kN or when the resulting bending moments at deck exceed 100 kNm. The drawings shall clearly indicate the relevant forces and bending moments acting on the supporting structure.

#### A 200 Supporting structures and foundations for pressure vessels for human occupancy and for gas storage

**201** Pressure vessel(s) exposed to static and dynamic loads while allowing contraction and expansion of the pressure vessel(s) under pressure variations and temperature variations, shall be supported in a proper manner. The stress level in the pressure vessel(s), connected pipes, the supporting structures and foundations shall be kept within acceptable level. Deflections allowed for by the required stiffness of supporting structure shall be given as a design input to the pressure vessel manufacturer(s).

**Guidance note:**

Typically the chambers and large gas storage tubes will expand and contract considerably in service due to pressure variations. All supporting structures and foundations for these pressure vessels shall allow for this movement.

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**202** The pressure vessels with supports shall be designed for a static inclination of 30° without exceeding the allowable stresses as specified in A104.

**203** Suitable supporting structures and foundations shall be provided to withstand a collision force acting on the pressure vessels corresponding to one half the weights of the pressure vessels in the forward direction and one quarter the weight of the pressure vessels in the aft direction.

**204** The loads mentioned in 203 and 204 need not to be combined with each other or with wave-induced loads.

**205** Unless removal of the pressure vessel(s) is a simple operation, the supporting structure(s) shall be able to sustain the static load of the pressure vessel(s) during periodic hydro testing or it shall be possible to shore/support the supporting structure(s) in order to avoid unacceptable deflections.

**A 300 Supporting structures and foundations for handling systems and lifting appliances**

**301** Supporting structures and foundations for handling systems and lifting appliances shall be determined according to DNV Rules for Classification of Ships Pt.3 Ch.3 Sec.5 or according to other recognised standards. Interfaces between the handling system structure and the vessel shall be especially considered. Drawings showing scantlings and joint configuration including maximum design loads are to be approved including (but not limited to) supporting structures for winches, sheaves and dampers.

**302** The dynamic coefficient shall as a minimum be taken as 2.2 when the lifting appliance is used for handling manned objects such as surface bells, baskets or Hyperbaric Evacuation Systems. For other lifting appliances, not used for lifting people, the dynamic coefficient shall as a minimum be 1.5.

**303** The side structure of the moon pool shall be strengthened with respect to possible impact loads from diving equipment guided through the moon pool.

**304** Design loads for supporting structure(s) of bell launch and recovery systems shall be based on DNV-OS-E402 Appendix A or DNV Rules for Classification of Ships Pt.3 Ch.3 Sec.5 whichever is greater.

**Guidance note:**

All lifting appliances used in the operation of the diving system shall be considered offshore lifting appliances.

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**A 400 Documentation**

**401** The following documentation shall as a minimum be submitted for approval and information:

- a) General arrangement of hangar area showing all lifting appliances and sheaves etc., including design loads
- b) Design loads and allowable deflection at each foundation
- c) Deflection calculation for the supporting deck structures under the diving chambers
- d) Installation procedures.

## SECTION 4 LIFE SUPPORT

### A. Piping

#### A 100 General

**101** Gases vented from the diving system should be vented to the open air away from sources of ignition, personnel or any area where the presence of those gases could be hazardous. Means should be provided to prevent any dangerous accumulation of gases. The discharge from overpressure relief devices and exhaust shall be led to a location where hazard is not created.

**102** Piping systems carrying mixed gas or oxygen under high pressure should not be arranged inside accommodation spaces, engine rooms or similar compartments.

Piping systems shall comply with the technical requirements for class I piping in these rules Pt.4 Ch.6.

**103** All high-pressure piping should be well protected against mechanical damage.

**104** Piping for gas and electrical cables shall be separated.

**105** All filters/strainers shall be arranged so that they can be isolated without interrupting the supply to essential systems.

**106** Diving system sanitary and drainage systems connected to ship systems shall be designed to avoid an unintentional pressure rise in the ship system in case of malfunction or rupture of the diving systems.

**107** Piping systems intended to be used in breathing gas and oxygen systems shall be cleaned and tested for purity in accordance with an approved test method. The minimum acceptable cleanliness levels, as defined in ASTM G93-03 Standard Practice for Cleaning Methods and Cleanliness Levels for Materials and Equipment Used in Oxygen-Enriched Environments, shall be:

- 1) ASTM Level B for non volatile residue in 'Oxygen' lines
- 2) ASTM Level D for non volatile residue in breathing gas lines
- 3) ASTM Level 175 for particulate contamination

#### A 200 Oxygen systems

**201** The discharge from overpressure relief devices and exhaust from O<sub>2</sub> systems shall be ducted to a safe place and not close to a source of ignition, engine room exhaust or ventilation from galley.

### B. Gas Storage

#### B 100 General

**101** Where gas mixtures with oxygen content less than 20% are stored in enclosed spaces, there shall be two oxygen analysers with an audio-visual low level alarm in addition to the ventilation requirements in B201. These analysers shall be mounted such that one is reading the upper levels and the other is reading the lower levels of the enclosed space.

#### B 200 Oxygen gas storage

**201** Oxygen bottles should be installed in a well-ventilated location. The rooms shall be separated from adjacent spaces and ventilated according to Sec.6 A404 and shall be fitted with an audio-visible oxygen alarm, at a manned control station.

**202** Oxygen bottles should not be stored near flammable substances.

Oxygen shall not be stored or ducted in any form close to combustible substances or hydraulic equipment.

**203** For diving support vessels with class notation FI-FI, the oxygen gas bottles shall be specially protected from heat that may radiate from a fire that is being extinguished.

## **SECTION 5**

### **POWER PROVISIONS, CONTROL AND COMMUNICATIONS**

#### **A. Electrical Systems**

##### **A 100 Objective**

**101** General requirements for electrical systems are given in Pt.4 Ch.8 and DNV-OS-E402, Sec.5. The purpose of this section is to specify additional requirements for electrical systems and equipment serving diving systems. Emphasis is therefore placed on the special needs associated with the design and manufacture of diving systems.

##### **A 200 Documentation**

**201** For electrical systems the following shall be documented:

- a) A description of the overall electrical system (system philosophy) shall be submitted. This document shall describe the operational modes of the system, failure scenarios (from loss of a single component / function till loss of the entire main or emergency system), redundancy principles, automatic changeover systems, etc.
- b) General arrangement showing location of all important electrical equipment for diving system. E.g. main/emergency switchboards and distributions, UPSes, motor starters for bell winches, hot water heaters, lighting, control stations, etc.
- c) Single line distribution system diagrams for the whole installation. The diagrams shall give information on full load, cable types and cross sections, and make, type and rating of fuse- and switchgear for all distribution circuits.
- d) Calculations on load balance, including emergency consumption and battery capacities
- e) Complete multi-wire diagrams, preferably key diagrams, of control and alarm circuits for all motors or other consumers
- f) Plans showing arrangements of batteries with information about their make, type and capacity
- g) Plans showing arrangement and single line diagrams of the communication system
- h) Some electrical equipment will require DNV product certificate according to Pt.4 Ch.8 Sec.1 B300.

##### **A 300 Design philosophy of electrical systems serving diving systems**

**301** All electrical equipment and installation, including power supply arrangements, should be designed for the environment in which they will operate to minimize the risk of fire, explosion, electrical shock and emission of toxic gases to personnel, and galvanic action of the surface compression chamber or diving bell. Electrical cables and piping for gas shall be separated.

**302** In the event of failure of the main source of electrical power supply to the diving system an independent source of electrical power should be available for the safe termination of the diving operation.

**303** It is admissible to use the ship's emergency source of electrical power as an emergency source of electrical power if it has sufficient electrical power capacity to supply the diving system and the emergency load for the vessel at the same time.

**304** The alternative source of electrical power should be located outside the machinery casings to ensure its functioning in the event of fire or other casualty causing failure to the main electrical installation.

**305** Interface between diving system and the ship or floating structure should be provided with suitable electric lighting. Primary and emergency lighting in all critical handling areas shall be provided.

#### **B. Communication**

##### **B 100 General**

**101** The communication system should be arranged for a fixed direct two-way communication between the control stands and:

- a) diving system handling positions
- b) dynamic position control centre
- c) bridge, ship's command centre or drilling floor

- d) crane
- e) ROV control stand.

This fixed communication systems shall also be arranged for direct two-way voice communication between the Dive control room and the SAT control room (for DSV-SAT).

**B 200 Testing**

**201** The communication system shall be functionally tested after installation.

## **SECTION 6 FIRE PROTECTION**

### **A. Fire Prevention**

#### **A 100 Objective**

**101** General requirements for fire protection are given in the rules Pt.4 Ch.10. The purpose of this section is to specify additional requirements for fire protection of areas containing diving equipment with auxiliaries and systems to be connected to the diving compression chambers and diving bells.

#### **A 200 Application and scope**

**201** These requirements apply to all systems. However, some systems may be located on open deck. In these cases the requirements for insulation against adjacent spaces and requirements for sprinkler systems shall be evaluated on a case by case basis.

#### **A 300 Documentation**

**301** Fire prevention, detection and extinction shall be documented as follows:

- a) General arrangement defining all spaces serving as “outer area”, their fire integrity towards other spaces and type of fixed fire-extinguishing proposed for each area as part of “outer area”.
- b) A list of insulation materials to be installed in the outer area, where possible with data on and or evaluation of flammability in conditions under which the materials can be used.
- c) Plans and specifications of fire detection, fire alarm and fire extinction equipment for the outer area.

#### **A 400 Arrangement and materials**

**401** Enclosed “outer area” shall have A-60 class towards other enclosed spaces. Outer area may be subdivided into several spaces by A-0 class. There shall be no direct access between categories A machinery spaces outside of “outer area”. At least one of the required escape routes from spaces not being part of outer area shall be independent of “outer area”. All doors between outer area and other adjacent enclosed spaces should be of self-closing type.

**402** Piping and cables essential for the operation of the diving system are regarded as part of the system and shall be laid in separate structural ducts insulated to A-60 class standard where these transit from other spaces as main switch board room or engine room into “outer area”.

**403** Outer area in the ship or floating structure should be arranged in spaces or locations which are adequately ventilated.

When situated in enclosed spaces the outer area shall be fitted with separate mechanical ventilation with minimum 8 air changes per hour.

**404** Insulation materials used in connection with the diving system should be of fire-retardant type in order to minimize the risk of fire and sources of ignition.

### **B. Fire Detection and Alarm System**

#### **B 100 Outer area**

**101** When situated in enclosed spaces, the outer area shall be equipped with automatic fire detection and alarm systems complying with SOLAS Reg. II-2/7.1 and FSS Code Ch.9 as mandated by DNV Rules for Classification of Ships Pt.4 Ch.10 Sec.4. The section or loop of detectors covering the outer area shall not cover other spaces. Fire detection panel shall be placed on the bridge, with repeater panel at dive control room and in engine control room and provisions shall be made for warning of faults.

A visual repeater, showing the alarm condition, shall be placed at the saturation- and diving control stand.

**102** *Outer area:* Those areas of the diving system that are exposed to atmospheric conditions during operation, i.e. outside the inner system and the room or area that surrounds or contains the diving system.

### **C. Fire Extinguishing**

#### **C 100 Outer area**

**101** Interior spaces containing diving equipment such as surface compression chambers, diving bells, gas

storage, compressors and control stands should be covered with a suitable fixed fire-extinguishing system. When situated in enclosed spaces, the outer area shall be equipped with a fixed, manually actuated fire extinguishing system with such a layout as to cover the complete system. Release positions for these systems shall be at the dive control room, bridge and / or other positions as required case by case.

**102** Coverage shall be sufficient to cover at least the largest area enclosed by A-0 class.

**103** The extinguishing system shall be either:

- a) a pressure water spraying system approved for use in machinery spaces of cat. A, or
- b) an equivalent fixed gas fire-extinguishing system in accordance with the FSS Code and IMO MSC/circ. 848, amended by MSC/Circ. 1267.

**104** If a gas system is selected, the agent shall be of a type not hazardous to humans in the concentration foreseeable in the protected space. The concentration shall be below the NOAEL as defined in IMO MSC/Circ.848/1267.

**105** When pressure vessels are situated in enclosed spaces, a manually actuated water spray system having an application rate of 10 l/m<sup>2</sup>/per minute of the horizontal projected area should be provided to cool and protect such pressure vessels in the event of external fire. For equivalent water-mist fire-extinguishing systems with application rate less than 5 l/min/m<sup>2</sup>, an additional object protection of 5 l/min/m<sup>2</sup> is accepted as equivalent to 10 l/min /m<sup>2</sup>.

Release positions for these systems shall be at the dive control room, bridge and / or other positions as required case by case.

The capacity shall be sufficient to cover the most demanding space enclosed by A-class divisions.

**106** When pressure vessels are situated on open decks, fire hoses may be considered as providing the necessary protection.

When situated on open deck, the outer area shall be provided with fire extinguishing equipment, which shall be considered in each case.

Hyperbaric evacuation systems shall be provided with fire extinguishing systems enabling launching of the hyperbaric evacuation unit in the event of a fire. Object protection of area for hyperbaric evacuation systems shall be activated automatically upon any confirmed fire onboard.

## D. Miscellaneous Equipment

### D 100 Fire-fighter's outfit

**101** A complete set of fire-fighter's outfit complying with DNV Rules for Classification of Ships Pt.4 Ch.10 Sec.2 for each person required for operation of the diving system during a fire shall be located at the main control stands. The sets are additional to other sets on board. Breathing apparatus are required for control stations manned during recovery of bell or launching of hyperbaric evacuation unit.

#### Guidance note:

Fire-fighter's outfit is recommended in consideration of the time it may take for recovery of the divers from the water, into the bell and all the way up to the hyperbaric evacuation system. The operator(s) of the diving system may be exposed to hot environments which render evacuation impossible unless they are protected whilst performing their work.

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### D 200 Portable fire extinguishers

**201** Portable fire extinguishers shall be of approved type and comply with DNV Rules for Classification of Ships Pt.4 Ch.10 Sec.2.

**202** Portable fire extinguishers shall be distributed throughout the space containing the diving system so that no point in the space is more than 10 m walking distance from an extinguisher.

**203** One of the portable fire extinguishers shall be fitted near each entrance.

**204** A portable fire extinguisher shall be fitted at the control stand.

**205** Spare charges or extinguishers shall be provided on board as follows:

- 100% for the first 10, and
- 50% for remaining extinguishers.

## SECTION 7 HYPERBARIC EVACUATION

### A. General

#### A 100 General

**101** An evacuation system shall be provided having sufficient capacity to evacuate all divers under pressure, in the event of the ship having to be abandoned, and shall be in accordance with the provisions of the “Guidelines and Specifications for Hyperbaric Evacuation Systems”, adopted by the IMO organization by resolution A.692(17).

Hyperbaric evacuation systems on diving support vessels classed by DNV shall comply with these statutory requirements as interpreted in DNV-RP-E403.

**Guidance note:**

As life saving appliances are governed by statutory regulations, there may be overriding requirements for hyperbaric evacuation systems (HES). Consequently, it is important to inform DNV at an early stage what Flag state is intended for the diving support vessel.

It is DNV’s intention to apply SOLAS requirements to hyperbaric evacuation systems “as far as is practicable”. This includes the launching arrangement.

In the cases where the system does not comply with the prescriptive requirements in SOLAS, DNV shall verify evaluations and tests that show substantially equivalent conformance with the recommendations. This is in accordance with recommendations given in SOLAS Ch. III Part A Regulation 4.

Guidelines and Specifications for Hyperbaric Evacuation Systems, adopted by the IMO organization by Resolution A.692(17) on 6 November 1991, shall be included as normative references under SOLAS. DNV interpretations to these Guidelines are given in DNV-RP-E403 “Hyperbaric Evacuation Systems”.

Yards, owners or designers will have to carry out engineering analyses according to the new SOLAS Ch. III, Reg. 38 as amended by IMO Res. 216(82).

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## SECTION 8 HANDLING OF NON-DNV CERTIFIED DIVING SYSTEMS

### A. General

#### **A 100 Diving systems in class with other class societies onboard DNV classed diving support vessels**

**101** Installed saturation diving systems and equipment carried onboard in excess of the minimum required for class shall either be maintained to applicable standards, or be removed or disconnected in such a way as to ensure that the installed system or equipment cannot be used.

Applicable standards may be those of a recognized classification society which has rules for diving systems acceptable to the Administration as stated in 2.1.4 of the IMO Code of Safety for Diving Systems, 1995 (Res. 831(19))

**102** For surface oriented diving systems the following minimum requirements apply when in use:

- a) all pressure components requiring certification shall be certified by a recognised authority
- b) certified pressure components shall be tested according to schedules defined in these rules.

**103** For diving systems Classified by other classification Societies, compliance shall be verified by DNV on a case by case basis. The following documents shall be submitted:

- a) Diving system Class certificate from the recognised Classification society
- b) IMO Diving System Safety Certificate (DSSC) (ref. IMO Code of Safety for diving systems adopted 23 November 1995 as res. A.831(19).), as required by the vessel's Maritime Administration.

**104** When a diving system Classified by another classification Society, is installed onboard a ship or mobile offshore unit covered by DNV Classification, the diving system shall be designed, manufactured and maintained in Class in accordance with the rules and the requirements of the Class Society in which the diving system is Classed and periodical surveys shall be carried out by that Class Society. Statutory requirements- and periodical surveys shall be carried out by a recognised organisation or by the Flag Administration itself.

**105** When diving systems, Classified by another recognised Classification society, are installed on DNV Classified diving support vessels, procedures for verification of compliance will include the following scope involving each society according to their individual scope:

- a) Classification of diving system:
  - i) The Classification society classifying the diving system, shall bring the entire diving system into class in accordance with their procedures, and issue all applicable certificates and reports.
  - ii) The classification certificate, and class status, issued by the diving system's Class society shall be presented to the attending DNV surveyor.  
DNV will consider conditions of class (CC) issued to the diving system by the diving system's Class society, to determine if any of these affect the main Class for the diving support vessel.
- b) Interoperability between diving system and diving support vessel:
  - i) The owners of the diving system shall ensure that DNV are informed of the various system interfaces affecting the diving support vessel before the diving system is installed onboard.
- c) DNV will verify supporting structures foundations pertaining to the diving support vessel in support of the diving system. Drawings and load calculations shall be submitted to DNV according to requirements in DNV Rules for Ships Pt.3 Ch.3 Sec.5.
- d) DNV will verify that additional power supplied from the diving support vessel to the diving system do not adversely affect the main class on the diving support vessel.
- e) Statutory Certification – when authorised by the Maritime Authorities:
  - i) The diving system's Class society will issue the Diving System Safety Certificate (DSSC) in compliance with the IMO Code of Safety for diving systems on behalf of the maritime authorities where the diving support vessel is registered. Compliance includes verification of the hyperbaric evacuation system against the guidelines referred to in chapter 3 of the IMO Code.
- f) The DSSC issued by the diving system's Class society shall be presented to the attending DNV surveyor.
- g) DNV will consider all conditions of authority (CA) issued to the diving system, to determine if any of these affect the statutory certification for the diving support vessel.

- h) If authorised, DNV may verify that the diving operations are included in the ship's management system in accordance with requirements in the ISM Code.
- i) The following documentation is required for information:
  - i) All class and statutory certificates
  - ii) Current class status of the dive system
  - iii) Evidence of a review by the diving systems class society for installation on the vessel. Normally this should include stamped drawings (for info or approved as relevant)
  - iv) Vessel GA with dive system arrangement
  - v) Block diagram of the dive system showing quantified vessel supplies and demarcation lines showing limit of dive system class
  - vi) Drawings of system foundations showing accelerations as installed and allowable deflections
  - vii) Details of intended area of operation including environmental conditions and contingency planning.
- j) The following documentation is required for approval:
  - i) Deck drawings showing supporting structure(s)
  - ii) Interface drawings for fresh, gray and black water, electrical and fire extinguishing systems
  - iii) Updated safety plan including escape routes for critical dive personnel involved in launching or manning the HES.

#### **A 200 Class entry of diving systems and diving support vessels**

**201** When a diving system, or part of a diving system, has been Classified by another recognised classification society, evidence of previous design approval will be required. Such evidence shall include drawings of the arrangement and details bearing the approval stamp, or specifically covered by an approval letter. In addition, for components requiring certification, the corresponding certificates shall be available along with maintenance records.

## SECTION 9 CLASSIFICATION OF DIVING SYSTEMS

### A. General

#### A 100 Objectives, application and scope

101 The objectives of this section are to provide an overview of the classification process for diving systems.

#### A 200 Classification

201 General regulations and classification principles are given in Pt.1 Ch.1 and Ch.2.

202 Diving systems designed for diving operations applying rope and/or umbilical connection between the submerged bell and the diving system may be given the class notation:

- a) ✖ **Diving system - SURFACE** or
- b) ✖ **Diving system - SAT**

as applicable.

203 The above class notations require that the diving system is certified by DNV in compliance with DNV-OSS-305 Rules for Certification and Verification of Diving Systems.

<i>Class</i>	<b>Diving system - SURFACE</b>	<b>Diving system - SAT</b>
Restrictions	$d_{\max} \leq 60$ msw *) TOP $\leq 8$ hours	None, except those imposed by the rule requirements
Provisions	Open or closed bell allowed No HES required	Closed bell Dedicated HES required
*) msw = metres sea water, $d_{\max}$ = maximum operating depth		

**Guidance note:**

These requirements ensure that those given in the IMO Code of Safety for diving systems adopted 23 November 1995 as res. A.831(19), are met.

Requirements for surveying of diving systems in operation are given in the rules Pt.7 Ch.1 Sec.6.

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#### A 300 Classification certificate

301 A Diving system Class notation will be issued in the Classification Certificate for the diving system as a formal statement confirming that the diving system has been completed in accordance with specified requirements.

302 Accompanying documents to the classification certificate will contain:

- a) diving system description and item number, in a data sheet (DNV Form 20.201a) accompanying the certificates and reports
- b) operational limitations and conditions of use for which the diving system is intended
- c) codes and standards with which the diving system has been found to comply

303 Examples of some supporting documents are shown in DNV-OSS-305 Appendix D.

#### A 400 Maintenance of Class Notation

401 During the operations phase, verification in order to maintain the Class notation is outlined in DNV Rules for Ships Pt.7 Ch.1 Sec.6.

402 Some certificates having a period of validity will have a specific area to be signed by DNV annually showing satisfactory completion of the annual assessments required so as to continue the certificate's validity. These certificates will become invalid if the signatures are not present.

For diving systems this applies to the statutory certificate 'IMO Diving System Safety Certificate' and certificates of conformance issued to modules.

### **A 500 Assumptions for classification**

**501** Classification is based on the assumption given in the rules Pt.1 Ch.1.

### **A 600 Verification of compliance during operation**

**601** Verification of compliance during operation is carried out by periodical or occasional surveys, of the system in sufficient detail to ensure that the specified requirements of the system continue to be achieved. (See Rules for Classification of Ships Pt.7 Ch.1)

### **A 700 Obligations of the parties to the classification**

**701** The companies responsible for the certification and Classification of the diving system and diving support vessel shall ensure compliance with the applicable rules, regulations and normative references. Compliance shall be demonstrated through verifiable evidence.

**702** Further obligations are given in the rules Pt.1 Ch.1.

### **A 800 Class entry of diving systems**

**801** Class entry procedures are, in general terms, given in Pt.1 Ch.1 Sec.2 B. For existing diving systems classified by another classification society, evidence of previous design approval will be required. Such evidence shall include drawings of the arrangement and details bearing the approval stamp, or specifically covered by an approval letter. In addition, for components requiring certification, the corresponding certificates shall be available along with maintenance records.

**802** After review of the evidence and examination and testing in accordance with relevant parts of DNV-OS-E402 Sec.2 J, the system may be registered under Class Notation with DNV.

### **A 900 Verbal forms and definitions**

**901** For verbal forms and definitions, refer to Pt.1 Ch.1 Sec.1, DNV-OSS-305 and DNV-OS-E402.