Helicopter decks
FOREWORD

DNV GL offshore standards contain technical requirements, principles and acceptance criteria related to classification of offshore units.

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Any comments may be sent by e-mail to rules@dnvgl.com

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CHANGES – CURRENT

General
This document supersedes DNV-OS-E401, April 2012.

Text affected by the main changes in this edition is highlighted in red colour. However, if the changes involve a whole chapter, section or sub-section, normally only the title will be in red colour.

On 12 September 2013, DNV and GL merged to form DNV GL Group. On 25 November 2013 Det Norske Veritas AS became the 100% shareholder of Germanischer Lloyd SE, the parent company of the GL Group, and on 27 November 2013 Det Norske Veritas AS, company registration number 945 748 931, changed its name to DNV GL AS. For further information, see www.dnvgl.com. Any reference in this document to “Det Norske Veritas AS”, “Det Norske Veritas”, “DNV”, “GL”, “Germanischer Lloyd SE”, “GL Group” or any other legal entity name or trading name presently owned by the DNV GL Group shall therefore also be considered a reference to “DNV GL AS”.

Main changes July 2015

- General
  The revision of this document is part of the DNV GL merger, updating the previous DNV standard into a DNV GL format including updated nomenclature and document reference numbering, e.g.:
  - Main class identification 1A1 becomes 1A.
  - DNV replaced by DNV GL.
  - DNV-RP-A201 to DNVGL-CG-0168. A complete listing with updated reference numbers can be found on DNV GL’s homepage on internet.

To complete your understanding, observe that the entire DNV GL update process will be implemented sequentially. Hence, for some of the references, still the legacy DNV documents apply and are explicitly indicated as such, e.g.: Rules for Ships has become DNV Rules for Ships.

Editorial corrections

In addition to the above stated main changes, editorial corrections may have been made.
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CHAPTER 1 INTRODUCTION

SECTION 1 INTRODUCTION

1 General

1.1 General

1.1.1 This standard is intended to provide requirements and guidance to the design of helicopter decks constructed in steel or aluminium, for mobile offshore units (MOUs), or offshore installations designed and built for installation at a particular offshore installation.

1.1.2 The requirements in this standard apply to units or installations with erected landing platform for helicopters or a landing area arranged directly on weather deck or supported by substructure anywhere on the unit or installation.

1.1.3 The standard is applicable to the design of complete helicopter deck structures including substructure and hull connections and reinforcements.

1.1.4 The standard has been written for general worldwide application. Governmental regulations may include requirements in excess of the provisions of this standard depending on the size, type, location and intended service of the offshore unit or installation.

Guidance note:
For Classed mobile offshore units (MOUs) relevant parts of statutory requirements, e.g. MODU Code and/or SOLAS will be applicable.

---e-n-d---of---g-u-i-d-a-n-c-e---n-o-t-e---

1.2 Objectives and scope

1.2.1 The objectives of this standard are to:

— provide an internationally acceptable standard of safety for helicopter decks by defining minimum requirements for the design, materials, construction, arrangement for safe helicopter operations and commissioning
— serve as a contractual reference document
— serve as a guideline for designers, suppliers, purchasers, contractors and regulators
— specify procedures and requirements for helicopter decks subject to DNV GL certification and classification.

1.2.2 The scope of this standard covers requirements for the helicopter deck structure, vessel safety, helicopter and refuelling and hangar facilities.

The scope excludes the NMD Helicopter deck regulations as applicable on Norwegian shelf. These are provided in DNVGL-SI-0166.

1.3 Organisation of this standard

This standard is divided into three main chapters:

Ch.1: General information, scope, definitions and references.

Ch.2: Technical provisions for helicopter decks for general application.

Ch.3: Specific procedures and requirements applicable for certification and classification in accordance with this standard.

2 Normative references

2.1 General

The standards given in Table 1, Table 3 and Table 4 include provisions, which through reference in this text
constitute provisions for this standard.

### 2.2 DNV GL rules

The rules given in Table 1 are referred to in this standard.

**Table 1 DNV GL rules for classification - Offshore units**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNVGL-RU-OU-0101</td>
<td>Offshore drilling and support units</td>
</tr>
<tr>
<td>DNVGL-RU-OU-0102</td>
<td>Floating production, storage and loading units</td>
</tr>
<tr>
<td>DNVGL-RU-OU-0103</td>
<td>Floating LNG/LPG production, storage and loading units</td>
</tr>
<tr>
<td>DNVGL-RU-OU-0104</td>
<td>Self elevating units</td>
</tr>
</tbody>
</table>

**Table 2 DNV Rules for classification of ships**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNV Pt.6 Ch.1 Sec.2</td>
<td>Helicopter Installations</td>
</tr>
</tbody>
</table>

### 2.3 Offshore standards

The offshore standards given in Table 3 are referred to in this standard.

**Table 3 DNV GL Offshore standards**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNVGL-OS-C101</td>
<td>Design of offshore steel structures, general - LRFD method</td>
</tr>
<tr>
<td>DNVGL-OS-C201</td>
<td>Structural design of offshore units - WSD method</td>
</tr>
<tr>
<td>DNVGL-OS-D101</td>
<td>Marine and machinery systems and equipment</td>
</tr>
</tbody>
</table>

### 2.4 Other references

The references given in Table 4 are referred to in this standard.

**Table 4 Other references**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNVGL-SI-0166</td>
<td>Verification for compliance with Norwegian shelf regulations</td>
</tr>
<tr>
<td>IMO</td>
<td>SOLAS requirements in force</td>
</tr>
<tr>
<td>IMO</td>
<td>Code for the Construction and Equipment of Mobile Offshore Drilling Units (MODU Code) in force</td>
</tr>
</tbody>
</table>

### 3 Informative references

The documents in Table 5 include acceptable methods for fulfilling the requirements in the standards. Other recognised documents may be used provided it is shown that they meet or exceed the level of safety of the actual standards.

**Table 5 Other DNV GL and DNV references**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNVGL-CG-0168</td>
<td>Plan Approval Documentation Types – Definitions</td>
</tr>
<tr>
<td>DNVGL-RP-C203</td>
<td>Fatigue strength analysis of offshore steel structures</td>
</tr>
<tr>
<td>DNV-RP-C205</td>
<td>Environmental Conditions and Environmental Loads</td>
</tr>
<tr>
<td>DNV Classification Note 30.1</td>
<td>Buckling Strength Analysis of Bars and Frames, and Spherical Shells</td>
</tr>
</tbody>
</table>
4 Definitions

Table 6 Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>shall</td>
<td>verbal form used to indicate requirements strictly to be followed in order to conform to the document</td>
</tr>
<tr>
<td>should</td>
<td>verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required</td>
</tr>
<tr>
<td>may</td>
<td>verbal form used to indicate a course of action permissible within the limits of the document</td>
</tr>
<tr>
<td>can</td>
<td>verbal form used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required</td>
</tr>
</tbody>
</table>

5 Abbreviations and symbols

5.1 Abbreviations

The abbreviations given in Table 7 are used in this standard.

Table 7 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>In full</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAA</td>
<td>Civil Aviation Authority</td>
</tr>
<tr>
<td>CG</td>
<td>class guideline</td>
</tr>
<tr>
<td>ICAO</td>
<td>International Civil Aviation Organisation</td>
</tr>
<tr>
<td>IMO</td>
<td>International Maritime Organization</td>
</tr>
<tr>
<td>LRFD</td>
<td>load and resistance factor design</td>
</tr>
<tr>
<td>MODU</td>
<td>mobile offshore drilling unit</td>
</tr>
<tr>
<td>OS</td>
<td>offshore standard</td>
</tr>
<tr>
<td>RP</td>
<td>recommended practice</td>
</tr>
<tr>
<td>SOLAS</td>
<td>International Convention for the Safety of Life at Sea</td>
</tr>
<tr>
<td>ULS</td>
<td>ultimate limit state</td>
</tr>
<tr>
<td>WSD</td>
<td>working stress design</td>
</tr>
</tbody>
</table>

5.2 Symbols

5.2.1 The following units are used:

- \( g = \text{gram} \)
- \( k = \text{kilo} \)
- \( m = \text{meter} \)
- \( cm = \text{centimetre} \)
- \( mm = \text{millimetre} \)
- \( t = \text{tonne} \)
- \( N = \text{Newton} \)
- \( s = \text{second} \).

5.2.2 The following Latin characters are used:

- \( g = \text{acceleration due to gravity} \)
- \( p = \text{pressure} \)
- \( A = \text{area} \)
- \( L = \text{length between perpendiculars} \)
- \( M = \text{mass} \)
- \( P = \text{force} \)
- \( V = \text{velocity} \).

5.2.3 The following Greek characters are used:

- \( \sigma = \text{stress} \)
- \( \eta = \text{usage factor} \).
CHAPTER 2 TECHNICAL PROVISIONS

SECTION 1 STRUCTURAL CATEGORISATION AND SELECTION OF MATERIALS

1 Structural categorisation

1.1 General
Selection of structural categories, material quality, and requirements for inspection of welds are following the principles and requirements given in DNVGL-OS-C101 Ch.2, Sec.3 or DNVGL-OS-C201 Ch.2 Sec.3.

1.2 Structural category
The main bearing parts of the helicopter deck with substructure shall in general be categorised as primary structure.

2 Material selection

2.1 General
2.1.1 Material specifications shall be established for all structural materials. Such materials shall be suitable for their intended purpose and have adequate properties in all relevant design conditions. Material selection shall be undertaken in accordance with the principles given in DNVGL-OS-C101 Ch.2 Sec.3 or DNVGL-OS-C201 Ch.2 Sec.3.

2.1.2 When considering criteria appropriate to material grade selection, adequate consideration shall be given to all relevant phases in the life cycle of the unit.

2.2 Design temperatures
The helicopter deck including support structure shall be designed for design temperatures equal to the lowest daily mean temperature for the area(s) where the unit shall operate. Definition of mean temperature is given in DNVGL-OS-C101 Ch.2 Sec.3 or DNVGL-OS-C201 Ch.2 Sec. 3.

3 Material connections

3.1 Steel and aluminium connections
3.1.1 In areas exposed to green sea/ sea spray, a non-hygroscopic material shall be applied between steel and aluminium in order to prevent galvanic corrosion. Bolts with nuts and washers shall be of stainless steel, quality A4-316 or equivalent.

3.1.2 Horizontal inertia forces in bolted connections may be required to be taken up by metal to metal stoppers with insulation tape in the gap.

3.1.3 Aluminium superstructures that are provided with insulating material between aluminium and steel shall be earthed to the hull. See DNV Rules for ships Pt.4 Ch.8 Sec.2.

3.1.4 For welded connections, any bimetallic connection flats shall be delivered from approved manufacturer with DNV GL certificates.
SECTION 2 DESIGN LOADS AND LOAD COMBINATIONS

1 General

1.1 General

The design loads and load combinations shall comply with the requirements listed in DNV Rules for ships Pt.6 Ch.1 Sec.2 [B] combined with wind loads as specified in [1.2]. It is to be noted that inertia forces with a 100 year return period shall be applied.

Guidance note:
For non-ship shaped units sea pressure on the helicopter deck can normally be excluded.

1.2 Wind loads

1.2.1 The wind loads shall be calculated using ‘gust’ (3 s averaging time interval) wind velocities.

Guidance note:
When evaluating wind pressures the following listed one minute sustained wind velocities at 10 m above base is normally to be used as a basis for calculating the gust wind velocities:

\[ V_{1\text{min.}10} = 30 \text{ m/s for the landing condition} \]
\[ V_{1\text{min.}10} = 55 \text{ m/s for the stowed condition}. \]

For additional information regarding wind conditions, please see DNV-RP-C205.

1.2.2 The wind pressure acting on the surface of helicopter decks shall be calculated using a pressure coefficient \( C_p = 2.0 \) at the leading edge of the helicopter deck, linearly reducing to \( C_p = 0 \) at the trailing edge, taken in the direction of the wind. The pressure may act both upward and downward.

1.2.3 For structures where vortex shedding may be of importance, vibration induced loads shall be taken into account.
SECTION 3 STRUCTURAL STRENGTH

1 Strength requirements

1.1 Deck plating and stiffeners
DNV Rules for ships Pt.6 Ch.1 Sec.2 [C200] shall be complied with for requirements to helicopter deck scantlings for deck plating and stiffeners.

1.2 Girders and supporting structure
The scantlings shall normally be based on direct stress analysis.

The basic allowable usage factor, $\eta_0$, is as follows:

--- Operational conditions: ---
Landing condition: $\eta_0 = 0.67$
Stowed condition: $\eta_0 = 0.80$

Guidance note:
When dimensioning the support structure part of the hull (e.g. integrated platform beams part of weather deck or deck beams below the supporting structure of separate platforms), the stresses from the loading of the helicopter deck should be combined with relevant global stresses. In operational landing conditions the still water hull bending stress should be applied, while for stowed conditions both still water and dynamic wave bending stress should be applied.

1.3 Buckling
Buckling evaluations shall be carried out according to DNV Classification Note 30.1 or equivalent internationally recognised codes and standards.
SECTION 4 MISCELLANEOUS

1 General
DNV Rules for ships Pt.6 Ch.1 Sec.2 [D] shall be complied for requirements to safety nets, tie-down points and surface friction of helicopter decks.

2 Hatch cover
In case of landing on a hatch cover section which is underlying in the packing joint, the strength or spacing of cleats shall be sufficient to keep the connection intact and tight.
SECTION 5 REQUIREMENTS TO VESSEL SAFETY - HELDK-S

DNV Rules for ships Pt.6 Ch.1 Sec.2 [E] shall be complied with for requirements to vessel safety.

Guidance note:
For operation onboard vessels with large storage tanks for hydrocarbons, e.g. FPSOs & FSOs, practical guidance for safe operations can be found in Guide to Helicopter/Ship Operations issued by the International Chamber of Shipping.

---e-n-d---of---g-u-i-d-a-n-c-e---n-o-t-e---
SECTION 6 REQUIREMENTS FOR HELICOPTER - HELDK-SH

DNV Rules for ships Pt.6 Ch.1 Sec.2 [F] shall be complied with for helicopter safety.
SECTION 7 REQUIREMENTS FOR HELICOPTER REFUELLING AND HANGAR FACILITIES - HELDK-SHF

Units equipped to support helicopter operations may be given the notation HELDK-SHF provided the requirements listed in DNV Rules for ships Pt.6 Ch.1 Sec.2 [G300] and DNVGL-OS-D101 Ch.2 Sec.3 [7] are complied with.
CHAPTER 3 CERTIFICATION AND CLASSIFICATION

SECTION 1 GENERAL

1 Introduction

1.1 Application

1.1.1 As well as representing DNV GL’s recommendations on safe engineering practice for general use by the offshore industry, the offshore standards also provide the technical basis for DNV GL classification, certification and verification services.

1.1.2 A complete description of principles, procedures, applicable class notations and technical basis for offshore classification is given by the rules for classification of offshore units, see Table 1.

Table 1 DNV GL rules for classification - Offshore units

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>DNVGL-RU-OU-0101</td>
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</tr>
<tr>
<td>DNVGL-RU-OU-0104</td>
<td>Self elevating units</td>
</tr>
</tbody>
</table>

Guidance note:

It will be necessary to also comply with statutory unit/ installation safety regulations of the state in which the unit/ installation is registered, e.g. MODU Code and SOLAS, and helicopter safety operation demands by the operators or guidance in this respect by the helicopter registry authorities. This applies to e.g.:

- size, location and marking of helicopter deck
- obstacle free approach and take-off
- rescue and fire fighting equipment
- helicopter facility operation manuals.

---e-n-d---of---g-u-i-d-a-n-c-e---n-o-t-e---

1.2 Class designation

1.2.1 Offshore units and installations fitted with helicopter decks that have been designed, constructed and installed in accordance with the requirements of this standard under supervision of DNV GL may be given the class notation HELDK together with qualifiers as defined in Table 2.

Table 2 HELDK class notation

<table>
<thead>
<tr>
<th>Class notation</th>
<th>Description</th>
<th>Qualifier</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HELDK</td>
<td>Helicopter deck</td>
<td>&lt;none&gt;</td>
<td>Structure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S</td>
<td>Additional requirements to ship safety.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H</td>
<td>Additional requirements to helicopter safety</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>Additional requirements to helicopter facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(N)</td>
<td>Evaluated with respect to requirements specified by the Norwegian Civil Aviation Authorities (CAA-N).</td>
</tr>
</tbody>
</table>

1.2.2 The application of the different qualifiers is restricted as follows:

- The qualifier H can only be applied together with the qualifier S.
- The qualifier F can only be applied together with the qualifiers SH.
- The qualifier (N) can only be applied together with qualifiers SH or SHF.

1.3 Technical requirements

Technical requirements for HELDK shall comply with Ch.2, as applicable:

- Ch.2 Sec.1 to Ch.2 Sec.4 for notation HELDK
— Ch.2 Sec.5 Additional requirements for qualifier S
— Ch.2 Sec.6 Additional requirements for qualifier H
— Ch.2 Sec.7 Additional requirements for qualifier F.

For addition additional requirements for qualifier (N) see DNVGL-SI-0166 Ch.2 Sec.10.

1.4 Assumptions

1.4.1 Any deviations, exceptions and modifications to the designed codes and standards given as recognised reference codes shall be documented and approved by DNV GL.

1.4.2 Where codes and standards call for the extent of critical inspections and tests to be agreed between contractor or manufacturer and client, the resulting extent is to be agreed with DNV GL.

1.5 Documentation

Documentation for classification shall be in accordance with the NPS DocReq (DNV GL Nauticus Production System for documentation requirements) and DNVGL-CG-0168.

SECTION 2 TESTING AND CERTIFIED PRODUCTS

Requirements to testing and certified products shall comply with the following references in DNV Rules for ships:

a) Pt.6 Ch.1 Sec.2 [A301] Table A1 Documentation type Z120
b) Pt.6 Ch.1 Sec.2 [A505]
c) Pt.6 Ch.1 Sec.2 [I].