Part 6 Additional class notations

Chapter 4 Equipment and design features
FOREWORD

DNV GL rules for classification contain procedural and technical requirements related to obtaining and retaining a class certificate. The rules represent all requirements adopted by the Society as basis for classification.

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CURRENT – CHANGES

This is a new document.

The rules enter into force 1 July 2016.
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SECTION 1 HELICOPTER INSTALLATIONS

1 General

1.1 Application

1.1.1 The requirements in this section apply to vessels with an erected landing platform for helicopters or a landing area arranged directly on the weather deck or on the top of deckhouse. These requirements shall be regarded as supplementary to those given for the assignment of main class.

The requirements are not intended to apply to landing areas used for occasional or emergency operations as regulated by SOLAS Ch. II-2 Reg. 18.2.2.

Guidance note:
The non-structural requirements given to the helicopter deck notations are based on "CAP 437 - offshore helicopter landing areas - guidance on standards, January 2005 edition" (UK Civil Aviation Authorities Publications).

1.2 Class notations

1.2.1 Vessels with equipment and or arrangements complying with relevant additional requirements of this chapter will be assigned one of the following class notations:

| HELDK, HELDK(S), HELDK(SH) or HELDK(SHF) | Equipped with helicopter deck |
| (CAA-N) | Implies that the helicopter facility has been evaluated for compliance with the Norwegian Civil Aviation Authorities helicopter operation regulations BSL D 5-1 governing Norwegian Continental Shelf operations |

1.2.2 Class notation HELDK requires compliance with the requirements given in Sec.1 [3.1.2].

Guidance note 1:
It will be necessary also to comply with statutory vessel safety regulations of the state in which the vessel is registered and helicopter safe operation demands by the operators or guidance in this respect by helicopter registry authorities or aviation authorities. This applies to for example:
— size, location and marking of helicopter deck
— obstacle free approach and take-off sectors
— rescue and fire-fighting (RFF) equipment.

If the Society is delegated to issue SOLAS Safety Construction and Safety Equipment Certificates, SOLAS Reg. II-2/18 will apply as a minimum requirement with respect to fire safety.

Guidance note 2:
The responsibility for meeting any national requirements not covered by these rules rests with the operator of the vessel on which the helicopter deck is arranged.

1.2.3 The notation may be extended to HELDK(S) if the requirements given in Sec.1 [3.1.2] and Sec.1 [3.1.3] are satisfied.
Guidance note:
HELDK(S) requirements represent minimum shipboard safety requirements according to CAP 437 and SOLAS with regard to fire safety and means of escape.

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

1.2.4 The notation may be extended to HELDK(SH) if the requirements given in Sec.1 [3.1.2], Sec.1 [3.1.3] and Sec.1 [3.1.4] are satisfied.

Guidance note:
HELDK(SH) requirements represent in addition to S, the minimum requirement to location and size of helicopter deck, height of obstacles, marking, lights and instrumentation for safe helicopter operations with CAP 437 as basis for details given.

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

1.2.5 The notation may be extended to HELDK(SHF) if the requirements given in Sec.1 [3.1.2], Sec.1 [3.1.3], Sec.1 [3.1.4] and Sec.1 [3.1.5] are satisfied.

Guidance note:
HELDK(SHF) provides requirements for on-board helicopter service facilities.

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

2 Definitions

2.1 Symbols

2.1.1 The following symbols are used:

- \( L \) = rule length (m)
- \( B \) = rule breadth (m)
- \( D \) = rule depth (m)
- \( T \) = rule draught (m)
- \( f_1 \) = material factor
  - = 1.0 for VL-NS steel
  - = 1.08 for VL-27 steel
  - = 1.28 for VL-32 steel
  - = 1.39 for VL-36 steel
  - = 1.47 for VL-40 steel

For details see the DNV GL rules for classification: Ships, SHIP Pt.3 Ch.3 Sec.1 for normal steel and SHIP Pt.3 Ch.3 Sec.1 for alternative materials. Note remark on reduced yield stress in heat affected zones for aluminium.

2.2 Helicopter installations

Table 1 Definition of terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>helideck</td>
<td>is a purpose built helicopter landing area located on a ship including all structure, firefighting appliances and other equipment necessary for the safe operation of helicopters</td>
</tr>
<tr>
<td>helicopter facility</td>
<td>is a helideck including any refuelling and hangar facilities</td>
</tr>
</tbody>
</table>
### 3 Documentation

#### 3.1 General

**3.1.1** Plans and particulars to be submitted for approval or information are specified in Table 2 to Table 6.

**3.1.2** For class notation **HELDK**, documentation shall be submitted as required by Table 2.

#### Table 2 Documentation Requirements – Class notation HELDK

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Helicopter deck arrangement</strong></td>
<td>H050 – Structural drawing</td>
<td>Deck, substructure and safety net supports including reaction forces at the hull supports.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>H050 – Structural drawing</td>
<td>Tie-down points, including capacity (breaking load).</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>H050 – Structural drawing</td>
<td>Steel and aluminium connections, including specification of insulation materials and bolts.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>H080 – Design analyses</td>
<td>Structural strength calculations including information on all relevant design loads. Including specification of helicopter type, overall length with rotors running, maximum total mass and wheel load distribution.</td>
<td>FI</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>Location of tie-down points.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z120 – Test procedure at manufacturer</td>
<td>Load test. For erected decks built up by unconventional profiles.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z120 – Report from test at manufacturer</td>
<td>Load test. For erected decks built up by unconventional profiles.</td>
<td>AP</td>
</tr>
<tr>
<td><strong>Helicopter deck nets</strong></td>
<td>Z030 – Arrangement plan</td>
<td>Landing net / rope net.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>Safety net, including strength.</td>
<td>AP</td>
</tr>
</tbody>
</table>

AP = For approval; FI = For information  
ACO = As carried out; L = Local handling; R = On request; TA = Covered by type approval; VS = Vessel specific

**3.1.3** For class notation **HELDK(S)**, documentation shall be submitted as required by Table 2 and Table 3.
### Table 3 Documentation Requirements – Class notation HELDK(S)

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helicopter deck arrangement</td>
<td>Z030 – Arrangement plan</td>
<td>Arrangement plan showing: escape routes, materials in helicopter deck and possible insulation towards superstructure, location of rescue- and firefighting equipment if relevant, location of hatches in the helicopter deck.</td>
<td>AP</td>
</tr>
<tr>
<td>Helicopter deck foam fire extinguishing system</td>
<td>G200 – Fixed fire extinguishing system documentation</td>
<td>Details and capacity calculations for fixed foam fire extinguishing.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>M020 – Material specification, fire related properties</td>
<td>Deck and insulation towards superstructure</td>
<td>AP</td>
</tr>
<tr>
<td>Aeronautical communication</td>
<td>Z100 – Specification</td>
<td>Details on VHF installation.</td>
<td>AP</td>
</tr>
</tbody>
</table>

3.1.4 For class notation **HELDK(SH)**, documentation shall be submitted as required by Table 2, Table 3 and Table 4.

### Table 4 Documentation Requirements – Class notation HELDK(SH)

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helicopter obstacle-free sector</td>
<td>Z030 – Arrangement plan</td>
<td>Including height of all obstacles.</td>
<td>AP</td>
</tr>
<tr>
<td>Helicopter deck daylight and night operations marks</td>
<td>Z030 – Arrangement plan</td>
<td>Including details and position of wind indicator, floodlights, perimeter lights and wiring diagrams for lights.</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>E170 – Electrical schematic drawing</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Helicopter deck arrangement</td>
<td>Z130 – Report from test at manufacturer</td>
<td>Fire test of aluminium deck. As described in Pt.4 Ch.10.</td>
<td>AP</td>
</tr>
</tbody>
</table>

3.1.5 For class notation **HELDK(SHF)**, documentation shall be submitted as required by Table 2, Table 3, Table 4 and Table 5.

### Table 5 Documentation Requirements – Class notation HELDK(SHF)

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helicopter deck arrangement</td>
<td>Z100 – Specification</td>
<td>Non-skid coating on deck between landing area and hangar and in the hangar.</td>
<td>AP</td>
</tr>
<tr>
<td>Object</td>
<td>Documentation type</td>
<td>Additional description</td>
<td>Info.</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Hangar arrangement</td>
<td>Z030 – Arrangement plan</td>
<td>Including escape routes, location of equipment, drainage arrangement, rope nets and rapid securing or traversing system (recessed grid, rails and other arrangements).</td>
<td>AP</td>
</tr>
<tr>
<td>Hangar</td>
<td>H050 – Structural drawing</td>
<td>Including hangar doors. Including functional loads / design information, e.g. the horizontal component of the helicopter down wash on the hangar.</td>
<td>AP</td>
</tr>
<tr>
<td>Helicopter fuel storage and distribution arrangement</td>
<td>Z030 – Arrangement plan</td>
<td>Refuelling area, including position relative to accommodation and embarkation areas. Including drainage facilities.</td>
<td>AP</td>
</tr>
<tr>
<td>Helicopter fuel storage tanks</td>
<td>H050 – Structural drawing</td>
<td>Including inspection hatches, level indicators, ventilation and foundations.</td>
<td>AP</td>
</tr>
<tr>
<td>Helicopter fuel piping system</td>
<td>S010 – Piping diagram</td>
<td>Including filters, flowmeters, delivery hoses, earth connections and emergency shut-down arrangement from safe location.</td>
<td>AP</td>
</tr>
<tr>
<td>Hazardous area classification</td>
<td>G080 – Hazardous area classification drawing</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Structural fire protection arrangements</td>
<td>G060 – Structural fire protection drawing</td>
<td>Helicopter hangar and service area, including decks, bulkheads, doors and closing appliances.</td>
<td>AP</td>
</tr>
<tr>
<td>Fire detection and alarm system</td>
<td>I200 – Control and monitoring system documentation</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hangar fire fighting system</td>
<td>G200 – Fixed fire extinguishing system documentation</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td>Ventilation systems for hangars</td>
<td>S012 – Ducting diagram</td>
<td></td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>S030 – Capacity calculation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

AP = For approval; FI = For information
ACO = As carried out; L = Local handling; R = On request; TA = Covered by type approval; VS = Vessel specific

3.1.6 For class notation (CAA-N), documentation shall be submitted as required by Table 6.

Table 6 Documentation Requirements – Class notation (CAA-N)

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbulence condition</td>
<td>Z300 - Declaration</td>
<td>Confirmation of documented turbulence condition for the helicopter deck.</td>
<td>FI</td>
</tr>
</tbody>
</table>

AP = For approval; FI = For information
ACO = As carried out; L = Local handling; R = On request; TA = Covered by type approval; VS = Vessel specific

For general requirements for documentation, including definition of the info codes, see SHIP Pt.1 Ch.3 Sec.2. For a full definition of the documentation types, see SHIP Pt.1 Ch.3 Sec.3.
3.1.7 Other plans, specifications or information may be required depending on the arrangement and the equipment used in each separate case. See Pt.2, Pt.3, Pt.4 and Pt.5, as appropriate.

4 Certification

4.1 General

4.1.1 All certificates required in this chapter are listed in Table 7 and shall be issued in compliance with the relevant Society procedures. Certificates shall be delivered to the Society surveyor at the construction site and/or elsewhere as requested.

Table 7 Certification Requirements

<table>
<thead>
<tr>
<th>Object</th>
<th>Certificate type</th>
<th>Issued by</th>
<th>Certification standard*</th>
<th>Additional description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage tanks and associated equipment for flammable</td>
<td>PC</td>
<td>Society</td>
<td></td>
<td>Concentrate foam to be delivered with type approval certificate and batch certificate stating physical properties and production date.</td>
</tr>
<tr>
<td>liquids (HELDK(SHF))</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foam concentrate</td>
<td>PC</td>
<td>Society</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Unless otherwise specified the certification standard is the rules.
PC = Product Certificate, MC = Material certificate, TR = Test report

For general certification requirements, see SHIP Pt.1 Ch.3 Sec.4.
For a definition of the certification types, see SHIP Pt.1 Ch.3 Sec.4 and SHIP Pt.1 Ch.3 Sec.5.

5 Testing

5.1 General

5.1.1 A load test procedure shall be submitted for review prior to the load test being carried out. The load test shall be witnessed by a Society surveyor. A report documenting the test and its results shall be appraised by the Society.

Requirements to the load test:

1) The beam shall be load tested without any permanent deflections with a load of 3 times the fraction of the maximum take-off mass of helicopter, acting on the wheel(s)/ part of tubular skid having the highest load.
2) Length between the supports shall be equal to or bigger than the maximum span that is used in the applicable design.
3) The support of the beam(s) shall reflect the worst possible situation in the applicable design.
4) The test load shall be distributed over an area equal to the contact area during landing, as specified by the helicopter manufacturer.

When simulating the contact area for the helicopter wheels, rubber pads, equivalent in size to the contact area, shall be fitted on the steel plate to which the force is applied.
6 Materials

6.1 General

6.1.1 The grades of steel and aluminium materials shall be in compliance with the requirements for hull materials given in SHIP Pt.3 Ch.3 Sec.1.

6.2 Steel and aluminium connections

6.2.1 In sea exposed areas, to prevent galvanic corrosion, a non-hygroscopic insulation material shall be applied between steel and aluminium. Bolts with nuts and washers shall be of stainless steel.

Guidance note:
Stainless steel shim is considered applicable non-hygroscopic material.

— end of guidance note —

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

6.2.3 Aluminium superstructures, which are provided with insulating material between aluminium and steel, shall be earthed to the hull. See Pt.4 Ch.8.

6.2.4 For welded connections, any bimetallic connection flats shall be delivered from approved manufacturer and with DNV GL (VL) certificate.

6.2.5 These rules consider aluminium helicopter decks as being equivalent to steel with respect to fire integrity when tested as outlined below.

Test procedure:
— size of prototype helicopter deck 5 × 5 m
— a static load simulating actual helicopter weight to be present on the deck
— helicopter fuel shall be continuously supplied to the deck for 10 minutes, so that the deck is filled with fuel at all times during the test. At all times during the test should fuel be dripping from drainage arrangements while there is a fire on the deck.

Acceptance criteria (visual observations of the deck and sealing):
— the helicopter deck shall not collapse or be deformed
— no fuel leakage or flames shall be observed under the deck.

The test shall be witnessed by a recognized Society.

Guidance note 1:
This test does not consider other aspects like for instance rotor damage caused by an overturned helicopter. For class notation HELDK(S), HELDK(SH) and HELDK(SHF) aluminium helicopter decks are required to be tested as outlined above.

The test report is subject to the Society’s approval.

— end of guidance note —

Guidance note 2:
For class notation HELDK, SOLAS Ch. II-2 Reg. 18.3.2 will be used when the Society are delegated to issue SOLAS safety certificates.

— end of guidance note —
7 Design loads and load combinations

7.1 General

7.1.1 The scantlings of each structural element shall be based on the most unfavourable of the following loading conditions:
— landing condition
— stowed condition (helicopter lashed onboard at sea).

Guidance note:
In the stowed condition, the helicopter deck strength and its supporting structure may be calculated according to SHIP Pt.3 Ch.6 and the wheel loading requirements given in SHIP Pt.3 Ch.10 Sec.5.
In the stowed condition, the helicopter deck strength and its supporting structure may be checked using the wheel loading requirements given in SHIP Pt.3 Ch.10 Sec.5.

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

7.1.2 Both the normal operational conditions and any identifiable accidental conditions shall be considered. The following loads are in general to be considered:
— landing impact forces
— gravity and inertia forces of the helicopter in stowed position
— hull still water loads (applicable for use of weather decks as helicopter deck)
— sea pressure.

Guidance note:
Wind loads on the helicopter in stowed condition may generally be neglected.

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

7.1.3 For landing platforms erected as separate structure the following loads are also to be considered:
— gravity and inertia forces of the structure with equipment
— wind forces (for erected structures)
— ice loads.

7.1.4 In the landing condition, the landing impact force shall be combined with associated environmental loads. Heel and trim need normally not be considered.

7.1.5 The loads in [2.2] to [2.5] shall be combined as follows:
Operational conditions:
1) Landing condition
   — landing force
   — gravity and inertia forces of the structure with equipment
2) Stowed condition (helicopter lashed onboard)
   — gravity and inertia of the helicopter
   — gravity and inertia of the structure with equipment
   — hull bending loads (only applicable for integrated helicopter decks)
   — sea pressure
   — ice loads on erected helicopter deck and supporting structure
   — green sea on pillars supporting erected helicopter decks.
3) Wind lift forces on erected structures (no helicopter on deck).
7.2 Landing forces

7.2.1 The total vertical force from the helicopter during landing shall be taken not less than:

\[ P_v = 2 \ g \ M_H \ (kN) \]

\[ M_H = \text{maximum take-off mass in t of helicopter.} \]

The total force \( P_v \) shall be considered as distributed on the helicopter's landing gear in the same manner as when the helicopter is resting on a horizontal surface and the helicopter's centre of gravity is in its normal position in relation to the landing gear.

7.3 Gravity and inertia forces (due to vessel motions and accelerations)

7.3.1 The dynamic design forces caused by the platform structure itself and, if applicable, by the helicopter in its stowed position are preferably to be taken either from direct calculations or model tests.

7.3.2 Worst case realistic load combinations of static and dynamic design forces shall be considered.

Guidance note:

For a ships in world-wide operation, inertia forces can be determined from SHIP Pt.3 Ch.4 Sec.3 for operational conditions.

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

7.4 Sea pressure

7.4.1 The sea pressure for superstructure deck and top of houses shall be taken in accordance with SHIP Pt.3 Ch.4 Sec.5. For elevated platforms with free water passage below, the reduction \( 4h_0 \) in the formula may be substituted by \( 4h_0 + k_0 \) where \( k_0 = \text{height of free water passage below in m.} \) Minimum sea pressure is \( 2.5 \ kN/m^2 \).

7.5 Green sea

7.5.1 Loads from green sea on pillars supporting erected helicopter decks shall be included for helicopter deck positioned in the fore ship. The horizontal load caused by green sea is given by the following equation:

\[ p = 4.1 \ C_D \ a \ (1.79 \ C_W - h_0 ) \ (kN/m^2) \]

\[ C_D = \text{drag coefficient} \]
\[ = 1.0 \text{ for circular cross section} \]
\[ = 2.0 \text{ for non circular sections} \]

\[ a = 2 + L/120, \text{ maximum 4.5} \]

\[ L = \text{length between perpendiculars} \]

\[ h_0 = \text{vertical distance in m from the waterline at draught T to the load point} \]

\[ C_W = \text{wave load coefficient, see SHIP Pt.3 Ch.4 Sec.5.} \]

This is a horizontal load acting in the direction of the ship longitudinal axis. It shall be used on the supporting structures, and shall be combined with acceleration loads as specified in the Rules for Classification of Ships, SHIP Pt.3 Ch.4 Sec.5.
7.6 Other loads

**7.6.1** For structures where wind suction forces may be of importance, e.g. bolted platforms, wind lift forces $P_w$ shall be taken into account by:

$$P_w = 1.2 \ A_D \ (kN)$$

$A_D = \text{deck area (m}^2\text{)}$

**7.6.2** Ice thickness for erected structures shall be taken into account in the stowed condition as follows:

- in the North Sea 5 cm on exposed surfaces
- in Arctic waters 15 cm on exposed surfaces

or by designers specification of maximum ice thickness.

**7.6.3** The helicopter deck shall be checked for other loads as applicable.

*Guidance note:*

Such loads should be presented to the Society.

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

8 Structural strength

8.1 General

**8.1.1** Decks for helicopters supported on wheels with pneumatic tyres shall have scantlings in accordance with the requirements given in [3.2] to [3.3].

8.2 Deck plating and stiffeners

**8.2.1** The minimum thickness of steel plating shall be:

$$t = \frac{k(1+s)\sqrt{P_w}}{f_1} + 2 \ (\text{mm})$$

The minimum thickness of aluminium plating shall be:

$$t = \frac{k(1+s)\sqrt{P_w}}{f_1} + 1 \ (\text{mm})$$

$k$

- 0.6 in separate platforms
- 0.65 in weather-decks general
- 0.7 in longitudinal framed strength deck and in weather deck hatch covers

Equipment and design features

The minimum section modulus of stiffeners shall be:

\[ Z = 1000 \frac{M}{\sigma} \text{ (cm}^2\text{)} \]

- \( M \) = bending moment (kNm) from the most unfavourable location of landing forces point loads. In most cases half fixed beam ends will be a reasonable assumption
- \( \sigma \) = 180 \( f_1 \) N/mm\(^2\) in general
- Reduced by still water longitudinal hull stress in strength deck longitudinals
- = 160 \( f_1 \) N/mm\(^2\) in weather deck hatch covers.

Support of stiffeners to girders shall have a shear area of not less than:

\[ A = 0.125 \frac{P_W}{f_1} \text{ (cm}^2\text{)} \]

8.2.2 Decks for helicopters supported on tubular skids shall have scantlings in accordance with the following.

The minimum thickness of steel plating shall be:

\[ t = k \frac{\sqrt{P_W}}{\sqrt[3]{f_1}} + 1.5 \text{ (mm)} \]

- \( k \) = 1.3 in separate platforms
- = 1.4 in weatherdeck general
- = 1.5 in longitudinal framed strength deck and in weather deck hatch covers
- = 2 in transversely framed strength deck
- \( P_W \) = fraction of total landing force \( P_v \) acting on the skid or saddle joint considered (kN)
- \( f_1 \) = as in [3.2.1]
- \( \varepsilon \) = a/s
- \( a \) = length of tubular line load, usually taken as 0.6 m (twice the distance from saddle joint to skid end)
- \( s \) = beam spacing (m).

Guidance note:
If ballast tank(s) are fitted directly below the helicopter deck, corrosion addition and section modulus corrosion factor shall be applied as stated in SHIP Pt.3 Ch.3 Sec.3.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---
\[ t = \frac{k\sqrt{P_W}}{f_1^{3/2}\varepsilon} \text{ (mm)} \]

\( k = 1.4 \) for separate platforms
\( = 1.6 \) for weather deck hatch covers.

\( f_1, P_W \) and \( \varepsilon \) as above.

Section modulus of stiffeners as for wheel helicopters.

8.2.3 In cases where the deck is proposed to be built from sections, the connections between them will have to be documented to give the same strength as required for an intact deck and also the necessary oil and fuel (including burning fuel) tightness.

8.3 Girders and supporting structures of separate platforms

8.3.1 The scantlings are normally to be based on direct stress analysis. Allowable stresses are:
- normal stress: \( \sigma = 160 f_1 \) N/mm\(^2\)
- shear stress: \( \tau = 90 f_1 \) N/mm\(^2\).

8.3.2 The cross sectional area of supporting steel members in compression shall not be less than:

\[ A = kP_p \text{ (cm}^2\text{)} \]

\( k \) is given in Figure 1.

\( P_p = \) pillar force or bulkhead stiffener force (kN)
\( l = \) length (m) of pillar or bulkhead stiffener
\( i = \sqrt{I/A} = \) radius of gyration (cm)
\( I = \) moment of inertia about the axis perpendicular to the expected direction of buckling (cm\(^4\))
\( A = \) cross-sectional area (cm\(^2\)).

When calculating \( I \) and \( A \) for bulkhead stiffeners a plate flange with breadth equal to 40 \( t \), where \( t = \) thickness of bulkhead, may be included.

The critical buckling stress of plating acting as girder flange shall not be less than:

\[ \sigma_c = \frac{\sigma_a}{0.67} \text{ (N/mm}^2\text{)} \]

\( \sigma_a = \) calculated compressive design stress.
Tripping brackets and local stiffening of plating shall be provided where necessary.

**Guidance note 1:**
The part of \( P \) caused by the helicopter can be reduced by 20% in the landing case.

--- end of guidance note ---

**Guidance note 2:**
Buckling strength of aluminium pillars and stiffeners should be calculated according to SHIP Pt.3 Ch.8.

--- end of guidance note ---

![Figure 1 k values](image)

### 8.4 Miscellaneous

**8.4.1** In case of landing on a hatch cover section that is underlying in the packing joint, the strength and spacing of cleats must be sufficient to keep the connection intact and tight.

### 9 Miscellaneous

#### 9.1 Personnel safety

**9.1.1** The landing area shall be surrounded by a safety net of not less than 1.5 m width. The safety net shall have an upward and outboard slope of about 10° from slightly below to slightly above the level of the landing area but not more than 250 mm.

**Guidance note:**
The safety net may further facilitate:
- that it can be safely secured in the upright position
- that it can be secured in the lowered position, in order to avoid being blown upright by rotor downdraft
- that it is flush with helicopter deck in the lowered position
- that the safety net webbing is installed with slack in order to contain personnel who fall over the deck edge (avoid rebounding)
- that the safety net webbing is made of flame resistant materials
- that the safety net webbing is made of material resistant to seawater
that it can be lowered and raised in a manner that minimises the risk for personnel falling overboard during operations.

---end of guidance note---

9.1.2 The flexibility and tightening shall be chosen to avoid rebounding. The number and shape of rails and brackets shall be chosen to minimise injuries.

9.1.3 The test load for safety net and safety net supporting structure surrounding a helicopter deck shall not be taken less than 100 kg dropped from 1 m.

Guidance note 1:
Approximate calculations may be based on a static load of 0.2 tons/m run of net. For soft, hammock type nets this load may be converted into 0.2 g0 kN/m acting along inner and outer rails in an inward plane 30° below the net plane, see Figure 2.

---end of guidance note---

Guidance note 2:
In rails, brackets and other details supporting safety nets, allowable stresses in approximate static calculations may be taken as given in [3.3.1].

---end of guidance note---

Figure 2 Safety net

9.1.4 A 5 cm high steel coaming shall border landing platforms and landing areas in exposed positions, to assist in minimising the probability of personnel or equipment from sliding off the helicopter deck. The coaming shall not impede good drainage of water and or spilt fuel.

9.2 Tie-down points

9.2.1 Helicopter decks shall have tie-down points for lashing of the helicopter. The tie-down points shall not protrude above the level of the helicopter deck. Helicopter operators can advise on the correct configurations.

9.2.2 The breaking load of the tie-down points for helicopters calling at the vessel should be confirmed from helicopter operator or manufacturer. Unless otherwise provided a value \( F \), per tie-down where \( M_H \) is given in [2.2] may be used.

\[
F = \frac{1.5 \ g_0 M_H}{n - 0.5}
\]

\( n \) = the number of active down points acting in same direction

\( F_{\text{min}} \) = 40 kN.
9.2.3 Tie-down points located on helicopter decks shall be flush fitted.

9.3 Surface friction of helicopter deck

9.3.1 The surface of helicopter decks and landing areas shall be of such a nature or so equipped that the static coefficient of friction between the helicopter's landing gear and the surface will be satisfactory (recommended value 0.6) in any weather condition. To prevent sliding in cold weather when there is danger for icing, the surface is either to have a grid of ribs (for wheel helicopters) or shall be arranged for fitting a rope net/landing net, which shall be kept on board.

9.3.2 The helicopter rope net mentioned in [9.3.1] shall have a size as given in Table 2.

Table 8 Minimum rope net size

<table>
<thead>
<tr>
<th>Deck diameter $D$ according to [6.1]</th>
<th>Net size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 13 m</td>
<td>$6 \times 9$ m</td>
</tr>
<tr>
<td>13 to 14 m</td>
<td>$9 \times 9$ m</td>
</tr>
<tr>
<td>14 to 20 m</td>
<td>$12 \times 12$ m</td>
</tr>
<tr>
<td>More than 20 m</td>
<td>$15 \times 15$ m</td>
</tr>
</tbody>
</table>

Note: The rope net shall be secured every 1.5 m. Mesh size and tightening shall be such as to avoid hooking of helicopter substructure.

10 Requirements for vessel safety - HELDK(S)

10.1 Fire-fighting - general

10.1.1 The requirements in this subsection are considered to cover the requirements in SOLAS Reg. II-2/18.1-5.

10.2 Structural fire integrity

10.2.1 Escape routes from the helicopter deck shall be arranged on opposite sides. Minimum two escape routes shall be provided.

10.2.2 In general, the construction of the helicopter decks shall be of steel or other equivalent material, see also [1.5.5]. If the helicopter deck forms the deckhead of a deckhouse or superstructure, it shall be insulated to “A-60” class standard.

10.2.3 Enclosed piping used in drainage systems should be made of steel, open scupper arrangement may however be made of aluminium. The drainage arrangement shall be lead directly overboard independent of any other system and shall be designed such that drainage does not fall onto any part of the ship. Drainage shall be provided at the perimeter of the helicopter decks. The deck shall be cambered approximately 1:100 to assure that fuel etc. is lead away from the deck.
10.3 Fire fighting equipment

10.3.1 A fixed foam application system consisting of either monitors or “pop up” nozzles with a minimum capacity of at least 6 l/m²/min shall be provided. The system shall be able to cover the whole of the helicopter landing area, and with sufficient foam medium to enable the foam application rate to be maintained for at least 5 minutes.

10.3.2 In addition to the fixed foam system, two hand held foam applicators with a capacity of at least 250 l/min each shall be provided. The fire hose connection shall be suitable for both foam equipment and fire water nozzle, see [5.3.4] 3).

10.3.3 The foam shall be of an approved medium suitable for the helicopter fuel used and for use with salt water.

10.3.4 The following fire fighting appliances shall be provided and stored near the means of access to the helideck:

1) At least two dry powder extinguishers having a total capacity of 45 kg.
2) CO₂ extinguishers of a total capacity of not less than 18 kg or equivalent.
3) Two fire hoses and two nozzles of an approved dual purpose type (jet/spray) sufficient to reach any part of the helicopter deck.
4) Two fire-fighter’s outfits dedicated for the helicopter deck. The fire-fighter’s outfit shall comply with Ch.3.2.1 of the FSS Code.
5) The following rescue equipment:
   — adjustable wrench
   — rescue axe, large (non-wedge or aircraft type)
   — cutters, bolt, 60 cm
   — crowbar, large
   — hook, grab or salving
   — hacksaw, heavy duty c/w 6 spare blades
   — blanket, fire resistant
   — ladder (two-piece)
   — life line, 5 mm, 15 m in length plus rescue harness
   — pliers, side cutting (tin snips)
   — set of assorted screwdrivers
   — harness knife c/w sheath
   — gloves, fire resistant
   — power cutting tool.

10.4 Communication between helicopter and vessel

10.4.1 Helicopter and vessel shall communicate through a VHF installation, maritime or aeromobile.

**Guidance note 1:**
For helicopter decks with frequent landings an aeromobile VHF should be installed and licensed by the aviation authority of the coastal state.

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

**Guidance note 2:**
For passenger ships, the communication requirements should be in accordance with SOLAS Chapter IV, Regulation 7.5.

---e-n-d---of---g-u-i-d-a-n-c-e---n-o-t-e---
Guidance note 3:
For naval craft, helicopter communications should be thorough HF, V/UHF normal and VHF/UHF.

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

10.4.2 A portable VHF apparatus with earphones shall be available. Three-way communication between helicopter, helicopter deck and bridge must be possible.

11 Requirements for helicopter safety - HELDK(SH)

11.1 Size of helicopter deck

11.1.1 The diameter D of the helicopter deck or landing area shall be according to Table 9.

Table 9 D-value and helicopter type criteria

<table>
<thead>
<tr>
<th>Type</th>
<th>D-value (m)</th>
<th>Perimeter &quot;D&quot; marking</th>
<th>Rotor Diameter (m)</th>
<th>Max. weight (kg)</th>
<th>&quot;t&quot; value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolkow Bo 105D</td>
<td>12.00</td>
<td>12</td>
<td>9.90</td>
<td>2 400</td>
<td>2.4t</td>
</tr>
<tr>
<td>Bolkow 117</td>
<td>13.00</td>
<td>13</td>
<td>11.00</td>
<td>3 200</td>
<td>3.2t</td>
</tr>
<tr>
<td>Agusta A109</td>
<td>13.05</td>
<td>13</td>
<td>11.00</td>
<td>2 600</td>
<td>2.6t</td>
</tr>
<tr>
<td>Dauphin SA 365N2</td>
<td>13.68</td>
<td>14</td>
<td>11.93</td>
<td>4 250</td>
<td>4.3t</td>
</tr>
<tr>
<td>EC 155B1</td>
<td>14.30</td>
<td>14</td>
<td>12.60</td>
<td>4 850</td>
<td>4.9t</td>
</tr>
<tr>
<td>Sikorsky S76</td>
<td>16.00</td>
<td>16</td>
<td>13.40</td>
<td>5 307</td>
<td>5.3t</td>
</tr>
<tr>
<td>Agusta/Bell 139</td>
<td>16.66</td>
<td>17</td>
<td>13.80</td>
<td>6 400</td>
<td>6.4t</td>
</tr>
<tr>
<td>Bell 212</td>
<td>17.46</td>
<td>17</td>
<td>14.63</td>
<td>5 080</td>
<td>5.1 t</td>
</tr>
<tr>
<td>Super Puma AS332L</td>
<td>18.70</td>
<td>19</td>
<td>15.00</td>
<td>8599</td>
<td>8.6t</td>
</tr>
<tr>
<td>Bell 214ST</td>
<td>18.95</td>
<td>19</td>
<td>15.85</td>
<td>7 936</td>
<td>8.0t</td>
</tr>
<tr>
<td>Super Puma AS332L2</td>
<td>19.50</td>
<td>20</td>
<td>16.20</td>
<td>9 300</td>
<td>9.3t</td>
</tr>
<tr>
<td>EC 225</td>
<td>19.50</td>
<td>20</td>
<td>16.20</td>
<td>11 000</td>
<td>11.0t</td>
</tr>
<tr>
<td>Sikorsky S92</td>
<td>20.88</td>
<td>21</td>
<td>17.17</td>
<td>11 861</td>
<td>11.9t</td>
</tr>
<tr>
<td>Sikorsky S61 N</td>
<td>22.20</td>
<td>22</td>
<td>18.90</td>
<td>9 298</td>
<td>9.3t</td>
</tr>
<tr>
<td>EHIOI</td>
<td>22.80</td>
<td>23</td>
<td>18.60</td>
<td>14 600</td>
<td>14.6t</td>
</tr>
<tr>
<td>Boeing BV234LR</td>
<td>30.18</td>
<td>30</td>
<td>18.29</td>
<td>21 315</td>
<td>21.3t</td>
</tr>
<tr>
<td>Chinook</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
11.2 Location

11.2.1 For location at ship’s ends a free approach and take-off sector of 210° is required. The whole deck or landing area shall be located within this sector.

**Guidance note:**
The ship end location is recommended.

---end---of---guidance---note---

11.2.2 For helicopter landing areas located amidships, across ship obstacle free sectors shall be provided. These sectors shall originate at the most forward and aft points on the periphery of the D reference circle and diverge at 15° forward and 15° aft relative to straight transverse lines.

11.2.3 For any helicopter landing areas amidships located adjacent to the ships side with one-sided approach, the obstacle free sector shall originate at the most forward and aft points on the periphery of the D reference circle and diverge to achieve 1.5 D at the ship’s side.

11.2.4 For erected helicopter decks there shall be sufficient separation between helicopter deck and underlying superstructure to ensure that air may flow freely between the deck and the underlying structure. This distance shall be minimum 1 m.

11.2.5 For naval craft, the requirements in [11.1] to [11.4] may be deviated from if so required by the navy.

**Guidance note:**
Vertical component of airflow from horizontal wind velocities up to 25 m/s should not exceed 0.9 m/s over the landing area at main rotor height.
Some helicopter operators may require turbulence conditions for different wind directions above the helicopter deck and information of possible exhaust emission from the ship that may have effect on the landing conditions.
Such environmental conditions are not covered by the HELDK(SH) notation, and are considered the operators responsibility to provide as applicable.

---end---of---guidance---note---

11.3 Height of obstacles

11.3.1 The landing area should be as flush as possible to avoid damage on skids, wheels or pontoons.

11.3.2 Steel or other solid construction at perimeter may extend 50 mm above deck level.

11.3.3 In the approach sector, on and outside of perimeter, only aids essential to helicopter operations are allowed to extend up to a maximum height of 250 mm, e.g. landing lights, floodlights, foam monitors, outer edge of safety net and similar arrangements.

11.3.4 In bow or stern located helicopter landing areas, outside the obstacle free sector, obstacle heights shall be limited to 0.05 D to a distance 0.62 D from the centre of the landing area and thence are required to be below a rising plane of 1:2 to a distance of 0.83 D from the centre of the landing area.

11.3.5 Forward and aft of the approach sector of a flight channel across the ship, within a length equal to helicopter overall length forward and aft of sector, obstacles are required to be below a plane with 1:5 longitudinal inclination.

11.3.6 For helicopter landing areas located adjacent to the ship’s side, outside the obstacle free sector, obstacles shall be limited to a height of 0.05 D for a distance of 0.25 D from the edge of the obstacle free sector and the landing area.
11.3.7 For naval craft, the requirements in [11.4] to [11.6] may be deviated from if so required by the navy.

11.3.8 No loose gear that can create foreign object damage shall be stored on or in the vicinity of the helicopter deck.

11.4 Daylight marking

11.4.1 Obstacles, which the helicopter operator should be especially aware of, shall be painted in diagonal stripes of contrasting colours.

11.4.2 Wind direction indicator (windsock) shall be provided so as to indicate the clear area wind condition representative for the helicopter deck.

11.4.3 The perimeter of the helicopter deck shall be marked with a 300 mm white line. The preferred colour of deck within perimeter line is dark grey or dark green.

11.4.4 The name of the vessel shall be marked on the helicopter deck surface between the origin of the obstacle-free sector and the aiming circle in symbols not less than 1 200 mm high and in a colour which contrasts to the helicopter deck surface.

11.4.5 Obstacle-free sector shall be marked on the helicopter deck by a black chevron, each leg being 790 mm long and 100 mm wide. The chevron shall delineate the separation of the 210º obstacle-free sector and the 150º limited obstacle sector.

11.4.6 The actual D-value of the helicopter deck shall be painted on the helicopter deck inboard of the chevron in alphanumeric symbols of 100 mm height and around the perimeter of the helicopter deck directly opposite and in 90º to each side of the chevron in with symbol of 600 mm height and rounded down to the nearest whole number.

11.4.7 The maximum allowable mass shall be marked on the helicopter deck in a position that is readable from the preferred final approach direction and consist of a two-or three-digit number expressed to one decimal place rounded to the nearest 100 kg and followed by the letter “t”. The height of the numbers shall be 900 mm with a line width of 120 mm.

11.4.8 An aiming circle, which shall be a 1 000 mm yellow line with inner diameter 0.5 D. Its centre should be displaced 0.1 D from the centre of the D-circle towards the outboard edge, except for decks with a midship cross flight channel.

11.4.9 A letter H shall be painted 4 × 3 m of 750 mm white lines located in the centre of the aiming circle with the mid-bar of the H located along the midline of the approach sector.

11.4.10 A signal flag to alert approaching helicopters that landing is prohibited in case the helicopter deck for technical reasons cannot be used shall be carried onboard. This shall be a red flag 4 000 × 4 000 mm with yellow diagonal cross that can be laid above the ‘H’ inside of the aiming circle.

11.4.11 For naval craft marking shall be in accordance with naval requirements.

Guidance note:
A signal or light that shows “Helicopter operations are going on” should be installed. The indicator should be displayed on this ship’s bridge and another made clearly visible for the pilot. The indicator should be able to be switched from a go to no go mark.

---end of guidance note---
11.5 Night operation marking

11.5.1 Floodlight shall be arranged for illumination of the total landing area, with care not to dazzle the pilot.

**Guidance note:**
Details of flood-lights should follow the recommendations given by ICAO's Regulation Annex 14. (ICAO = International Civil Aviation Organisation).

---end-of-guidance-note---

11.5.2 Green lights shall be fitted on the perimeter line, maximum 3 m apart. The intensity of lighting shall be 30 candela. The lighting shall not be visible below the helicopter deck level.

**Guidance note:**
Details of perimeter-lights should follow the recommendations given by ICAO's Regulation Annex 14.

---end-of-guidance-note---

11.5.3 Floodlights, perimeter lights, and obstruction lights shall have electric power fed from emergency and transitional source of power in compliance with the requirements in SHIP Pt.4 Ch.8 Sec.7 [2]. The transitional power shall last for at least 30 min.

The system shall also have a supply circuit from main power so that a single failure in either the main electric power distribution system or the emergency power distribution system shall not render the helicopter deck lighting inoperable.

Individual protected distribution circuits shall be arranged to
- floodlights
- perimeter lights
- obstruction lights.

11.5.4 The wind indicator shall be illuminated.

11.5.5 All obstacles, which may obstruct the landing approach shall be indicated by red obstruction lights visible from all directions, or floodlighting or a combination of both.

11.5.6 For naval craft light marking shall be in accordance with naval requirements.

11.6 Instrumentation

11.6.1 Wind velocity and direction, barometric pressure, vessel's roll and pitch shall be recorded and communicated to helicopter before landing. Simple instruments for this purpose shall be available.

**Guidance note:**
For use in connection with Ship Helicopter Operations Limitations (SHOLS), the roll and pitch information must be true values.

---end-of-guidance-note---
12 Requirements for helicopter refuelling and hangar facilities - HELDK(SHF)

12.1 Classification and application

12.1.1 The requirements in this sub-section apply to vessels equipped to support helicopter operations. The rules concerning refuelling are limited to handling of fuel with flame point above 60ºC. For fuel with lower flame point, special considerations are required and the storage tank/systems shall comply with the relevant regulations as given in RU SHIPS Pt.5 Ch.9 concerning transport of low flashpoint liquids.

12.1.2 Vessels equipped in compliance with the requirements given in this sub-section may be given the class notation HELDK(SHF), provided the conditions given for HELDK, HELDK(S) and HELDK(SH) are also fulfilled.

12.1.3 The requirement in this sub-section cover permanent shipboard installations for refuelling and maintenance hangar for helicopters. The requirements in this subsection are also considered to cover the requirements in SOLAS Reg. II-2/18.7.

12.2 Helicopter refuelling area

12.2.1 The helicopter fuel storage tanks shall be constructed to suitable standards and material that is compatible with helicopter fuel and secured to the vessels structure. The tank shall have inspection hatch, level indicator and ventilation arrangement.

12.2.2 The pumping unit shall be arranged with flow meter and emergency shut down system from safe location.

12.2.3 Drainage facilities in way of the refuelling area to be arranged with drainage to collection tank or directly overboard.

12.2.4 One 25 kg powder extinguisher and one foam applicator shall be arranged for protection of the helicopter refuelling station.

12.2.5 No Smoking signboard and clear refuelling instruction shall be provided at the refuelling station.

12.3 Hangar

12.3.1 The hangar shall be designed in accordance with the requirements given for superstructures as given in SHIP Pt.3.

12.3.2 The deck in the hangar area shall be designed in accordance with load requirements provided for wheel loading and car deck structure.

Guidance note:
Requirements are given in SHIP Pt.5 Ch.4, as appropriate.

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

12.3.3 The hangar door shall be weathertight and be able to withstand the horizontal component of the helicopter down wash.
12.3.4 The hangar door shall be equipped with suitable opening and closing mechanisms of adequate strength.

12.3.5 The hangar door or the immediate surround shall be fitted with a viewing port, which permits personnel to observe operations on the flight deck. The viewing port shall be fabricated from hardened armour plate safety glass. The viewing port shall have a minimum diameter of 150 mm and be equipped with a blackout cover.

12.3.6 There shall be a minimum clearance between hangar door and the appropriate helicopter according to the traversing system.

   Guidance note:
   The clearance should be $\geq 0.5 \text{ m}$ each side for rail guided traversing systems and $\geq 0.6 \text{ m}$ each side for non-rail guided systems.

12.3.7 The hangar shall be equipped with a general access, in addition to the main hangar door, between the flight deck and the hangar area. The door shall open onto the flight deck area and maintain weather tightness and fire resistance of the hangar area.

12.3.8 The hangar shall be treated as a category A machinery space with regard to structural fire protection, ref SOLAS Ch.II-2.

12.3.9 The hangar shall be provided with mechanical ventilation of non-sparking type having a capacity of at least 6 air changes per hour.

12.3.10 The hangar shall be provided with fixed fire detection system

12.3.11 The hangar shall be protected by a fixed water based fire extinguishing system with application rate of not less than $10\text{ l/min/m}^2$ and with possibilities for injection of foam liquid for not less than 20 minutes.

12.3.12 The hangar shall be provided with drainage sufficient to handle the water spray system and also to ensure safe drainage in case of spill from the helicopter. Drainage shall be lead directly overboard at safe location.

12.3.13 Electrical equipment within the height of 450 mm above the deck shall be of ex proof certified type.

12.3.14 Personnel safety equipment

   The support facility shall be equipped with:
   
   Fire-fighters outfits
   — fire-fighter’s equipment as required in [5].

   Other personnel safety equipment including:
   — goggles
   — helmets
   — gloves.

12.3.15 The deck within the hangar shall be provided with tie-down points in a pattern to ensure safe mooring of the helicopter when parked. The strength of the tie down points shall comply with [4.1.4].
13 (CAA-N)

13.1 Application

13.1.1 Vessels equipped in compliance with the requirements given in this sub-section may be given the class notation (CAA-N). E.g. HELDK(SH,CAA-N).

It is a prerequisite that the vessel in addition has either HELDK(SH) or HELDK(SHF) notation. E.g. HELDK(SHF,CAA-N).

Guidance note: (CAA-N) means that the helicopter facility has been evaluated for additional requirements specified by the Norwegian Civil Aviation Authorities, in "CAA-N BSL D 5-1, Regulation 26 October 2007, no. 1181" governing commercial air traffic to and from helicopter decks on vessels and offshore installations operating on the Norwegian Continental Shelf.

13.1.2 The size of the helicopter deck shall not be less than 1.25 × D.

13.1.3 The stress levels calculated under [2] and [3] shall not exceed 0.67 times the material's breaking strength.

13.1.4 The rescue equipment shall in addition to [5.3.4](5) include:
— total of two 2 fire axes
— total of 3 stainless steel knives
— two explosion proof hand torches
— hammer
— jack with minimum 0.5 tonne capacity.

13.1.5 The number indicating maximum allowable mass shall be 1 000 mm height and 500 mm wide. The letter "t" shall be 800 mm height and 300 mm wide. Line width shall be 150 mm for both.

13.1.6 Effects from turbulence shall be documented by testing in wind tunnel or simulation model.

14 Testing

14.1 General

14.1.1 Test procedures shall be submitted for approval.

14.2 Testing of landing area and hangar deck

14.2.1 The helicopter deck shall be hose tested for watertightness.

14.2.2 Drainage in the landing and hangar deck area shall be tested for functionality with all fire extinguishing systems in operation.

14.2.3 The coating on the landing area and in the hangar HELDK(SHF) shall be tested in order to check that the required coefficient of friction or more is obtained.
14.3 Testing of visual landing aids

14.3.1 The visual landing aids shall be tested for correct functionality.

14.4 Testing of fire protection

14.4.1 The fire protection system shall in accordance with approved test procedures be functionality tested. The test shall cover:

— remote control functions of foam monitor(s)
— validity of batch certificate for the foam concentrate
— correct mixing ratio of foam proportions
— helicopter deck foam system (by means of monitors) if installed, shall include throw length of monitors (75% of throw length credited in still air) with sea water
— helicopter deck foam system (by means of pop up sprinklers) if installed, shall include function test of pop-up nozzles and their distribution pattern in accordance with system manuals with sea water
— hangar-fixed fire extinguishing system complying with SOLAS 2000 II-2/10.5 shall be tested as required for water based spray/mist/foam systems for machinery category A spaces.
SECTION 2 WINDFARM SERVICE

1 Introduction

1.1 Objective

1.1.1 The objective of this chapter is to define requirements supporting safe and reliable operation of ship’s equipment and systems used on vessels intended for servicing offshore installation, including windfarms.

1.2 Scope

1.2.1 The scope of this chapter includes requirements regarding personnel transfer systems, cargo and fuel oil transfer systems and noise and vibration.

1.3 Class notations

1.3.1 Crafts built in compliance with the rules in this chapter may be assigned the class notation Windfarm.

1.3.2 When the additional class notations Windfarm is used together with the class notation Passenger the maximum number of passengers shall not exceed 60.

2 Documentation

2.1 General

2.1.1 Documentation requirements for additional class notation Windfarm are given in Table 1.

2.1.2 All listed information is to be provided as given in Table 1. Drawings with insufficient information will be returned unstamped.

Table 1 Documentation requirements – additional class notation Windfarm

<table>
<thead>
<tr>
<th>Object</th>
<th>Documentation type</th>
<th>Additional description</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bow</td>
<td>H050 – Structural drawing</td>
<td>Including: — contact area — connection of the fender to the bow — railings incl. scantlings and foundations</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z240 – Calculation report</td>
<td>Document presenting calculations of design forces as described in Sec.4 [2]</td>
<td>FI</td>
</tr>
<tr>
<td>Personnel transfer arrangement</td>
<td>H050 – Structural drawing</td>
<td>Including: — equipment model — self weight — dynamic loads as required in Sec.4 [2.7]</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z030 – Arrangement plan</td>
<td>Including foundation and hoisting arrangements.</td>
<td>FI</td>
</tr>
<tr>
<td>Fuel oil system</td>
<td>S010 – Piping diagram</td>
<td>Drawing showing details of the bunkering system if fitted</td>
<td>AP</td>
</tr>
<tr>
<td>Object</td>
<td>Documentation type</td>
<td>Additional description</td>
<td>Info</td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Noise and vibration</td>
<td>Z140 – Test procedure for quay and sea trial</td>
<td>Including: Specification of measuring locations. Required loading conditions. Required operation conditions for machinery. Instrumentation to be used</td>
<td>AP</td>
</tr>
<tr>
<td></td>
<td>Z150 – Report from quay and sea trial</td>
<td>Measured levels listed in tables and preferably plotted on a general arrangement plan. For noise: If the specified criterion is exceeded, octave band readings shall be reported.</td>
<td>AP</td>
</tr>
</tbody>
</table>

AP = For approval; FI = For information  
ACO = As carried out; L = Local handling; R = On request; TA = Covered by type approval; VS = Vessel specific

For general requirements for documentation, including definition of the info codes, see SHIP Pt.1 Ch.3 Sec.2.  
For a full definition of the documentation types, see SHIP Pt.1 Ch.3 Sec.3.

### 3 Strength and safety requirements for personnel transfer systems

#### 3.1 Bow strength when pushing against or connecting with other structures

**3.1.1** When arranged for such, the area of the bow intended to be pushed against another structure shall be strengthened to withstand the applied loads.

**3.1.2** The design contact area(s) shall be shown on the drawing of the bow structure. The contact area shall be considered to be the part of the bow that makes regular contact with another structure (e.g. a wind turbine tower boat landing structure), including any load spreading effects from the fender system.

**3.1.3** The contact area shall be dimensioned for a horizontal force $F_H$, a vertical force $F_V$ and a side force $F_S$.

**3.1.4** The horizontal force $F_H$ shall be taken as the static bollard push as stated by the designer.

*Guidance note:*
When calculating the design horizontal force, $F_H$, consideration should be given to the strength of the structures that the craft will push against to minimise the likelihood of them being damage during routine operations. For vessels designed to push against wind turbine tower landing structures the horizontal force, $F_H$, need not be larger than the associated design contact force for the landing pile. See also DNV-OS-J101 Sec.4 [4.3] for the design of offshore wind turbine structures.

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

**3.1.5** The vertical force, $F_V$, shall be taken as:

$$F_V = \mu F_{BP} \text{ (kN)}$$

where:

$\mu = \text{the coefficient of friction acting between the fender and the connection, unless otherwise stated, this shall be taken 1.0}$

**3.1.6** The side force, $F_S$, shall not be less than 30 kN.

**3.1.7** A combined load case shall also be considered where the horizontal force, $F_H$, vertical force, $F_V$, and side force, $F_S$, are applied to the contact area simultaneously.
3.1.8 The allowable stresses for bow structure shall be as given in Pt.3 Ch.2, Pt.3 Ch.3, or Pt.3 Ch.4, as applicable. The allowable stress shall be taken from the relevant chapters for plate, stiffeners or girders using allowable stresses as for ships side subjected to sea loads.

3.1.9 In addition, the bow structure shall be designed for an accidental collision. The collision load shall be taken as the worst combination of $F_{RD}$, $F_V$ and $F_S$, where $F_{RD}$ is the horizontal force caused due to a rapid deceleration:

$$F_{RD} = (\Delta + A_m)a_{coll} \text{ (kN)}$$

$\Delta$ = the displacement of the craft at the design water line (tonnes)
$A_m$ = the surge added mass (tonnes). Unless otherwise stated, this shall be taken as $0.2 \times \Delta$
$a_{coll}$ = the collision deceleration (m/s$^2$). Unless otherwise stated, this shall be taken as $0.25g_0$

3.1.10 The allowable stresses for the bow structure when the accidental collision loads are applied shall be as given in Part 3 Chapters 2, 3 or 4, as applicable. The allowable stress shall be taken from the relevant chapters for plate, stiffeners or girders using allowable stresses as for watertight bulkheads.

3.1.11 The contact area shall be supported at intervals not exceeding 0.3 metres by web plates or girders aligned with deck longitudinal stiffeners or other similar structure. As a minimum, one web plate or girder shall be fitted on either side of the contact area, see Figure 1. Unsupported plating in the contact area shall be a minimum of 12 mm unless buckling stiffeners are fitted. A lower plate thickness may be accepted if supported by buckling calculations.

![Figure 1 Support of contact area](image)

3.1.12 If part of the bow structure is designed to be removable details of the connection shall be submitted for approval.
3.2 Fendering system

3.2.1 When arranged for such, the area of the bow intended to be pushed against other structures shall be protected by a fender arrangement. Fenders shall be attached to the bow structure and attachment points shall be aligned with internal stiffeners or other similar structure.

3.2.2 Fender connections shall be capable of transferring the applied loads given in [1.1.3] and [1.1.7] to the bow structure. Fenders shall be supported against rotation due to the application of the loads given in [1.1.3] and [1.1.7].

3.3 Hand rails and securing points for personnel on the foredeck during transfer

3.3.1 Hand rails or guard rails shall be fitted in the bow area and their connections to the craft shall be capable of withstanding the force of a person attached at a single point during a rapid deceleration or collision.

3.3.2 The design load, \( F_{\text{PER}} \), shall be applied in the direction giving highest stresses in the deck connection and/or foundation:

\[
F_{\text{PER}} = 10 \ m_{\text{per}\text{coll}} \ N
\]

Where:

\( m_{\text{per}} \) is the mass of a person including all equipment (kg). \( m_{\text{per}} \) should not be taken less than 100 kg.

3.3.3 Hand rails and guard rails required by [1.3.1] should be a minimum of 1.0 metre high, measured from the deck/structure they are attached to.

3.4 Turbine access system foundation

3.4.1 The craft may, as an alternative to the requirements in given [2.1] and [2.2], be equipped with a turbine access system. The foundation of the turbine access system shall comply with requirements given in [1.5] to [1.7].

3.4.2 Approval of turbine access system is not covered.

3.5 Design loads for foundations and supporting structures

3.5.1 The structural strength of the supporting structure shall be based on the design loads as specified by the equipment manufacturer. The designer shall specify:

— Equipment model
— Self-weight
— Maximum dynamic loads on deck foundation.
3.6 Allowable stresses

3.6.1 The allowable stresses shall be as given in Pt.3 Ch.2, Pt.3 Ch.3, or Pt.3 Ch.4 Sec.2, as applicable. The allowable stress shall be taken from the relevant chapters for plate, stiffeners or girders using allowable stresses as for decks.

3.6.2 In way of structures subject to global bending stresses, the allowable stresses will be especially considered.

3.7 Stability

3.7.1 The effect of the system on stability shall be calculated and included in the stability booklet for the vessel.

3.7.2 Means of retracting/disconnecting the personnel transfer system in the case of overload shall be provided. The loads applied to the vessel shall be such as to minimise any heeling moment. If this is not possible the adverse effect upon stability of the added weight and moment shall be taken into account.

3.8 Field of vision from bridge

3.8.1 Field of vision requirements as applicable, shall be fulfilled with the turbine access system in its stowed position.

4 Cargo and fuel oil transfer systems

4.1 General

4.1.1 Cargo handling systems shall comply with the requirements of Pt.4 Ch.6.

4.2 Certification requirements

4.2.1 Cargo and fuel oil transfer systems shall be certified in accordance with Table 2.

Table 2 Certification requirements

<table>
<thead>
<tr>
<th>Object</th>
<th>Certificate type</th>
<th>Issued by</th>
<th>Certification standard*</th>
<th>Additional description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo pumps for flammable liquids</td>
<td>PC</td>
<td>Society</td>
<td></td>
<td>The Society's type approval certificate (TA)</td>
</tr>
</tbody>
</table>

*Unless otherwise specified the certification standard is the rules.

PC = Product Certificate, MC = Material certificate, TR = Test report

For general certification requirements, see SHIP Pt.1 Ch.3 Sec.4.
For a definition of the certification types, see SHIP Pt.1 Ch.3 Sec.4 and SHIP Pt.1 Ch.3 Sec.5.
4.3 Cargo pumps

4.3.1 Cargo pumps shall be provided with remote shut down devices capable of being activated from a dedicated cargo control location which is manned at the time of cargo transfer. Remote shut down shall also be capable of being activated from at least one other location outside the cargo area and at a safe distance from it.

4.3.2 Segregation between cargo piping systems where cross-contamination causes safety hazards or marine pollution hazards shall be by means of spectacle flanges, spool pieces or equivalent. Valve segregation is not considered equivalent.

4.4 Bunkering arrangements for fuel oil transfer

4.4.1 Craft designed for operation on windfarms may be fitted with bunkering arrangements for the transfer of limited amounts of fuel oil to fixed or floating installations.

Guidance note:
In this context “limited amounts of fuel oil” is intended to restrict transfers to those normally required to service backup diesel generators installed on installations such as wind turbines. The intent is that risks are minimised through:

— limited volumes of fuel to lower the fire risk and environmental/pollution hazard
— limiting the time during which the craft is required to be kept on-station
— limiting the extent to which bunkering could interfere with essential propulsion and auxiliary systems.

Bunkering of large amounts of fuel oil, for example to other vessels or large storage tanks is not provided for in the rules.

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

4.4.2 The bunkering system shall be operated in a safe manner by properly trained personnel. The safe manning requirements for the bunkering operation shall be described in the craft’s operational manual. In addition, the craft shall have a bunkering manual describing the procedures for fuel transfers.

Guidance note:
For the purposes of these rules, it is assumed that an adequate number of personnel are provided to fulfil the following functional requirements during bunkering:

— provide control of the craft during fuel transfer
— provide control of the bunkering operation on the vessel
— provide control of the filling hose and nozzle located on the wind turbine/installation.

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

4.4.3 No fuel oil with a flashpoint of less than 60°C shall be transferred.

4.4.4 Bunkering arrangements shall not interfere with the supply of fuel to the main propulsion and auxiliary systems:

— supply suctions, pumps, pipes, filters, valves, etc. shall be dedicated to the bunkering system and not used for supplying propulsion and auxiliary engines
— where bunkering fuel is supplied from tanks also supplying propulsion and auxiliary engines, provision shall be made to prevent the depletion of safe fuel reserves for the craft
— a dedicated tank shall be provided when the total bunkering capacity is greater than 20% of the craft’s total fuel oil capacity.

4.4.5 The design and installation of the bunkering arrangements shall adequately control the risk of fire and explosion. For this purpose, the following functional requirements shall be met:

— means shall be provided to control leakage of fuel oil
— means shall be provided to limit the accumulation of flammable vapours
— the ignitability of combustible materials shall be restricted
— ignition sources shall be separated from combustible materials and flammable liquids.

4.4.6 Piping systems for bunkering shall comply with the requirements for fuel oil tank arrangement and piping in Pt.4 Ch.6 Sec.5 [1.1] and Pt.4 Ch.6 Sec.5 [1.2], with the modifications specified hereafter.

4.4.7 Fuel oil tanks fitted with outlet pipes for bunkering shall be fitted with shut-off valves located on the tank itself. These valves shall be arranged for remote shut-off from the operating compartment.

4.4.8 Piping between the fuel oil tank and bunkering station shall be made of rigid pipes.

4.4.9 Pumps used for bunkering fuel shall be fitted with readily accessible shut-off controls operable from both the bunkering station and the operating compartment. Such controls shall not constitute an ignition hazard.

4.4.10 Arrangements shall be made to prevent overpressure in the bunkering. Any relief valves shall discharge back to the supply tank in a safe manner.

4.4.11 Arrangements shall be made to allow draining of the bunkering piping and safe isolation of the filling hose for its maintenance or replacement.

4.4.12 Bunkering stations shall:
— be situated above the deck and in clear and open air
— be separated from ignition sources (e.g. powered anchor windlasses, crane installations, etc.)
— be clearly visible from the operating compartment
— be clearly marked and fitted with no smoking sign
— be provided with a drip tray or save-all such that any spill can be collected and led to a collecting tank or equivalent
— be provided with a readily accessible positive closing valve fitted between the rigid piping system and the flexible filling hose
— be provided with an additional portable fire extinguisher, as applicable, easily accessible from the bunkering station.

4.4.13 Filling hoses shall:
— be of suitable type and comply with a relevant international standard e.g. SAE, ISO
— be effectively furled/stowed when not in use and protected from damage
— be fitted with a suitable filling nozzle incorporating an automatic shut off device
— be fitted with permanent pressed-on end couplings.

5 Noise and vibration

5.1 General

5.1.1 This section provides requirements to noise and vibration for service craft, aiming to limit exposure levels to those acceptable for health and safety as specified in national and international standards.

5.2 References

5.2.1 Vibration is defined as structural motion in the frequency range 1 to 100 Hz.
5.2.2 Noise is defined as audible air pressure fluctuations generated by ship machinery, systems or structure, i.e. in the frequency range 20 to 20 000 Hz. Basic noise quantity and units are defined in ISO 31/VII.

5.2.3 Reference is made to national and international standards on noise criteria related to hearing damage and speech intelligibility for safety reasons.

5.2.4 The standards shown below contain provisions which are referred to in this text or have been used by the Society as basis when developing the rules:
— IMO Resolution A. 468 (XII), Code of Noise Levels on Board Ships
— EU Directive 2003/10/EF.

5.3 Local vibrations

5.3.1 Vibrations in the hull structural elements are not considered in relation to the requirements for scantlings given in the rules. It is however assumed that special investigations are made to avoid harmful vibrations, causing structural failures, malfunction of machinery and instruments or annoyance to crew and passengers/workers.

5.4 Structural vibrations on propeller driven craft

5.4.1 Propellers optimised for high speed may be inefficient in a bollard push condition. For craft designed to make regular contact with another structure (e.g. a wind turbine tower boat landing structure), it is recommended that the propeller is also optimised for the bollard push condition. If a fixed pitch propeller is chosen, the pitch shall be chosen with due consideration of the pushing condition and shall not cause overloading of the engines.

Guidance note:
A propeller optimised for high speed only will be inefficient during a static push and may cause excessive vibrations in structural elements due to impulses from the propeller. In the extreme cases, this can lead to fatigue cracking and damage may occur after as little as 100 to 200 running hours.

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

5.4.2 For propeller driven craft designed to regularly make contact with another structure, the craft shall comply with the structural vibration requirements for the SV notation given in Pt.6 Ch.6 Sec.1 for the aft ship. The aft ship shall be considered to be the part of the ship aft of amidships. The vibration levels set in the SV notation shall be met in both the transit and pushing conditions.

5.5 Noise

5.5.1 Compliance with the rules shall be verified through measurements. The measurements and reporting shall be carried out according to the procedures described in ISO 2923. The instrumentation to be used for the measurements shall comply with the requirements given in ISO 2923.

5.5.2 A test program shall be approved prior to the measurements. The test program is at least to include the following information:
— specification of measuring locations
— required operating conditions for machinery
— instrumentation to be used.

5.5.3 During the tests, generally the power output on the propulsion machinery shall correspond to at least 85% of maximum continuous power available. All other machinery shall be run under normal operating
conditions during the tests. Air-conditioning supply and ventilation shall be run at normal full capacity during the tests.

5.6 Noise criteria

5.6.1 The following upper acceptable noise limits apply:

<table>
<thead>
<tr>
<th>Condition</th>
<th>Limit (dB(A))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery spaces, continuously manned¹</td>
<td>90</td>
</tr>
<tr>
<td>Machinery spaces, not continuously manned²</td>
<td>110</td>
</tr>
<tr>
<td>Wheelhouse/navigation position – When pushing against fixed structures</td>
<td>75</td>
</tr>
<tr>
<td>Wheelhouse/navigation position – Transit</td>
<td>65</td>
</tr>
</tbody>
</table>

1) IMO Resolution A.468 (XII) defines protection against risk of noise-induced hearing loss by specifying an upper limit of 90 dB(A) for continuously manned working spaces, including machinery spaces. Besides, it is specified that personnel entering spaces with noise levels greater than 85 dB(A) are required to wear ear protection. The 85 dB(A) limit is in accordance with the EU Directive 2003/10/EF on noise, Article 3, specified as daily noise exposure limit called "upper exposure action value" for 8-hours exposure.

2) For machinery spaces with noise levels of above 110 dB(A), as well as requirements for acceptable ear protectors and marking with warning signs, reference is made to IMO Resolution A.468(XII).
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