RULES FOR
CLASSIFICATION OF

SHIPS

NEWBUILDINGS

SPECIAL EQUIPMENT AND SYSTEMS
ADDITIONAL CLASS

PART 6 CHAPTER 1

MISCELLANEOUS NOTATIONS

JANUARY 2009

CONTENTS PAGE

DET NORSKE VERITAS

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CHANGES IN THE RULES

General

The present edition of the rules includes amendments and additions decided by the Board as of December 2008 and supersedes the January 2006 edition of the same chapter.

The rule changes come into force as indicated below.

This chapter is valid until superseded by a revised chapter. Supplements will not be issued except for an updated list of corrections presented in Pt.0 Ch.1 Sec.3. Pt.0 Ch.1 is normally revised in January and July each year.

Revised chapters will be forwarded to all subscribers to the rules. Buyers of reprints are advised to check the updated list of rule chapters printed in Pt.0 Ch.1 Sec.1 to ensure that the chapter is current.

Main changes coming into force 1 July 2009

- **General**

— The notation **(CAA-N)** has been included (evaluation of helicopter deck for compliance with the Norwegian Civil Aviation Authorities helicopter operation regulations BSL D 5-1 governing Norwegian Continental Shelf operation).

— Requirements taking into account "green sea" on pillars, supporting helicopter decks located in the fore ship, have been added under Sec.2 B500.

— Safety requirements based on “CAP 437 - offshore helicopter landing areas - guidance on standards, January 2005 edition” (UK Civil Aviation Authorities Publications), and fire safety requirements for helicopter deck installations as required by SOLAS, have been incorporated.

— Any references to naval standards have been removed.

Corrections and Clarifications

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

Comments to the rules may be sent by e-mail to *rules@dnv.com*
For subscription orders or information about subscription terms, please use *distribution@dnv.com*
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SECTION 1
GENERAL REQUIREMENTS

A. Classification

A 100 Application

101 The rules in this chapter apply to vessels with various special equipment and or arrangements not covered by chapters dealing with particular equipment or types of vessel. The requirements shall be regarded as supplementary to those given for the assignment of main class.

A 200 Class notations

201 Vessels with equipment and or arrangements complying with relevant additional requirements of this chapter will be assigned one of the class notations given in Table A1.

Table A1 Class notations

HELDK, HELDK-S, **HELDK-SH** or **HELDK-SHF**	equipped with helicopter deck (See Sec.2)
(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
CRANE	equipped with shipboard crane (See Sec.3)
DSV-SURFACE, DSV-BOUNCE or **DSV-SAT**	equipped with diving systems (See Sec.4)
DEICE or **DEICE-C**	equipped with de-icing / anti-icing systems (See Sec.5)
OPP-F	arranged and equipped with additional oil pollution prevention measures - fuel oil systems (See Sec.6)

B. Definitions

B 100 Symbols

101 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 NV-NS steel
= 1.08 for NV-27 steel
= 1.28 for NV-32 steel
= 1.39 for NV-36 steel
= 1.47 for NV-40 steel

For details see Pt.3 Ch.1 Sec.2 B for normal steel and Pt.3 Ch.1 Sec.2 C for alternative materials. Note remark on reduced yield stress in heat affected zones for aluminium.

C. Documentation

C 100 General

101 Plans and particulars to be submitted for approval or information are specified in the respective sections of this chapter.

SECTION 2
HELICOPTER INSTALLATIONS

A. General

A 100 Classification

101 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).

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102 Class notation **HELDK** requires compliance with the requirements given in A, B, C and D.

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 Det Norske Veritas 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.

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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.

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103 If the requirements given in A, B, C, D and E are satisfied, the notation may be extended to **HELDK-S**.

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.

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104 If the requirements given in A, B, C, D, E and F are satisfied, the notation may be extended to **HELDK-SH**.

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.

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105 If the requirements given in A, B, C, D, E, F and G are satisfied, the notation may be extended to **HELDK-SHF**.

Guidance note:

HELDK-SHF provides requirements for on-board helicopter service facilities.

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A 200 Definitions

201 The following terms and abbreviations are used:

— *Helideck* is a purpose built helicopter landing area located on a ship including all structure, fire-fighting appliances and other equipment necessary for the safe operation of helicopters.
— *Helicopter facility* is a helideck including any refuelling and hangar facilities.
— *Helicopter landing area* means an area on a ship designed for emergency landing of helicopters.
— *RAST* means recovery assist, secure and traverse.
— *SHOLS* means ship helicopter operations limitations.

A 300 Documentation

301 For class notation **HELDK** the following documentation shall be submitted for approval:

a) Structural design and details with scantlings and particulars of materials used.

b) Tie-down points, type and location on helicopter deck.

c) Details of steel and aluminium connections as given in 500 where such connections are used.

d) Details on safety net, including strength.

e) Details on landing net/ rope net, where such net is used.

f) Supporting hull structure shall be clearly shown on the submitted drawings and the reaction forces at the hull supports shall be specified.

g) For erected helicopter decks where the deck is built up by unconventional profiles, the capacity of the profiles shall be documented by load test(s).

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 DNV surveyor.

A report documenting the test and its results shall be appraised by DNV.

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 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.

302 For class notation **HELDK** the following documentation shall be submitted for information:

a) Plans showing arrangement of the helicopter deck.

b) Structural strength calculations for helicopter deck and supporting structure, including information on all relevant design loads. Helicopter wheel load distribution shall be specified.

c) Type, overall length with rotors running and maximum total mass of helicopter shall be specified.

303 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.

304 For class notation **HELDK-S** the following additional documentation shall be submitted for approval:

a) Arrangement plan showing:

— escape routes
— materials in helicopter deck and possible insulation towards superstructure
— location of rescue- and fire fighting equipment
— if relevant, location of hatches in the helicopter deck.

b) Details and capacity calculations for the fixed foam fire extinguishing.

c) Drainage arrangement.

d) Details on communication between helicopter and vessel.

305 For class notation **HELDK-SH** the following documentation shall be submitted for approval in addition to what is requested under 301-305:

a) Obstacle free sector, including height of all obstacles.

b) Daylight and night operation marking, including wiring diagram for lights.

c) Details and position of wind indicator.

d) Test report for fire test of aluminium helicopter deck if applicable, see 505.

306 For class notation **HELDK-SHF** the following documentation shall be submitted for approval in addition to what is requested under 301-306 for refuelling areas:

a) Arrangement of helicopter refuelling area and position in relation to accommodation and embarkation areas.

b) Area classification for re-fuelling area if fuel with flashpoint below 60º is used.

c) Details of drainage facilities in way of the refuelling area.

d) Details of helicopter fuel storage tank including: material specification, inspection hatch, level indicator and ventilation and fastening of tank to ship structure.

e) Piping system for refuelling including: pump, filters, flowmeter, delivery hose, bounding cable and emergency shut down arrangement from safe location.

f) Additional fire extinguishers and foam applicator covering the refuelling unit.

307 For class notation **HELDK-SHF** the following documentation shall be submitted for approval in addition to what is requested under 301-306 for hangar/service area:

a) Detailed structural drawings of hangar and hangar door.
Functional loads /design information e.g. horizontal component of the helicopter down wash on hangar to be specified.

b) Fire rating of bulkheads and decks, doors and closing appliances.

c) Ventilation arrangement of hangar.

d) Helicopter hangar layout with drainage arrangements and rope nets and rapid securing or traversing system (recessed grid, rails and other arrangements).

e) Particulars about non skid coating on the deck between landing area and hangar and in the hangar.

f) Tie-down points, type and location in hangar.

g) Hangar layout including location of equipment.

h) Specification and location of fixed fire extinguishing arrangements in the hangar, including equipment and calculation of discharge capacities.

i) Specification and location of fire detectors, alarm devices and call points.

j) Specification of electrical installation in defined gas hazardous areas in the hangar, in accordance with Pt.4 Ch.8 Sec.11 B102.

k) Escape routes from the hangar.

308 For class notation **(CAA-N)** the following documentation shall be submitted for information:

a) Confirmation of documented turbulence condition for the helicopter deck.

A 400 Materials

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

A 500 Steel and aluminium connections

501 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.

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

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

504 For welded connections, any bimetallic connection flats shall be delivered from approved manufacturer and with DNV certificate.

505 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 5x5 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/SH/SHF**, aluminium helicopter decks are required to be tested as outlined above.

The test report is subject to DNV's approval.

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Guidance note 2:

For notation **HELDK**, SOLAS Ch. II-2 Reg. 18.3.2 will be used when DNV are delegated to issue SOLAS safety certificates.

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B. Design Loads and Load Combinations

B 100 General

101 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 checked using Pt.3 Ch.1 and the wheel loading requirements given in Pt.5 Ch.2 Sec.4.

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102 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.

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103 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.

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

105 The loads in 200 to 500 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).

B 200 Landing forces

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

$P_v = 2\ g_0\ M_H$ (kN)
M_H = 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.

B 300 Gravity and inertia forces (due to vessel motions and accelerations)

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

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

Guidance note:

For ships in world-wide operation, inertia forces can be determined from Pt.3 Ch.1 Sec.4, and combined according to Pt.3 Ch.1 Sec.4 C500 for operational conditions.

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303 For vessels with class notation **Supply Vessel** the accelerations acting on the helicopter deck and supporting structure shall be taken in accordance with Pt.5 Ch.7 Sec.3 E200.

B 400 Sea pressure

401 The sea pressure for superstructure deck and top of houses shall be taken in accordance with Pt.3 Ch.1 Sec.4 C200. For elevated platforms with free water passage below, the reduction 4 h_0 in the formula may be substituted by $4h_0 + k_0$ where k_0 = height of free water passage below in m. Minimum sea pressure is 2.5 kN/m^2.

B 500 Green sea

501 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 = drag coefficient
= 1.0 for circular cross section
= 2.0 for non circular sections
a = 2 + L/120, maximum 4.5
L = length between perpendiculars
h_0 = vertical distance in m from the waterline at draught T to the load point
C_W = wave load coefficient, see Pt.3 Ch.1 Sec.4 B200.

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 Pt.3 Ch.1 Sec.4 C500.

B 600 Other loads

601 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:

$$P_w = 1.2A_D \text{ [kN]}$$

A_D = deck area [m^2].

602 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.

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

Guidance note:
Such loads should be presented to DNV.

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C. Structural Strength

C 100 General

101 Decks for helicopters supported on wheels with pneumatic tyres shall have scantlings in accordance with the requirements given in 200 to 300.

C 200 Deck plating and stiffeners

201 The minimum thickness of steel plating shall be:

$$t = \frac{k(1+s)\sqrt{P_W}}{\sqrt{f_1}} + 2 \quad \text{[mm]}$$

The minimum thickness of aluminium plating shall be:

$$t = \frac{k(1+s)\sqrt{P_W}}{\sqrt{f_1}} + 1 \quad \text{[mm]}$$

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
= 0.9 in transversely framed strength deck
s = beam spacing [m]
P_W = fraction of total landing force P_v acting on the wheel[s] considered [kN]
f_1 = see Sec.1.

The minimum section modulus of stiffeners shall be:

$$Z = 1000\frac{M}{\sigma} \text{ [cm}^3\text{]}$$

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
σ = 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:

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

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

The minimum thickness of steel plating shall be:

$$t = \frac{k\sqrt{P_W}}{\sqrt{f_1\sqrt[3]{\varepsilon}}} + 1.5 \quad \text{[mm]}$$

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 201
ε = 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 t_k and section modulus corrosion factor W_k shall be applied as stated in Pt.3 Ch.1 Sec.2 D and Pt.3 Ch.1 Sec.3 C1000.

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The minimum thickness of aluminium plating shall be:

$$t = \frac{k\sqrt{P_W}}{\sqrt{f_1\sqrt[3]{\varepsilon}}} \quad \text{[mm]}$$

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

f_1, P_W and ε as above.

Section modulus of stiffeners as for wheel helicopters.

203 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.

C 300 Girders and supporting structures of separate platforms

301 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.

302 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 Fig.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:

$$\sigma_c = \frac{\sigma_a}{0.67} \quad [N/mm^2]$$

σ_a = calculated compressive design stress.

Tripping brackets and local stiffening of plating shall be provided where necessary.

Guidance note 1:

The part of P_P caused by the helicopter can be reduced by 20% in the landing case.

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Guidance note 2:

Buckling strength of aluminium pillars and stiffeners should be calculated according to Pt.3 Ch.1 Sec.14 C.

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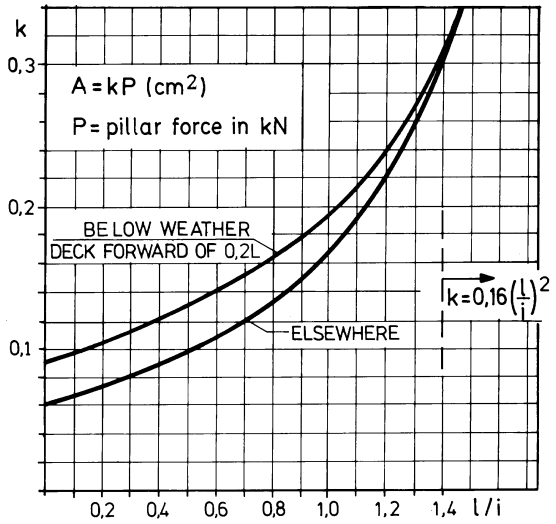

Fig. 1
k values

C 400 Miscellaneous

401 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.

D. Miscellaneous

D 100 Personnel safety

101 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 re-bounding)
- 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.

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

103 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 g_0 kN/m acting along inner and outer rails in an inward plane 30° below the net plane, see Fig 2.

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Guidance note 2:

In rails, brackets and other details supporting safety nets, allowable stresses in approximate static calculations may be taken as given in C301.

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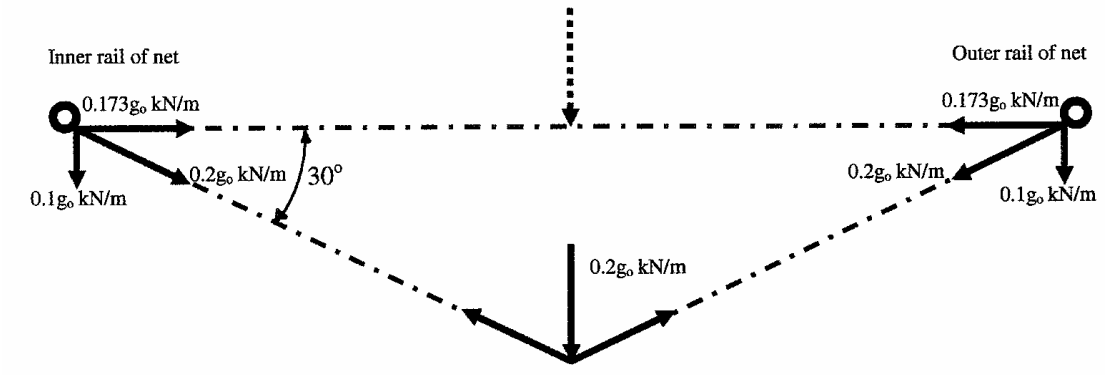

Fig. 2
Safety net

104 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.

D 200 Tie-down points

201 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.

202 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 B200 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_{min} = 40 kN.

203 Tie-down points located on helicopter decks shall be flush fitted.

D 300 Surface friction of helicopter deck

301 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.

302 The helicopter rope net mentioned in 301 shall have a size as given in Table D1.

Table D1 Minimum rope net size

Deck diameter D according to F100	*Net size*
Less than 13 m	6 × 9 m
13 to 14 m	9 × 9 m
14 to 20 m	12 × 12 m
More than 20 m	15 × 15 m

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.

E. Requirements for Vessel Safety (HELDK-S)

E 100 Fire-fighting - General

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

E 200 Structural fire integrity

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

202 In general, the construction of the helicopter decks shall be of steel or other equivalent material, see also A505. If the helicopter deck forms the deckhead of a deckhouse or superstructure, it shall be insulated to "A-60" class standard.

203 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.

E 300 Fire fighting equipment

301 A fixed foam application system consisting of either monitors or "pop up" nozzles with a minimum capacity of at least 6 *l*/m^2/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.

302 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 304 3).

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

304 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) CO_2 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.

E 400 Communication between helicopter and vessel

401 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.

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

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Guidance note 3:
For naval craft, helicopter communications should be thorough HF, V/UHF normal and VHF/UHF.

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

F. Requirements for Helicopter Safety (HELDK-SH)

F 100 Size of helicopter deck

101 The diameter D of the helicopter deck or landing area shall be according to Table F1.

Table F1 D-value and helicopter type criteria

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

F 200 Location

201 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.

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202 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.

203 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.

204 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.

205 For naval craft, the requirements in 201 to 204 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.

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F 300 Height of obstacles

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

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

303 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.

304 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.

305 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.

306 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.

307 For naval craft, the requirements in 304 to 306 may be deviated from if so required by the navy.

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

F 400 Daylight marking

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

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

403 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.

404 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.

405 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.

406 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.

407 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.

408 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.

409 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.

410 A signal flag to alert approaching helicopters that landing is prohibited in case the helicopter deck for technical reasons can not 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.

411 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.

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F 500 Night operation marking

501 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).

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502 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.

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503 Floodlights, perimeter lights, and obstruction lights shall have electric power fed from emergency and transitional source of power in compliance with the requirements in Pt.4 Ch.8 Sec.7 B. 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.

504 The wind indicator shall be illuminated.

505 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.

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

F 600 Instrumentation

601 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.

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G. Requirements for Helicopter Refuelling and Hangar Facilities (HELDK-SHF)

G 100 Classification and application

101 The requirements in G apply to vessels equipped to support helicopter operations. The rules concerning refuelling is limited to handling of fuel with flame point above 60º C.

For fuel with lower flame point, special considerations are required and the storage tank/ systems shall comply with the relevant regulations as given in Pt.5 Ch.7 Sec.10 concerning transport of low flashpoint liquids.

102 Vessels equipped in compliance with the requirements given in G may be given the class notation **HELDK-SHF**, provided the conditions given in A to F are also fulfilled.

103 The requirement in G 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.

G 200 Helicopter refuelling area

201 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.

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

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

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

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

G 300 Hangar

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

302 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 Pt.5 Ch.2, as appropriate.

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303 The hangar door shall be weathertight and be able to withstand the horizontal component of the helicopter down wash.

304 The hangar door shall be equipped with suitable opening and closing mechanisms of adequate strength.

305 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.

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

Guidance note:

The clearance should be ≥ 0.5 m each side for rail guided traversing systems and ≥ 0.6 m each side for non-rail guided systems.

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307 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.

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

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

310 The hangar shall be provided with fixed fire detection system

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

312 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.

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

314 *Personnel safety equipment*

The support facility shall be equipped with:

Fire-fighters outfits

— fire-fighter's equipment as required in E.

Other personnel safety equipment including:

— goggles
— helmets
— gloves.

315 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 D104.

H. (CAA-N)

H 100 Application

101 Vessels equipped in compliance with the requirements in H 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.

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

103 The stress levels calculated under B and C shall not exceed 0.67 times the material's breaking strength.

104 The rescue equipment shall in addition to E304(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.

105 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.

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

I. Certification and Testing

I 100 General

101 Test procedures shall be submitted for approval.

I 200 Certification

201 NV certificates are required for:

— storage tanks and associated equipment for flammable liquids (**HELDK-SHF**)
— foam concentrate foam to be delivered with type approval certificate and batch certificate stating physical properties and production date.

I 300 Testing of landing area and hangar deck

301 The helicopter deck shall be hose tested for watertightness.

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

303 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.

I 400 Testing of visual landing aids

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

I 500 Testing of fire protection

501 The fire protection system shall in accordance with ap-

proved 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 proportioner
- 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 3
SHIPBOARD CRANES

A. General

A 100 Classification

101 The requirements in this section apply to vessels with permanent cranes.

102 Vessels equipped in compliance with the following requirements may be given the class notation **CRANE.**

For vessels intended for lifting as their main purpose reference is also made to the requirements for crane vessels given in Pt.5 Ch.7.

103 The crane shall be delivered with DNV's certificate in compliance with the DNV Standard for Certification No. 2.22 "Lifting Appliances".

A 200 Scope

201 The following matters are covered by the classification:

— supporting structure for the crane
— devices for locking the crane in parked position (vessel at sea)
— the crane itself with respect to safety and functioning.

A 300 Documentation

301 The following plans and particulars shall be submitted for approval:

— plan showing location of the crane during operation and in parked position
— plans showing supporting structures and strengthening of hull (deck) in way of supports
— arrangement plan of rack bar (toothed bar) with details of supports
— plans showing devices for locking the parked crane to the hull (vessel at sea)
— plans of electrical installations for the crane
— information on the vessel's stability for conditions with the crane in operation.

302 The following plans and particulars shall be submitted for information:

— assembly plan showing principal dimensions of the crane and limiting positions of its movable parts.

303 Documentation of control and monitoring systems shall be submitted for design assessment. Pt.4 Ch.9 Sec.1 indicates the extent of required documentation.

B. Design Loads

B 100 General

101 In addition to the specific design loads given in the DNV Standard for Certification No. 2.22 "Lifting Appliances" loads due to ship motions shall be considered. Design values of linear and angular accelerations are given in Pt.3 Ch.1 Sec.4.

C. Overturning and Sliding

C 100 Overturning

101 Devices shall be provided for all cranes in parked position (vessel at sea) to be anchored to the hull structure. The anchoring devices shall be designed to withstand inertia forces due to ship motions and loads due to «out of service» winds. The strength calculations shall be based on accepted principles of statics and strength of materials, applying the safety factors as stipulated for Load Case III in the DNV Standard for Certification No. 2.22 "Lifting Appliances".

C 200 Sliding

201 In parked position (vessel at sea) sliding is normally to be prevented by means of anchoring devices. See 100. If sliding is prevented by friction between rail and wheels the coefficient of friction shall not be taken greater than 0.15.

202 For crane in operation sliding is normally not to take place unless the forces parallel to rails exceed 1.3 times the values for Load Case II in the DNV Standard for Certification No. 2.22 "Lifting Appliances". If this requirement is not satisfied, sliding shall be prevented by some device for locking the crane in position. The strength of this device shall be based on the safety factors for Load Case II.

D. Testing

D 100 General

101 After completed installation on board, functional testing of the crane shall be carried out as specified in the DNV Standard for Certification No. 2.22 "Lifting Appliances".

E. Stability

E 100 Stability requirements for heavy lift operations

101 The stability for vessels for which lifting operations are the main or one of the main functions shall also to be in compliance with the crane criteria given in Pt.5 Ch.7 Sec.7.

The crane criteria shall be applied when the maximum heeling arm created by the crane and its load exceeds 0.10 m at any operational displacement.

SECTION 4
DIVING SYSTEMS

A. General

A 100 Classification

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

DSV-SURFACE or
DSV-BOUNCE or
DSV-SAT

as applicable, when the vessel is equipped with a diving system certified by the Society in compliance with DNV-OSS-305 and DNV-OS-E402.

Diving systems defined in these rules as **DSV-BOUNCE** or **DSV-SAT**, in use on DNV classified support vessels, shall be certified and maintained in class with DNV or a classification society recognised by DNV.

For diving systems defined in these rules as **DSV-SURFACE** the following minimum requirements apply when in use:

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

For diving systems classified and/or certified by other classification societies, compliance shall be verified by DNV on a case by case basis.

Guidance note:

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

Requirements given in IMCA guidelines are also taken into consideration when applying these rules.

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Guidance note:

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

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102 The various class notations are related to positioning class **DYNPOS-AUTR** or **POSMOOR-V**, and the intact and damage stability class **SF**, to the maximum operation depth d_{max} and maximum operation time T_{OP} as given in Table A1.

Table A1 Class notations

Class	**DSV-SURFACE**	**DSV-BOUNCE**	**DSV-SAT**
Restrictions	$d_{max} \leq 60$ m $T_{OP} \leq 8$ hours	$d_{max} \leq 125$ m $T_{OP} \leq 24$ hours	None, except those imposed by the rule requirements

In the DNV-OSS-305 and DNV-OS-E402 the major differences between **DSV-SURFACE**, **DSV-BOUNCE** and **DSV-SAT** diving systems are specified.

103 The main particulars of the diving system will be entered in the "Register of vessels classed with DNV".

104 Cranes and other lifting appliances for diving bell handling systems shall be certified according to DNV Standard for Certification No. 2.22 "Lifting Appliances" as far as applicable, and the additional requirements for handling systems given in DNV-OSS-305 and DNV-OS-E402.

A 200 Scope

201 Classification will cover the following matters:

— the vessel's ability to keep its position during diving operations
— the hull structural arrangements related to the diving system, e.g. moonpool (launching and recovery well for bell)
— the arrangement and installation of the diving system
— the complete diving system with respect to safety and functioning
— stability and floatability.

A 300 Documentation

301 Plans shall be submitted for approval as given in DNV-OSS-305 and DNV-OS-E402.

B. Position Keeping

B 100 General

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

102 The requirements for mooring systems with anchors shall, as a minimum, comply with the notation **POSMOOR-V** or equivalent.

103 Diving support vessels utilising dynamic positioning systems (**DYNPOS**) shall comply with DNV rule requirements as stated in these rules and in DNV-OSS-305 and DNV-OS-E402.

Normative references in the above rules include DNV-OSS-101 and IMO MSC/Circ.645 of 6 June 1994.

Guidance note:

'Guidelines relating to specification and operation of dynamically positioned diving support vessels' published by the Norwegian Petroleum Directorate and Petroleum Engineering Division of UK Department of Energy 1 May 1983 and/or IMCA D 010 Rev.2 issued July 2000 'Diving operations from vessels operating in dynamically positioned mode', and/or IMCA M 103 'Guidelines for the design and operation of Dynamically Positioned Vessels' issued February 1999, may be referred to.

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C. Diving System Arrangement Layout and Location

C 100 General

101 Diving systems shall be arranged, laid out and located in accordance with DNV-OS-E402 Sec.2 E.

D. Electrical Systems

D 100 General

101 Electrical systems shall comply with requirements given in DNV-OSS-305 and DNV-OS-E402.

Normative references in these rules include DNV-OS-D201.

E. Fire Prevention, Detection and Extinction

E 100 General

101 Fire prevention, detection and extinction systems shall comply with requirements given in DNV-OSS-305 and DNV-OS-E402.

Normative references in these rules include DNV-OS-D301.

F. Sanitary Systems for DSV-BOUNCE and DSV-SAT systems

F 100 General

101 Sanitary systems shall comply with requirements given in DNV-OSS-305 and DNV-OS-E402.

G. Testing

G 100 General

101 After completing installation, the diving system shall be tested in compliance with an approved test program in the presence of a surveyor. The required tests are stated in DNV-OSS-305 and DNV-OS-E402.

H. Stability and Floatability

H 100 General

101 The requirements for stability and floatability as given in Pt.5 Ch.7 Sec.3 D and Sec.4 B for additional class notation **SF**, shall be met as far as these requirements are applicable.

I. Hyperbaric Evacuation Systems

I 100 General

101 Hyperbaric evacuation systems shall comply with requirements given in DNV-OSS-305 and DNV-OS-E402.

Guidance note:

These requirements ensure that the requirements given in IMO Guidelines and Specifications for Hyperbaric Evacuation Systems - Resolution A.692(17), are met.

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SECTION 5
DEICING AND ANTI-ICING SYSTEMS

A. General

A 100 Application

101 The requirements in this section apply to vessels intended for operation in cold climate areas.

102 The requirements are supplementary to those given for the main class.

A 200 Assumption

201 The icing as caused by sea spray and or atmospheric water (snow, rain and fog) is assumed to be moderate, corresponding to an ice layer accretion of between 3 and 6 cm per day, depending on ship size.

A 300 Classification

301 Vessels with systems and equipment complying with the relevant requirements specified in the following may be given the class notation **DEICE** or **DEICE-C** as appropriate.

A 400 Scope

401 The requirements for the class notation **DEICE** are aimed at maintenance of the following functions and properties of the vessel and its equipment under icing conditions:

— main functions (see Pt.1 Ch.1 Sec.1 A200)
— manoeuvrability
— stability
— crew safety (rafts, lifeboats, gangways, etc.).

402 The requirements for the class notation **DEICE-C** have the same basic scope as given in 401. In addition, it is aimed at facilitation of deck cargo handling under icing conditions.

A 500 Definitions

501 The equipment and areas requiring measures against ice accretion are divided into the two categories:

— category I
— category II.

502 Category I equipment areas are defined as equipment or areas necessary for:

— navigation
— steering
— propulsion
— anchoring
— lifesaving.

503 Category II equipment or areas are defined to comprise:

— decks and superstructures
— helicopter decks
— railings
— cargo deck area (class notation **DEICE-C**).

A 600 Documentation

601 The following plans and particulars shall be submitted for approval:

— arrangement of anti-icing and deicing equipment for the various areas. Heating capacities shall be specified
— diagram of compressed air supply to important consumers outside machinery space
— electrical single line distribution diagrams for anti-icing and deicing equipment with information about:
  — full load
  — cable type and cross section
  — make, type and rating of fuse and switch gear
  — make, type and rating of heating cable
— electrical schematic diagram, for all control and instrumentation circuits, with information on make, type and rating of all equipment
— fastening arrangement and spacing of electrical cables and fluid pipes for heating purposes
— mechanical deicing arrangements, methods and location
— storage facilities and specification of hand tools for manual ice removing, protective clothing, lines, etc., to be carried onboard
— test program for anti-icing and deicing systems.

602 The following manuals shall be submitted for approval and shall be kept onboard:

— manual for anti-icing precautions and deicing procedures
— stability manual (see also B) including load conditions with ice accretion.

A 700 Testing

701 After completed installation the anti-icing and deicing systems shall be tested to the satisfaction of the Society. A test program shall be proposed by the builders for approval by the Society.

B. Stability and Watertight Integrity

B 100 General

101 The vessels are in any intended service condition, including additional weights due to accretion of ice as specified in 200, to be able to satisfy intact and damage stability criteria.

B 200 Icing stability

201 The ice load as calculated according to 202 to 203 shall be included in the loading conditions.

Loading conditions including ice load shall satisfy the applicable stability requirements.

202 The ice weigh distribution shall as a minimum be as calculated from the following:

$$W = \frac{300}{K}(1 - C) \quad (kg/m^2)$$

where

W = the weight distribution over the horizontally projected area of the ship

K and C shall be taken from the following table:

Summer freeboard:	K:	*Ship length:*	C:
FB ≤ 2 m	1	Lpp < 50 m	0
2 m < FB ≤ 6 m	1.25	50 m ≤ Lpp < 100 m	0.075
6 m < FB ≤ 9 m	1.5	100 m ≤ Lpp < 200 m	0.2
FB > 9 m	1.75	Lpp ≥ 200 m	0.25

For ships with length above 100 m, the weight distribution W aft of L/2 can be set to 100 kg/m^2 of the horizontally projected area.

203 The weight of ice on vertical surfaces has been taken into account and included in 202 and need not be calculated separately.

C. Anti-icing and Deicing Arrangements and Equipment

C 100 General

101 Arrangements and methods for anti-icing and deicing will be considered for approval in each case. Manual deicing may be accepted to a limited extent when such procedure is found to be capable of serving its purpose satisfactorily.

Guidance with more detailed requirements for different parts of the ship and equipment is found in C200, C300 and at the end of this section.

102 For category I equipment or areas anti-icing arrangements are required with sufficient capacity to keep the equipment or areas free from ice (generally be means of heating or cover) at all times in the service areas and under icing conditions specified (see A100 and A200).

103 For category II equipment or areas deicing arrangements are required with sufficient capacity for removal of accreted ice within a reasonable period of time (normally 4 to 6 hours) under the icing conditions specified.

104 Heating power capacity for anti-icing and deicing shall not be less than:

- 300 W/m^2 for open deck areas, helicopter decks, gangways, stairways, etc.
- 200 W/m^2 for superstructures
- 50 W/m for railings with inside heating.

Heating capacities for other areas will be considered in each individual case.

105 In arrangements with electric heating cables or heating pipes with fluids as heating medium, special attention shall be paid to the heat transfer from the cables or pipes to the equipment or structure to be heated. The spacing of cables or pipes shall be appropriate for efficient heating. The fastening of cables or pipes shall be such that the heat will be readily dissipated to the equipment or structure to be heated.

106 Switchboard for anti-icing and deicing shall be arranged as required for distribution switchboards. A wattmeter or amperemeter, indicating the total load shall be installed on the switchboard. Marking on the switchboard shall state the load on each circuit, as well as the total load.

All circuits shall have earth failure monitoring with alarm. Energized circuits shall be indicated by means of a signal lamp for each circuit.

Heating cables shall be short circuit and overload protected as required by Pt.4 Ch.8. However, self regulated cables do not require overload protection.

Motors on open deck, being part of category I or category II equipment, shall be naturally cooled, i.e. without external fan.

The electrical installation shall also comply with the rule requirements in Pt.4 Ch.8.

107 For anti-icing and deicing arrangements applying heating by fluids in pipes, the valves shall be marked with equipment or area to be heated, and open and closed position of the valves shall be indicated. Pumps applied for anti-icing purposes (category I equipment or areas) shall be arranged with redundancy. The piping systems for anti-icing and deicing purposes are also to comply with the rules in Pt.4 Ch.6.

Due regard shall be paid to the piping arrangements to avoid that the heating fluid freezes.

Guidance note:

Insulation of piping simultaneously with circulation of the heating medium is one way to ensure that the heating medium is not freezing.

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

108 Supply of compressed air to category I consumers outside machinery space, shall be provided with air drying sufficient to lower the dew point to not warmer than –30°C.

C 200 Class notation DEICE - general

201 The specified equipment and or areas, which by definition (see A500) are of category I, shall have anti-icing arrangements, normally by heating or cover. Other means of anti-icing may be accepted upon special consideration. Alternative means of providing anti-icing shall not interfere with the proper functioning of the vessel.

Specified equipment and or areas for anti-icing:

- communication equipment (i.e. antennae)

  Guidance note:

  Whip type antennae may not need heating arrangements.

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

- scanning equipment (radar)

  Guidance note:

  Rotating radar antennae may not need heating arrangements.

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

- navigation lights

  Guidance note:

  Normally, the navigation lights develop sufficient heat to avoid ice deposit, except for forward lower light.

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

- windows in the wheelhouse, within the required field of vision, shall be provided with appropriate heating arrangements. Wheelhouse windows shall comply with the appropriate ISO standards

  Guidance note:

  Reference is made to ISO 3434 and ISO 8863. The heating capacity should be designed for an outdoor air temperature of –20°C or less.

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

  Guidance note:

  When a field of vision larger than defined by SOLAS is required by a class notation, e.g. **NAUT-AW**, this should be taken into account.

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

- window wipers, where arranged

  Guidance note:

  Reference is made to ISO 17899 for marine electric window wipers.

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

- equipment necessary for maintaining propulsion (i.e. cooling water sea chests)

  Guidance note:

  A sea water arrangement similar to that required for ice class **ICE-C** is generally considered sufficient, i.e. a full capacity return of cooling water to a sea chest situated close to the centre line.

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

- special equipment essential for safety, depending on type of vessel
- fire fighting lines and monitors (if arranged for fighting

fires in other vessels and offshore structures, e.g., class notation **Fire Fighter**)
— anchors including windlass, chain and hawse pipe

Guidance note:

For large vessels not occupied in coastal operations the anchor windlass can be accepted to be so arranged that a short time for ice removal is necessary, and a combination of deicing and anti-icing may give an acceptable availability.

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

— air pipe vent heads for tanks

Guidance note:

As a minimum this should be applied to ballast and fresh water tanks, as well as pressure relief valves for cargo tanks if relevant.

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

— air horns
— lifeboats with davits
— pick-up boats including launching area
— rafts
— EPIRBs (emergency position-indicating radio beacons)
— escape exits
— storage facilities for lifesaving outfit, e.g., rescue suits, lines, picks and similar equipment for de-icing purposes
— ventilation inlets to spaces where ventilation is essential for the safe operation of the ship
— scuppers and drains.

202 The equipment or areas specified below, which by definition (see A500) are of category II, shall have deicing arrangements:

— open deck areas
— gangways and stairways
— helicopter deck if any
— superstructure
— railings
— outdoor piping
— winches
— shark jaw and guide pins
— stern roller
— deck lighting equipment.

In addition to the above, other operational equipment may be required to have deicing arrangements as found necessary.

203 Spaces containing piping or components with water shall have arrangements to prevent freezing of the water.

Guidance note:

Assessment of heating need shall be based on an outdoor temperature of –20°C.

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

204 Equipment and areas in connection with additional class notations are not required to be fitted with deicing or anti-icing measures unless this is safety related.

Guidance note:

Rescue arrangements in a vessel with class notation Standby should be regarded as category I equipment/ area.

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

C 300 Class notation DEICE- additional measures for tankers (gas, oil, chemical)

301 For tankers the following ship type specific equipment shall be considered as category I equipment:

— Cargo tank ventilation arrangement (e.g. P/V valves, safety valves, flame arresters, P/V breakers).
— ESD valves (gas tankers).
— Emergency towing arrangement.

302 Safe access to bow should as far as possible and practicable be located in an under-deck or on-deck tunnel. If this is not fulfilled, personal safety equipment suitable for safe walking on iced surfaces must be readily available for use close to the entrance to cargo deck.

303 For large vessels not occupied in coastal operations a longer ice removal period than defined in C103 may be considered for some of the category II equipment and areas, depending on an evaluation of the effect on the vessel's safety.

C 400 Class notation DEICE-C for supply vessels

401 The requirements given in 200 shall be complied with as applicable. In addition, the cargo deck area shall be arranged for proper handling of cargo under icing conditions.

402 The arrangement for deicing may be by heating or by appropriate removable or sliding covers for the cargo, or other suitable means. The cargo deck-lighting shall also be provided with deicing facilities.

C 500 Class notation DEICE-C for tankers

501 The requirements given in 200 and 300 shall be complied with as applicable. In addition, the cargo deck area shall be arranged for proper handling of cargo under icing conditions.

502 The arrangement for deicing may be by heating or by appropriate permanent or removable covers for the cargo manifold area, or other suitable means. The cargo deck-lighting shall also be provided with deicing facilities. The cargo valves shall be so arranged that they can be operated also under icing conditions.

503 The cargo manifold shall be of cold resistant steel.

C 600 Special equipment

601 Protective clothing, safety lines, hand tools, crampons for shoes and similar equipment for deicing purposes shall be kept onboard. The quantity of the equipment shall be sufficient for the assumed extent of manual deicing.

602 The equipment for manual deicing shall be kept in storage facilities and at locations protected from accretion of ice by covers or other anti-icing arrangements.

C 700 Power generator capacity

701 For calculation of required electric generator capacity (see Pt.4 Ch.8), the power requirements for the heating arrangements shall be included as specified below:

— 100% of electric power needed for anti-icing purposes
— 50% of electric power needed for deicing purposes.

702 For anti-icing and deicing arrangements applying heating by fluids in pipes, additional capacity of steam plants or thermal oil heaters must be calculated, taking 100% of the power consumption for category I equipment and areas, and 50% of the power consumption for category II equipment and areas into consideration.

SECTION 6
ADDITIONAL OIL POLLUTION PREVENTION MEASURES - FUEL OIL SYSTEMS

A. General

A 100 Application

101 The requirements in this section apply to vessels arranged and equipped with additional oil pollution prevention measures for the fuel oil system.

102 The requirements in this section are supplementary to those given for the main class.

A 200 Classification

201 Vessels arranged and equipped as required in the following may be given the class notation **OPP-F**.

A 300 Documentation

301 Information concerning control positions for fuel oil bunkering and transfer operations shall be submitted.

302 The drawings required for approval in connection with the main class shall include details confirming compliance with the requirements of this section.

A 400 Definitions

401 For the purpose of this section, fuel oil means any oil used as fuel in connection with propulsion and auxiliary machinery of the ship.

B. Arrangement of Fuel Oil Tanks

B 100 General

101 Tanks for fuel oil including overflow tanks and tank capacity exceeding 30 m^3 for waste oils, sludge etc. shall be located above the moulded line of the bottom shell plating, but not less than the distance h as specified below:

h = B/20

or

h = 2.0 m, whichever is the lesser

The minimum value of h = 0.76 m

In the curved area of the bilge and at locations without a clearly defined curve of the bilge, the oil fuel boundary line shall run parallel to the line of the midship flat of bottom as shown in Fig.1.

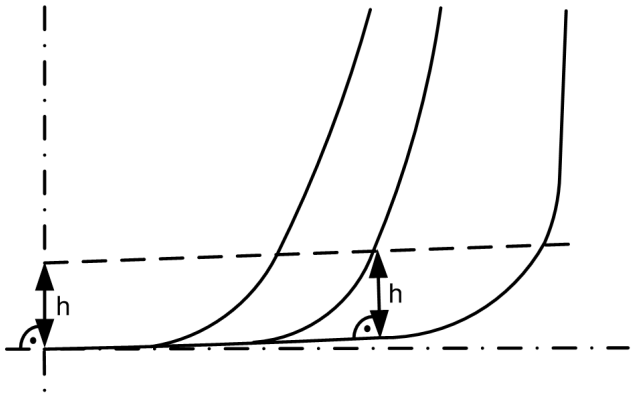

Fig.1

102 For ships having an aggregate fuel oil capacity below 5 000 m^3 tanks for fuel oil including overflow tanks shall be located inboard of the moulded line of the side shell plating, but not less than the distance w which, as shown in Fig.2, is measured at any cross-section at right angles to the side shell, as specified below:

w = 0.4 + 2.4 C/20 000 m

Where C is the vessels total volume of fuel oil, in m^3, at 98% tank filling.

The minimum value of w = 1.0 m, however for individual tanks with an fuel oil capacity of less than 500 m^3 the minimum value is 0.76 m.

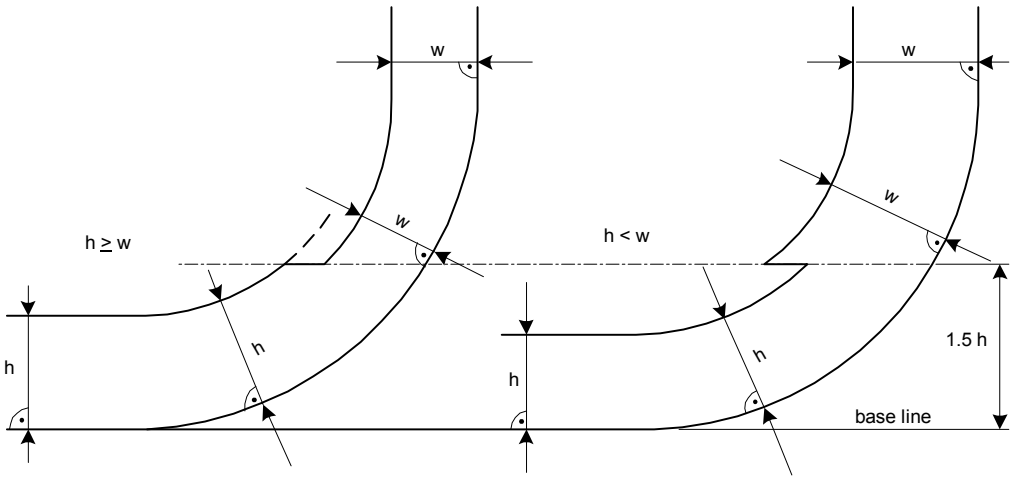

Fig.2

103 For ships with an aggregate fuel oil capacity of 5 000 m^3 and over, fuel oil tanks including overflow tanks shall be located inboard of the moulded line of the side shell plating, but not less than the distance w which, as shown in Fig.2, is measured at any cross-section at right angles to the side shell, as specified below:

w = 0.5 + C/20 000 m

or

w = 2.0 m, whichever is the lesser.

The minimum value of w = 1.0 m.

104 Individual fuel oil tanks shall not have a capacity of over 2 500 m^3.

105 Combined fuel oil and water ballast tanks shall not be arranged.

C. Sundry

C 100 General

101 Lines of fuel oil piping located at a distance from the ship's bottom less than h, as defined in B101, or from the ship's side less than w, as defined in B102 and B103 shall be fitted with valves or similar closing devices within or immediately adjacent to the fuel oil tank.
These valves shall be capable of being brought into operation from a readily accessible enclosed space, the location of which shall be accessible from the navigation bridge or the propulsion machinery control position, without traversing exposed freeboard or superstructure decks.
The valves shall close in case of remote control system failure (fail to close), and shall be kept closed at sea at any time when the tank contains fuel oil, except when they may be opened during fuel oil transfer operations.

102 Suction wells in fuel oil tanks may protrude into the double bottom below the boundary line defined by the distance h provided that such wells are as small as practicable and the distance between the well bottom and the bottom shell shall not be less than 0.5 h.

103 All fuel oil bunker tanks shall be fitted with a high level alarm which shall be activated before the tank is overfilled. The alarm signal shall be given where the person in charge of the bunkering or transfer operation will normally be located. High level alarms need not be fitted to fuel oil bunker tanks that are provided with an overflow line to another fuel oil tank, which is fitted with a high level alarm.

104 All bunkering lines shall be fitted with a remotely operated closing valve. Closing of the valve shall be possible from where the person in charge of the bunkering operation will normally be located.

105 On the open decks of the vessel all bunkering and filling manifolds as well as all vent and overflow pipes to/from fuel oil tanks and lubricating oil tanks shall be fitted with permanent drip trays or coamings with capacity not less than 80 litres (0.5 US barrels) for vessels between 300 GT and 1 600 GT and not less than 160 litres (1.0 US barrels) for vessels of 1 600 GT and above.

106 A bilge water holding tank arranged for pre-separation of oily bilge water before it is processed through the bilge water separating or filtering equipment shall be installed. The capacity of the bilge water holding tank shall be as given in Table C1.

Table C1 Capacity of bilge water holding tank

Main engine rating (kW)	*Capacity (m^3)*
Up to 1000	1.5
Above 1000 up to 20 000	$1.5 + \frac{P - 1000}{1500}$
Above 20 000	$14.2 + 0.2\frac{P - 20000}{1500}$
P = main engine rating in kW.	

For high speed short range vessels and other vessels with an unusually high main engine rating the capacity of the bilge water holding tank shall be especially considered.

For vessels operating with fuel oil with relative density at 15°C greater than 0.94 and viscosity at 37.8°C greater than 220 centistokes, the bilge water holding tank shall be fitted with heating facilities.

107 On vessels operating with heavy fuel oil the tank(s) for sludge from the fuel oil purifiers shall be built without internal structures.