SYS-NEQ-OSV

March 2016

Rule Note
NR 633 DT R00 E

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BUREAU VERITAS

MARINE & OFFSHORE DIVISION

GENERAL CONDITIONS

ARTICLE 1

1.1. - BUREAU VERITAS is a Society the purpose of whose Marine & Offshore Division (the "Society") is the classification (" Classification ") of any ship or vessel or offshore unit or structure of any type or part of it or system therein collectively hereinafter referred to as a "Unit" whether linked to shore, river bed or sea bed or not, whether operated or located at sea or in inland waters or partly on land, including submarines, hovercrafts, drilling rigs, offshore installations of any type and of any purpose, their related and ancillary equipment, subsea or not, such as well head and pipelines, mooring legs and mooring points or otherwise as decided by the Society.

The Society:

- "prepares and publishes Rules for classification, Guidance Notes and other documents (" Rules ");
- "issues Certificates, Attestations and Reports following its interventions (" Certificates ");
- "publishes Registers.

1.2. - The Society also participates in the application of National and International Regulations or Standards, in particular by delegation from different Governments. Those activities are hereafter collectively referred to as " Certification ".

1.3. - The Society can also provide services related to Classification and Certification such as ship and company safety management certification; ship and port security certification, training activities; all activities and duties incidental thereto such as documentation on any supporting means, software, instrumentation, measurements, tests and trials on board.

1.4. - The interventions mentioned in 1.1., 1.2. and 1.3. are referred to as " Services ". The party and/or its representative requesting the services is hereinafter referred to as the " Client ". **The Services are prepared and carried out on the assumption that the Clients are aware of the International Maritime and/or Offshore Industry (the "Industry") practices.**

1.5. - The Society is neither and may not be considered as an Underwriter, Broker in ship's sale or chartering, Expert in Unit's valuation, Consulting Engineer, Controller, Naval Architect, Manufacturer, Shipbuilder, Repair yard, Charterer or Shipowner who are not relieved of any of their expressed or implied obligations by the interventions of the Society.

ARTICLE 2

2.1. - Classification is the appraisement given by the Society for its Client, at a certain date, following surveys by its Surveyors along the lines specified in Articles 3 and 4 hereafter on the level of compliance of a Unit to its Rules or part of them. This appraisement is represented by a class entered on the Certificates and periodically transcribed in the Society's Register.

2.2. - Certification is carried out by the Society along the same lines as set out in Articles 3 and 4 hereafter and with reference to the applicable National and International Regulations or Standards.

2.3. - **It is incumbent upon the Client to maintain the condition of the Unit after surveys, to present the Unit for surveys and to inform the Society without delay of circumstances which may affect the given appraisement or cause to modify its scope.**

2.4. - The Client is to give to the Society all access and information necessary for the safe and efficient performance of the requested Services. The Client is the sole responsible for the conditions of presentation of the Unit for tests, trials and surveys and the conditions under which tests and trials are carried out.

ARTICLE 3

3.1. - **The Rules, procedures and instructions of the Society take into account at the date of their preparation the state of currently available and proven technical knowledge of the Industry. They are a collection of minimum requirements but not a standard or a code of construction neither a guide for maintenance, a safety handbook or a guide of professional practices, all of which are assumed to be known in detail and carefully followed at all times by the Client.**

Committees consisting of personalities from the Industry contribute to the development of those documents.

3.2. - **The Society only is qualified to apply its Rules and to interpret them. Any reference to them has no effect unless it involves the Society's intervention.**

3.3. - The Services of the Society are carried out by professional Surveyors according to the applicable Rules and to the Code of Ethics of the Society. Surveyors have authority to decide locally on matters related to classification and certification of the Units, unless the Rules provide otherwise.

3.4. - **The operations of the Society in providing its Services are exclusively conducted by way of random inspections and do not in any circumstances involve monitoring or exhaustive verification.**

ARTICLE 4

4.1. - The Society, acting by reference to its Rules:

- "reviews the construction arrangements of the Units as shown on the documents presented by the Client;
- "conducts surveys at the place of their construction;
- "classes Units and enters their class in its Register;
- "surveys periodically the Units in service to note that the requirements for the maintenance of class are met.

The Client is to inform the Society without delay of circumstances which may cause the date or the extent of the surveys to be changed.

ARTICLE 5

5.1. - **The Society acts as a provider of services. This cannot be construed as an obligation bearing on the Society to obtain a result or as a warranty.**

5.2. - **The certificates issued by the Society pursuant to 5.1. here above are a statement on the level of compliance of the Unit to its Rules or to the documents of reference for the Services provided for.**

In particular, the Society does not engage in any work relating to the design, building, production or repair checks, neither in the operation of the Units or in their trade, neither in any advisory services, and cannot be held liable on those accounts. Its certificates cannot be construed as an implied or express warranty of safety, fitness for the purpose, seaworthiness of the Unit or of its value for sale, insurance or chartering.

5.3. - **The Society does not declare the acceptance or commissioning of a Unit, nor of its construction in conformity with its design, that being the exclusive responsibility of its owner or builder.**

5.4. - The Services of the Society cannot create any obligation bearing on the Society or constitute any warranty of proper operation, beyond any representation set forth in the Rules, of any Unit, equipment or machinery, computer software of any sort or other comparable concepts that has been subject to any survey by the Society.

ARTICLE 6

6.1. - The Society accepts no responsibility for the use of information related to its Services which was not provided for the purpose by the Society or with its assistance.

6.2. - **If the Services of the Society or their omission cause to the Client a damage which is proved to be the direct and reasonably foreseeable consequence of an error or omission of the Society, its liability towards the Client is limited to ten times the amount of fee paid for the Service having caused the damage, provided however that this limit shall be subject to a minimum of eight thousand (8,000) Euro, and to a maximum which is the greater of eight hundred thousand (800,000) Euro and one and a half times the above mentioned fee. These limits apply regardless of fault including breach of contract, breach of warranty, tort, strict liability, breach of statute, etc.**

The Society bears no liability for indirect or consequential loss whether arising naturally or not as a consequence of the Services or their omission such as loss of revenue, loss of profit, loss of production, loss relative to other contracts and indemnities for termination of other agreements.

6.3. - All claims are to be presented to the Society in writing within three months of the date when the Services were supplied or (if later) the date when the events which are relied on of were first known to the Client, and any claim which is not so presented shall be deemed waived and absolutely barred. Time is to be interrupted thereafter with the same periodicity.

ARTICLE 7

7.1. - Requests for Services are to be in writing.

7.2. - **Either the Client or the Society can terminate as of right the requested Services after giving the other party thirty days' written notice, for convenience, and without prejudice to the provisions in Article 8 hereunder.**

7.3. - The class granted to the concerned Units and the previously issued certificates remain valid until the date of effect of the notice issued according to 7.2. here above subject to compliance with 2.3. here above and Article 8 hereunder.

7.4. - The contract for classification and/or certification of a Unit cannot be transferred neither assigned.

ARTICLE 8

8.1. - The Services of the Society, whether completed or not, involve, for the part carried out, the payment of fee upon receipt of the invoice and the reimbursement of the expenses incurred.

8.2. - **Overdue amounts are increased as of right by interest in accordance with the applicable legislation.**

8.3. - **The class of a Unit may be suspended in the event of non-payment of fee after a first unfruitful notification to pay.**

ARTICLE 9

9.1. - The documents and data provided to or prepared by the Society for its Services, and the information available to the Society, are treated as confidential. However:

- "Clients have access to the data they have provided to the Society and, during the period of classification of the Unit for them, to the **classification file** consisting of survey reports and certificates which have been prepared at any time by the Society for the classification of the Unit ;
- "copy of the documents made available for the classification of the Unit and of available survey reports can be handed over to another Classification Society, where appropriate, in case of the Unit's transfer of class;
- "the data relative to the evolution of the Register, to the class suspension and to the survey status of the Units, as well as general technical information related to hull and equipment damages, may be passed on to IACS (International Association of Classification Societies) according to the association working rules;
- "the certificates, documents and information relative to the Units classed with the Society may be reviewed during certificating bodies audits and are disclosed upon order of the concerned governmental or inter-governmental authorities or of a Court having jurisdiction.

The documents and data are subject to a file management plan.

ARTICLE 10

10.1. - Any delay or shortcoming in the performance of its Services by the Society arising from an event not reasonably foreseeable by or beyond the control of the Society shall be deemed not to be a breach of contract.

ARTICLE 11

11.1. - In case of diverging opinions during surveys between the Client and the Society's surveyor, the Society may designate another of its surveyors at the request of the Client.

11.2. - Disagreements of a technical nature between the Client and the Society can be submitted by the Society to the advice of its Marine Advisory Committee.

ARTICLE 12

12.1. - Disputes over the Services carried out by delegation of Governments are assessed within the framework of the applicable agreements with the States, international Conventions and national rules.

12.2. - Disputes arising out of the payment of the Society's invoices by the Client are submitted to the Court of Nanterre, France, or to another Court as deemed fit by the Society.

12.3. - **Other disputes over the present General Conditions or over the Services of the Society are exclusively submitted to arbitration, by three arbitrators, in London according to the Arbitration Act 1996 or any statutory modification or re-enactment thereof. The contract between the Society and the Client shall be governed by English law.**

ARTICLE 13

13.1. - **These General Conditions constitute the sole contractual obligations binding together the Society and the Client, to the exclusion of all other representation, statements, terms, conditions whether express or implied. They may be varied in writing by mutual agreement. They are not varied by any purchase order or other document of the Client serving similar purpose.**

13.2. - The invalidity of one or more stipulations of the present General Conditions does not affect the validity of the remaining provisions.

13.3. - The definitions herein take precedence over any definitions serving the same purpose which may appear in other documents issued by the Society.

BV Mod. Ad. ME 545 L - 7 January 2013

RULE NOTE NR 633

NR 633
SYS-NEQ-OSV

March 2016

Section 1 General

Section 2 Bridge Design and Configuration

Section 3 Arrangements of Workstations

Section 4 Bridge Equipment

Section 5 Ergonomics and Human Machine Interface

Section 6 Bridge Equipment Tests

SECTION 1 GENERAL

1 General

1.1 Application

1.1.1 The additional class notation **SYS-NEQ-OSV** may be assigned to ships:

- designed for the operations as listed in Sec 2, [1.1.2]
- satisfying the specific requirements given in this Rule Note, as relevant, regarding bridge design and instrumentation, and
- equipped with further means, as given in this Rule Note, for safe operation in all the waters, including areas with harsh operational and environmental conditions such as the North Sea.

1.2 Objectives

1.2.1 The additional class notation **SYS-NEQ-OSV** aims to reduce:

- the risk, during bridge operation, of bridge system failure causing collision, contact and grounding
- heavy weather damage.

1.2.2 The following main areas, related to the bridge systems, are concerned:

- mandatory and additional workstations
- field of vision from workstations
- location of instruments and equipment
- ergonomics and human machine interface
- range of instrumentation
- alarm management, including watch monitoring and alarm transfer system
- instrument and system tests.

1.2.3 To this end, this Rule Note gives requirements on the following items affecting the navigation safety:

- design of workplace, based on analyses of functions to be performed under various operating conditions and the technical support to be installed
- bridge working environment, based on factors affecting the performance of human operators
- range of instrumentation, based on information needs and efficient performance of the various tasks
- equipment reliability applicable to all the types of bridge equipment, based on common requirements to ensure their suitability under various environmental conditions
- performance of different types of bridge equipment, based on their specific functions
- human and machine interface, based on the analyses of human limitations and compliance with ergonomic principles
- tests and trials based on the need to make sure that technical systems operate in accordance with their approved specifications before being considered as reliable and used for real operations.

2 Definitions

2.1 Term and abbreviations

2.1.1 Terms used in the Rule Note are defined below:

- Additional functions:

  Additional functions requiring work tasks not directly related to primary bridge functions or operations defined in Sec 2, [1.1.2].

- Blind sector:

  An obstruction in a field of vision caused by window divisions, bridge structure or outside construction with a clear sector on both sides.

- BAMS:

  Bridge Alert Management System

  A system that harmonizes the priority, classification, handling, distribution and presentation of alerts, to enable the bridge team to devote full attention to the safe operation of the ship and to immediately identify any alert situation requiring action to maintain the safe operation of the ship.

- BNWAS:

  Bridge navigational watch alarm system.

- Bridge:

  The area from which the navigation and/or control of the ship are exercised, comprising the wheelhouse and the bridge wings.

- Bridge system:

  The total system for the performance of bridge functions, comprising bridge personnel, technical systems, human and machine interface and procedures.

- Bridge wing:

  The part of the bridge on each side of the wheelhouse, which extends to the ship's side.

- Cargo Operations:

  Operations related to transferring or receiving general mixed cargo or liquid cargo between ship and offshore installation, included control and monitoring of own ship and cargo gear.

- Category A alert:

  Alert for which graphical information at the task station directly assigned to the function generating the alert is necessary, as decision support for the evaluation of the alert-related condition.

- Category B alert:

  Alert where no additional information for decision support is necessary besides the information which can be presented at the BAMS.
- Category C alert:

  Alert that cannot be acknowledged on the bridge but for which information is required about the status and treatment of the alert.
- Catwalk:

  Arrangement outside the wheelhouse allowing a person safe access to windows along the bulkhead(s).
- CCTV:

  Closed circuit television.
- Collision avoidance functions:

  Detection and plotting of other ships and moving objects; determination and execution of course and speed deviations to avoid collision.
- Commanding view:

  View without obstructions, which could interfere with the navigator's ability to perform his main tasks, at least covering the field of vision required for safe performance of collision avoidance functions.
- Conning information display:

  A screen-based information system that clearly presents information from sensor inputs relevant to navigation and manoeuvring, as well as all corresponding and upcoming orders given by an automatic navigation system to steering and propulsion systems if connected.

  The conning position is the place in the wheelhouse with a commanding view providing the necessary information for conning, and which is used by navigators when monitoring and directing the ship's movements.
- Control:

  Either effectuate actions or have orders effectuated.
- Display:

  An observable illustration of an image, scene or data on a screen.
- Distress situations:

  Loss of propulsion and/or steering, or when the ship is not seaworthy due to other reasons (situation prior to abandon ship situation).
- Docking:

  Manoeuvring the ship alongside a berth and controlling the mooring operations.
- Easily accessible:

  Within 5 m distance from working position.
- Easily readable:

  Within the horizontal angle of 90 degrees to each side and vertical angle of 90 degrees below - to 60 degrees above the horizon from the normal line of sight for the operator.
- ECDIS:

  Electronic chart display and information system

  A navigation information system, which with adequate back-up arrangements can be accepted as complying with the up-to-date chart required by regulation V/20 of SOLAS Chapter V, and be accepted as meeting the chart carriage requirements of SOLAS Chapter V, as amended by Res. MSC.99(73), by displaying selected information from a SENC.
- Emergency situations:

  When incidents seriously affect internal operating conditions of the ship and the ability to maintain safe course and speed (fire, technical failure, structural damage).
- ENC:

  Electronic nautical chart

  The database, standardised as to content, structure and format, issued for use with ECDIS on the authority of government authorised hydrographic offices.
- Ergonomics:

  Application of the human factors implication in the analysis and design of the workplace and equipment.
- Field of vision:

  Angular size of a scene that can be observed from a position on the ship's bridge.
- Manoeuvring:

  Operation of thrusters, steering systems and propulsion machinery as required to move the ship into predetermined directions, positions or tracks.
- Monitoring:

  Act of constantly checking information from instrument displays and environment in order to detect any irregularities.
- Navigation:

  Planning of the ship's route and determination of position and course of the ship, execution of course alterations and speed changes.
- Navigational bridge:

  The area of the bridge where transit operation is performed.
- Normal operating conditions:

  When all shipboard systems and equipment related to primary bridge functions operate within design limits, and weather conditions or traffic, do not cause excessive operator workloads.
- Officer of the watch (OOW):

  Person responsible for the safety of navigation and bridge operations until relieved by another qualified officer.
- Operational bridge functions:

  Functions related to ship handling in relation to the operation the ship is engaged in. Such functions are:
  - manoeuvring functions
  - deck equipment operation (for anchor handling, oil recovery and cargo transfer operations)
  - rescue operation
  - monitoring of internal safety systems
  - external and internal communication related to safety in bridge operation and distress situations
  - docking functions.

- Primary bridge functions:

  Functions related to determination, execution and maintenance of safe course, speed and position of the ship in relation to the waters, traffic and weather conditions. Such functions are:

  - route planning functions
  - navigation functions
  - collision avoidance functions
  - manoeuvring functions
  - docking functions
  - monitoring of internal safety systems
  - external and internal communication related to safety in bridge operation and distress situations.

- Readable:

  Within a horizontal sector of 225° and vertical sector from 90° below to 60° above the horizon from the operators normal eye position.

- Rescue:

  An operation where a defined ship is, either bringing own personnel being in distress in the water to safety, or is assisting an offshore platform, barge or another ship in bringing their personnel being in distress in the water to safety.

- Route monitoring:

  Continuous surveillance of the ship's sailing (position and course) in relation to a preplanned route and the waters.

- Route planning:

  Pre-determination of course lines, radius turns and speeds in relation to the waters to be navigated.

- Rudder angle:

  Rudder angle mean thruster angle when main propulsion is azimuth thrusters.

- Safety operation:

  Handling of emergency and distress situations on board own ship or assisting other ships and offshore installations in such situations.

- SENC:

  System electronic navigational chart

  A database resulting from the transformation of the ENC by ECDIS for appropriate use, updates to the ENC by appropriate means and other data added by the mariner.

- Screen:

  A device used for presenting visual information based on one or several displays.

- Towing operation:

  An operation including one or more ships capable to assist offshore platforms, barges and ships in moving from one position to another, or in keeping their defined position.

- Wheelhouse:

  Enclosed area of the bridge.

- Within reach:

  The distance the operator can reach and use a control unit. For other workstations than workstations for offshore operations the area may be increased to:

  - From a standing position this distance is regarded to be maximum 800 mm in forward direction and 1400 mm sideways.
  - From a seated position, at a distance of 350 mm from a console, this distance is regarded to be maximum 1000 mm, and maximum 800 mm for frequently used equipment.

- Workstation:

  A work place at which one or several tasks constituting a particular activity are carried out and which provides the information and equipment required for safe performance of the tasks.

  - Workstation for communication:

    A workplace for operation and control of equipment for distress and safety communication (GMDSS), and shipboard communication for ship operations.

  - Workstation for primary bridge functions:

    A workplace with commanding view used by navigators when carrying out navigation, route monitoring, traffic surveillance and manoeuvring functions, and which enables monitoring of the safety state of the ship.

  - Workstation for safety operations:

    A workplace dedicated organisation and control of internal emergency and distress operations, and which provides easy access to information related to the safety state of the ship.

3 Documentation

3.1 Documents to be submitted

3.1.1 Documents according Tab 1 are to be submitted.

3.2 Certification requirements

3.2.1 Certification documentation is to be submitted for the following devices:

- Automatic Identification System (AIS)
- BNWAS
- BAMS
- CCTV
- Depth measuring system
- ECDIS equipment
- External communication (including GMDSS)
- Gyro/heading system
- Heading control System (autopilot)
- Internal communication
- Position system
- Radar equipment
- Sound reception system

- Speed measuring system
- Steering/Manoeuvring control system
- Sunscreens
- Track Control system (TCS)
- Weather Information System
- Wiper system

Note 1: Depending on the flag, a BV type approval certificate or a MED certificate will be required.

Table 1 : Documentation to be submitted

Item No.	I/A **(1)**	Documentation
1	I	General arrangement plan
2	A	Navigation bridge design drawing
3	A	Drawing of vertical field of vision at navigation bridge
4	A	Drawing of horizontal field of vision at navigation bridge
5	A	Navigation bridge nautical workstation arrangement plan
6	A	Navigation bridge windows framing arrangement plan
7	A	Plan of system arrangement at navigation bridge
8	A	Navigation bridge coating specification
9	A	List of equipment of the navigation systems
10	A	Navigation system power supply arrangement
11	A	Navigation system arrangement plan
12	A	Test procedure for quay and sea trial of navigation systems
13	A	Bridge alarm management - Control system functional description
14	A	Functional description of steering mode selection system
15	A	Arrangement plan of the lighting system within the wheelhouse
16	A	Arrangement plan of the ventilation system in the wheelhouse
17	A	Arrangement plan of the external communication systems
18	A	Arrangement plan of Local Area Network (LAN) for navigation systems
19	A	Electrical schematic drawing of the automatic telephone system
20	A	Arrangement plan of the automatic telephone system
21	A	Equipment list of Ultra High Frequency (UHF) telephone system

(1) A : to be submitted for approval
I : to be submitted for information.

SECTION 2 BRIDGE DESIGN AND CONFIGURATION

1 General

1.1 Bridge operations

1.1.1 The design of the bridge is to be carried out taking into account not only the operational tasks but also the navigational tasks, according to the mission of the ship.

1.1.2 The following operations shall be facilitated from the bridge as applicable:

- anchor handling
- cable/pipe laying operations
- cargo operations
- docking operations
- fire fighting
- fire fighting well intervention operations
- oil recovery
- pilot boarding manoeuvring
- safety operations
- search/rescue operations
- seismic operations
- subsea operations
- towing operations
- transit
- wind turbine installation.

2 Workstations

2.1 Navigational bridge

2.1.1 The design and location of the workstations is to enable the ship to be navigated and manoeuvred safely and efficiently by:

- one navigator under normal operating conditions, and
- two navigators in close co-operation when the workload exceeds the capacity of one person, and when under pilotage.

2.1.2 As a minimum, the following workstations for primary bridge functions are to be provided at the navigational bridge:

- workstations for navigating and manoeuvring
- workstations for monitoring workstation for route planning
- workstation for docking/search/rescue operations

Note 1: Workstation for docking operations or Workstation for route planning may be combined with other workstation.

2.2 Operational bridge

2.2.1 Workstations arrangement for several other functions will be considered on an ship serving in multi-roles. Separate workstations are required in order to facilitate these functions.

2.2.2 Workstations are to be designed and located in order to enable safe and efficient positioning/ manoeuvring of the ship and safe and efficient operation/ monitoring of all deck equipment needed for carrying out the different operations relevant for the ship.

2.2.3 Workstations arrangement is to facilitate performance by one operator under normal operating conditions, as well as by two operators in close co-operation when the workload exceeds the capacity of one person.

2.2.4 A workstation for ship handling and a workstation for aft support are required at the bridge in order to allow operations either by one operator alone or by two operators in close co-operation.

3 Visibility

3.1 General

3.1.1 The bridge is to be planned with the aim to optimize its location and layout to achieve continuous access to visual information from outside the wheelhouse and easy co-operation between bridge personnel, promoting effective and safe bridge resource management.

The view of the working deck, location of funnel(s), location of workstations and field of vision from workstations is to be optimized.

3.1.2 Window arrangement

Field of vision is to be optimized from each workstation. Divisions between windows and bulkheads is to be kept to a minimum.

3.2 Windows

3.2.1 Internal light sources is not to cause glare in bridge windows or affect the view required for safe performance of bridge operations

3.2.2 To help avoid reflection from lights in wheelhouse consoles, all bridge windows are, as far as practicable, to be inclined from the vertical plane top out, at an angle of not less than 15° and not more than 25°.

3.2.3 Windows are to be as wide as possible and not less than 1200 mm wide at a height of 1600 mm above the wheelhouse deck within the required field of vision from the workstations for navigation and navigation support.

3.2.4 Windows are not to be less than 1000 mm wide at a height of 1600 mm above the wheelhouse deck within the required field of vision from other workstations.

3.2.5 Windows within any required field of vision area are to have in general have a minimum height of 2000 mm above the wheelhouse deck and the lower edge is to be maximum 1000 mm above the wheelhouse deck.

3.3 Blind sectors

3.3.1 Blind sectors (due to cargo, cargo gear, divisions between windows and other obstructions appearing in the required field of vision), is to be as few and as small as possible, and in no way hamper a safe lookout from the workstations for primary bridge functions and offshore operations.

3.3.2 The front/ aft bulkhead of bridge wings are, as far as practicable, to be aligned with the line of sight from the relevant workstations in order to avoid excessive blind sectors.

The divisions between front windows should not exceed 150 mm. If stiffeners are used, divisions should not exceed 100 mm in width and 120 mm in depth.

3.4 Clear view through windows

3.4.1 At least two clear-view windows are to be provided on the navigation bridge front windows.

3.4.2 A clear view through at least two of the windows aft of the workstations for ship handling and aft support is to be provided.

3.4.3 Depending on the bridge configuration, additional clear-view windows are to be provided.

3.4.4 A clear view through bridge windows within the field of vision required from the workstations for primary bridge functions, offshore operations, rescue and fire fighting is to be provided at all times regardless of weather conditions. The following installations are required:

- Sunscreens are to be provided. The sunscreens are to be of type roller blinds and offer anti-glare and heat rejecting properties. Only the outer surface are to be highly reflective while the inner surface is to offer a non-reflective appearance. Anti-glare effect (reduction) better than 80% and heat rejection better than 60% should be achieved
- Heavy duty wipers and fresh water window washing system are to be provided to ensure a clear view in bad weather conditions.
- Efficient de-icing and de-misting systems to ensure a clear view in all operating conditions.
- Heated glass panels panes are to be used on board ships to be assigned class notation for navigation in ice
- When two sets of wipers are installed, the wipers are to be arranged with overlap in order to limit the blind sector in the required wiping area
- Window wipers to be connected to the main and emergency power system
- Window wipers to be provided within the 225° field of vision arc from docking/rescue workstations when maneuvering is possible.
- Above systems installed is to comply with appropriate international recognised standards.

3.4.5 No glass panes giving any blurred effect are to be used on the line of sight. The linearity of the view through the windows is not to be adversely affected by the design of window.

3.4.6 A catwalk or other means is to be provided to the windows without adjacent deck to help maintenance of window wipers and manual cleaning of bridge front and rear windows

4 Working environment

4.1 General

4.1.1 Toilet facilities are to be provided on or adjacent to the bridge.

4.1.2 Unless otherwise justified, wheelhouse spaces are to be provided with heating and air cooling systems. System controls are to be readily available for the officer of the watch.

4.2 Deckhead height

4.2.1 The clear deckhead height in the wheelhouse is to take into account the installation of deckhead panels and instruments as well as the height of door openings required for easy entrance to the wheelhouse. The following clear heights for unobstructed passage is to be provided:

- The clear height between the bridge deck surface covering and the underside of the deck head beams, or deckhead, whichever is lower, is to be at least 2,25 m.
- The lower edge of deckhead mounted equipment is to be at least 2,1 m above the deck in open areas, walkways and at standing workstations.
- The lower edge of entrances and doors to the wheelhouse from adjacent passageways is not to be less than 2000 mm
- the lower edge of deckhead mounted equipment is not to degrade the vertical field of vision in the required horizontal sector.

4.2.2 It is to be possible to secure doors to open deck areas in the open position.

4.2.3 Ships with fully enclosed bridge wings is to have at least one door providing direct access to the adjacent area outside the wheelhouse.

4.3 Passageways

4.3.1 A clear route between the fore and aft bridge is to be provided. The width of the passageway is to be at least 1200 mm and not less than 700 mm at any single point of obstruction. The number of obstructions between the points of entry to the bridge from lower decks and the clear route referred to above is to be limited.

4.3.2 Every effort is to be made to allow a clear route across the wheelhouse from bridge wing to bridge wing. The width of the passageway is to be at least 1200 mm and not less than 700 mm at any single point of obstruction.

4.3.3 If consoles at workstations for primary functions or other consoles are located away from the front bulkhead with the purpose of giving passageway, the width of the passageway is to be sufficient for one person to pass a stationary person and in general, is not to be less than 600 mm.

4.3.4 The distance between separate workstation areas is to be sufficient to allow unobstructed passage for persons not working at the stations. The width of such passageways is not to be less than 700 mm, also considering persons sitting or standing at their workstation.

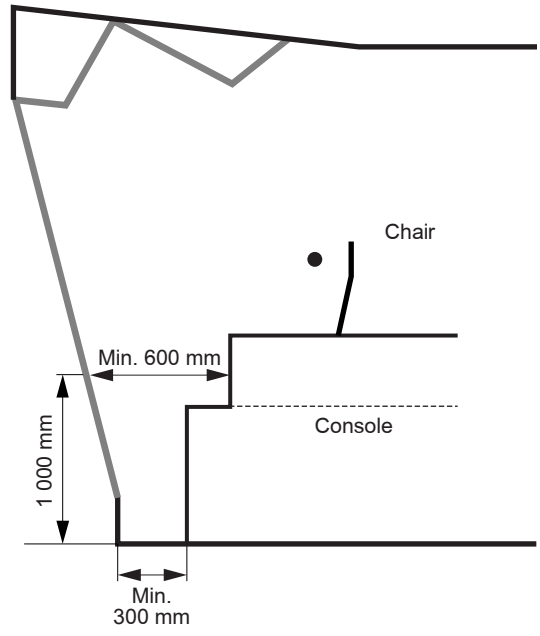
4.3.5 Entries to workstations is to be sufficiently wide to allow operators easy access to aft workstations, and their width is to be not less than 700 mm.

4.3.6 If a passageway/opening between the workstation for navigating/maneuvering & monitoring is provided for easy movement between the workstations, such passage may be accepted 400 mm wide.

4.3.7 If the entries to workstations are between the bridge bulkhead and the workstation consoles, their width is not to be less than 300 mm at deck level and 600 mm at 1000 mm above deck level. See Fig 1.

4.3.8 Direct access is to be provided for each individual workstation (aft workstations).

Figure 1 : Passageway between console and aft windows



4.3.9 An example of bridge lay out is described in Fig 2.

4.4 Safety of personnel

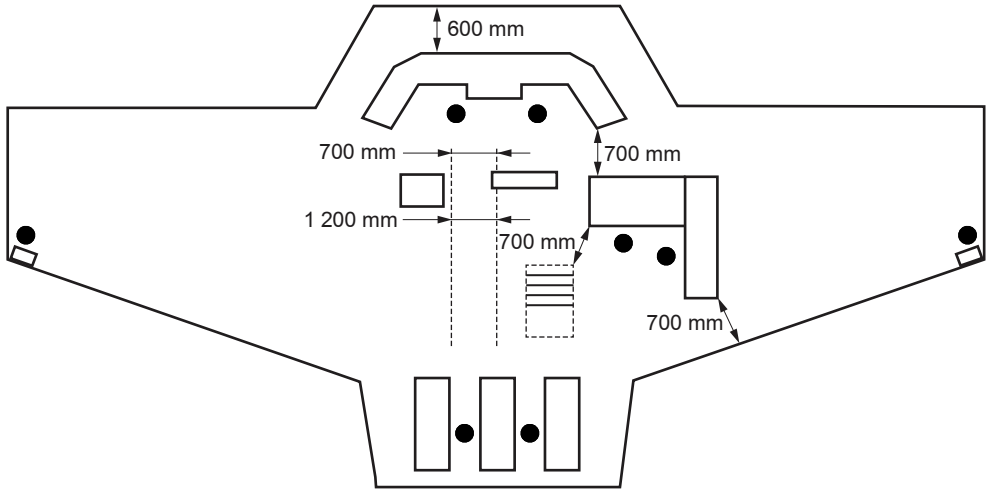
4.4.1 The bridge area and the wings areas, is to be free of physical hazards to bridge personnel (sharp edges, protuberances).

4.4.2 Adequate means are to be provided for anti-slip of the floor, whether it is dry or wet.

4.4.3 Sufficient handrails or the equivalent are to be fitted to stand or move between the workstations.

4.4.4 All safety equipment on the bridge are to be clearly marked and easily accessible and have its stowage position clearly indicated.

Figure 2 : Example of bridge lay out



4.5 Vibration and noise

4.5.1 The noise level on the bridge is not to interfere with verbal communication and mask audible alarms.

4.5.2 Uncomfortable levels of vibration is to be avoided in the bridge

4.6 Temperature and ventilation

4.6.1 The wheelhouse is to be equipped with an adequate temperature control system. As a minimum, the external temperatures which are to be taken into account are from -20ºC to 35ºC at a relative humidity of 70%.

4.6.2 Control of temperature and ventilation system is to be possible from bridge or adjacent locations.

4.7 Light arrangement in wheelhouse and on deck

4.7.1 An adequate level of lighting facilitating the performance of all bridge tasks at sea and in port, daytime and night time, is to be provided. Workstation areas are to have a greater luminance than the ambient lighting level.

4.7.2 During periods of darkness, the lighting provided to discern control devices and read labels and marking is to preserve the night vision of the officer of watch (OOW). it is to be possible to decrease the illumination intensity to nearly zero.

4.7.3 Illumination level is to be adjustable depending on the different areas of the bridge (see Tab 1).

Note 1: White ceiling lights for bridge illumination do not require dimming facilities.

4.7.4 Red and filtered illumination levels are to be available in night time.

Lighting sources located in adjacent spaces are not to illuminate the wheelhouse at nighttime.

4.7.5 Lighting of workstation which could be used by personnel other than OOW are to be provided with separate on/off switcher. Lighting and glare, if any, are to be properly shielded

4.7.6 The lighting installation is to be such that the glaring lights from deck lights and the searchlights will not dazzle the operator at the workstations.

4.7.7 Precautions are to be taken in order to avid glare, reflections on windows, deckhead surfaces and bridge surfaces

Table 1 : Illumination levels

Location	Colour and illumination	
Wheelhouse	general	White At least 200 lux
Workstations	day	White At least 300 lux
	night	Red Variable up to 20 lux
Open staircase inside wheelhouse	day	White At least 200 lux
	night	Red Variable up to 20 lux **(1)**
Chart table	day	White Variable 100-1000 lux
	night	White filtered Variable up to 20 lux
Toilet	day	White At least 200 lux
	night	Red Variable up to 20 lux
(1) As an alternative, fixed indirect red or filtered white light may be provided in the steps		

SECTION 3 ARRANGEMENTS OF WORKSTATIONS

1 Workstation requirements

1.1 General

1.1.1 Consoles are to be divided into 2 separate areas:

- one for the display of information located in the upper (vertical) part of the console
- one for the location of equipment necessary for taking action on the information located in the lower (horizontal) part.

1.1.2 Desktops to be used from sitting positions only is to be more 750 mm high.

1.1.3 Desktops to be used from sitting and standing positions is to be more than 800 mm high.

1.1.4 The general height of consoles forming a workstation for radio communication or other additional tasks that are to be used by the officer is not to obstruct the field of vision required maintaining a proper lookout from a sitting position at the console. The height of consoles located at workstations for additional functions, including equipment installed on top of console, is not to exceed 1300 mm.

1.2 Requirements for overhead consoles

1.2.1 Consoles installed in ceiling are not to obstruct the vertical field of vision from the workstations for an operator with a height of eye of 1800 mm. See Fig 1.

1.2.2 The use of overhead consoles is generally to be limited to indicators and information displays. Displays with important information is to be located within the easily readable field of vision of the operator.

1.2.3 Where overhead displays serve frequently operated equipment the controls should be located within a radius of 800 mm from an eye position 1600 mm above deck and within reach from a seated position at the workstation and be available when standing or moving the chair to enable access to other equipment. See Fig 1.

1.2.4 Overhead consoles is to be angled to suit the line of sight from the working position. See Fig 2.

1.3 Chairs

1.3.1 Workstations for navigating, manoeuvring and aft support are to be fitted with a chair.

1.3.2 Rails for fore and aft adjustment of the chairs is to be installed flush with the deck surface or fitted with an anti-trip skirting board.

1.3.3 Backrest inclination is to be between 102° and 108°.

1.3.4 An adjustable footrest is to be provided for a range of knee joint heights between 380 mm and 580 mm.

Figure 1 : Overhead consoles abeam

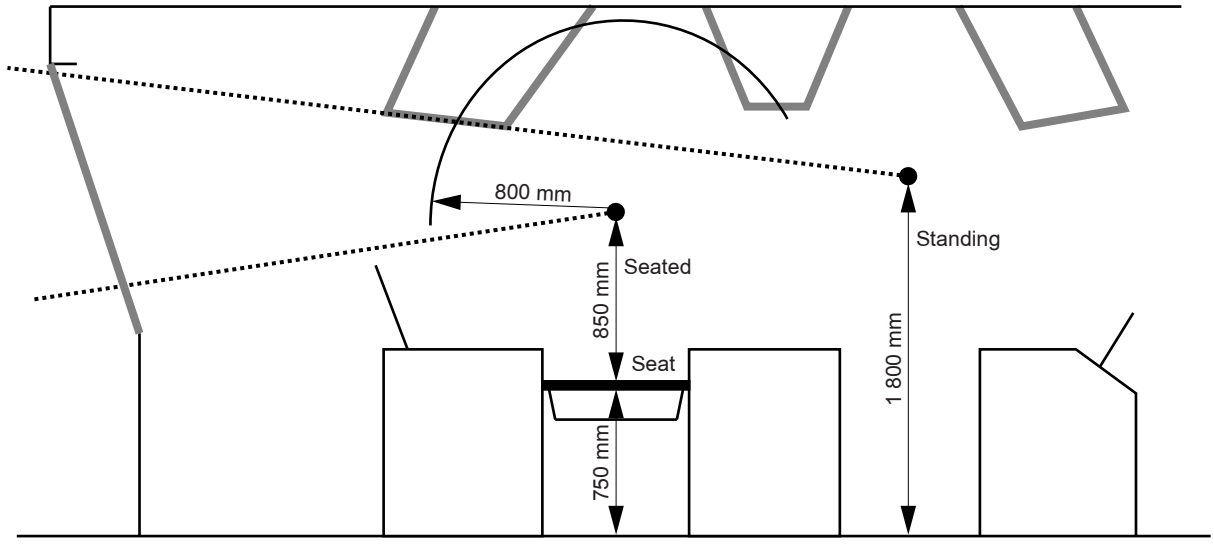
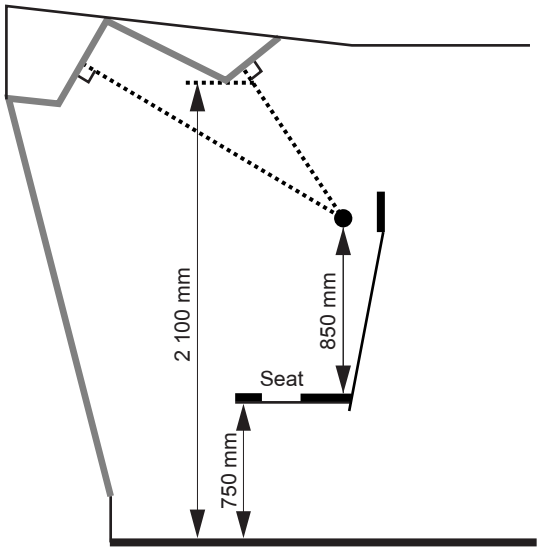


Figure 2 : Overhead consoles aft



2 Primary workstations

2.1 General

2.1.1 The design and location of the primary workstations is to enable safe and efficient traffic surveillance, navigation and manoeuvring of the ship. The workstations is to be designed and located so as to enable the ship to be navigated and manoeuvred safely and efficiently by both:

- one qualified crew member under normal operating conditions at sea
- two qualified crew members working together in periods of high workload.

2.2 Primary workstation layout

2.2.1 The main working position at workstations for navigation, manoeuvring and traffic surveillance is to be the working position for operating the radar with collision avoidance functions. It is to be within reach from a seated position.

2.2.2 Heading and speed controls are to be located within reach of the seated working position at workstations for navigating and manoeuvring to facilitate collision or grounding avoidance manoeuvres without losing view of the traffic. The ECDIS for position-fixing and route monitoring are to be available easily from the manoeuvring position.

2.2.3 A passageway in front of the workstations may be provided to give direct easy access to windows for monitoring. Alternatively, there may be a gap between two workstations close to the windows.

2.2.4 Access to front windows may be provided from the workstations for navigating and manoeuvring between the centre console and a chart radar provided the conning information display is readable from the working position at the chart radar and controls for heading and speed adjustments are located within reach.

2.2.5 If readability and control of chart information can be maintained from a seated position, access to the front windows from the workstations for navigating and manoeuvring may also be provided between the radar and ECDIS. This may be achieved when the radar is provided with chart facilities. Alternatively, remote controls for the ECDIS may be used, provided the chart information is easily readable from the seated position. An other solution is to locate the ECDIS in the centre console and the conning display above the front windows if monitor screens are readable from seated position.

2.3 Workstation consoles for primary functions

2.3.1 For front workstations an eye height of 1500 mm is used. In order not to obstruct the line of sight from a position of 350 mm behind a console of average depth and any passageway in front of consoles, giving a total horizontal distance of maximum 2300 mm between the operator and the steel bulkhead, the console height, including foundation, is not to exceed 1200 mm. See Fig 9.

2.3.2 The height of console desktops is to enable easy use of equipment to be used from sitting position. The console height is not to obstruct the required field of vision.

2.3.3 A standard console height of 1200 mm is acceptable even if the top of the console interferes with the line of sight from a sitting eye height of 1500 mm.

2.4 Chairs at workstations for primary functions

2.4.1 Chairs are to be installed at the workstation for monitoring and at the workstations for navigating and Manoeuvring. They are to be easy adjustable in order to suit an eye height of 1500 mm. The seated location is to be located at 350 mm from the console. See Fig 9.

3 Navigating and manoeuvring workstations

3.1 General requirements

3.1.1 Navigating and manoeuvring workstations is to facilitate:

- fixing and plotting the ship's position, heading, track and speed
- monitoring the traffic by sight and hearing as well as by all available means
- analysis of the traffic situation
- collision avoidance decision making
- heading changes
- speed changes
- steering mode changes
- internal and external communication
- docking aid operation
- monitoring of all alarms
- monitoring of time, heading, speed, track, propeller revolutions, thrust indicator, pitch indicator, helm angle and rudder angle.

3.2 Field of vision

3.2.1 The horizontal field of vision from the working position at the workstation for monitoring and from the seated position at the workstations for navigating & manoeuvring is to extend over an arc of not less than 225°, that is from dead ahead to not less than 22.5° abaft the beam on either side of the ship. See Fig 3.

3.2.2 A horizontal field of vision to the horizon of 360° is to be obtained by using not more than 2 positions inside the wheelhouse on either side of the workstations for navigating & manoeuvring, being not more than 15 m apart.

3.2.3 The view of the sea surface from the workstations for navigating & manoeuvring, using an eye height of 1500 mm above deck, is not to be obscured by more than two ship lengths or 500 m, whichever is less, forward of the bow to 10° on either side, under all conditions of draught and trim. See Fig 4.

3.2.4 When the distance between the windows and the viewing point 350 mm aft of the consoles at the workstations for navigating and manoeuvring is more than 2300 mm, the height of the lower edge of the windows in the sector from ahead to 90° on each side shall be decreased sufficiently to maintain the line of sight from an eye height of 1500 mm above deck.

3.2.5 Blind sectors caused by obstructions appearing in the required field of vision of 225° is to be as few and as small as possible. The total arc of blind sectors within this field of vision is not to exceed 30°. See Fig 5.

3.2.6 Over an arc from dead ahead to at least 10º on each side of the bow, seen from the workstations for navigating & manoeuvring, no blind sector is to exceed 5º. Elsewhere, each individual blind sector within the required field of vision is not to exceed 10º.

3.2.7 The clear sector between two blind sectors is to at least 5º and not less than the size of the broadest blind sector on either side of the clear sector.

Figure 3 : Horizontal field of vision

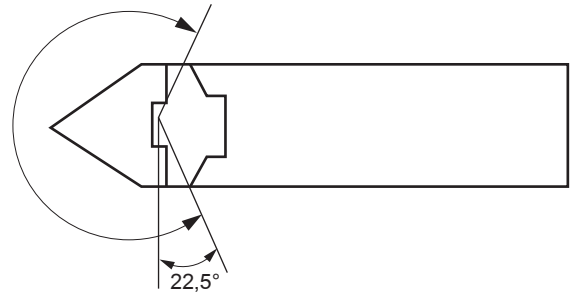


Figure 4 : Vertical field of vision forward of the bow

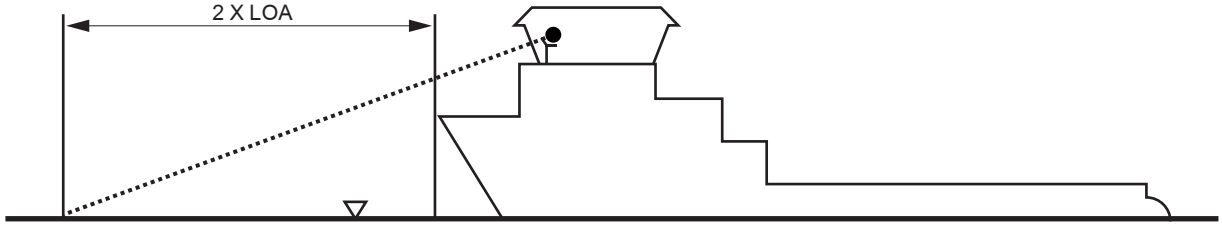
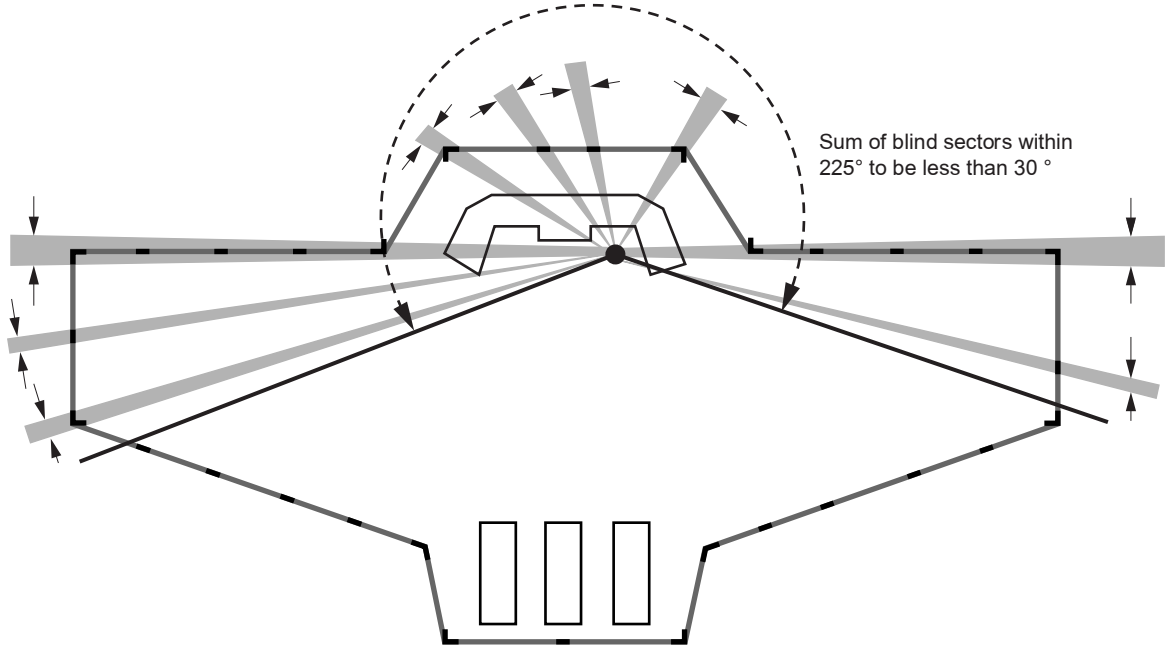


Figure 5 : Blind sectors seen from workstations for navigating and manoeuvring



3.2.8 If helicopter deck or other platforms are installed above and in front of wheelhouse obstructing the vertical field of vision, a vertical angle of view of not less than 5° above the horizontal plane, extending from eye height in forward direction, is to be provided irrespective of helicopter deck or other structures placed on top of the wheelhouse.

3.2.9 It is to be possible to observe the ship bow for reference of ship position/ heading from the workstation. Guidance note:

Note 1: Mast can be used as reference.

3.3 Requirements for anchor handling and towing

3.3.1 The sea surface within 600 meters from the ship's stern must be visible from the workstation for monitoring of towing units. See Fig 7.

3.3.2 Wire stoppers and the entire breadth of the ship's stern are to be visible from the normal working position aft. See Fig 6.

3.3.3 From the workstation the operator is to be able to monitor the spooling of the wire, the towing guide and the relative horizontal angle of the tow wire at the stern roll.

Note 1: A CCTV system may be used.

3.4 Seismic vessels

3.4.1 The horizontal field of view from the normal forward workstation is to enable the operator to monitor the start of streamers in a sector not less than ± 30°.

3.4.2 The sea surface is to be visible from the working position not less than 1000 meters from the ship's stern for monitoring of towing units. See Fig 8.

3.4.3 The horizontal field of vision from the normal working position in front is to enable the operator to monitor the start of streamers in a sector not less than ± 30°. See Fig 9.

Guidance note: These requirements may be obtained with use of CCTV system.

Note 1: A CCTV system may be used.

3.5 Equipment

3.5.1 The following instruments and equipment are to be installed within reach from a sitting position:

- propulsion back-up control (when provided)
- propulsion control
- heading control system or track control system (as provided)
- manual steering control with override control of automatic systems
- steering mode selector
- means for take command to workstation (steering, propulsion, thrusters)
- VHF
- UHF
- automatic telephone
- whistle push button
- emergency stop for propellers/thrusters
- central alarm panel (AMS)
- BNWAS
- engine alarm panel (engine alarm panel/ E0 alarm panel might be included in central alarm panel)
- window wiper and wash controls for the windows within the required field of vision
- searchlight controls (when provided).

Figure 6 : Horizontal field of vision for anchor handling and towing operations

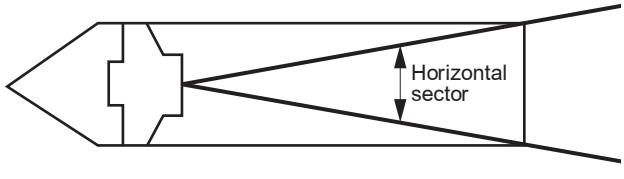


Figure 7 : Monitoring of tow for anchor handling and towing

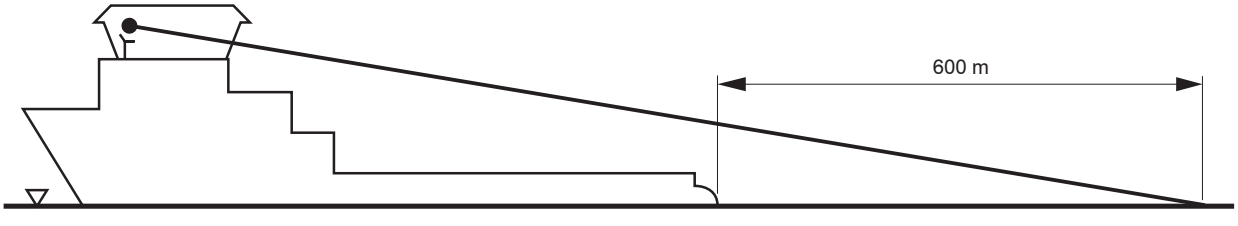


Figure 8 : Monitoring of tow for seismic vessels

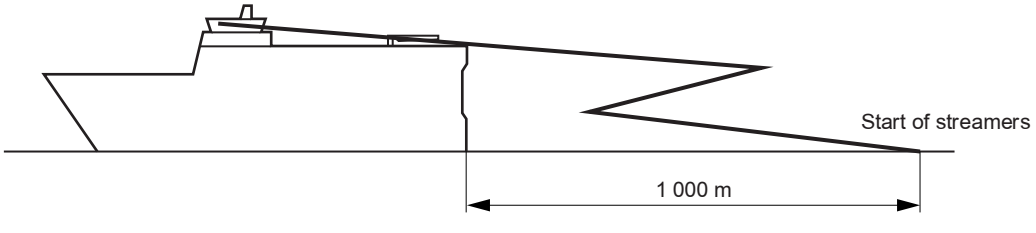
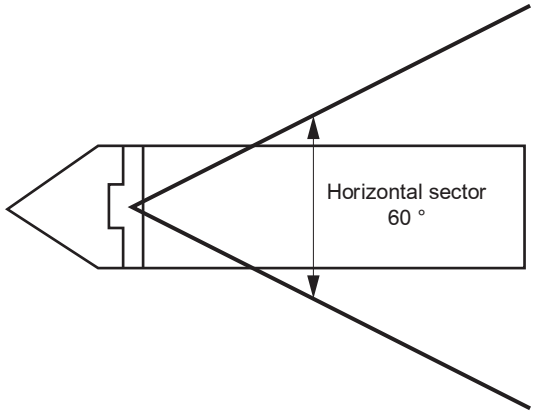


Figure 9 : Monitoring of tow for seismic vessels



3.5.2 The following equipment is to be installed within reach from a standing position at the workstation where also controls for propulsion and steering can be operated:

- chart radar with ARPA
- ECDIS
- thruster control(s)
- thruster back-up control(s) (when provided)
- joystick control (when provided).

3.5.3 Following means are to be easily accessible from the workstations for navigating & manoeuvring and include:

- instruments and equipment installed at the navigation support workstation
- alarm panel for additional functions, such as fire, emergency, etc.
- dimmer controls for lights to be used at the workstation
- controls for the sound reception system.

CCTV controls, for anchor handling and towing operations, (if applicable).

3.6 Information required

3.6.1 Information considered essential for the safe and efficient performance of tasks at the workstations for navigating & manoeuvring is to be easily readable, and audible when relevant, from the working position at the workstation. It includes:

- propeller revolution and engine rpm/ load as relevant
- thrust indication or alternatively thruster pitch and RPM (as provided)
- propeller pitch (when provided)
- rudder angle
- rudder order, if the steering system is a follow-up system
- ship's heading (steering repeater)
- ship's speed
- water depth
- wind direction and speed
- time
- alarms and warnings
- sound from navigational aids and ship's whistles
- conning display
- gyro compass monitoring system
- Magnetic compass (if provided).

3.6.2 Additional requirements for anchor handling and towing operations:

- winch tension, wire length and wire speed indication (may be part of conning display)
- monitor(s) for supporting view of tow or wire (if applicable).

4 Monitoring workstation

4.1 Role of workstation

4.1.1 The monitoring workstation is for the following tasks:

- Fixing and plotting the ship's position, heading, track and speed
- Navigational communications
- Monitoring of time, heading, speed and track, rudder angle, propeller rpm and pitch
- Changes to pre-planned route during the voyage.

4.2 Field of vision

4.2.1 Monitoring workstations are to meet the same requirements set out above for field of view as workstations for navigating and manoeuvring, except the additional requirements for anchor handling and towing operations. See [3.2].

4.3 Equipment

4.3.1 From a standing position at the monitoring workstation the navigator is to be able to easily reach:

- Radar
- ECDIS backup arrangement
- A chart table, unless the ship uses ECDIS only as the official chart system
- Position-fixing systems including GPS
- VHF
- Internal telephone
- Whistle control
- BNWAS
- BAMS.

4.4 Information

4.4.1 Essential information essential for operations at the monitoring workstation is to be easily readable from the working position at the workstation. including:

- propeller revolutions and engine rpm/ load as relevant
- propeller pitch (when provided)
- rudder angle
- ship's heading
- ship's speed
- water depth
- time
- distance run
- conning display.

5 Offshore operations workstation

5.1 General

5.1.1 Workstation for ship handling and workstation for aft support is to be so arranged and designed that two qualified operators can work either separately or in close co-operation (depending on the workload or the nature of the operations).

5.1.2 The workstation for aft support is to facilitate control of offshore operations and serve as backup for manoeuvring functions if operator at workstation for ship handling becomes inoperative.

5.2 Layout

5.2.1 Aft-facing workstations for ship handling and offshore operations are to be located close together to facilitate close co-operation between the two workstations and to avoid duplication of equipment and indicators.

5.2.2 Access to the back-up manoeuvring controllers from both workstations is to be provided.

5.2.3 Consoles/panels located between operator and aft windows are not to obstruct the view of cargo deck.

5.2.4 The width of consoles is to be kept as narrow as possible in order to avoid operator stretching over the console in order to reach equipment mounted outside normal reachable area and thus risking unintended activation/ movement of controls.

5.2.5 The space provided for the chair seat and the operator is to be kept to a minimum. See Fig 10.

5.3 Workstation consoles for offshore operations

5.3.1 Workstation consoles are not to obstruct the view through windows required for monitoring aft deck operations from sitting position at the workstations for offshore operations. Consoles located in athwart ship direction are not to obstruct the required field of vision from the workstation.

5.3.2 A vertical angle of view not less than +/- 5° in relation to the horizontal line of vision is to be provided by adjusting the size of windows if necessary. See Fig 11.

5.4 Chairs

5.4.1 Chairs are to be provided for the aft-facing ship handling and aft support workstations. They should be operator adjustable over a range of +/- 100 mm to give an elbow height of 50 mm above the level of adjacent consoles. See also [5.5].

5.4.2 The arrangement of chairs and workstations is to be such as to facilitate safe and efficient operation. The chair is to be instantly moveable if any essential equipment is not in the easy reach area.

5.5 Priority zones

5.5.1 Equipment and indicators at workstations are to be located according to importance and frequency of operation.

Figure 10 : Size of consoles when common centre console is used

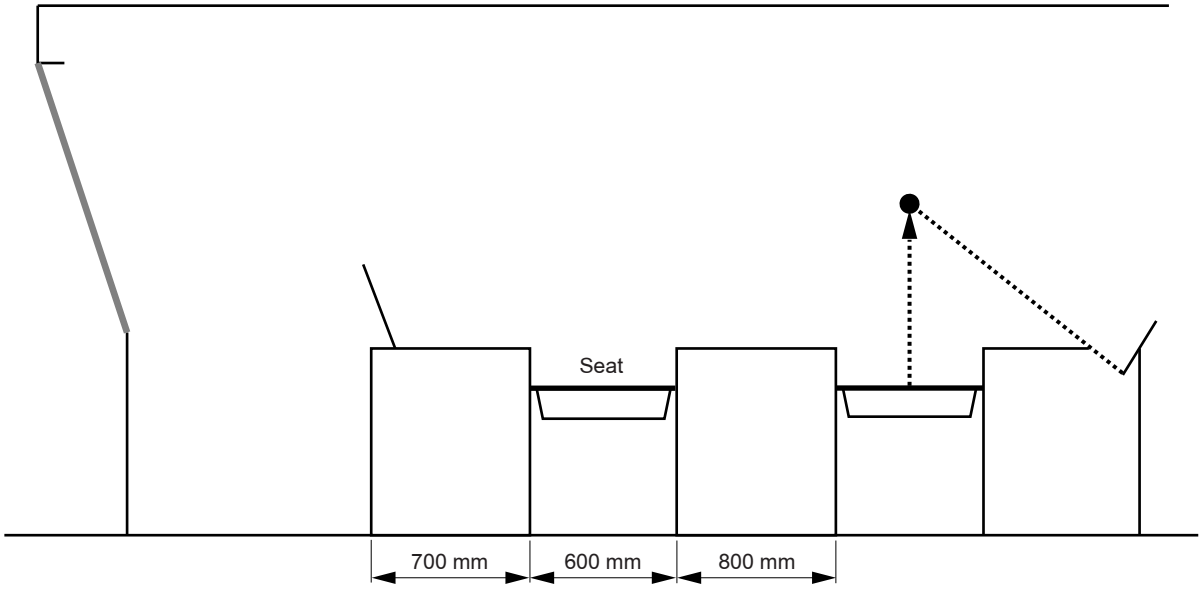
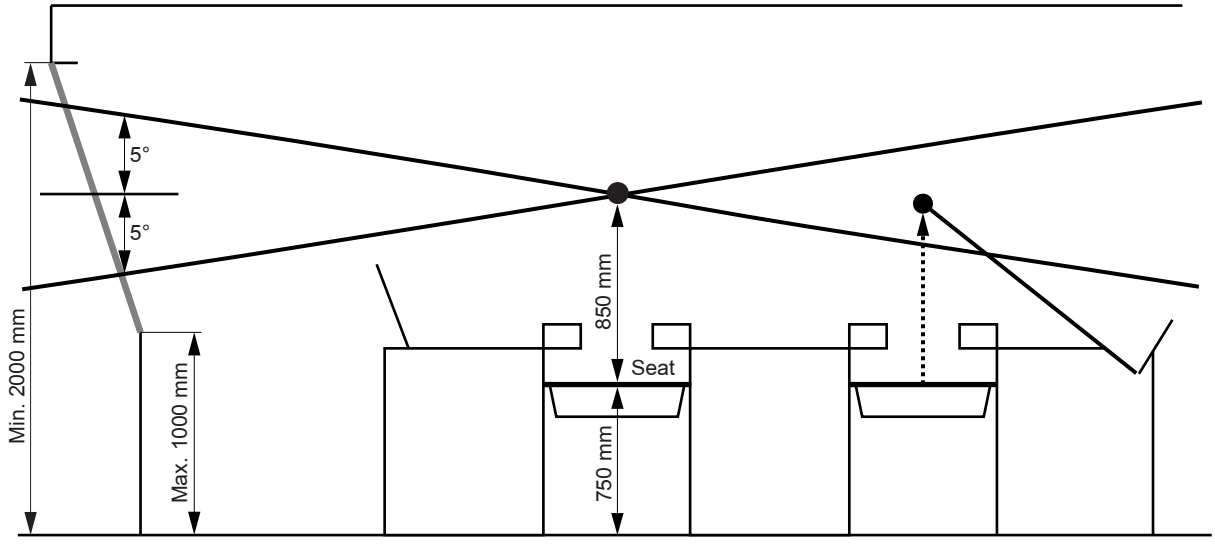


Figure 11 : Location of workstation consoles and window size in the field of vision arc between abeam and 30° aft of abeam



6 Workstation for ship handling

6.1 General

6.1.1 The ship handling workstation is to facilitate:

- main propulsion control
- thruster control
- main and auxiliary machinery status monitoring
- dynamic positioning system control and monitoring
- communication with other ships, platforms and internally
- monitoring and silencing alarms from equipment serving other functions located on the bridge requiring action or attention from the operator (e.g. fire alarms, GMDSS alarms, engine alarms)
- visual monitoring of cargo or other aft deck operations
- monitoring workstation for aft support
- monitoring workstations for navigating and manoeuvring and ship handling
- berthing or unberthing the ship.

6.2 Field of vision

6.2.1 The horizontal field of vision from the aft ship handling workstation is to extend over an arc of not less than 180°, from right astern to not less than the beam on either side of the ship.

6.2.2 For monitoring of ships side by side or platforms when lying alongside, the horizontal field of view beside the broadest part of the wheelhouse is to extend over an arc of not less than 5°, See Fig 12.

6.2.3 In order to maintain a horizontal field of vision when the ship is rolling in heavy seas, there is to be an unobstructed view at an angle of at least 5° above and below the horizontal plane from the workstation for offshore operations in the sector from abeam to 30° abaft the beam. The height of the upper edge of the windows is to be at least 2000 mm under all circumstances.

6.2.4 The height of the lower edge of the windows is to be a maximum 1000 mm above deck under all circumstances.

6.2.5 Workstations and the lower edge of windows are not to obstruct the line of sight 5° below the horizontal plane. See Fig 13.

6.2.6 There is to be a view from the workstations for offshore operations of the cargo rail and working deck. Any obstructions in this view is to be kept to a minimum. Over an arc of not less than 120°, i.e. from right astern to not less than 30° abaft the beam on either side of the ship, the height of the lower edge of the windows above the bridge deck is to be so that the bulkhead below the windows does not obstruct the view of the cargo deck.

6.2.7 There is to be view at an angle of at least 20° above the horizontal plane from the workstation for offshore operations over an arc of 120°, that is from right astern to not less than 30° abaft the beam on either side of the ship in order to see cargo coming down to the aft deck from cranes. For ships not engaged in cargo handling to/ from platforms the above vertical view can be reduced to not less than 10° above the horizontal plane. See Fig 15 and Fig 14.

Figure 12 : Horizontal field of vision from workstations for offshore operations

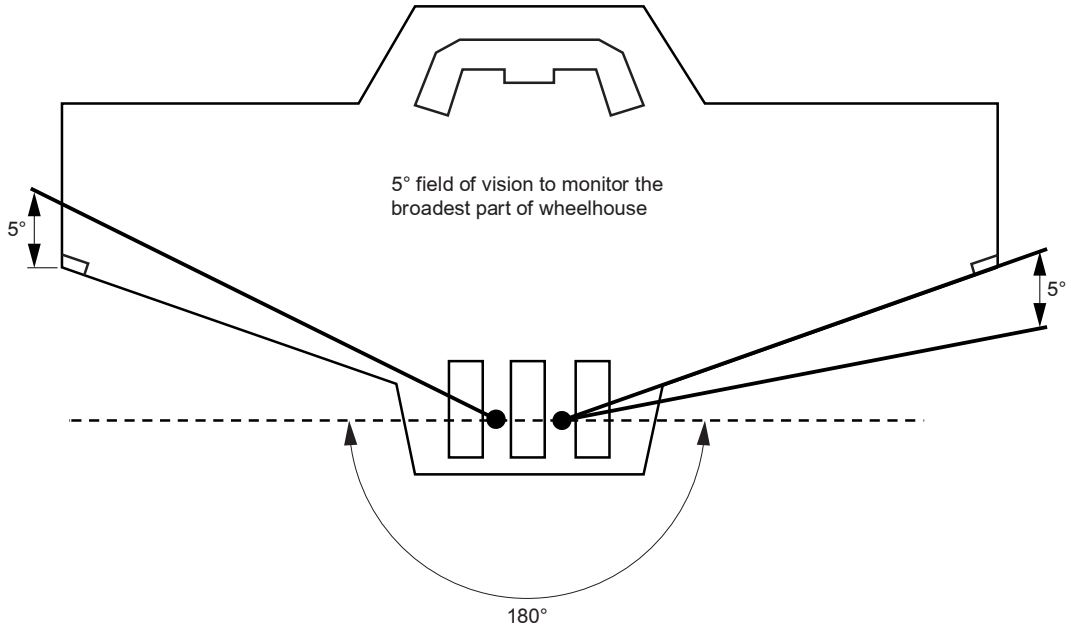
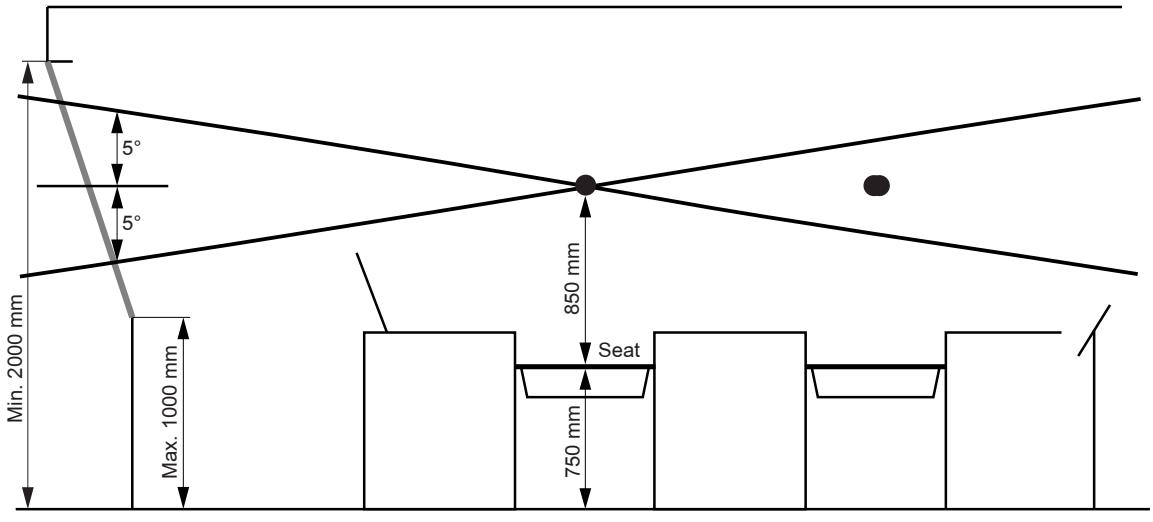


Figure 13 : Vertical field of vision in the sector from abeam to 30° aft



6.2.8 The total arc of blind sectors within the required 180° field of vision at the workstation for offshore operations is not to exceed 20° and no blind sector caused by cargo, cargo gear, divisions between windows or other obstructions appearing in the required field of vision is to exceed 10°.

6.2.9 The clear sector between two blind sectors is to be at least 5° and not less than the size of the broadest blind sector on either side of the clear sector. See Fig 14.

6.2.10 The eye position of the operator at the workstations is to be taken for calculation purposes to be 1600 mm above deck with the seat in the normal working position.

6.2.11 It is to be possible to monitor visually the workstations for navigating & manoeuvring, from workstation for ship handling

6.3 Equipment required

6.3.1 The following controls and displays are to be within easy reach of the qualified crew member operating the aft ship handling workstation:

- dynamic positioning system (when provided)
- joystick
- independent joystick system (when provided)
- manual steering control (including any back-up mode)
- steering gear control and alarm system

Figure 14 : Overview of the fields of vision required from workstations for offshore operations

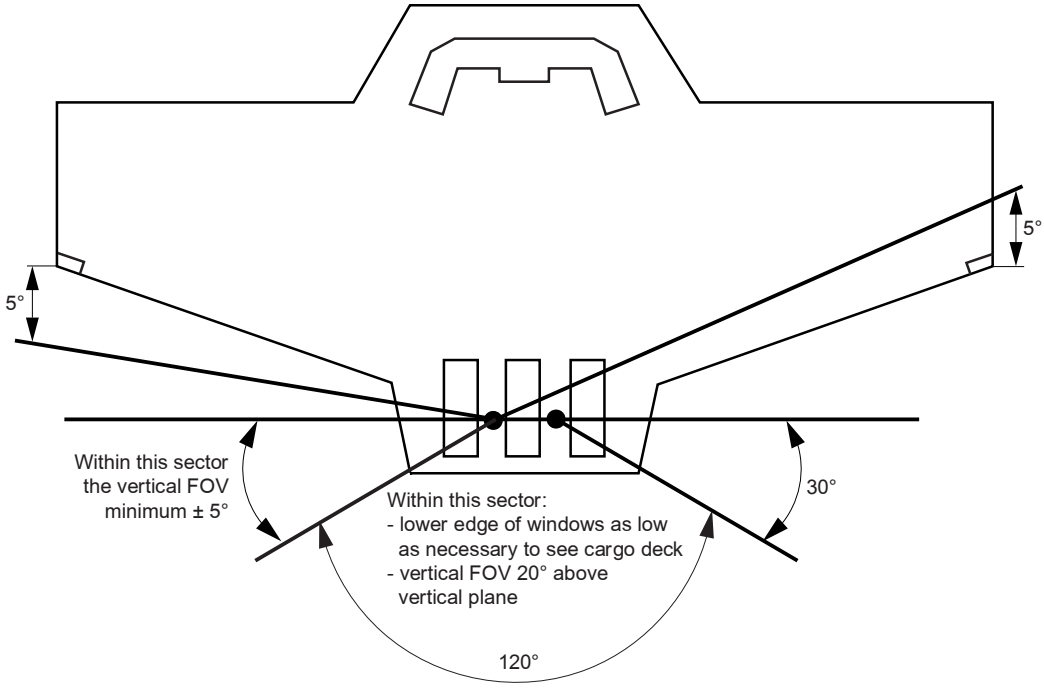
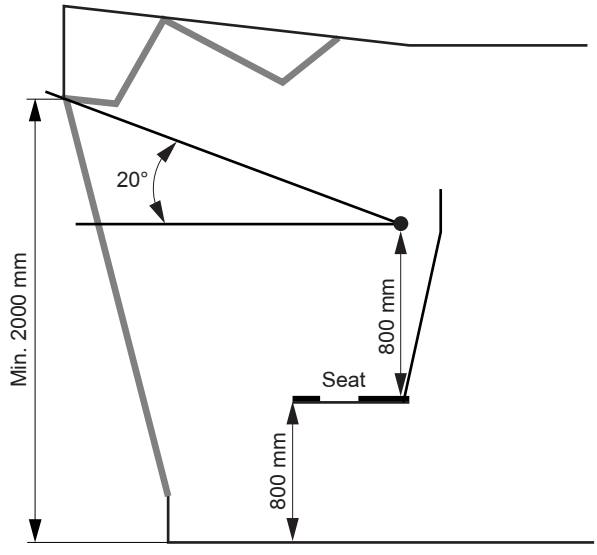


Figure 15 : Vertical field of vision in the sector of 120° astern



- longitudinal thrust control
- lateral thrust control
- propulsion control
- propulsion back-up control (when provided)
- thruster control(s)
- thruster back-up control(s) (when provided)
- extension alarm panel
- BAMS
- Mode selector switch and means for take command of workstation (steering, propulsion, thrusters)
- whistle push button
- VHF
- UHF
- automatic telephone
- search light controls
- window wiper and wash controls for the windows within the required field of vision
- deck light controls
- means for controlling the chart radar (or radar and ECDIS)
- means for controlling towing pins and jaw
- arrangement for placement of papers as instructions, procedures and plans.

6.3.2 Priority is to be given to location of controls for joy-stick, dynamic positioning (if installed), propulsion throttles, rudder controls, thrusters and necessary communication (UHF, VHF and telephone systems).

6.3.3 The following equipment is to be installed sufficiently close to the operator's working position, so that it is not necessary to leave the chair for taking appropriate action.

- alarm panel for additional functions, such as fire, emergency, cargo, etc.
- GMDSS equipment that may require attention
- alarm systems included in BAMS may not necessarily be located at the workstation.

Note 1: Additional requirements for anchor handling operation: anchor handling position surveillance system control (system for aiding the ship to find the correct anchor position given by the rig).

6.4 Information to be provided

6.4.1 Following Information is to be easily readable, and audible when relevant, from the working position at the workstation:

- propeller revolution and engine rpm/ load as relevant
- propeller pitch (when provided)
- thrust indication or alternatively thruster pitch and RPM (as provided)
- rudder angle
- rudder order, if the steering system is a follow-up system
- ship's heading
- ship's speed
- water depth
- wind direction and speed
- time
- essential status information of main and auxiliary machinery, as relevant
- alarms and warnings
- conning display
- chart information
- traffic information
- collision warning
- grounding warning.

Note 1: Additional requirements for anchor handling and towing operations:

- essential winch information (tension, length, wire speed)
- CCTV monitors for monitoring of winch equipment and spooling apparatus.

7 Aft support/offshore operations workstation

7.1 Field of vision

7.1.1 field of vision is to be in accordance with [6.2].

7.2 Equipment

7.2.1 The following functions are to be operated by the navigator at the workstation for aft support and are to be within reach from a sitting position at the workstation:

- joystick
- manual steering control (including any back-up mode)
- propulsion control
- propulsion back-up control (when provided)
- thruster control
- mode selector switch and means for take command of workstation (steering, propulsion, thrusters)
- VHF
- UHF
- internal telephone
- central alarm panel
- means for controlling towing pins and jaw
- cargo operation system
- auxiliary equipment needed for the relevant operations
- BAMS
- means to secure and read instructions, procedures and plans on paper.

7.2.2 The following additional equipment is required for anchor handling and towing operations:

- winch control system
- auxiliary systems for use during anchor handling and towing operations
- controls for CCTV for monitoring winch and spooling apparatus.

7.3 Information required

7.3.1 Essential information is to be easily readable or audible. It includes:

- propeller and engine rpm/ load as relevant
- propeller pitch
- thrust indication or thruster pitch and RPM
- rudder angle
- rudder order, when the steering gear is in "follow up" mode
- ship's heading
- ship's speed
- water depth
- wind direction and speed
- time
- conning display.

7.3.2 The following additional information is required for anchor handling and towing operations:

- relevant winch information for safe operation of winch system
- CCTV monitors for winch and spooling apparatus.

8 Workstation for fire fighting

8.1 General

8.1.1 The fire fighting workstation may be mobile or located at several different places to facilitate the field of vision requirement.

8.2 Field of vision

8.2.1 The field of vision from the fire fighting workstation is to extend over an arc equivalent to the sector the fire monitors are meant to cover.

8.2.2 The fire fighting operator is to be able to monitor the workstations for navigating and manoeuvring, and the workstation for ship handling.

8.3 Fire fighting controls

8.3.1 Fire fighting monitor controls is to be fixed or portable to facilitate the field of vision. Portable equipment is to have fixed stands at the workplace, ensuring correct direction when in use.

8.4 Information to be provided

8.4.1 Displays, instruments and indicators providing information considered essential for safe and efficient performance of the tasks at the workstation for fire fighting are to be easily readable, and audible when relevant, from the working position at the workstation.

9 Search/rescue operations workstation

9.1 General

9.1.1 The rescue operations workstation is to facilitate the following operation:

- monitor the rescue area along the ship's side
- control main propulsion
- control thrusters
- communicate internally and externally
- work with the operators at the ship handling and navigating and manoeuvring workstations.

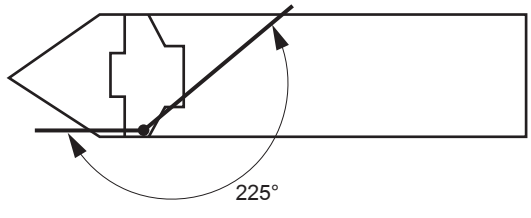
9.2 Field of vision

9.2.1 The field of vision from the rescue workstation is to provide an unobstructed view of the ship's side and the water surface along the ship's side, particularly with respect to monitoring of the rescue area.

9.2.2 The field of vision from the rescue workstation is to extend over an arc of not less than 225°, from right ahead to right astern through the side of the ship on which the workstation is located and then to 45° on the opposite stern. See Fig 16.

9.2.3 Monitoring of the workstations for navigating & manoeuvring or workstation for ship handling is to be possible from the workstation for rescue.

Figure 16 : Horizontal field of vision



9.3 Equipment required

9.3.1 The following equipment is to be within easy reach of the workstation operator:

- searchlight controls
- manual steering control
- propulsion control
- thruster control
- mode selector switch and means for take command of workstation (steering, propulsion, thrusters)
- emergency stop for propellers/ thrusters
- VHF
- UHF
- internal telephone
- BAMS.

9.4 Information to be displayed

9.4.1 Following information is to be easily readable, and audible when relevant, from the working position at the workstation:

- propeller revolution
- propeller pitch (when provided)
- thrust indicator or alternatively thruster pitch and RPM
- ship's speed
- wind direction and speed
- rudder angle.

10 Communication workstation

10.1 General

10.1.1 Communications equipment and equipment for additional functions not required for the safe navigation of the ship are to be installed in a separate communications workstation.

10.2 Field of vision

10.2.1 The field of vision from the communications workstation is to extend at least over an arc from 90° on the port bow, through forward, to 22.5° abaft the beam on the starboard side.

10.2.2 The workstation is to allow an effective lookout. The minimum operator eye height to be considered is 1500 mm above wheelhouse deck. If necessary the workstation may be located on a lower level below the wheelhouse deck (maximum of 200 mm), but chairs at the workstation are to be high enough to provide the equivalent eye height.

10.2.3 Blind sectors caused by deck supports and other obstructions located inside or outside of the wheelhouse shall be minimized. Each individual blind sector caused by any obstruction whether inside or outside of the wheelhouse shall not exceed 10°.

10.3 Equipment required

10.3.1 All communication devices required for GMDSS are to be provided at this workstation. Additional communication devices, if any, are preferably to be available at this workstation.

10.3.2 Provisions are to be made to provide the operator at workstation for ship handling with means for accepting GMDSS alarms remotely.

10.3.3 Navtex is to be located at this workstation.

10.3.4 Relevant telephone directories, channel plans, emergency contacts and operational contact lists are to be provided.

11 Safety monitoring and emergency operations workstation

11.1 General

11.1.1 This workstation is to enable the storage and use of relevant drawings, safety plans, ship safety systems and internal communication equipment in order to enable monitoring of the safety state of the ship as well as planning and management of emergency operations.

11.1.2 This workstation is to be located close to the communications workstation

11.1.3 Direct visual and audible contact with the workstations from which the ship is manoeuvred is to be provided.

11.2 Equipment required

11.2.1 The following equipment is to be made available:

- bookshelves and drawers of sufficient size
- internal communication systems
- navigation light controls.

11.3 Information to be displayed

11.3.1 Information to be displayed includes:

- fire alarm status
- emergency procedures
- safety plans
- watertight door status
- fire door status (when applicable).

SECTION 4 BRIDGE EQUIPMENT

1 Bridge equipment requirements

1.1 General

1.1.1 All applicable regulations and guidelines issued by the International Maritime Organization are to be complied with, in particular: IMO A.694(17): 1991, General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids.

1.1.2 All navigational equipment installed is to be approved and certified by an approved body to IMO performance standards.

1.1.3 Any additional equipment not required by SOLAS or these rules is to comply with performance requirements not inferior to the rules or associated IMO performance standards as deemed applicable.

1.1.4 Additional bridge equipment, not required by the rules or international regulations that may have an impact on the safety of main functions is to comply with the applicable requirements of NR467 Rules for Steel Ships, Part C, Chapter 3.

1.2 Equipment location and installation

1.2.1 Instruments and displays are to be permanently mounted to facilitate safe operation. Portable equipment and tools to be used by bridge personnel must have designated storage.

1.2.2 The instructions and recommendations detailed by the manufacturer are to be followed for the installation of all equipment and antennas and the layout and location must not impair the designed efficiency.

1.2.3 Radar antennas are to be installed to minimize blind sectors and provide 360° detection. Any blind sector in one radar system shall as far as possible be covered by the other radar system.

1.3 Interference

1.3.1 Special care is to be taken to ensure that the location of equipment does not impair its performance, especially in an exposed position,

1.3.2 Interference between the antennas for radars, position-fixing receivers and VHF communication systems is to be avoided and the equipment sited so that the designed efficiency is not substantially impaired.

1.3.3 There is to be a wide separation between transmitting and receiving antenna cables.

1.4 Radiation hazard

1.4.1 Antenna units are to be located so as not to constitute a hazard to personnel working in the vicinity. Radar wave guides, satellite communication and HF transmitter feed lines should be shielded by means of isolating trunks or fences to protect personnel from open wave-guide radiation power and accidental contact with high voltages.

1.4.2 Warning notices detailing safe distances are to be posted in the vicinity of or on satellite communication or radar antenna units.

1.5 Vibration and shock isolation

1.5.1 External deck equipment is not to be affected by vibration.

1.5.2 The antenna system and instrument installation is to be designed and installed, to withstand the expected vibration, based on the ship's construction, speed, trim and the sea state.

1.5.3 Antenna systems including active elements are to be provided with a mount design configured to withstand potential shock damage.

1.6 Protection from high temperature

1.6.1 Instruments are to be located away from excessive heat sources such as a heating vents or exhausts.

1.6.2 Instruments in a bridge instrument console are to be protected from excessive heat by conduction or, if necessary, cooled down by forced air flow.

1.7 Central alarm system interface

1.7.1 Any equipment that gives audible alarms or audible warning signals is to be provided with two-way communication so that the central alarm system can be used for indication of alarms and warnings. The audible alarm and warnings on both the equipment and the central alarm system are to be arranged so they can be muted mutually.

1.8 BAMS

1.8.1 All equipment that gives audible alarms or audible warning signals are to be provided with a communication interface suitable for presentation and acknowledgement of their alerts by a central BAMS

2 Equipment requirements

2.1 Heading information system

2.1.1 Two separate and independent gyro compasses, or other means having the capability to determine the ship's heading in relation to geographic true North (e.g. a transmitting heading device, type approved according to ISO 22090) are to be provided. At least one of the compasses is to be a gyro compass.

2.1.2 The system is to enable distribution of heading information to other equipment, such as ECDIS, radar

2.1.3 The system is to identify which of the compass that is in use.

2.1.4 Automatic correction of speed and latitude errors is to be fitted to the gyro compasses.

2.1.5 Means are to be provided for comparing the two compasses and an alarm is to be given if the difference between the compasses exceeds the set value.

2.1.6 No single failure in power supply or distribution system is to cause the loss of heading information to other systems depending on heading information including:

- Heading/bearing repeaters
- Heading control system/track control system
- Joystick system
- Dynamic positioning system
- Radar system
- ECDIS.

2.2 Position fixing systems

2.2.1 Two separate and independent position fixing systems are to be provided. At least one of the systems is to be a GPS.

Note 1: Independence may be achieved by separate antenna systems, display/control units, power supply and digital interface output/distribution units.

2.2.2 At least one of the position-fixing systems is to be capable of receiving and decoding differential data broadcasted for navigational purposes by maritime radio beacons.

2.2.3 The position system and the distribution system are to be so arranged that a single failure in power supply, or distribution units, may not cause continuous loss of position information, to other systems which depend on position fixing information including:

- Track control system
- Dynamic positioning system
- Chart radar system
- ECDIS
- GMDSS.

2.3 Steering and manoeuvring systems

2.3.1 Means for manual and automatic steering are to be provided.

2.3.2 The automatic steering system may be a heading control system, track control system or Dynamic Positioning system.

2.3.3 A manual steering override control is to be provided adjacent to the automatic steering control position. Instant take-over is to be provided in case of failure in any of the automatic steering systems mentioned in [2.3.2], including the mode switch itself.

2.3.4 A Common mode selector switch controlling all propulsion and thrusters shall be provided as applicable at each workstation. Means shall be provided for controlling steering, propulsion and thrusters as applicable.

2.3.5 A clear indication is to be provided when a workstation is in command. A characteristic warning is to be sounded whenever command is taken on a workstation. The warning is to be audible at all workstations provided with a common mode selector switch. A clear status message is to be displayed on the workstation in command.

2.3.6 Means for take control of all propulsion and all thrusters are to be provided at all workstations where steering or manoeuvring is to be carried out. The transfer of control is to enable the operator to take control with the same settings as on the previous workstation in control, or with neutral settings.

2.3.7 The operator is to be able to select a mode for all propulsion and thrusters with one common switch, so that when autopilot, manual mode, joystick or dynamic positioning is selected, all the propellers and thrusters will be controlled in the selected mode. This switch is to be approved according to NR467 Rules for Steel Ships, Pt C, Ch 3, Sec 6.

2.3.8 Normal and back-up control of thrusters and propulsion are to have the same interface.

2.3.9 If any steering or propulsion means not required by these rules is provided, this is to be selectable and necessary indicators for operation to be installed at this location.

2.4 Speed measuring system

2.4.1 A speed log measuring speed through water is to be provided.

2.4.2 Sensors for speed log are to be protected against ice or be fitted with gate valve for sensor replacing at sea without need for dry docking.

2.5 Depth measuring system

2.5.1 Echo sounder system for measuring the water depth under the keel is to be provided.

2.5.2 Sensors for echo sounder are to be provided with means for ice protection or to be fitted with gate valve for sensor replacing at sea without need for dry docking.

2.6 Radar systems

2.6.1 Two separate and independent radar systems are to be provided. Inter-switching of the main components is to be possible.

2.6.2 One of the radars is to operate in X-band and the other in S-band, unless specific operations of the ship make a second X-band radar more appropriate.

2.6.3 All radars are to be equipped with performance monitors.

2.6.4 If any single failure may have an impact on inter-switching between radars, then a bypass facility is to be provided with clear instructions adjacent to the inter-switch.

2.6.5 Both radars are to be provided with a daylight display with a minimum effective diameter of not less than 340 mm (320 mm for radar image).

2.6.6 Both radars are to be equipped of Cat. 1 type.

2.6.7 The radar at workstations for navigating and manoeuvring is to be interfaced to AIS for graphical display of AIS reported targets in accordance with relevant IMO standards and guidelines.

2.6.8 The radar at workstations for navigating and manoeuvring is to be a Chart Radar with the ability to display selected parts of Electronic Navigational Chart ENC. This radar is also to be able to display the ship's position and the route used on the ECDIS.

2.6.9 A slave display is to be installed at the workstation for ship handling, able to display selected parts of ENC in accordance with [2.6.8]. This slave system is to be provided with means of controlling the range and adjusting tuning, anti-sea clutter, anti-rain clutter and gain.

Note 1: Alternative means to chart radar may be slave radar + slave ECDIS.

2.7 ECDIS

2.7.1 An approved Electronic Chart Display and Information System (ECDIS) is to be provided.

2.7.2 An independent electronic back-up for the ECDIS is to be provided. The ECDIS back-up function may be a second chart radar or a second ECDIS, when located at the monitoring workstation.

2.7.3 The ECDIS is to be linked to the chart radar, to enable direct display of the active route on the chart radar.

2.8 AIS Minimum Keyboard Display (MKD)

2.8.1 It must be possible to operate the AIS MKD from the ECDIS and/or the radar installed at the workstation for navigation and manoeuvring.

2.9 Bridge Navigational Watch Alarm System (BNWAS)

2.9.1 The bridge is to be equipped with a surveillance system, with motion sensors, which monitors the presence of an alert OOW. The BNWAS is to ensure that the navigational watch is manned when the ship is underway at sea. The BNWAS system is to be type approved according to the IMO Performance standard for Bridge Navigational Watch Alarm System, and is also to comply with the requirements in these rules.

2.9.2 Means to reset the BNWAS function, by automatic detection of human motion, are to be provided at:

- Workstation for navigating and manoeuvring
- Workstation for monitoring and
- Workstation for ship handling.

If motion detection is provided at workstation for offshore operation, and workstation for offshore support, it is to be possible to select/deselect the bridge area in use (i.e. select between fore and aft bridge).

2.9.3 The officer of the watch must be able to select individually any of the navigation officers or the captain as the assigned back-up officer who will receive the second stage remote audible alarm. The following locations are to always receive the third stage remote audible alarm:

- Captain's cabin and office
- Officers' office
- Officers' mess
- Officers' day room
- Cargo control room (if provided)
- Gymnasium (if provided)
- Sky lobby (if provided)
- Other public rooms and areas (if provided).

2.9.4 The BNWAS second and third stage remote audible alarms shall not be acknowledged by the motion detection system.

2.9.5 The BNWAS second and third stage remote audible alarms shall be inter-connected with the alert transfer system without influencing on the alarm handling of the BAMS.

2.10 BAMS

2.10.1 An Bridge alert management system (BAMS) enabling all alarms generated by individual navigational equipment and other equipment generating alarms in wheelhouse to be centralised in one common BAMS display. This panel shall be located at the required workstations enabling easy identification of the source and cause of the alarms and rapid acknowledgement of category B alarms and cancellation of audible category A alarm signals shall be provided.

2.10.2 The BAMS shall offer the possibility to display Category A alerts from the same task station as aggregated alerts.

2.10.3 Category B Alerts, which are not required by IMO performance standards or this Rule Note and Category C alerts, may be aggregated to provide one alert at the BAMS.

2.10.4 The BAMS shall present the alert messages in English language using standard maritime terminology where such exists. Proprietary messages shall be clear text allowing for prompt comprehension of the message and pertinent actions to be taken.

2.10.5 The audible level of alarms and warnings should be 75 dB(A).

The minimum equipment to be integrated by the BAMS should include:

- track control system (if relevant)
- heading control system
- heading information systems
- Radars
- ECDISs
- EPFSs
- speed logs
- Echo sounder
- BNWAS
- AIS
- GMDSS.

Additional equipment may comprise:

- Automation alarm panel
- Steering gear alarm panel
- Navigation light alarm panel
- VDR alarm panel, etc.
- Other sources giving alarms and warnings in wheelhouse.

2.10.6 The number of alerts is to be kept as low as possible by providing indications for information of lower importance not requiring any action.

2.11 Conning display system

2.11.1 Conning displays are to be provided giving the operator information about the operational status of the ship. Conning information as part of dynamic positioning displays can be accepted at workstations for offshore operations provided that the conning information is available continuously and easily readable.

2.11.2 From the positions where navigation and manoeuvring are carried out, information required for the efficient monitoring of the status of the operation and safe performance of bridge functions, are to be easily and continuously visible. Information not related to safe operation shall be avoided.

The conning display should, as a minimum, show:

- Steering mode (manual, autopilot, dynamic positioning, joystick, transit/ docking mode, as applicable.)
- Heading and speed
- Rudder and helm angle
- Water depth
- Essential information from the power management system or equivalent information
- Thruster status indications
- Individual thruster indications or alternatively individual thruster pitch and RPM (as provided)
- Propulsion status indication
- Propeller revolutions
- Pitch indication, when relevant
- Winch load (and available force), wire length and wire speed, when relevant
- Wind indication.

If the ship is equipped with track control system, see IMO performance standard for additional information.

2.11.3 The conning information display is to utilize graphical display techniques and locate relevant sensor input data appropriately around and on a symbol illustrating own ship.

2.11.4 The orientation of the conning display graphic is to be the same as the ship's orientation as seen from the operator position.

2.11.5 Parts of the display area might be dedicated to user interface for the BAMS.

2.11.6 Independent indicators for rudder, propulsion and thrusters may be omitted when the required information is provided in mutually redundant conning displays at the required workstations. Rudder, pitch and RPM indicators are to be type approved.

2.12 Internal telephone system

2.12.1 An automatic internal telephone system is to be provided

a) An automatic internal telephone system is to be installed and is to provide two-way voice communication between the bridge and:
   - All officers' cabins
   - All deck hand cabins
   - All public rooms
   - All normal working spaces and
   - All emergency working positions.

b) The internal telephone network is to capable of handling more than four simultaneous calls.

c) The bridge must be fitted with at least two independent telephone extensions.

d) The telephone extensions in the bridge and engine control room is to be provided with priority functions over any other extension.

e) Incoming calls on adjacent telephones are to be distinguishable by lights and/or different ring tones.

f) The internal telephone system is to be supplied by both main and emergency sources of power.

2.13 External communications

2.13.1 At least two fixed independent VHF systems capable of simultaneous use are to be fitted at the relevant workstations.

2.13.2 At least two fixed independent UHF systems capable of simultaneous use are to be fitted at the relevant workstations.

2.14 CCTV systems

2.14.1 CCTV system is to provide the operator with true color pictures of relevant areas for compensating lack of direct visual viewing.

2.14.2 The monitor size is to be adequate for easy viewing from the operator's position.

2.14.3 CCTV cameras mounted on open deck and exposed to sea water mist are to be fitted with fresh water lens wash and wipers for cleaning.

2.14.4 CCTV system used for compensating lack of direct visual viewing are to be connected to the main and emergency power system

2.15 Weather information system

2.15.1 An anemometer providing wind speed and direction is to be fitted.

2.15.2 Ships engaged in worldwide trade are to be equipped with a shipboard weather station providing information about air temperature, air humidity and barometric pressure.

2.15.3 Ships are to be equipped with a weather information system

Note 1: Note: A marine computer including a software application for receipt and displaying of regular weather forecasts, or a weather fax may be acceptable.

Ships not engaged in worldwide trade may, if found unreasonable, be exempted from this requirement provided an alternative suitable system or method for receiving relevant weather information is provided.

2.16 Search lights

2.16.1 At least two remotely controlled searchlights are to be fitted capable of illuminating any area 360° around the ship with vertical adjustment sufficient to illuminate the sea close to the ship's side and up to 35° above the horizon.

3 Electrical power supply

3.1 Main electrical power supply

3.1.1 The power supply requirements in this Note are additional to those given in Nr467 Rules for Steel Ships, Part C, Chapter 2.

3.1.2 The power supplies to the distribution panels are to be arranged with automatic changeover facilities between main and emergency power sources. Failure of one of the power supplies to the distribution panels is to initiate an audible and visual alarm.

3.2 Stand-by power supply

3.2.1 The equipment listed below must be fitted with an Uninterruptible Power Supply (UPS) with a capacity to keep the equipment running during a black-out period of at least 10 minutes.

- One radar (including the antenna) at workstations for navigating and manoeuvring
- Position-fixing system
- ECDIS at workstations for navigating and manoeuvring.

3.2.2 At least one gyro compass is to be provided with a UPS with a capacity to keep it running for 30 minutes.

3.2.3 The UPS used to supply bridge equipment is to be provided with automatic bypass functionality.

3.2.4 Appropriate means for bypassing the UPS manually, in case of failure in the automatic bypass, is to be provided.

3.2.5 Failure of the UPS is to initiate an audible and visual alarm.

SECTION 5 ERGONOMICS AND HUMAN MACHINE INTERFACE

1 Human - machine interface

1.1 General

1.1.1 Equipment and indicators are to be designed with due regard to the human operator. Controls and indicators are to be so constructed that they can be efficiently operated by suitably qualified personnel.

1.1.2 During all operations, it is to be possible to observe the ship's status, the state of systems in use and other essential data.

1.1.3 Operation of controls and equipment are to either give the user feedback of the action through the control itself or through an indicator/ display adjacent to or in the natural vicinity of where the operation takes place.

2 Controls

2.1 Control devices

2.1.1 The number of operational controls, their design and manner of function, location, arrangement and size are to provide for simple, quick and effective operation.

2.1.2 Controls is to be arranged in functional groups.

2.1.3 Revolving controls for changing values up or down are to be designed so that clockwise turn increase value and vice versa. If push buttons are used, the push button at right are to increase value and vice versa.

2.1.4 For main control devices regulating the ship's heading during normal navigation in transit mode, a clockwise or starboard movement is to turn the ship's bow towards starboard and vice versa. For thrusters being used during manoeuvring, the control device movement is to correspond to the resulting thrust force.

2.2 Operation of controls

2.2.1 All operational controls are to permit normal adjustments to be easily performed and are to be arranged in a manner which minimises the possibility of inadvertent operation. Controls not required for normal operation are not to be readily accessible.

2.2.2 In all operations, it is to be a clearly marked or consistent simple action to recover from a mistaken choice or to leave an unwanted state. It is to be possible for the user to start, interrupt, resume and end an operation. Incomplete or interrupted manual inputs is not to inhibit the operation of the equipment.

2.3 Identification of controls

2.3.1 All operational controls and indicators are to be easy to identify and to read from the position at which the equipment is normally operated. The controls and indicators is to be identified in English and marine terminology is to be used.

3 Presentation of information

3.1 General

3.1.1 Displays and indicators is to present the simplest information consistent with their function.

3.1.2 During all operations, the system's state is to be observable with essential data displayed.

3.1.3 All information required by the user to perform an operation is to be available on the current display.

3.1.4 It is to be possible at any step of a screen supported operation to return to the original display status prior to initiation of operations by single operator action.

3.1.5 Feedback timing is to be consistent with the task requirements. There is to be clear feedback from any action within a short time. Where a perceptible delay in response occurs, visible indication is to be given.

3.2 Menus

3.2.1 Frequently used operations are to be available in the upper menu level, on dedicated software or hardware buttons.

3.2.2 Main display is to be available with a single operator action.

3.3 Text/symbols

3.3.1 Displayed text is to be clearly legible to the user and easy to understand.

3.3.2 The equipment is to employ marine terminology.

3.3.3 Where additional on-line help is available it is to be in task dependent form, easy to search and list the steps to be carried out.

3.4 Illumination

3.4.1 All information is to be presented on a background of high contrast, emitting as little light as possible at night, so that it does not degrade the night vision of the officer on watch.

3.4.2 Each instrument is to be fitted with an individual light adjustment. In addition, groups of instruments normally in use simultaneously may be equipped with common light adjustment.

3.4.3 Warning and alarm indicators are to be designed to show no light in normal position that is indication of a safe situation. Means are to be provided to test the lamps.

3.4.4 Colour coding of functions and signals is to be in accordance with international standards.

Note 1: As a guidance: ISO 2412 "Shipbuilding: Colours of indicator lights" may be used.

3.4.5 Means for adjusting the display and operating panel brightness are to be provided. Operator panels and other functional controls is to be illuminated to ensure ease of operation in the dark. Night vision is to be secured by considering the following:

- Warning and alarm indicators are not to be show light in normal position (indication of a safe situation). All instruments are to be fitted with permanent internal or external light source to ensure that all necessary information is visible at all times
- Means are to be provided to avoid light and colour changes upon, e.g. start-up and mode changes, which may affect night vision
- All information is to be presented on a background of high contrast, emitting as little light as possible by night.

4 Readability of information

4.1 General

4.1.1 Instruments or displays providing visual information to more than one person are to be located for easy viewing by all users concurrently. If this is not possible, the instruments or displays are to be duplicated.

4.2 Location

4.2.1 The information presented is to be clearly visible to the user and permit easy and accurate reading

4.2.2 Instruments meant to be operated or fitted in connection with controls is to be readable from a distance of at least 1 000 mm. All other instruments are to be readable from a distance of at least 2 000 mm.

4.2.3 Each instrument is to be placed with its face normal to the navigator's line of sight, or to the mean value if the navigator's line of sight varies through an angle.

SECTION 6 BRIDGE EQUIPMENT TESTS

1 On board testing of bridge equipment

1.1 General

1.1.1 After installation of equipment in ships, on-board testing of the equipment is to be performed.

1.1.2 Navigational equipment intended to be fitted on board are to be type approved.

1.2 Test program

1.2.1 A detailed program for the on board testing of this equipment is to submitted for approval.

1.2.2 Tests to be performed for each type of equipment are to be detailed and are to include the tests defined in this Section.

1.3 General requirements for the testing of all types of bridge equipment

1.3.1 Test procedure is to be in line with the specification and instructions given by the Manufacturer of the relevant equipment.

1.3.2 All equipment necessary to carry out the test are to be made available

1.3.3 Failure modes are to be tested on equipment and systems.

1.3.4 Power supply alarms, UPS capacity/ battery discharge test and bypass functionality are to be tested.

1.3.5 Starting the individual systems and changeover from normal conditions to failure conditions are to be tested

1.3.6 Failure conditions of computer system(s), especially power failure, are to be tested or simulated. Manual re-starts and, if relevant, automatic re-start and automatic back-up are to be tested.

1.3.7 If computer system(s) is used to carry out primary and secondary functions, the testing of this system is to be carried out with maximum load from both primary and secondary functions.

1.3.8 Additional tests may be required, at the discretion of the society.

2 Individual testing

2.1 Heading measuring and information system

2.1.1 The settle point error of the master compass(es) and the alignment with the ship's centre line are to be measured. Bearing of the quay at which the ship is berthed may be used as a reference

2.1.2 The bearing repeaters' alignment with the ship's centre line are to be checked. A bearing dioptre must be available.

2.1.3 The divergence between No. 1 master compass and the gyro repeaters is to be checked. After switching to No. 2 master compass, the divergence with the gyro repeaters is to be checked again.

2.1.4 The monitoring functions of the compass system are to be tested.

2.1.5 The means for correcting errors caused by speed and latitude are to be tested.

2.1.6 Verification of the Magnetic compass' error in contrast with the Gyro Compass bearing reference is to be carried out at port and at sea trials.

2.2 Steering system

2.2.1 Following functions are to be tested:

- take command functionality at different workstations
- steering mode selector(s) in all modes at all workstations
- manual steering devices
- joystick (if installed).

2.3 Automatic steering system

2.3.1 The heading-keeping/ track keeping performance of the heading / Track control system is to be tested at full sea speed. Adaptive heading / Track control system is to tested at reduced speed.

2.3.2 The performance of the heading / Track control is to be checked for a change in heading of 10° and 60° to both sides. The overshoot angle is to be determined.

2.3.3 The off heading alarm/ off track alarm is to be tested.

2.3.4 The rate-of-turn or radius function (if provided) is to be tested.

2.3.5 Change of operational steering mode is to be tested.

2.3.6 The override function is to be tested in all steering modes.

2.3.7 The low speed track control system is to be tested at speed for seismic operations (typically 2 to 5 knots).

2.4 Rudder indicator(s)

2.4.1 The rudder indicator(s) on the bridge is to be tested against the indicator on the rudderstock.

2.5 Speed log

2.5.1 The speed log is to be tested for accuracy and, if necessary, calibrated.

2.6 Echo sounder

2.6.1 Functions of the echo sounder are to be tested. Depth is to be measured at a fixed position for exact comparison of accuracy and at full speed ahead on all range scales available.

2.6.2 The depth warning or alarm is to be tested.

2.7 Radar system

2.7.1 Chart radar functionality of the radar is to tested, in particular reference position, orientation and scale. Official ENC data are to be loaded before testing.

2.7.2 The accuracy of bearing of the radars is to be tested by the reading of at least 4 fixed positions on the display at a known position of the ship.

2.7.3 The accuracy of range measurement is to be tested by measuring the distance to at least 2 fixed positions at each range while the ship is in a known position.

2.7.4 The heading marker is to be checked against a visible target dead ahead and adjusted if necessary.

2.7.5 Inter-switching facilities, including bypass function, are to be tested.

2.7.6 Target automatic acquisition is to be checked.

2.7.7 Performance monitors are to be checked.

2.7.8 Indication on the display of the bearing and distance to the object, as well as the heading of own ship, are to be tested.

2.7.9 Tests are to be carried out to verify that the system gives warning when the limits of CPA and TCPA are exceeded and that a warning is given when the object enters the guard ring.

2.7.10 Input from speed sensors is to be checked.

2.8 Sound reception system

2.8.1 The sound reception system is to be tested by measuring and comparing the sound level outside and inside the wheelhouse. The directional indication (if provided) is to be tested.

2.9 Electronic position-fixing systems

2.9.1 Functions of all electronic position-fixing fitted system are to be tested

2.9.2 The accuracy of the electronic position-fixing system is to be checked.

2.9.3 Interference from other transmitting is to be tested.

2.10 Automatic Identification System (AIS)

2.10.1 Interconnections and good working of the different elements is to be tested.

2.10.2 Information related to the ship (Ship Name, Call sign, MMSI number etc.) are to be verified.

2.11 Electronic Chart Display and Information System (ECDIS)

2.11.1 The accuracy, functionality, automatic functions and the alarm or warning functions of the ECDIS are to be tested.

2.11.2 Official ENC data to be loaded before testing.

2.11.3 Route planning, route monitoring, including alarms, are to be tested.

2.11.4 The ECDIS back-up system is to be tested for proper interconnection with the primary ECDIS.

2.12 Conning display

2.12.1 The performance of conning displays function is to be tested.

2.13 Propulsion system

2.13.1 Proper functioning of the propulsion system is to be tested.

2.14 Communication systems

2.14.1 The communication systems are to be tested for proper function, including the automatic telephone system, internal communication system between workstations, VHF, UHF.

2.14.2 The priority function for the telephones in the wheelhouse and engine control room over the other extensions is to be verified.

2.15 BAMS

2.15.1 The alarm announcement function of the central alarm system is to be tested for verifying correct alarm syntax, audibility level and acknowledgement function.

2.15.2 Connection to the central alarm of all equipment providing alarms is to be tested.

2.15.3 It shall be tested that the alert transfer of unacknowledged Category A alerts from the BAMS are transferred to the BNWAS for initiation of the BNWAS 2nd and 3rd stage alarms.

2.16 BNWAS

2.16.1 The functionality and time settings of the BNWAS shall be checked.

2.16.2 Transfer of second and third stage BNWAS alarms to the accommodation and the motion sensor(s) shall be tested.

2.17 CCTV system

2.17.1 The CCTV system (if provided) is to be tested for verifying appropriate reproduction on the indoor monitor, including colour correctness, brightness, dimming facilities.

2.17.2 Means for cleaning the camera lens are to be tested for cameras located in areas exposed to salt-mist.

2.18 Window clear view devices

2.18.1 The means for maintaining clear view through bridge windows are to be tested.