



RULES FOR
CLASSIFICATION OF

SHIPS

NEWBUILDINGS

SPECIAL EQUIPMENT AND SYSTEMS
ADDITIONAL CLASS

PART 6 CHAPTER 20

NAUTICAL SAFETY – OFFSHORE SERVICE VESSELS

JULY 2006

*This booklet includes the relevant amendments and corrections
shown in the July 2009 version of Pt.0 Ch.1 Sec.3.*

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INTRODUCTION

General

The Board approved this new chapter in June 2006.

The rules come into force on 1 July 2006.

This chapter is valid until superseded by a revised chapter.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

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

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SECTION 1 GENERAL

A. Objectives and Safety Philosophy

A 100 Objectives of rules

101 The objective of the rules for nautical safety is to reduce the risk of failure in bridge operation causing collision, contact and grounding, and heavy weather damage and in this context, include:

- requirements to specified bridge system elements
- relevant requirements and recommendations adopted by the International Maritime Organization (IMO)
- relevant international standards within the subjects of the rules or indicating the points in which they differ.

A 200 Safety philosophy

201 In order to achieve optimum safety and efficiency in bridge operation, the philosophy applied address the total bridge system. The total bridge system is considered to comprise four essential parts, see Fig.1:

- the technical system, which shall deduce and present information as well as enable the proper handling of the ship, including setting of course and speed
- the human operator, who shall evaluate available information, decide on the actions to be taken and execute the decisions
- the man and machine interface, which shall safeguard that the technical system is designed with due regard to human abilities
- the procedures, which shall ensure that the total bridge system performs satisfactorily under different operating conditions

- qualifications, capacity and quality of the human operator in relation to the functions to be carried out
- specification, automation level and condition of the technical system in relation to information needs, workloads and reliability
- physical abilities and information processing capacity of the human operator in relation to working conditions and the technical systems he shall operate
- tasks to be performed and technical aids available under various operating conditions as basis for establishing working routines and operating procedures.

With the exception of operator quality, the elements mentioned form the basis for the rules given.

203 The rules take into consideration that the modes of operation and the manning of the bridge will vary in accordance with the condition of internal technical systems and the availability of relevant external systems, and that operating conditions can be influenced by the waters to be navigated, traffic and weather conditions.

204 The rules aim at safeguarding that the officer of the watch, at his workstation, has full control of all the functions he is responsible for. Furthermore, that the bridge enables safe and efficient co-operation by two navigators when required.

Guidance note:

It should be noted that the manning of the navigational watch at all times shall be in accordance with the national regulations of the flag state and for the waters in which the ship is operating.

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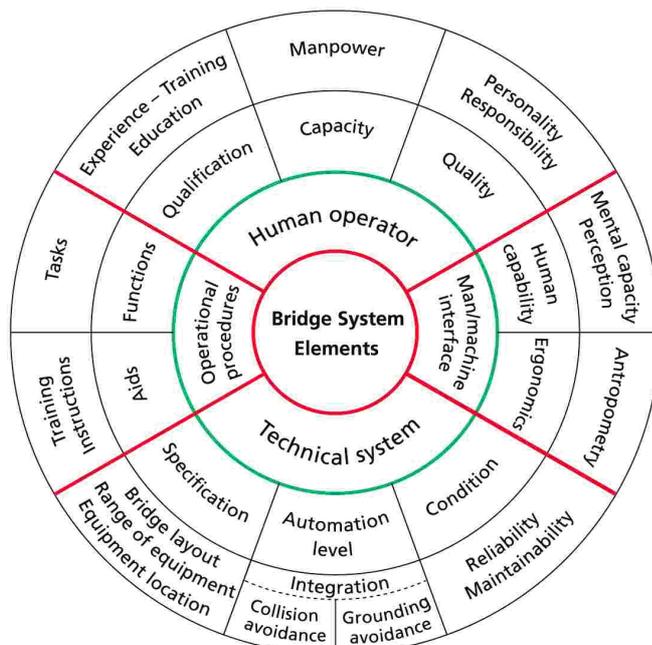


Fig. 1
The total bridge system

202 The various elements considered making up the main parts (see Fig.1) of the bridge system are:

B. Scope of the Rules

B 100 Scope of rules

101 The requirements given in each section address the elements of the bridge system affecting the safety of navigation as specified in A200, and regulate the following areas with the aim to reduce the probability of bridge system failure, see Fig.2:

- design of workplace, based on analyses of functions to be performed under various operating conditions and the technical aids 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 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 ensure that technical systems perform in accordance with their approved specifications before being relied upon and used in practical operation.

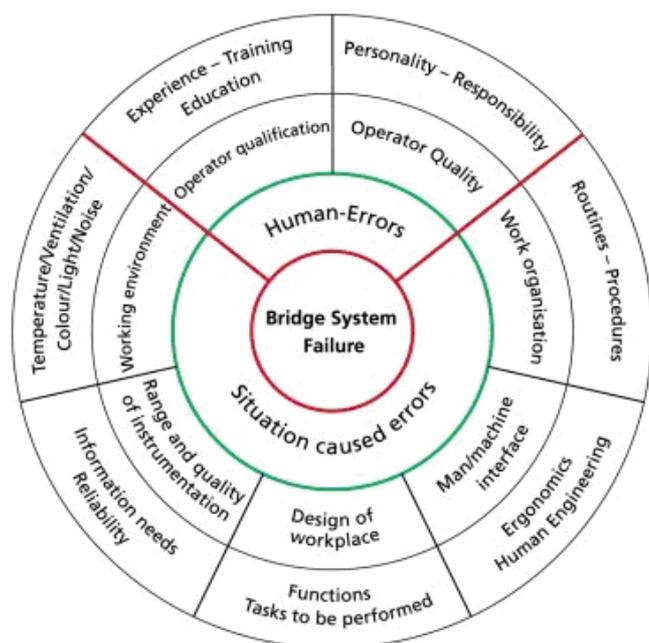


Fig. 2
Overview of bridge system areas affecting safe and efficient operations

B 200 Structure of the Rules

201 The rules are structured to:

- establish functional requirements to the greatest possible extent
- give guidance as to how functional requirements can be met by technical solutions or other remedies that safeguard the performance of the function.

202 A Guidance note gives solutions that can be approved, but does not exclude the application of alternative solutions provided the functional requirements are met.

203 Where rule requirement apply to vessels intended for specified operations such as AH, Tug, AHTS, Oilrec. and FiFi the Society will base the approval on the information given in the class request. For vessels designed and prepared for operations that are not visible from class request, such as Rescue, relevant Rules for such operations will be applied unless written confirmation received from yard and owner.

C. Definitions

C 100 Terms and abbreviations

101 *Abnormal operating conditions*: When internal technical system failures require operation of back-up systems on the bridge or when they occur during an irregular operating condition, or when the officer of the watch becomes unfit to perform his duties and has not yet been replaced by another qualified officer.

102 *Additional functions*: Additional functions requiring work tasks not directly related to primary bridge functions or offshore operations.

103 *AH*: Anchor handling.

104 *AHTS*: Anchor Handling, Tug Supply.

105 *Back-up navigator*: A navigational officer who has been designated by the ship's master to be on call to assist or replace the officer of the watch when required.

106 *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.

107 *BNWAS*: Bridge Navigational Watch Alarm System.

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

109 *Bridge wing*: The part of the bridge on each side of the wheelhouse, which extends to the ship's side.

110 *Bridge*: The area from which the navigation and control of the ship are exercised, comprising the wheelhouse and the bridge wings.

111 *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. Ships only designed for cargo operation is named Platform Supply Vessel.

112 *Catwalk*: Arrangement outside the wheelhouse allowing a person safe access to windows along the bulkhead(s).

113 *CCTV*: Closed Circuit Television.

114 *Coastal waters*: Waters that encompass navigation along a coast at a distance less than the equivalence of 30 minutes of sailing with the relevant ship speed. The other side of the course line allows freedom of course setting in any direction for a distance equivalent to at least 30 minutes of sailing with the relevant speed.

115 *Collision avoidance functions*: Detection and plotting of other ships and moving objects; determination and execution of course and speed deviations to avoid collision.

116 *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.

117 *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.

118 *Conning station or position*: 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.

119 *Control*: Either effectuate actions or have orders effectuated.

120 *Display*: An observable illustration of an image, scene or data on a screen.

121 *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).

122 *Docking*: Manoeuvring the ship alongside a berth and controlling the mooring operations.

123 *DP*: Dynamic Positioning.

124 *DPO*: Dynamic Positioning system Operator.

125 *Easily accessible*: Within 5 m distance from working position.

126 *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.

127 *Electronic chart display and information system (ECDIS)*: 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 car-

riage requirements of SOLAS Chapter V, as amended by Res. MSC.99(73), by displaying selected information from a system electronic nautical chart (SENC).

128 *Electronic nautical chart (ENC)*: The database, standardised as to content, structure and format, issued for use with ECDIS on the authority of government authorised hydrographic offices.

129 *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).

130 *Ergonomics*: Application of the human factors implication in the analysis and design of the workplace and equipment.

131 *External safety operations*: Assisting other in emergency situations.

132 *Field of vision (FOV)*: Angular size of a scene that can be observed from a position on the ship's bridge.

133 *FiFi*: Fire Fighting.

134 *Hand-grasp area*: For equipment/ control units continuously used. See Sec.3 E500 for specification of area

135 *Helmsman*: Person who steers the ship under way.

136 *Irregular operating conditions*: When external conditions cause excessive operator workloads.

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

138 *Monitoring*: Act of constantly checking information from instrument displays and environment in order to detect any irregularities.

139 *Narrow waters*: Waters that do not allow the freedom of course setting to any side of the course line for a distance equivalent to 30 minutes of sailing with the relevant ship speed.

140 *Navigation*: Planning of the ship's route and determination of position and course of the ship, execution of course alterations and speed changes.

141 *Navigational bridge*: The area of the bridge where transit operation is performed.

142 *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.

143 *Ocean areas*: Waters that encompass navigation beyond the outer limits of coastal waters. Ocean areas do not restrict the freedom of course setting in any direction for a distance equivalent to 30 minutes of sailing with the relevant ship speed.

144 *Officer of the watch (OOW)*: Person responsible for the safety of navigation and bridge operations until relieved by another qualified officer.

145 *Oilrec*: Oil recovery.

146 *On Hand*: For equipment/ control units used frequently or special important. See Sec.3 E500 for specification of area.

147 *Operational bridge*: The area of the bridge where workstations for offshore operations are located.

148 *Operational bridge functions*: Functions related to ship handling in relation to the operation the vessel 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.

149 *Popliteal height*: The vertical distance from the footrest to the underside of the thigh.

150 *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.

151 *PSV*: Platform Supply Vessel. A PSV is a vessel carrying out cargo operations.

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

153 *Rescue*: An operation where a defined vessel is, either bringing own personnel being in distress in the water to safety, or is assisting an offshore platform, barge, production module/ vessel or another ship in bringing their personnel being in distress in the water to safety.

154 *Route monitoring*: Continuous surveillance of the ship's sailing (position and course) in relation to a pre-planned route and the waters.

155 *Rudder angle*: Rudder angle mean thruster angle when main propulsion is azimuth thrusters.

156 *Route planning*: Pre-determination of course lines, radius turns and speed in relation to the waters to be navigated.

157 *Safety operation*: Handling of emergency and distress situations on board own ship or assisting other vessels and offshore installations in such situations.

158 *SAR*: Search And Rescue.

159 *Screen*: A device used for presenting visual information based on one or several displays.

160 *SOLAS*: The International Convention for the Safety of Life at Sea, 1974.

161 *Superstructure*: Decked structure, not including funnels, which is on or above the freeboard deck.

162 *System electronic navigational chart (SENC)*: 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.

163 *Towing operations*: An operation including one or more offshore service vessels capable to assist offshore platforms, barges and production modules/vessels in moving from one position to another, or in keeping their defined position.

164 *Tug*: Vessel with class notation **Tug**.

165 *Wheelhouse*: Enclosed area of the bridge.

166 *Wheel-over-line*: The line parallel to the new course line where the ship has to initiate a curved track to eliminate the effect of any offset with respect to the new course, taking into consideration the distance required for the ship to build up the necessary turn rate.

167 *Wheel-over-point*: The point where the ship has to initiate a curved track, taking into consideration the distance required for the ship to build up the necessary turn rate.

168 *Within easy reach:* For equipment/ control units used at the workstation. See Sec.3 E500 for specification of area.

169 *Within reach:* The distance the operator can reach and use a control unit. See Sec.3 E500 for specification of areas. For other workstations than workstations for offshore operations the area may be increased to:

- From a standing position at a console 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, which shall be within easy reach.

170 *Workstation (WS):* 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.

171 *Workstation for communication:* A work place for operation and control of equipment for distress and safety communication (GMDSS), and shipboard communication for ship operations.

172 *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.

173 *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.

D. Class Notations

D 100 General

101 In order to offer classification that meets the individual needs of ship owners, related to different types and trades of ships, the rules for nautical safety offshore service vessels are divided into two class notations, **NAUT-OSV(T)** and **NAUT-OSV(A)**.

102 The class notation **NAUT-OSV(T)** gives basic requirements within bridge design, instrumentation and location of equipment, and is primarily addressing vessels trading in tropical waters.

103 The class notation **NAUT-OSV(A)** extends the basic requirements for bridge design and instrumentation, and, in addition, requires further means for safe operation in all waters including areas with harsh operational and environmental conditions such as the North Sea.

D 200 Contents of class notations and extensions

201 The class notations **NAUT-OSV(T)** and **NAUT-OSV(A)** cover the following main areas:

- 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.

202 Requirements only applicable to the class notation **NAUT-OSV(T)** or to the class notation **NAUT-OSV(A)** are marked with “**NAUT-OSV(T)**” or “**NAUT-OSV(A)**”, respectively.

203 All other requirements apply to both **NAUT-OSV(T)** and **NAUT-OSV(A)**.

D 300 Documentation of compliance

301 The class notations **NAUT-OSV(T)** and **NAUT-OSV(A)** imply that the ship is built and equipped in compliance with the relevant sections of this chapter.

302 Ships satisfying the requirements for class notation **NAUT-OSV(T)** will have the following text entered in the "Appendix to the classification certificate":

- The class notation denotes that the bridge has been designed in accordance with established functional requirements and principles of ergonomics for reduced workload and improved operational conditions. Furthermore, that the bridge arrangement provides the information and equipment required for safe performance of the functions to be carried out at dedicated workstations. The extent of the class notation is addressing normal operation in other areas than the North Sea and similar harsh conditions.

303 Ships satisfying the requirements for class notation **NAUT-OSV(A)** will have the following text entered in the "Appendix to the classification certificate":

- The class notation denotes that the bridge has been designed in accordance with established functional requirements and principles of ergonomics for reduced workload and improved operational conditions in all waters including areas with harsh operational and environmental conditions such as the North Sea. Furthermore, that the bridge arrangement provides the information and equipment required for safe performance of the functions to be carried out at dedicated workstations.

D 400 Class assignment

401 The ship will be assigned class notation **NAUT-OSV(T)** or **NAUT-OSV(A)** when the relevant requirements given in these rules are complied with.

E. Documentation for Approval

E 100 The following documentation shall be submitted for approval

101 General arrangement drawing with description of the vessel, propulsion and thrusters configuration, all requested class notations and a list of the operations the vessel is intended for (Tow, SAR, FiFi, Cargo operations, AH, Safety operations, Rescue, Oilrec.)

102 A scaled drawing showing the bridge configuration and dimensions of the wheelhouse and bridge wings, entrances/doors, location of toilet, location of all workstations and stand-alone equipment within the wheelhouse and on the bridge wings.

103 Scaled drawing(s) showing the configuration of workstations/ consoles showing their dimensions and shape and the location of all instruments within the consoles including their user interface.

104 Drawing showing the arrangement of chairs related to the consoles including possibilities for adjustment both horizontally and vertically. Priority zones according to Sec.3 E500 shall be indicated for the workstations for offshore operations.

105 Drawing(s) showing the vertical and horizontal FOV seen from the operator's eye position at all required workstations. (FiFi monitor coverage area to be indicated if FiFi). All blind sectors seen from the operator's eye position to be shown (shaded).

106 Drawing(s) showing the dimensions and framing of win-

dows and details about the size and shape of division/stiffeners between windows and inclination of bridge windows.

107 Drawing(s) showing the arrangement of window wipers, fresh water wash, sunscreens and de-misting system (heating) on the bridge windows.

108 Drawing(s) showing the arrangement of lighting (red & white), ventilation and heating on the bridge.

109 List of all navigation and manoeuvring equipment with identification of manufacturer, type, model, type approval reference (if any), and safe inst. dist. to magnetic compass.

110 Technical documentation, as required to describe functionality required by the **NAUT-OSV** requirements going beyond the performance standards for the respective equipment, for navigation and communication equipment as follows:

- *Heading measuring systems*: Block diagram including power connection(s) and data interfaces with other equipment.
- *Steering control system and propulsion control system*: Block diagram including power connection(s) and data interfaces with other equipment. Functional description of operational controls including description of mode change and command location transfer and associated alarms and indications. Drawings/ pictures showing operational controls.
- *Heading control system (Autopilot)/ Track control system*: Block diagram including power connection(s) and data interfaces with other equipment.
- *Radar system*: Block diagram including power connection(s) and data interfaces with other equipment.
- *ECDIS and ECDIS back-up*: Block diagram including power connection(s) and data interfaces with other equipment. Functional description of the relation between the ECDIS, ECDIS back-up and Chart Radar including descriptions of route transfer, AIS/ radar target presentation, etc.
- *Conning Display system*: Block diagram including power connection(s) and data interfaces with other equipment. Drawings/ pictures showing the conning display(s).
- *Central Alarm system*: Block diagram including power connection(s) and data interfaces with other equipment.

Drawings/ pictures showing the central alarm panel display(s).

- *Communication systems*: Block diagram including power connection(s) and data interfaces with other equipment.
- *Watch monitoring and Alarm transfer system*: Block diagram including power connection(s) and data interfaces with other equipment.
- *CCTV system*: Block diagram including power connection(s). Functional description of operational controls. Drawings/ pictures showing operational controls.

111 List of all equipment on the bridge provided with audible alarm and description of interfacing for external silencing of the audible sound at both sources.

112 Drawing showing the antenna arrangement including satellite communication systems, radars, VHF's, AIS, GPS, television and other installed antennas.

113 A test program in compliance with the requirements for on-board testing given in Sec.6.

F. Documentation for Information

F 100 The following documentation shall be submitted for information

101 Operational and technical manuals for the equipment serving primary bridge functions shall be submitted for information when requested.

G. Functional Tests

G 100 The following tests shall be carried out

101 Tests, which give evidence of the satisfactory operation of instruments and integrated navigation and control systems in accordance with the rules, shall be carried out. Failure modes shall be tested as realistically as possible. The tests shall be based on test programmes approved by the Society, see E113.

SECTION 2 BRIDGE DESIGN AND CONFIGURATION

A. General

A 100 Bridge operations

101 Based on the variety of missions offshore service vessels (OSV) carry out, different operations will be performed from the navigational and the operational bridge. Some operations may be performed from both the operational and the navigational bridge depending on the character of the operation.

Guidance note:

The basis for these rules is the traditional offshore service vessel with the deck aft of the vessel superstructure and rule wording reflect this. Other vessel designs are possible and will be considered to meet these rules when the functional requirements are met.

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102 Performance of the following operations shall, as applicable, be facilitated from the navigational bridge:

- transit
- docking operations
- towing operations
- search operations
- fire fighting (FiFi).

103 Performance of the following operations shall, as applicable, be facilitated from the operational bridge:

- docking operations
- cargo operations
- anchor handling
- towing operations
- safety operations
- rescue operations
- oil recovery (Oilrec)
- fire fighting (FiFi).

B. Workstations

B 100 Navigational bridge

101 The design and location of the workstations shall enable the ship to be navigated and manoeuvred safely and efficiently by one navigator in ocean areas and coastal waters under normal operating conditions, as well as by two navigators in close co-operation when the workload exceeds the capacity of one person, and when under pilotage.

102 The following workstations for primary bridge functions shall be arranged at the navigational bridge as a minimum to achieve safe and efficient operation under all conditions:

- workstation for navigation
- workstation for navigation support
- workstation for route planning
- workstation for docking operations.

Guidance note:

Workstation for route planning may be combined with workstation for navigation support or workstation for navigation.

Workstation for docking operations may be part of workstation for rescue or workstation for navigation and/ or workstation for ship handling.

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B 200 Operational bridge

201 In addition to normal bridge functions carried out on a conventional ship in connection with watch duty on the bridge, arrangement for several other functions will have to be taken into consideration on an offshore service vessel serving in multi-roles. These functions are normally carried out from the operational part of the bridge on an offshore service vessel. Separate workstations are required in order to facilitate these functions.

202 The design and location of the workstations shall 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.

203 The configuration of the workstations shall 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.

204 To allow operations either by one operator alone or by two operators in close co-operation, the following workstations are required at the operational bridge:

- workstation for ship handling
- workstation for aft support.

B 300 Additional workstations

301 When functions additional to the primary functions and functions related to cargo operation shall be performed, workstations shall be arranged for these.

Such workstations may include:

- workstation for rescue operations
- workstation for fire fighting
- workstation for safety monitoring and emergency operations
- workstation for communication.

Guidance note:

Workstation for safety monitoring and emergency operations may be combined with workstation for communication. Workstation for FiFi may be mobile or located in several different places.

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B 400 Required workstations for different types of vessels

401 Based upon the operations the vessel is designed to perform, according to Sec.1 E102, the following workstations shall be provided:

Table B1 Workstations			
<i>Workstation for:</i>	<i>All</i>	<i>Rescue</i>	<i>FiFi</i>
Navigation	X		
Navigation support	X		
Route planning	X*		
Docking	X*		
Ship handling	X		
Aft support	X		
Rescue		X	
Fire fighting			X
Communication	X**		
Safety	X		
* The workstations for route planning and docking may be combined with other workstations.			
** When GMDSS station is located in wheelhouse			

Guidance note:

Requirement for workstations Fire Fighting and Rescue will be based upon the information required in Sec.1 E101.

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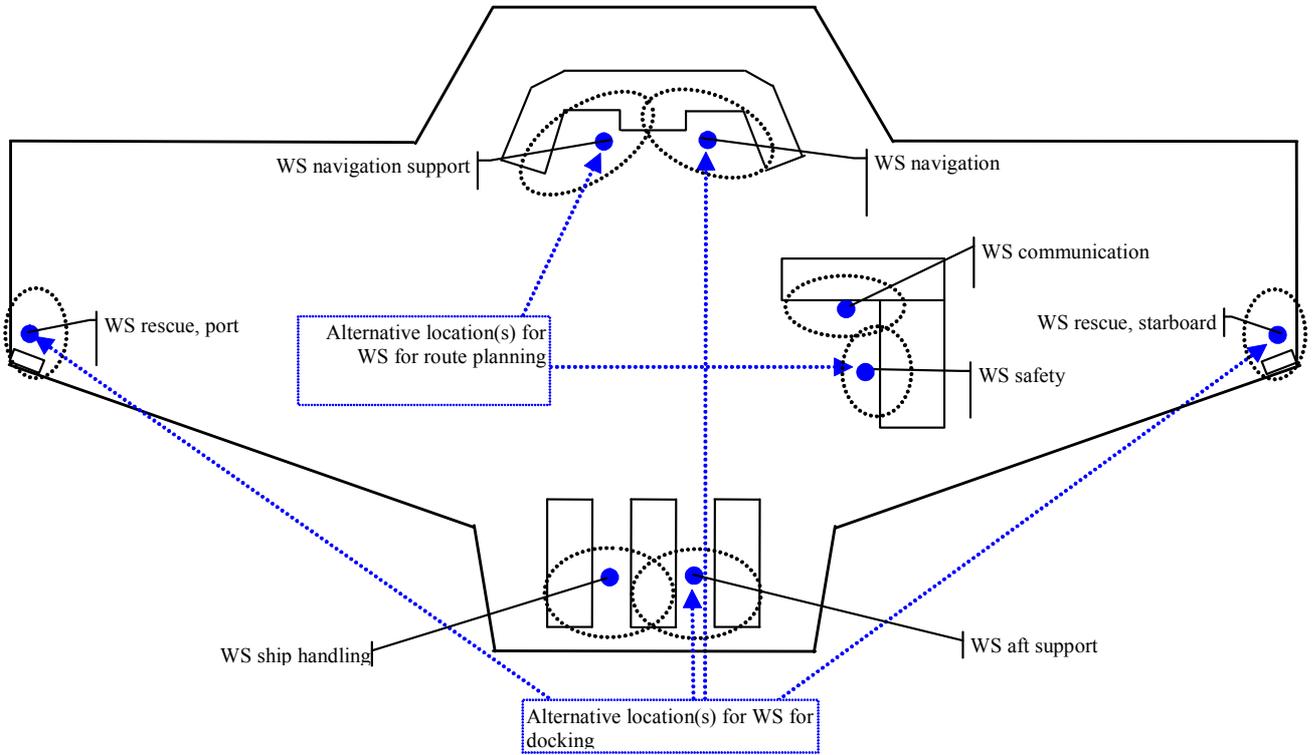


Fig. 1
Example of bridge configuration and arrangement of workstations

C. Visibility

C 100 General

101 The bridge shall be planned with the aim to optimise its location and layout to achieve continuous access to visual in-

formation from outside the wheelhouse and easy co-operation between bridge personnel, promoting effective and safe bridge resource management. Particular attention shall be given to optimising the view of the working deck, location of funnel(s), location of workstations and field of vision from workstations.

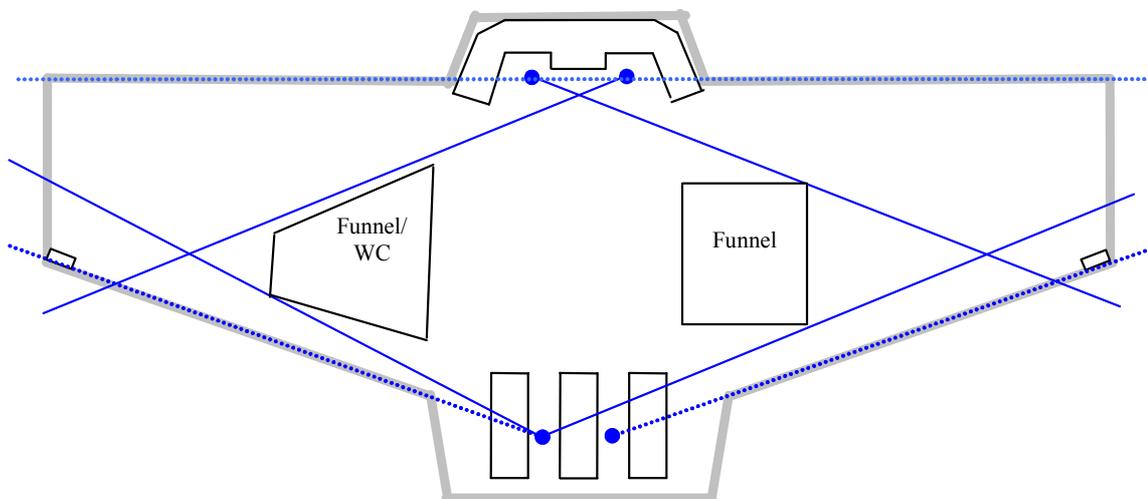


Fig. 2
Example of a bridge configuration and possible location of workstations

C 200 Window arrangement

201 Field of vision shall be optimized from each workstation. Bulkheads and window divisions shall as far as possible be arranged in one line seen from relevant workstations. Priority shall be given to the workstations for navigation and ship handling.

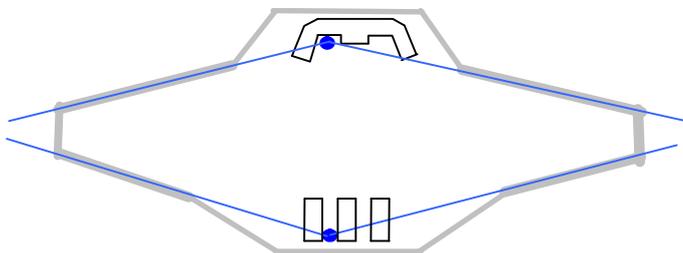


Fig. 3
Bridge bulkheads aligned with line of sight from workplaces to minimise blind sectors

See also examples Fig.1 and 2

C 300 Windows

301 Internal light sources shall not cause glare in bridge windows or affect the view required for safe performance of bridge operations. To help avoid reflection (glare) from lights in wheelhouse consoles, all bridge windows shall, as far as practicable, be inclined from the vertical plane top out, at an angle of not less than 15° and not more than 25°.

302 Windows shall be as wide as possible and not less than 1 200 mm wide at a height of 1 600 mm above the wheelhouse deck within the required field of vision from the workstations for navigation and navigation support. Windows shall not be less than 1 000 mm wide at a height of 1 600 mm above the wheelhouse deck within the required field of vision from other workstations.

Guidance note:

The width of the windows directly forward of the centre consoles may be less than 1200 mm in order to avoid that those window divisions/ stiffeners are located in front of any workstations.

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303 Windows within any required field of vision area shall in general have a minimum height of 2 000 mm above the wheelhouse deck and the lower edge shall be maximum 1 000 mm above the wheelhouse deck. See also Sec.3 C200 and Sec.3 F200 for additional requirements depending of workstation arrangement.

C 400 Blind sectors

401 Blind sectors caused by cargo, cargo gear, divisions between windows and other obstructions appearing in the required field of vision, shall 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.

Guidance note:

See Sec.3 C200, Sec.3 D200, Sec.3 F200 and Sec.3 G200 for details for the different workstations.

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402 The front/ aft bulkhead of bridge wings shall be aligned with the line of sight from the relevant workstations in order to avoid excessive blind sectors. See Fig 1, 2 and 3.

403 Divisions and stiffeners between windows shall be kept to a minimum and not be placed immediately in front of any workstation, for example chairs at workstations.

404 The width of divisions between windows, especially within the required field of vision, shall, as far as practicable, not exceed 150 mm. If stiffeners are used, the width between

window glasses shall, as far as practicable, not exceed 100 mm and the depth of the stiffeners shall, as far as practicable, be less than 120 mm. If stiffeners between windows shall be covered, this shall not cause further obstruction of the field of vision from any position inside the wheelhouse.

405 Horizontal divisions between windows shall be avoided in required field of vision sectors.

C 500 Clear view through windows

501 NAUT-OSV(T): A clear view through at least two of the navigation bridge front windows and, depending on the bridge configuration, an additional number of clear-view windows shall be provided at all times, regardless of weather conditions. Additionally, a clear view through at least two of the windows aft of the workstations for ship handling and aft support and, depending on the bridge configuration, an additional number of clear-view windows shall be provided.

Guidance note:

Window wipers and de-misting should be installed forward of the workstations for navigation and navigation support and aft of the workstations for ship handling and aft support. If easy access to the windows provided with window wipers and de-misting is hampered, e.g. by consoles located against the bulkhead, additional windows should be provided with window wipers and de-misting.

Sunscreens of roller blind type should be installed on windows within the field of vision required from the workstations for navigation, navigation support, ship handling, aft support, FiFi and rescue.

It should be noted that sunscreens might also be required for other windows to prevent direct sunlight from obscuring information on monitor screens and displays.

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502 NAUT-OSV(A): A clear view through bridge windows within the field of vision required from the workstations for primary bridge functions, offshore operations, rescue and FiFi shall be provided at all times regardless of weather conditions. The following installations are required:

- sunscreens of roller blind type to ensure clear view in bright sunshine
- heavy duty wipers and fresh water window washing system to ensure a clear view in rain and stormy seas
- efficient de-icing and de-misting systems to ensure a clear view in all operating conditions. Heated glass panels shall be used on board ships to be assigned class notation for navigation in ice
- above systems installed shall comply with appropriate ISO standards.

Guidance note:

It should be noted that sunscreens might also be required for other windows to prevent direct sunlight from obscuring information on monitor screens and displays.

The window wipers should comply with ISO 17899 and be capable of wiping the window centre at a frequency of 0.5 Hz. The window wipers should, as far as practicable, cover 85%, in both vertical and horizontal direction, of the window area necessary to meet the field of vision requirements. (e.g. window size: 200 cm x 120 cm - minimum wiped area: 170 cm x 102 cm).

Reference is also made to ISO 8863 and ISO 3434 for specifications for de-icing/de-misting by hot air and heated glass panes respectively.

Class notations for navigation in ice includes **ICE**, **POLAR**, **DEICE** and **WINTERISED**. Window panes for vessels with DEICE notation will need a power loading of 12 to 15 W/dm² in accordance with ISO 3434. Window panes for vessels with class notation **WINTERISED** shall meet the appropriate power loading in ISO 3434 in accordance with the design temperature.

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503 A fixed catwalk or similar arrangement with means to prevent an accidental fall shall be fitted at the windows without adjacent deck to enable cleaning of windows and repair work in the event of failure of the cleaning systems.

D. Working Environment

D 100 General

101 Throughout the various design stages of the ship, care shall be taken to achieve an optimal working environment for bridge personnel.

102 Toilet facilities shall be provided on or adjacent to the bridge.

103 Refreshment facilities and other amenities provided for the bridge personnel shall include means for preventing damage to bridge equipment and injury to personnel resulting from the use of such facilities and amenities.

D 200 Deckhead height

201 The clear deckhead height in the wheelhouse shall 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 shall be provided:

- clear deckhead height between the wheelhouse flooring and the deckhead shall be at least 2 250 mm
- the lower edge of deckhead mounted equipment in open areas and passageways, as well as the upper edge of door openings to open deck areas, shall be at least 2 100 mm above the deck
- the lower edge of entrances and doors to the wheelhouse from adjacent passageways shall not be less than 2 000 mm
- the lower edge of deckhead mounted equipment shall not degrade the vertical field of vision in the required horizontal sector.

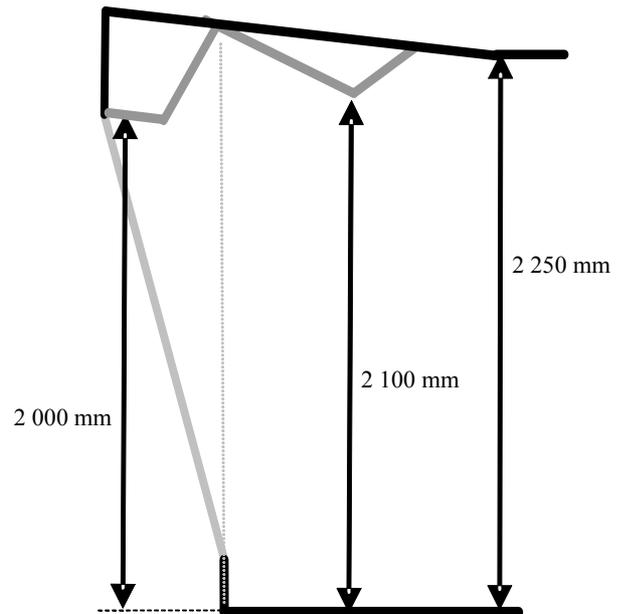


Fig. 4
Deckhead height

202 It shall be possible to secure doors to open deck areas in the open position, and it shall be possible to open doors with one hand.

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

D 300 Passageways

301 There shall be a clear route between the fore and aft bridge. The width of the passageway shall be 1 200 mm and not less than 700 mm at any single point of obstruction.

302 There shall be no obstructions between the points of entry to the bridge from lower decks and the clear route referred to above. This passageway shall be at least 700 mm wide.

303 There shall be a clear route from the workstation(s) for rescue operations to the clear route between the fore and aft bridge defined above. The width of this passageway shall be 1 200 mm and not less than 700 mm at any single point of obstruction.

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

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

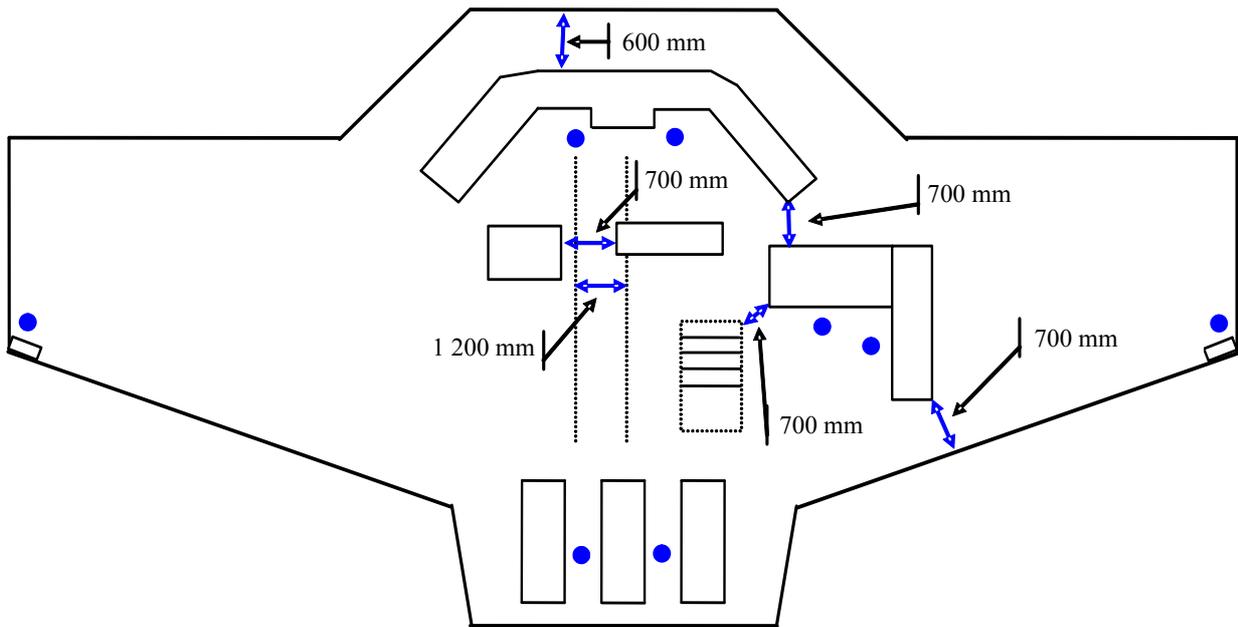


Fig. 5
Passageways between workstations

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

307 If the entries to workstations are between the bridge bulkhead and the workstation consoles, their width shall not be less than 300 mm at deck level and 600 mm at 1 000 mm above deck level.

308 Direct access shall be provided for each individual workstation.

402 The bridge deck shall be free of trip hazards such as curled up carpet edges, loose gratings or equipment. See also Sec.3 A503.

403 NAUT-OSV(A): The bridge deck covering shall be of anti-slip type.

404 Means shall be provided for properly securing portable equipment.

405 Hand or grab rails shall be fitted to enable personnel to move or stand safely in bad weather. Protection of stairway openings shall be given special consideration.

406 All safety equipment on the bridge shall be clearly marked and easily accessible and have its stowage position clearly indicated.

D 500 Vibration and noise

501 Uncomfortable levels of noise, or noise which may affect safe and efficient bridge operation, shall not occur in the bridge area.

Guidance note:

Bridge equipment

The noise level for the workplace should not exceed 65 dB(A) in good weather, with workplace instruments in operation.

Noise from ventilation and air intake fans and other noise sources should be excluded from the workplace by suitable siting of the fans and associated trunking.

The vessel's sirens or whistles should be placed as high as practicable and, if possible, forward of any workplace, so that the noise level does not exceed 100 dB(A).

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502 The noise level produced by individual bridge equipment shall not exceed 60 dB(A)/1m.

503 Uncomfortable levels of vibration causing both short and long term effects shall be avoided in the bridge area.

Guidance note:

The workplace should ideally be sited clear of the nodes and antinodes of the fundamental mode of vertical hull vibration in order to avoid longitudinal and vertical vibration.

The fundamental frequency of vibration of the superstructure

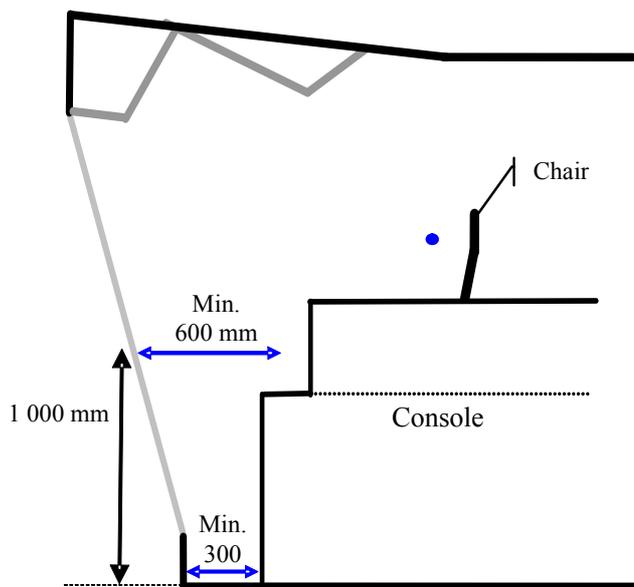


Fig. 6
Passageway between console and aft windows

D 400 Safety of personnel

401 The bridge area shall be free of physical hazards to bridge personnel. There shall be no sharp edges or protuberances that could cause injury to personnel.

block should not be close to the propeller blade frequency or its harmonics at service speed.

Table D1 lists the vibration ranges which should be avoided.

Table D1 Vibration ranges	
Range	Effect
0.1 to 0.5 Hz	Motion sickness, particularly around 0.25 Hz
1.5 to 30 Hz	Vision blur, particularly 10 to 25 Hz
10-20 Hz	Involuntary increase in muscle tone, leading to difficulty in controlling posture and movement
Sum: 0 to 30 Hz major source of problems	Magnitude of effects depends upon vibration amplitude

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D 600 Temperature and ventilation

601 NAUT-OSV(T): The wheelhouse shall be equipped with an adequate temperature control system. The temperature in the wheelhouse shall be according to COMF-C(3) as a minimum. External temperature range to be according to the ship design condition, but as a minimum from 10°C to 35°C at a relative humidity of 70%.

602 NAUT-OSV(A): The wheelhouse shall be equipped with an adequate temperature control system. The temperature in the wheelhouse shall be according to COMF-C(3) as a minimum. External temperature range to be according to the ship design condition, but as a minimum from -20°C to 35°C at a relative humidity of 70%.

603 The wheelhouse ventilation system shall comply with appropriate ISO standards.

Guidance note:

The ventilation system should comply with ISO 8864 and be capable of supplying fresh air to at least 10 persons with fresh air supply of 0.008 m³/s per person.

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604 Control of temperature and ventilation system shall be possible from bridge or adjacent locations.

D 700 Light arrangement on bridge and on deck

701 An adequate level of lighting facilitating the performance of all bridge tasks at sea and in port, daytime and night

time, shall be provided. Workstation areas shall have a greater luminance than the ambient lighting level.

702 Care shall be taken to avoid glare and stray image reflections on windows and deckhead surfaces. High brightness contrast between work areas and surroundings shall be avoided. Non-reflective or matt surfaces shall be used to reduce indirect glare to a minimum. Lighting arrangements above workstations shall be arranged with dimmable narrow beam light fixtures with a minimum of horizontal stray light.

Guidance note:

Bright colours should not be used. Dark or mid green colours are recommended, alternatively, blue or brown may be used.

Indication of reflection range for some typical colour densities:

Table D2 Reflectance range	
Reflectance range	Typical colour densities
5% to 10%	Dark Green or Blue or Brown
15% to 30%	Mid Green or Blue or Red
50% to 60%	Pale Green or Blue or Yellow
80% to 90%	Off White or Pale Yellow

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703 The bridge surface finishes shall have a matt coating and colours with low reflection range in order to reduce the reflections and indirect glare to a minimum. Deckhead areas above workstations, bulkheads at window heights and consoles are of special importance.

704 A satisfactory degree of flexibility within the lighting system shall enable the bridge personnel to adjust lighting intensity and direction as required in the different areas of the bridge and at individual instruments and controls.

705 During hours of darkness, it shall be possible to discern control devices and read displayed information.

706 Adequate lighting shall be provided in order to allow monitoring of deck both daytime and night time.

707 It shall be avoided that glaring lights from deck lights and searchlights are dazzling the operator at the workstations.

708 Toilet shall be provided with red light for use during night and white light for day time. Alternatively can white dimmable light be used provided that dimming switch is located outside of toilet.

SECTION 3 WORKSTATION ARRANGEMENT

A. Requirements for the Various Workstations

A 100 General

101 This section gives the functional requirements for the various workstations and defines the tasks to be carried out at each workstation. Minimum field of vision, required equipment and information necessary for safe performance of the tasks are given for each workstation as relevant.

A 200 General workstation requirements

201 Workstations and consoles shall be arranged and ergonomically designed to optimise the user's working conditions and to minimise excessive or unnecessary work.

202 A functional workstation designed in accordance with the established overall operational and ergonomic requirements for safe operation must provide:

- a sufficient area for performance of the tasks to be carried out by the number of people that may be required to attend
- providing individual workplaces in accordance with the distribution of tasks at maximum bridge manning
- consoles designed for operations at specific workplaces in standing and/ or seated position
- enabling installation of equipment to be within reach from the working position
- avoiding obstruction of the view through bridge windows from operators position
- chairs, if installed, designed in accordance with ergonomic requirements for efficient use of the equipment installed in workstation consoles and adjustable for maintenance of the required fields of vision.

A 300 General workstation consoles requirements

301 In principle, consoles shall be divided into two 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

302 The height of desktops to be used from sitting positions only shall not be less than 750 mm.

303 The height of desktops to be used from sitting and standing positions shall not be less than 800 mm.

304 The general height of consoles forming a workstation for radio communication or other additional tasks that are to be used by the officer shall not 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 (i.e. printers) installed on top of console, shall not exceed 1 300 mm.

A 400 General overhead consoles requirements

401 Consoles installed in ceiling shall not obstruct required vertical field of vision from the workstations seen from an operator with eye height of 1 800 mm. See Fig.1.

Guidance note:

Eye height of 1 800 mm for calculation purposes in order to secure that the lower edge of overhead consoles not conflict with the field of vision for operators with above average height.

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402 Overhead consoles shall primarily be used for indicators and information displays. Consoles with pertinent and important information shall be located within the easily readable field of vision for the operator.

403 If it is necessary with overhead consoles for the mounting of equipment to be operated frequently, these shall be located 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.

Guidance note:

Within reach in this content mean a radius of 800 mm from eye position 1 600 mm above deck.

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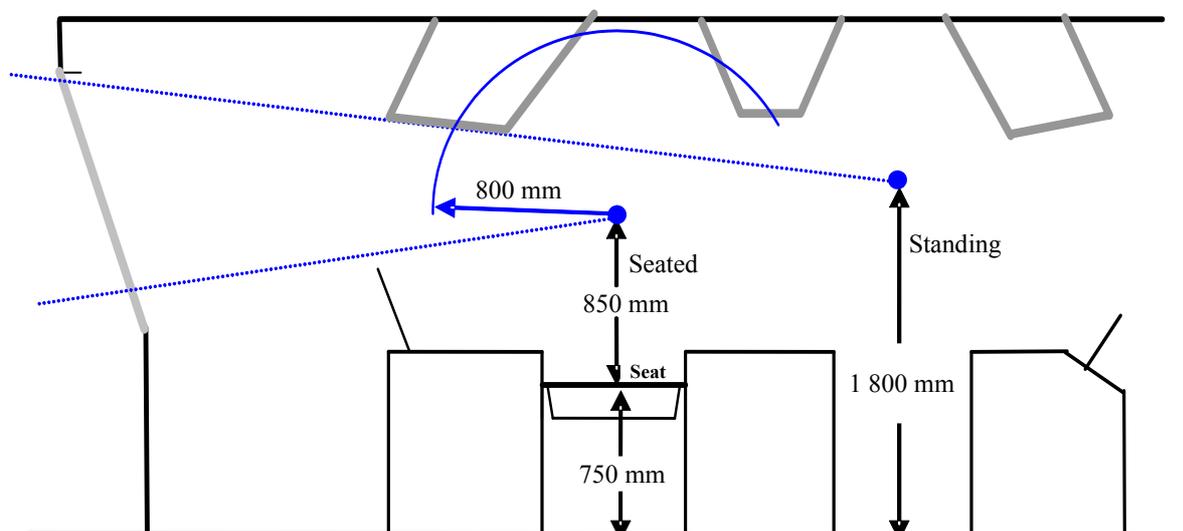


Fig. 1
Overhead consoles abeam

404 The overhead consoles shall be tilted to suit the line of sight from the working position.

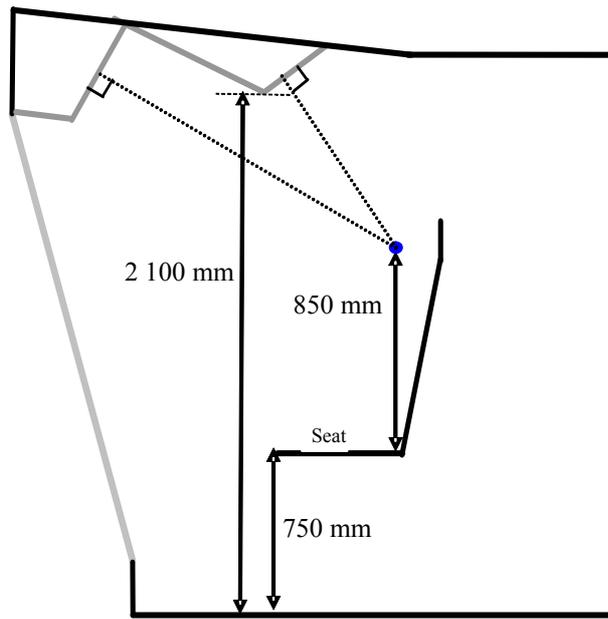


Fig. 2
Overhead consoles aft

A 500 General chair requirements

501 Chairs shall be installed at the workstations for navigation, navigation support, ship handling and aft support.

Guidance note:

See also B400 and E400.

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502 It shall be easy to enter and leave the chairs in any position.

503 Deck rails for backward/forward adjustments of the chairs shall be installed flush with the deck surface or with anti-trip skirting board if installed in a passageway area.

504 Backrest inclination shall be within the interval of 102° and 108°.

505 Chair foot-rest shall be provided.

Guidance note:

The chair foot-rest height shall be adjustable according to a popliteal (relating to the area behind the knee joint) height in the interval of 380 mm to 580 mm.

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B. Workstations for Primary Bridge Functions

B 100 Principle

101 The design and location of the workstation for navigation and the workstation for navigation support shall enable

safe and efficient traffic surveillance, navigation and manoeuvring of the vessel under all circumstances. The configuration of the workstations shall facilitate performance by one navigator under normal operating conditions, as well as by two navigators in close co-operation when the workload exceeds the capacity of one person.

102 Workstation for navigation shall facilitate all functions related to traffic surveillance, navigation and manoeuvring during normal operating conditions.

103 The workstation for navigation support shall facilitate navigation functions during periods with high workload, during degraded functionality at the workstation for navigation or work as a pilot's workstation when under pilotage.

B 200 Layout for workstations for primary bridge functions

201 The workstations for primary bridge functions shall have working positions for navigation, manoeuvring and traffic surveillance as close together as possible for efficient use by the officer of the watch, but also enabling the tasks to be performed by two navigators in close co-operation. The working position for operating the radar with collision avoidance functions shall be regarded as the main working position at these workstations and shall be within reach from a seated position.

202 Controls for heading and speed adjustments shall be located within reach from working position at workstation for navigation to enable collision avoidance manoeuvres without losing view of the traffic, and ECDIS for position-fixing and route monitoring shall be readily available.

203 Manoeuvring functions from seated position are related to heading and speed adjustments for collision and grounding avoidance. Manoeuvring also requiring the use of thrusters may be carried out in standing position at the workstation.

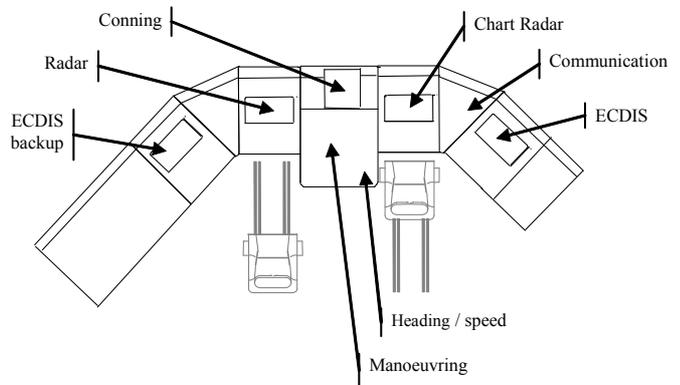


Fig. 3
Principle location of main equipment in relation to seated and standing working positions

204 Direct easy access to windows in front of the workstations may be provided by arranging a passageway in front of the consoles, or, if the workstations are installed close to the front bulkhead, by providing direct entry between two consoles at the forward part of the workstation.

Guidance note:

Access to front windows may be provided from the workstation for navigation support. See Fig.4

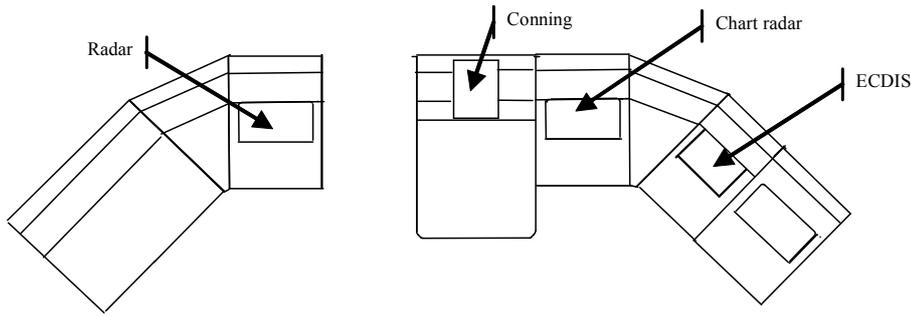


Fig. 4
Access to front windows from the workstation for navigation support

Access to front windows may be provided from the workstation for navigation between the centre console and a chart radar provided the conning information display is readable from the work-

ing position (at the chart radar) and controls for heading and speed adjustments are located within reach. See Fig.5

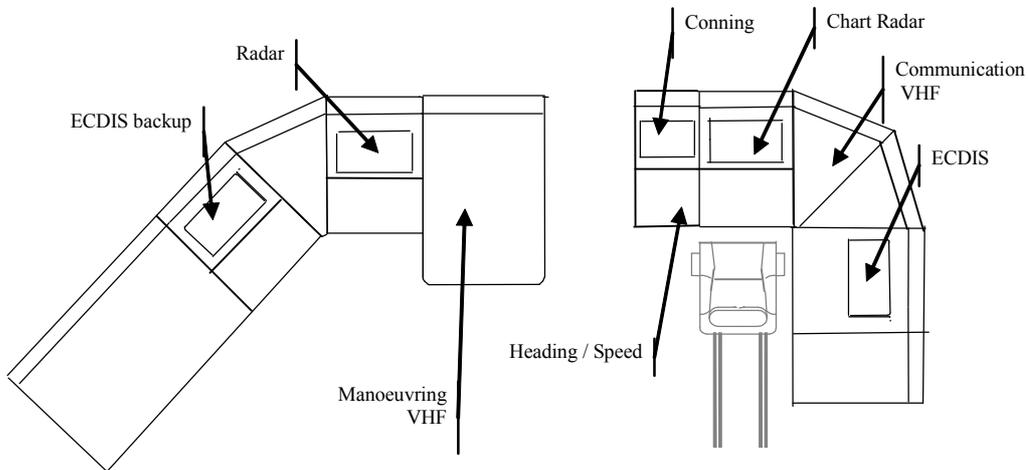


Fig. 5
Entrance to front windows may be provided from the workstation for navigation

Access to front windows may also be provided from the WS for navigation between the radar and ECDIS if readability and control of chart information can be maintained from seated position. This may be achieved when the radar is provided with chart facilities. Alternatively, remote control facilities for operation of

ECDIS may be used, provided the chart information is easily readable from seated position. Another alternative may be to locate ECDIS in the centre console and the conning display above front windows if monitor screens are readable from seated position. See Fig.6.

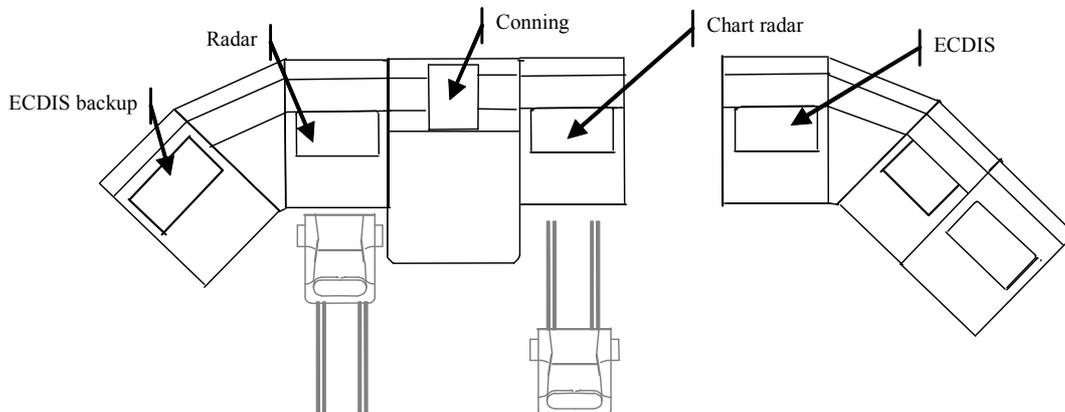


Fig. 6
Access to front windows from workstation for navigation, between chart radar and ECDIS

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B 300 Workstation consoles for primary functions

301 An operator is considered to have an eye height of 1 600 mm. In order not to obstruct the line of sight from a position of 350 mm behind a console of average depth and any passage-way in front of consoles, giving a total horizontal distance of maximum 2 300 mm between the operator and the steel bulk-head, the console height, including foundation, shall not exceed 1 200 mm. See Fig.7.

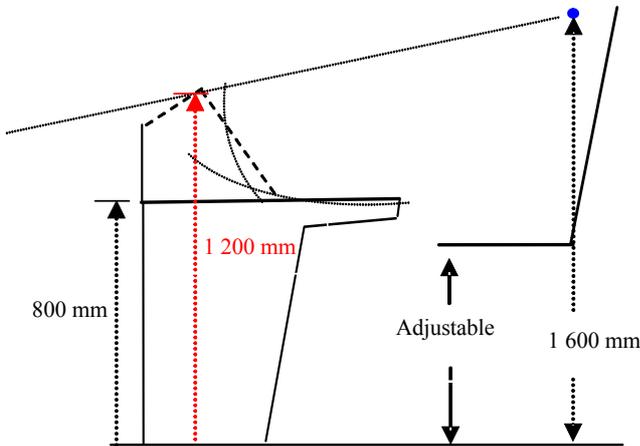


Fig. 7
Consoles in front of a seated working position should provide sufficient leg room, thereby extending the reaching distance from sitting position.

302 The height of console desktops at bridge workstations shall enable easy use of equipment required for safe performance of the tasks to be performed from sitting position. The console height shall not obstruct the required field of vision.

303 A standard console height of 1 200 mm is acceptable even if the top of the console interferes with the line of sight from a sitting eye height of 1 600 mm.

B 400 Chairs at workstations for primary functions

401 Chairs shall be installed at the workstation for navigation support and at the workstation for navigation, and it shall be easy to adjust the vertical position of the chairs to suit an eye height of 1 600 mm.

Guidance note:

The vertical adjustment of the seat rest should range from 600 mm to 850 mm above the deck surface.

See also A500

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402 It shall be possible to move the chairs for easy reach of the equipment to be used and to move the chairs away from the consoles to achieve good working conditions from a standing position.

Guidance note:

It should be possible to adjust chairs to a position close to the front console (distance from chair back-rest to console front should be not more than 550 mm) and away from the workstation area to facilitate a passage of 600 mm between chair front and working area including operator.

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C. Workstation for Navigation

C 100 Workstation tasks

101 The workstation for navigation shall enable the following tasks to be performed:

- determine and plot the ship's position, heading, track and speed
- monitor the traffic by sight and hearing as well as by all available means
- analyse the traffic situation
- decide on collision avoidance manoeuvres
- alter heading
- change speed
- carry out a change of operational steering mode
- effect internal and external communication related to manoeuvring
- handle other external communication available on the bridge
- operate docking aid systems
- monitor time, heading, speed, track, propeller revolutions, thrust indicator (when available), pitch indicator (if the ship is equipped with pitch propeller), rudder order and rudder angle
- monitor all alarm conditions on the bridge.

C 200 Field of vision

201 In order to enable the officer of the watch to carry out his functions in compliance with the international regulations for preventing collisions at sea, the horizontal field of vision from the working position at the workstation for navigation support and from the seated position at the workstation for navigation shall 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.

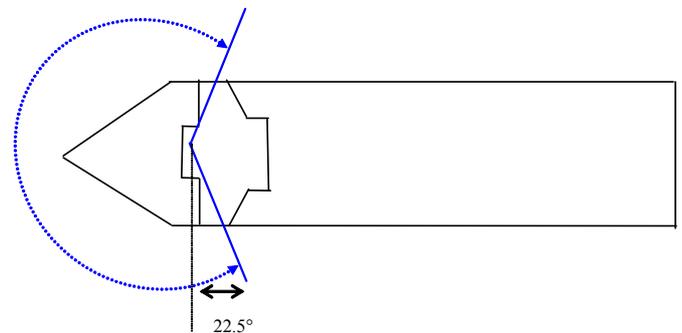


Fig. 8
Horizontal field of vision

202 A horizontal field of vision to the horizon of 360° shall be obtained by using not more than 2 positions inside the wheelhouse on either side of the workstation for navigation, being not more than 15 m apart.

203 In order to be able to perform manoeuvres timely to avoid critical situations, the view of the sea surface from the workstation for navigation, using an eye height of 1 600 mm above deck, shall not 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.

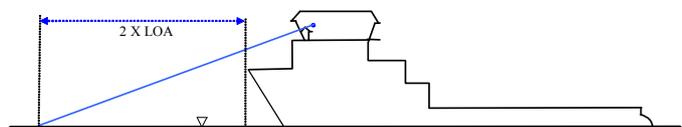


Fig. 9
Vertical field of vision forward of the bow

204 When the distance between the windows and the viewing point 350 mm aft of the consoles at the workstations for navigation support and navigation is more than 2 300 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 1 600 mm above deck.

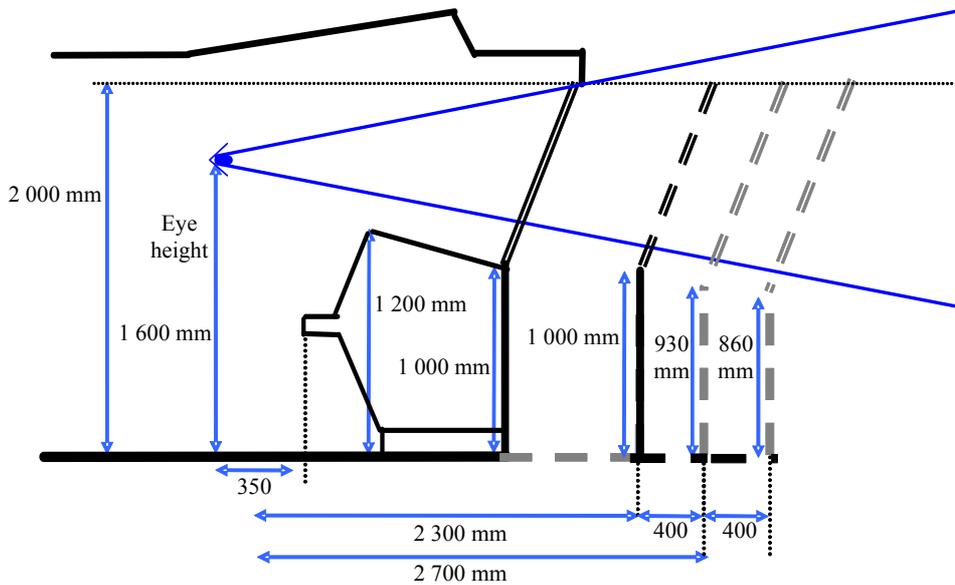


Fig. 10
Vertical field of vision over consoles

205 Blind sectors caused by cargo, cargo gear, divisions between windows and other obstructions appearing in the required field of vision of 225° shall be as few and as small as

possible, and in no way hamper a safe lookout from the workstation for navigation. The total arc of blind sectors within this field of vision shall not exceed 30°.

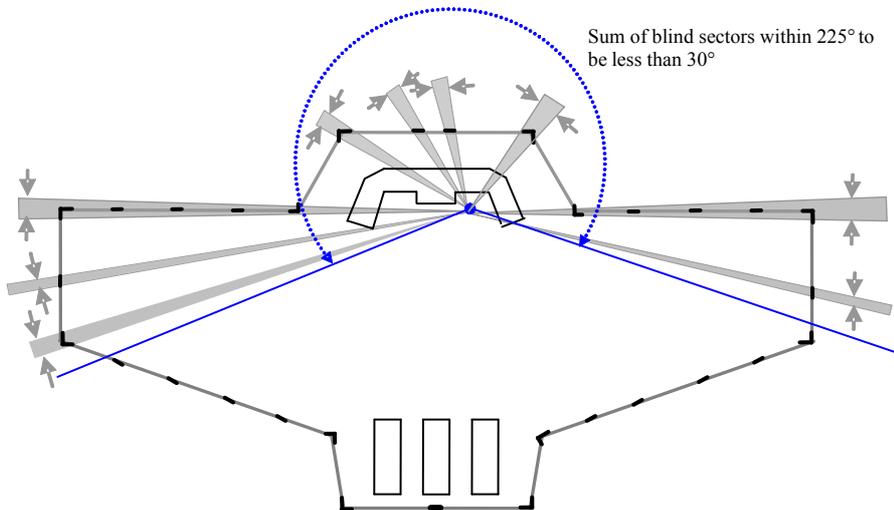


Fig. 11
Blind sectors seen from workstation for navigation

206 Over an arc from dead ahead to at least 10° on each side of the bow, seen from the workstation for navigation, no blind sector shall exceed 5°. Elsewhere, each individual blind sector within the required field of vision shall not exceed 10°.

Guidance note:

See also Sec.2 C400 for calculation of blind sectors.

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207 The clear sector between two blind sectors shall be at least 5° and not less than the size of the broadest blind sector on either side of the clear sector.

208 If helicopter deck or other platforms are installed above

and in front of wheelhouse obstructing the vertical field of vision, the lower parts of this platform shall be at least 2 500 mm above wheelhouse deck.

209 It shall be possible to observe the ship bow for reference of ship position/ heading from the workstation.

Guidance note:

If direct observation of the ship bow/ forecastle is hampered, a mast can be used as reference.

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210 It shall be possible to visually monitor the workstations for offshore operations.

C 300 Additional requirement for AH, AHTS and Tug:

301 From the working position at the workstation it shall be possible to see the sea surface within 600 meters from the ship's stern for monitoring of towing units.

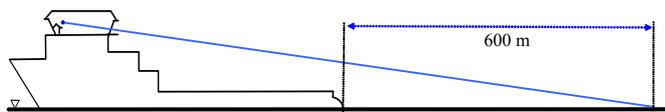


Fig. 12
Monitoring of tow for AH, AHTS and Tug vessels

302 The horizontal field of vision from the normal working position shall cover a sector not less than ship stern breadth and it shall be possible to see wire stoppers.

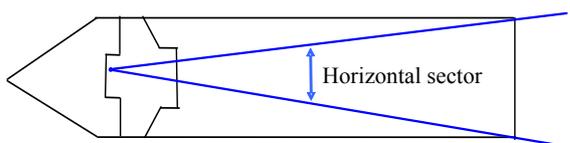


Fig. 13
Horizontal field of vision for AH, AHTS and Tug

303 It shall be possible to monitor the spooling of the wire, the towing guide and the relative horizontal angle of the tow wire at the stern roll.

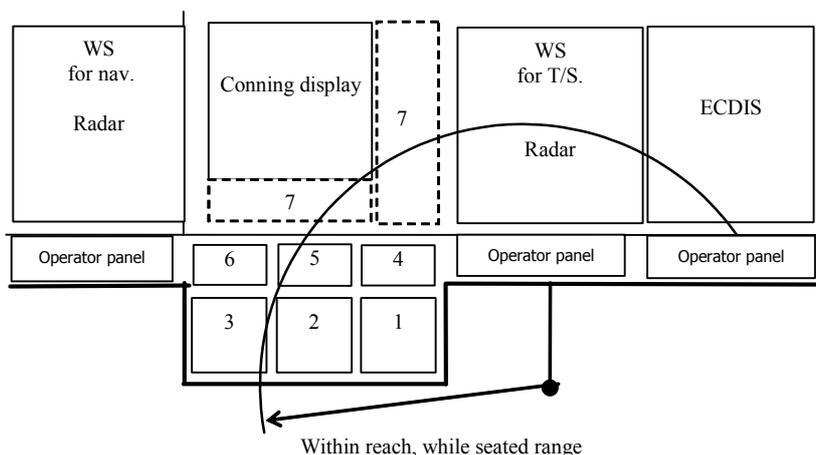
Guidance note:

These requirements may be obtained with use of CCTV system. These additional requirements for AH, AHTS and Tug are not applicable from workstation for navigation support.

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C 400 Equipment to be available

401 Instruments and equipment that shall be operated by the



- Description:
1. Automatic steering
 2. Propulsion
 3. Thruster (If provided)
 4. Steering – Override control, Mode selector
 5. Communication – External
 6. Communication – Internal
 7. Available space

Fig. 14
Example of location of important equipment

404 Means to be used at intervals for securing safe heading and speed in the waters to be navigated and for safety of bridge operation shall be easily accessible from the workstation for navigation 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

navigator at the workstation for navigation, and considered essential for safe and efficient performance of the operator's tasks, shall be within reach from a sitting position at the workstation. Priority shall be given to location of controls for radar, ARPA, heading and speed.

402 The following instruments and equipment shall be installed within reach from a sitting position:

- chart radar with ARPA
- ECDIS
- propulsion control
- propulsion back-up control (when provided)
- 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
- 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).

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

- thruster control(s)
- thruster back-up control(s) (when provided)
- joystick control (when provided).

— controls for the sound reception system.

405 Additional requirement for AH, AHTS and Tug:

- controls for CCTV system (if applicable).

C 500 Information to be provided

501 Information considered essential for the safe and efficient performance of tasks at the workstation for navigation shall be easily readable, and audible when relevant, from the

working position at the workstation. Essential information 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
- 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.

*Not required for **NAUT-OSV(T)**

502 Additional requirements for AH, AHTS and Tug:

- 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).

D. Workstation for Navigation Support

D 100 Workstation tasks

101 The workstation for navigation support shall enable the following tasks to be performed:

- determine and plot the ship's position, heading, track and speed
- effect internal and external communication related to navigation
- monitor time, heading, speed and track, rudder angle, propeller
- revolutions and propeller pitch (when applicable)
- adjustment of pre-planned route during the voyage.

D 200 Field of vision

201 Same requirements as for workstation for navigation, except the additional requirements for AH, AHTS and Tug. See C200.

D 300 Equipment to be available

301 The following instruments and equipment that shall be operated by the navigator at the workstation for navigation support, and considered essential for safe operations, shall be within reach from a standing position at the workstation:

- radar with ARPA
- ECDIS backup arrangement
- chart table
- relevant position-fixing systems (GPS)
- VHF
- automatic telephone
- whistle push button
- central alarm panel.

D 400 Information to be provided

401 Information considered essential for operations at the workstation for navigation support shall be easily readable from the working position at the workstation. Essential information includes:

- 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*.

*Not required for **NAUT-OSV(T)**.

E. Workstation for Offshore Operations

E 100 Principle

101 The design and location of the workstation for ship handling and the workstation for aft support shall enable safe and efficient manoeuvring of the vessel under all circumstances and shall facilitate command and control of the vessel's offshore operations.

102 Workstation for ship handling and workstation for aft support shall be so arranged and designed that two qualified operators can work either separately or in close co-operation if the workload exceeds the capacity of one operator or the nature of the operation requires two operators.

103 Workstation for ship handling shall facilitate all functions related to manoeuvring and command during normal operating conditions.

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

E 200 Layout for workstations for offshore operations

201 The workstations for offshore operations shall be located close together to allow close co-operation between the two workstations and for efficient use of console space, thereby avoiding duplicate installation of equipment and indicators.

202 Both workstations shall have access to the back-up controllers for manoeuvring.

203 Any consoles/panels located between operator and aft windows shall not obstruct the view of cargo deck and shall be possible to remove instantly if prime access to workstation is hampered by the console.

204 The width of consoles shall 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.

Guidance note:

The width of consoles intended for use from one side only should not exceed 700 mm. For consoles to be used from both sides, the width may be increased to 800 mm provided that equipment mounted on the far side is not relevant for the operator at the adjacent workstation.

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205 To ensure optimum area for installed equipment that shall be within reach, the space provided for the chair seat and the operator shall be kept to a minimum.

Guidance note:

The space provided for the chair seat and the operator should not be more than 600 mm wide, chair armrests with equipment are not included in this 600 mm.

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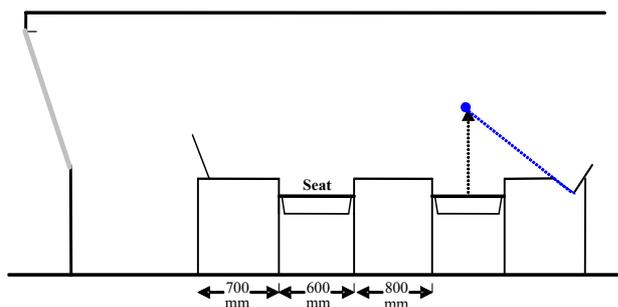


Fig. 15
Size of consoles when common centre console is used

E 300 Workstation consoles for offshore operations

301 Workstation consoles shall not 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 shall not obstruct the required field of vision from the workstation.

302 The relationship between the total height of the console, the height of desktop for equipment installations and the sitting height is decisive for achieving optimum vertical field of vision, optimum reaching distance and efficient use of equipment when seated. The distance to side windows and the size of windows affect the vertical view. A vertical angle of view not less than $\pm 5^\circ$ in relation to the horizontal line of vision shall be provided by adjusting the size of windows if necessary.

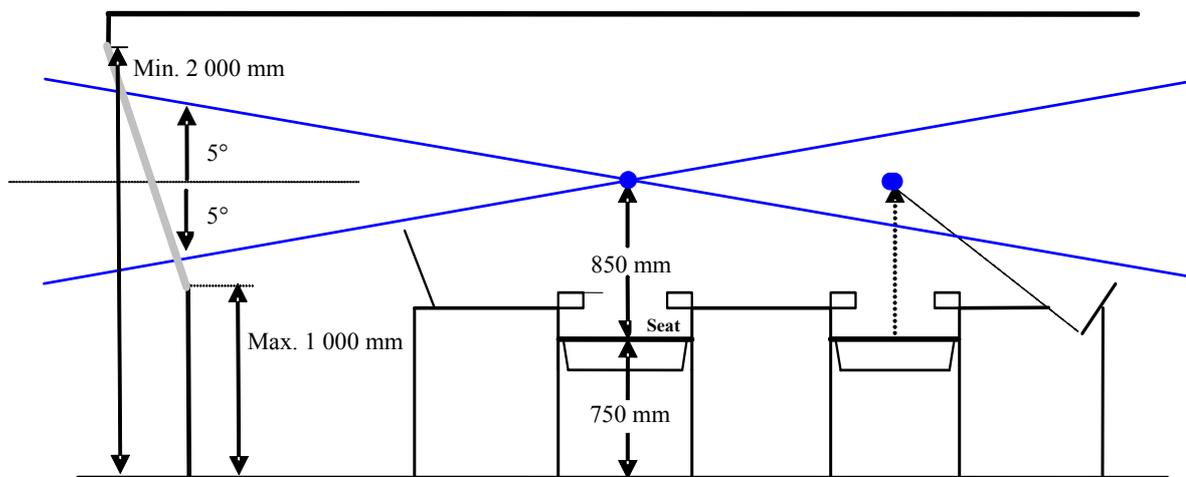


Fig. 16
Location of workstation consoles and window size in the FOV arc between abeam and 30° aft of abeam.

E 400 Chairs at workstations for offshore operations

401 Chairs, with armrests or equivalent, shall be installed at the workstation for ship handling and the workstation for aft support. It shall be easy to adjust the vertical position of the chairs to obtain an elbow height of 50 mm above the level of adjacent consoles.

Guidance note:

It should be possible to adjust the vertical distance between chair seat and adjacent console desktops in the range of ± 100 mm. This may be obtained by adjusting the height of the chair or the adjacent consoles.

See also A500.

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402 Chairs and consoles at WS for offshore operations shall be arranged as integrated design in order to obtain the required level of ergonomics and availability of equipment

403 If it is necessary to move the chair for operation of essential equipment located outside easy reach area, it shall be possible to move the chair instantly without having to leave the chair.

E 500 Priority zones for location of equipment and indicators

501 Required equipment and indicators at workstations for ship handling and aft support shall be located according to importance and frequency of operation.

Guidance note:

Tables and figure below indicates priority of some of the equipment and indicators at workstations for ship handling and aft support. Required equipment and information at the workstations are listed in paragraph F and G.

Priority zones explanation (P):

Indicators meant for reading

A – Easily readable Within an horizontal sector of 180° and vertical in the area up 60° and down 90° from the operators normal line of sight. See Pt.4 Ch.9 Sec.6. See also Sec.5 D

B - Readable

Within an horizontal sector of 225° and vertical in the area up 60° and down 90° from the operators normal eye position.

Equipment meant to be operated

- 1 – Hand grasp
 - 2 – On hand
 - 3 – Within easy reach
 - 4 – Within reach (Possible to reach while seated in working position)
 - 5 – Easily available (Available when standing or when moving chair)
 - 6 – Other that may require attention during operations
- See figure below

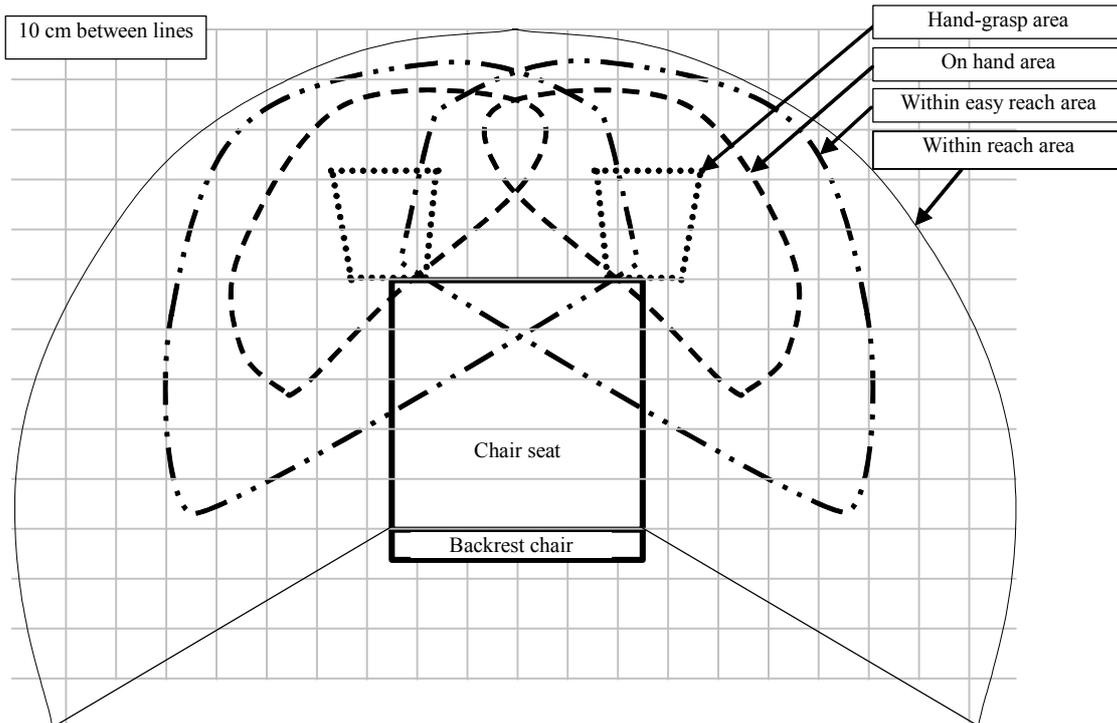


Fig. 17
Classification of reaching areas in the horizontal plane

Table E1 Priority zones (P) of different equipment and indicators depending of operation							
<i>Operation: Manoeuvring, applicable for all operations</i>							
<i>Workstation - ship handling</i>				<i>Workstation - aft support</i>			
<i>P</i>	<i>Controls</i>	<i>P</i>	<i>Information</i>	<i>P</i>	<i>Controls</i>	<i>P</i>	<i>Information</i>
1	Longitudinal thrust control	A	Thrust/ force indicators	3	Longitudinal thrust control*	B	Thrust/ force indicators
1	Lateral thrust control	A	Thrust/ force indicators	3	Lateral thrust control*	A	Thrust/ force indicators*
2	Main propulsion/ engine systems controls	B	Machinery status awareness information	3	Main propulsion/ engine systems controls*	B	Machinery status awareness information*
2	Rudder controls	A	Rudder angle	3	Rudder controls*	A	Rudder angle*
4	Steering gear control and alarm system	B	Status info				
3	Thruster systems control	B	Status info				
3	DP System	B	DP System status info	3	DP System*	B	DP System status info*
1	Joystick	A	Joystick order and response	3	Joystick*	A	Joystick order and response*
2	Joystick system	B	Joystick status	3	Joystick system*	B	Joystick status*
3	Steering mode selector	B	Mode indication	3	Steering mode selector*	B	Mode indication*
2	Means for take command (Steering, thrust) Fore - Aft	B	Mode indication	3	Means for take command (Steering, propulsion, thrusters)*	B	Mode indication*
2	VHF	B	Channel indication/ plan	2	VHF	B	Channel indication
2	UHF	B	Channel indication/ plan	2	UHF	B	Channel indication
2	Search light						
2	Whistle						
2	Telephone	B	Telephone list	3	Telephone	B	Telephone list
2	Window cleaning controls						
4	Deck light control						
2	Central alarm panel	B	Alarm indication				
4	Intern light ctrl (incl. dimming)	A	Conning display**			B	Conning display**
4	Sound power telephone	B	Clock			B	Clock
		A	Speed indication			A	Speed indication
		B	Depth indicator			B	Depth indicator
		B	Wind direction and speed indication			B	Wind direction and speed indication
		A	Heading indication			A	Heading indication
4	arrangement for placement of papers as instructions, procedures and plans			4	arrangement for placement of papers as instructions, procedures and plans		
<i>Operation: Cargo, applicable for vessels intended for cargo operations</i>							
P	Controls	P	Information	P	Controls	P	Information
3	Cargo control system	B	Cargo information monitor	2	Cargo control system	B	Cargo information monitor
3	Telephone			2	Telephone		
<i>Operation: Anchor handling, applicable for vessels intended for AH</i>							
P	Controls	P	Information	P	Controls	P	Information
		B	Tension indicator	1	Tension controllers	A	Tension indicators
		B	Wire speed indicator	1	Winch speed control	A	Wire speed indicator
				1	Wire spooling controller		
		B	Camera monitor	2	Surveillance camera controller	A	Camera monitor
				2	Jaw shaft controller		
				2	Wire lock controller		
4	Chart radar controller	B	Chart radar				
3	Anchor handling position surveillance system control	B	Anchor handling position surveillance system monitor				
4	DGPS						
<i>Operation: Fire fighting, applicable for vessels intended for FiFi</i>							
P	Controls	P	Information	P	Controls	P	Information
				1	Fire monitor controllers	B	Pressure indicator
						B	Wind indicator
1	Longitudinal thrust control	A	Thrust/ force indicators	3	Longitudinal thrust control*	B	Thrust/ force indicators

* The main principle is that the workstation for aft support shall always be able to instantly take over the manoeuvring function from workstation for ship handling and this may be either by joystick, DP or by manual means.

** Not required for **NAUT-OSV(T)**

F. Workstation for Ship Handling

F 100 Workstation tasks

101 The workstation for ship handling shall, as applicable, facilitate the following tasks:

- control main propulsion
- control of thrusters not being part of the main propulsion, e.g. side thrusters
- monitor status on main and auxiliary machinery
- control and monitor DP system (when provided)
- communicate with other ships, platforms and internally on own ship
- monitor and silence 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)
- visually monitor cargo operations
- monitor workstation for aft support
- monitor workstation for navigation and ship handling
- berth the ship
- operate necessary supporting equipment.

F 200 Field of vision

201 In order to enable the operator(s) at the workstations for offshore operations to carry out the required functions, the horizontal field of vision from the workstation shall extend over an arc of not less than 180° that is from right astern to not less than the beam on either side of the ship.

202 For monitoring of vessels side by side, platforms when lying alongside and other relevant situations, it shall be possible to monitor a horizontal field of not less than 5° beside the broadest part of the wheelhouse.

Guidance note:

This 5° field of vision may either be before or behind the broadest part of the wheelhouse, see Fig 25.

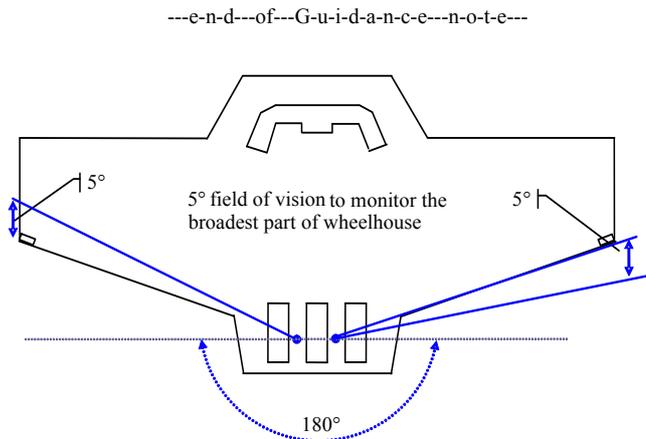


Fig. 18
Horizontal field of vision from workstations for offshore operations

203 In order to maintain a horizontal field of vision when the ship is rolling in heavy seas, there shall 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 shall be at least 2 000 mm under all circumstances.

204 The heights of consoles and lower edge of windows above the bridge deck shall not obstruct the line of sight passing 5° below the horizontal plane. The height of the lower edge of the windows shall be maximum 1 000 mm above deck under all circumstances.

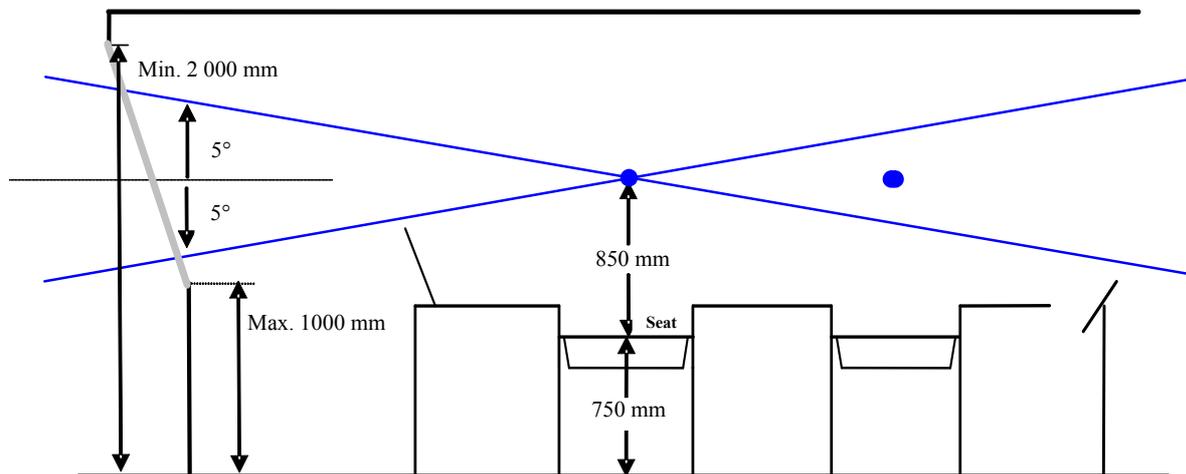


Fig. 19
Vertical field of vision in the sector from abeam to 30° aft

205 From the workstations for offshore operations there shall be a view of the cargo rail and working deck. Any obstructions in this view shall be kept to a minimum. Over an arc of not less than 120°, that is 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 shall be so that the bulkhead below the windows do not obstruct the view of the cargo deck.

206 In order to see cargo arriving at the aft deck from cranes and other nearby constructions, there shall be an unobstructed 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. See Fig. 20 and 21. For ships not engaged in cargo handling to/ from platforms, or other operations requiring equivalent vertical view, the above vertical view can be reduced to not less than 10° above the horizontal plane.

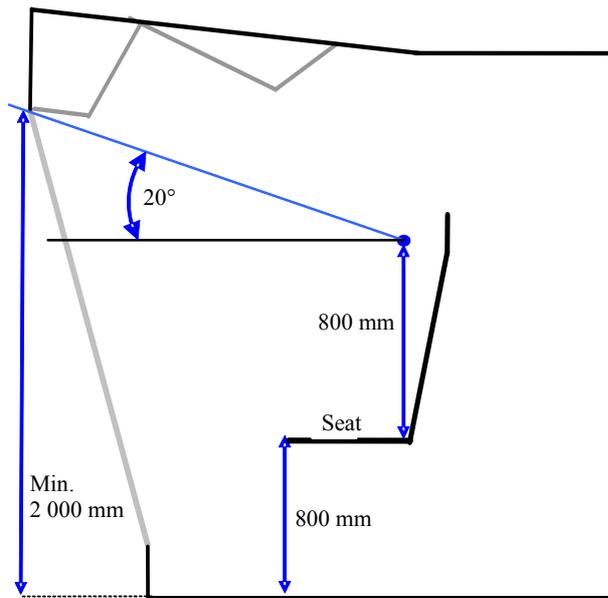


Fig. 20
Vertical field of vision in the sector of 120° astern

207 No blind sector caused by cargo, cargo gear, divisions between windows and other obstructions appearing in the required field of vision shall exceed 10°.

The total arc of blind sectors within the required 180° field of vision at the workstation for offshore operations shall not exceed 20°.

208 The clear sector between two blind sectors shall be at least 5° and not less than the size of the broadest blind sector on either side of the clear sector.

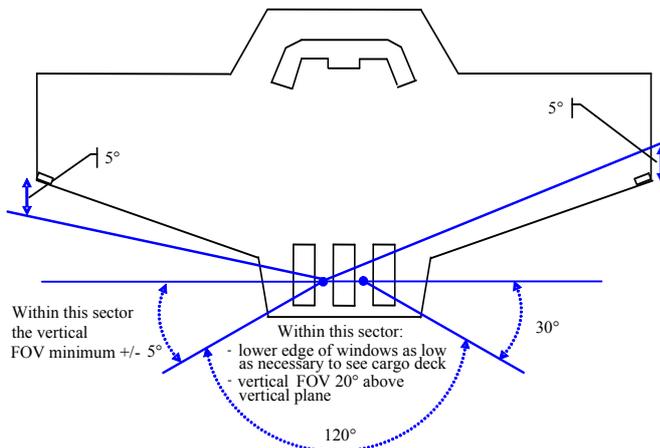


Fig. 21
Overview of the fields of vision required from workstations for offshore operations

209 The applied eye position of the operator(s) at the workstations shall be 1 600 mm above deck with the seat in the normal working position (for calculation purposes).

210 From workstation for ship handling it shall be possible to visually monitor the workstation for navigation.

F 300 Equipment to be available

301 The following instruments and equipment that shall be operated by the navigator at the workstation for ship handling, and considered essential for safe and efficient performance of

his tasks, shall be within reach from a sitting position at the workstation:

- dynamic positioning system (when provided)
- joystick
- joystick system
- manual steering control (including any back-up mode)
- steering gear control and alarm system
- longitudinal thrust control
- lateral thrust control
- propulsion control
- propulsion back-up control (when provided)
- thruster control(s)
- thruster back-up control(s) (when provided)
- means for take command to workstation (steering, propulsion, thrusters)
- steering mode selector
- 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
- central alarm panel
- means for controlling the chart radar (or radar and ECDIS) See Sec.4 B609*
- arrangement for placement of papers as instructions, procedures and plans.

* Not required for pure platform supply vessels.

302 Main manoeuvring controls shall be defined by the owner and these controls together with communication controls shall be "on hand" when seated.

303 Priority shall be given to location of controls for joystick, DP (if installed), propulsion throttles, rudder controls, thrusters and necessary communication (UHF, VHF and telephone systems).

See E500 for priority of equipment.

304 Equipment that might require attention from the operator during operation shall be installed sufficiently close to the operator's working position, so that it is not necessary to leave the chair for taking appropriate action. The following equipment shall be considered:

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

305 Additional requirements for AH and AHTS:

- anchor handling position surveillance system control (system for aiding the ship to find the correct anchor position, often received from rig before operation).

F 400 Information to be provided

401 Information considered essential for safe and efficient performance of tasks at the WS for ship handling shall be easily readable, and audible when relevant, from the working position at the workstation. Essential information includes:

- 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*.

* Not required for pure platform supply vessels.

** Not required for **NAUT-OSV(T)**.

See E500 for priority of information.

402 Additional requirements for AH, AHTS and Tug:

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

G. Workstation for Aft Support

G 100 Workstation tasks

101 The workstation for aft support shall facilitate the following tasks:

- control main propulsion for backup of manoeuvring function
- control of thrusters not being part of the main propulsion, e.g. side thrusters, for backup of manoeuvring function
- monitor status on main and auxiliary machinery, as relevant
- communicate with other ships, platforms and internal on vessel
- monitor and control cargo operations
- emergency stop of cargo operations
- control and monitor winch operations, as relevant
- monitor workstation for ship handling.

G 200 Field of vision

201 Same requirements as for workstation for ship handling, see F200.

G 300 Equipment to be available

301 The following instruments and equipment that shall be operated by the navigator at the workstation for aft support, and considered essential for safe and efficient performance of his tasks, shall 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*
- means for take command to workstation (steering, propulsion, thrusters)*
- VHF
- UHF
- automatic telephone
- cargo operation system
- auxiliary equipment needed for the relevant operations
- arrangement for placement of papers as instructions, procedures and plans.

* The main principle is that the workstation for aft support shall always be able to instantly take over the manoeuvring function from workstation for ship handling and this may be either by joystick, DP or by manual means.

302 Priority shall be given to location of controls for propul-

sion, steering and thrusters and equipment necessary for the relevant operations. Equipment shall be prioritized in order of frequency in use and importance.

See E500 for priority of equipment.

303 Equipment that might require attention from the operator during operation shall be installed sufficiently close to the operator's position so that it is not necessary to leave the workstation for taking appropriate action.

304 Additional requirements for AH, AHTS and Tug:

- winch control system
- auxiliary systems for use during AH, AHTS and Tug operations
- controls for CCTV monitors for winch and spooling apparatus monitoring.

G 400 Information to be provided

401 Information considered essential for safe and efficient performance of tasks at the WS for aft support shall be easily readable, and audible when relevant, from the working position at the workstation. Essential information includes:

- 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
- conning display*.

*Not required for **NAUT-OSV(T)**.

See E500 for priority of information.

402 In addition, information regarded necessary for the relevant operations shall be easily readable from the operator's position at the workstation.

403 Additional requirements for AH, AHTS and Tug:

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

H. Workstation for Fire Fighting (FiFi)

H 100 Workstation tasks

101 The workstation for fire fighting shall facilitate the following tasks:

- monitor the vertical and horizontal sectors where the fire monitors are effective
- operate controls for FiFi equipment
- co-operate with the workstation for ship handling or workstation for navigation (visual view of operator at workstation).

102 The workstation may be mobile or located at several different places for covering the field of vision requirement.

H 200 Field of vision

201 In order to enable the officer at the workstation for FiFi to carry out his tasks in a safe manner, the field of vision from the workstation(s) shall extend over an arc equivalent to the sector the fire monitors are meant to operate.

202 In addition, it shall be possible to monitor the workstation for navigation and workstation for ship handling.

H 300 Equipment to be available

301 Operational controls for the FiFi monitors shall be either fixed at one designated location, or the controls may be portable if the acquired field of vision demands alternative working positions. Portable equipment shall have fixed stands at the workplace, ensuring correct direction when in use.

H 400 Information to be provided

401 Displays, instruments and indicators providing information considered essential for safe and efficient performance of the tasks at the workstation for FiFi shall be easily readable, and audible when relevant, from the working position at the workstation.

I. Workstation for Rescue Operations

I 100 Workstation tasks

101 The workstation for rescue operations shall facilitate the following tasks:

- monitor the rescue area along the ship side
- control main propulsion
- control of thrusters not being part of the main propulsion, e.g. side thrusters
- communicate with other ships, platforms, and internally on ship
- co-operate with workstation for ship handling or workstation for navigation (visual view of operator at workstation).

102 If co-operation with workstation for ship handling or workstation for navigation is impracticable, all tasks necessary for carrying out rescue operations safely and efficiently shall be carried out from workstation for rescue operations.

I 200 Field of vision

201 In order to enable the officer at the workstation for rescue operations to carry out his tasks in a safe manner, the field of vision from this workstation shall extend over an arc of not less than 225°, that is 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.

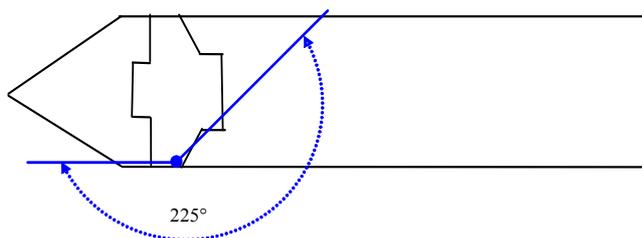


Fig. 22
Horizontal field of vision

202 From the workstation for rescue operations there shall be 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.

203 In addition it shall be possible to monitor the workstation for navigation or workstation for ship handling.

I 300 Equipment to be available

301 The following instruments and equipment that shall be operated by the navigator at the workstation for rescue operations,

and considered essential for safe and efficient performance of his tasks, shall be within reach from a standing, or sitting position if a chair is installed, at the workstation:

- searchlight controls
- manual steering control*
- propulsion control*
- thruster control*
- emergency stop of propellers/ thrusters
- VHF
- UHF
- automatic telephone
- central alarm panel.

* A joystick control system may replace individual steering, propulsion and thruster control units, if the joystick control enables de-activation of individual propellers and thrusters by the navigator.

302 Priority shall be given to location of the manoeuvring controls (steering, propulsion and thrusters) and search light controls.

I 400 Information to be provided

401 Information considered essential for safe and efficient performance of the tasks at the WS for rescue operation shall be easily readable, and audible when relevant, from the working position at the workstation. Essential information includes:

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

J. Workstation for Communication

J 100 Workstation tasks

101 Where other external communication equipment than that related to the safe operation of the vessel is installed on the bridge, it shall be located in a separate workstation for communication. Other functions related to safe and efficient operation of the vessel may be located adjacent to this workstation.

J 200 Field of vision

201 In order to enable the officer of the watch to use workstations for communication and additional bridge functions for short periods of time, the field of vision from these workstations shall extend at least over an arc from 90° on port bow, through forward, to 22.5° abaft the beam on starboard side.

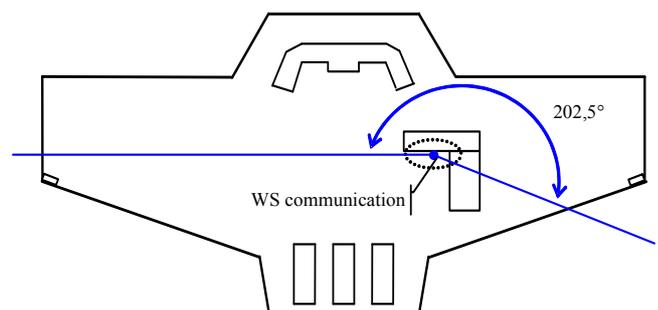


Fig. 23
Field of vision from workstation for communication

202 The arrangement at the workstation shall facilitate effective lookout and the minimum operator eye height shall be considered to be 1 600 mm. above wheelhouse deck. If the workstation is lowered compared to wheelhouse deck, the chair(s) at the workstation shall be of a long-legged type allowing for equivalent eye height.

Guidance note:

Maximum lowering of the workstation is 200 mm.

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

J 300 Equipment to be available

301 All communication equipment required for GMDSS shall be provided at this workstation and additional communication equipment supplied shall preferably be available at this workstation. Provisions shall be made to provide the operator at workstation for ship handling with means for accepting GMDSS alarms remotely. Navtex shall be located at this workstation.

J 400 Information to be provided

401 Information such as telephone directories, channel plans, emergency contacts and other relevant contact points shall be provided.

K. Workstation for Safety Monitoring and Emergency Operations

K 100 Workstation tasks

101 The workstation for safety monitoring and emergency operations shall enable monitoring of the safety state of the ship as well as planning and management of emergency operations. The workstation shall enable storage and use of relevant drawings, safety plans, ship safety systems and internal communication equipment. The workstation shall be located close to the workstation for communication/ GMDSS equipment enabling use of all available means for external communication. Direct visual and audible contact with the workstations from which the vessel is manoeuvred shall be provided.

K 200 Equipment to be available

201 Equipment and means to be available include:

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

K 300 Information to be provided

301 Information related to safety operations shall include:

- fire alarm status
- emergency procedures
- safety plans
- watertight doors
- fire doors.

SECTION 4 BRIDGE EQUIPMENT

A. General Bridge Equipment Requirements

A 100 General requirements

101 All navigational and radio equipment installed shall comply with IMO Res. A.694(17) "General requirements for ship borne radio equipment forming part of the GMDSS and for electronic navigational aids".

Guidance note:

Equipment should meet the requirements specified in IEC 60945.

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102 All installed equipment shall meet the requirements in relevant IMO performance standard and applicable ISO or IEC standard.

103 Any system or instrument failure shall result in the least critical of any possible new condition.

104 Individual equipment installed shall not degrade the reliability, performance and readability of other equipment it is interfacing.

105 Additional bridge equipment not type approved, shall prove that the functions, accuracy and reliability do not affect nautical safety. The equipment shall comply with the manufacturer's specification, if approved by the Society.

106 Any equipment or systems that may affect the safety of main functions, that is steering and propulsion, shall meet applicable requirements given in Pt.4 Ch.9 and be certified, if not type approved.

A 200 Location and installation of equipment

201 All instruments, panels, etc. shall be permanently mounted in consoles or at other appropriate places, taking into account both operational and environmental conditions. All other items, such as safety equipment, tools, lights, pencils etc. to be used by bridge personnel, shall be stored in designated places.

202 Any equipment, antennas and arrangement shall be installed in such a manner that the designed efficiency is not substantially impaired and, unless otherwise specified, follow the instructions and recommendations detailed by the manufacturer.

203 Radar antennas shall be installed to enable detection of targets within 360°. Blind sectors occurring in one radar system shall, as far as practicable, not occur in the other system.

A 300 Interference

301 When placing equipment that shall be used in an exposed position, special care shall be taken to ensure that the location does not impair the performance of the equipment.

302 The antennas for radars, position-fixing receivers and VHF communication systems shall be installed in such a manner that interference is avoided and the designed efficiency is not substantially impaired.

Guidance note:

VHF operating performance is highly dependent upon antenna location and height, and each antenna should be erected as high as possible, away from obstacles, wires, radar beams, etc. To avoid direct VHF-to-VHF radiation, the antennas should be vertically separated from each other at a distance not causing harmful interference.

The antennas for navigation receivers should be mounted in a location permitting a high degree of vertical or horizontal polarised

isolation against MF/HF transmitter antenna configuration. The GPS antenna should be positioned outside the main lobe of INMARSAT-C, VHF and transmitting radar antennas.

The S-band radar antenna should preferably be located at heights, which do not interfere with other shipboard obstructions. Nearby location of satellite communication antenna should not degrade the radar performance.

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303 Transmitting and receiving antenna cables shall be widely separated.

A 400 Radiation hazard

401 Antenna units shall be located so as not to constitute a hazard to personnel working in the vicinity.

Guidance note:

The site of radar wave guides, satellite communication and HF transmitter feed lines should be safeguarded, so as to protect personnel against open wave-guide radiation power and accidental contact with high voltages, by means of isolating trunks or fences.

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

402 Satellite communication or radar antenna units are required to have a warning label, detailing safe distances, posted in the vicinity or on the equipment.

A 500 Vibration and shock isolation

501 Above deck equipment shall be sited so as to prevent the installation from being affected by vibration.

502 The antenna system and instrument installation shall withstand vibration to an extent that includes known standards for vibration environment according to the ship's construction, speed trim and the sea state.

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

A 600 Temperature protection

601 Instruments to be installed shall be located away from excessive heat sources, such as a heating vent or equipment heat exhaust.

602 Instruments to be fitted into a bridge instrument console shall be protected from excessive heat by conduction or, if necessary, by forced air flow.

Guidance note:

Redundant systems should be installed in consoles where two or more systems are located and forced air flow is necessary to ensure proper function of the equipment.

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A 700 Interface to central alarm system

701 All equipment that gives audible alarms or audible warning signals shall be provided with two-way communication so that the central alarm system can be used for indication of alarms and warnings and the equipment shall be so arranged that the audible alarm and warnings on both the equipment and the central alarm system can be muted mutually.

Guidance note:

IEC 61162-1 should be used as communication standard.

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B. Equipment Requirements

B 100 Heading information system

101 Two separate and independent gyro compasses or other means having the capability to determine the ship's heading in relation to geographic (true) North shall be provided. At least one of the compasses shall be a gyro compass.

Guidance note:

One of the gyro compasses can be replaced by a Transmitting heading devices type approved according to ISO 22090-2.

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102 The system shall enable distribution of heading information to other systems.

103 The system shall identify which of the compass that is in use.

104 The Gyro compass system shall be provided with means for automatic correction of the errors caused by speed and latitude.

105 Means shall be provided for comparing the two compasses and an alarm shall be given if the difference between the compasses exceeds the set value.

106 The heading information system and the distribution system shall be so arranged that no single failure in power supply or distribution units may cause loss of heading information to consumers depending of heading information for function.

Guidance note:

The following equipment is depending of heading information for normal function:

- heading/ bearing repeaters
- heading control system/ track control system
- joystick system
- DP system
- radar system
- ECDIS.

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

B 200 Position system

201 Two separate and independent position fixing systems shall be provided. At least one of the position receivers shall be a GPS.

Guidance note:

The independence of the two position-fixing systems may be achieved by separate antenna systems, display/ control units, power supply and digital interface output/ distribution units.

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

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

203 The position system and the distribution system shall be so arranged that no single failure in power supply or distribution units may cause continuous loss of position information to consumers depending of position information for function.

Guidance note:

The following equipment is depending of position information for function:

- track control system
- DP system
- chart radar system
- ECDIS.

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B 300 Steering and manoeuvring systems

301 The ship shall be equipped with means for manual and automatic steering of the ship.

302 The automatic steering system may be either a heading control system or a track control system.

303 Steering override control enabling instant take-over in case of failure of the automatic steering system (heading control system or track control system) shall be provided adjacent to the automatic steering control position.

Guidance note:

This will normally only apply to workstation for navigation.

In case of azimuth thrusters as main propulsions, particular attention should be made to Sec.5 B100 and the steering override control.

One operator action is accepted as instant take over.

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

304 Means for take command of all propulsion and all thrusters shall be provided at all workstations where steering or manoeuvring shall be carried out.

Guidance note:

It shall be possible to take command at workstations where steering or manoeuvring is arranged for. The transfer of command shall be arranged in a manner enabling the operator to either take command with the same settings as on the previous workstation in command or with neutral settings.

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

305 It shall be a clear indication when workstation is in command.

306 Common mode selector switch controlling all propulsion and thrusters shall be provided as applicable at each workstation.

Guidance note:

The mode selector shall enable the operator to select mode of all propulsion and thrusters with one action. E.g. when selecting Autopilot, Manual mode (transit or manoeuvring as applicable for any azimuth thrusters system), Joystick or DP with this selector switch, all the propellers and thrusters should be controlled in the selected mode.

This switch shall be approved according to Pt.4 Ch.9.

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

307 Any back-up control of thrusters and propulsion shall have same user interface as the normal controls.

B 400 Speed measuring system

401 A speed log measuring speed through water shall be provided.

402 NAUT-OSV (A): Sensor(s) for speed log shall have means for ice protection or be fitted with gate valve for sensor replacing at sea without need for dry docking.

B 500 Depth measuring system

501 Echo sounder system for measuring the water depth under the keel shall be provided.

502 NAUT-OSV (A): Sensor(s) for echo sounder shall have means for ice protection or be fitted with gate valve for sensor replacing at sea without need for dry docking.

B 600 Radar systems

601 Two separate and independent radar systems enabling inter-switching of the main components shall be provided.

Guidance note:

See A203 with respect to radar antenna installation.

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

602 One of the radars shall operate in X-band. The second radar shall operate in S-band or, where considered appropriate based on operational aspects, in X-band.

603 Each individual radar system installed shall be equipped with a performance monitor.

604 If the radar inter-switching is so designed that one single failure may have an impact on both radars, then sufficient bypass facilities shall be provided and user instruction for bypassing shall be posted adjacent to the inter-switch.

605 Both radars shall have a daylight display with a minimum effective diameter of not less than 340 mm.

606 Both radars shall be equipped with ARPA.

607 The radar at workstation for navigation shall be interfaced to AIS for graphical display of AIS reported targets in accordance with relevant IMO standards and guidelines.

608 The radar at workstation for navigation shall be a Chart Radar with the ability to display selected parts of SENC. This radar shall also be able to display the ship's position and the route used on the ECDIS.

Guidance note:

A Chart radar is a radar able to display selected parts of Electronic Navigational Chart (ENC) in accordance with IEC 60936-3.

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609 One of the radar systems shall be provided with additional slave display (for installation at workstation for ship handling) with possibility for displaying selected parts of ENC in accordance with 608. This slave system shall have means for controlling the range and adjust tuning, anti sea clutter, anti rain clutter and gain.

Guidance note:

This requirement is not applicable for pure platform supply vessels.

This requirement is related to NAUT-OSV as specified for workstation for ship handling in Sec.2. Alternative means to chart radar, can be slave radar + slave ECDIS.

Radar display shall have a daylight display with a minimum effective diameter of not less than 250 mm.

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B 700 ECDIS

701 Electronic chart display and information system (ECDIS) shall be provided.

702 Electronic back-up for ECDIS shall be provided and shall be independent of ECDIS.

Guidance note:

Conning display, a second chart radar or a second ECDIS may serve the ECDIS back-up function when located at workstation for navigation support.

See IEC 61174 Annex G for further details about ECDIS Back-up.

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

703 ECDIS shall be able to transfer route information to chart radar for enabling display of active route on the chart radar.

Guidance note:

Route information shall be in accordance with IEC 61162 and shall be possible to send directly to chart radar without use of external media such as diskettes.

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

B 800 Central alarm system

801 A central alarm system enabling all bridge alarms and all bridge warnings giving audible signal to be centralised in one common panel or screen at the required workstations enabling easy identification of the source of the alarm and rapid cancellation of the audible alarm shall be provided.

Guidance note:

Conning display may be used as user interface for central alarm system.

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

802 The central alarm system shall enable indication of alarms and warnings initiated by all systems and individual equipment located on the bridge giving audible alarms.

Guidance note:

The central alarm system should normally include system alarms/warnings and operational alarms/warnings initiated by all bridge equipment giving audible alarms. When it's possible to operate equipment and silence alarms from the normal working position at the applicable workstation(s) it might be given exception for connection this equipment to the central alarm system, provided that the individual equipment is either operable from all workstations where central alarm panel are required or that the equipment gives alarms only when applicable workstation is in use.

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

803 It shall be possible to cancel the audible alarm on the individual equipment and the corresponding audible alarm at the central alarm system by one single operator action.

Guidance note:

Audible alarm is for attracting attention and when the operator acknowledges on the central alarm panel this should silence all audible alarms (sound should be muted both on the central alarm system and on all equipment where the alarm(s) is originated from).

When the operator acknowledges the alarm at the equipment that initiated the alarm, the sound should be muted both on the equipment where the alarm is acknowledged and on the central alarm system provided that no other unacknowledged alarms are present.

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

804 The visual indication and the audible alarm on the central alarm panels shall be according to Table B1.

Table B1 Visual and audible indication of alarms and warnings		
Alarm status	Indication*	Sound
New active unacknowledged alarms (no operator actions taken)	R/B	Yes
Active unacknowledged alarms silenced but to be acknowledged on task (e.g. ARPA)	R/B	No
Active unacknowledged alarms which cause was removed.	R/B	Yes
Acknowledged alarms which cause was removed.	No	No
Active acknowledged alarms	R	No
Active warnings	Y/B	2 sec.
Active unacknowledged warnings which cause was removed.	No	No
Active acknowledged warnings	Y	No

* The indication of alarm status depends upon the technology used and for example will the following apply for text based system, icon based system and LED panel system:
R – Red font, Red icon or Red LED
B – Bold font, Blinking icon or Blinking LED
Y – Yellow font, Yellow icon or Yellow LED.

805 The visual indication shall as a minimum identify which equipment the alarm is originated from.

Guidance note:

It is recommended that the central alarm panels are able to show the alarm cause as contained in the IEC 61162-1 "ALR" sentence.

For GMDSS radio equipment it is required that the alarm information as given on the radio equipment is displayed on the central alarm panels in order to silence the sound at the GMDSS equipment.

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

806 The visual alarm indication shall remain until the alarm condition is rectified and the alarm is acknowledged.

807 If the central system displays all necessary information for decision making the, alarm status may be acknowledged at the central alarm system.

808 If the central alarm panels only indicates the source (e.g. equipment) of the alarm, the audible alarm at the equipment and central alarm system shall be possible to be silenced from the central alarm panels. Cancellation of the visual alarm indication shall in this case only be possible at the individual equipment.

809 Warning and alarm indicators shall show no light in normal position (indication of a safe situation).

810 The central alarm panels shall be able to simultaneously show minimum 10 alarms/ warnings .

Guidance note:

The central alarm panels shall be able to show unacknowledged alarms if more than 10 alarms/ warnings are active.

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

811 If audible alarm is not silenced within 30 seconds, the central alarm system shall initiate transfer of signal to the bridge navigational watch alarm system (BNWAS) for activation of the BNWAS second stage remote audible alarm.

812 Failure of the Central Alarm System shall not affect connected equipment.

813 The central alarm system shall be able to communicate with connected equipment in accordance with IEC 61162-1.

Guidance note:

The central alarm system shall be able to handle the IEC 61162-1 "ALR" and "ACK" sentences.

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

B 900 Bridge navigational watch alarm system

901 Bridge navigational watch alarm system (BNWAS) shall be provided.

902 The BNWAS reset function shall be activated by automatic detection of operator motion.

Guidance note:

Motion sensors to automatic monitor activity at workstations to be used during normal operation shall be provided. The system shall be able to reset timer based upon operator head movement of 15° to each side in a period of 2 seconds.

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903 The BNWAS shall have an input port allowing direct activation of the second stage remote audible alarm from the central alarm system.

B 1000 NAUT-OSV(A): Conning display system

1001 Conning displays shall be provided.

Guidance note:

Conning displays shall provide the operator with information about the operational status of the vessel. Conning information as part of DP displays can be accepted at workstations for offshore operations provided readability for operators and that the conning information is available continuously.

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

1002 Information required for efficient monitoring of the status of the operation and safe performance of bridge functions, shall be systematised and displayed for easy and continuous viewing from the positions where navigation and manoeuvring are performed. Information not related to safe operation shall be avoided.

Guidance note:

Conning display shall, as a minimum, display the following information:

- steering mode (manual, autopilot, DP, joystick, transit/ docking mode, as applicable..)
- essential information from the power management system or equivalent information
- heading
- speed
- rudder angle
- water depth
- 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 vessel is equipped with track control system, see IMO performance standard for additional information.

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1003 To enable easy viewing, the conning information display shall utilise graphical display technique and locate relevant sensor input data appropriately around and on a symbol illustrating own ship.

1004 The orientation of the conning picture shall be consistent with the ship orientation as seen from the operator position.

1005 Parts of the display area might be dedicated to user interface for central alarm system.

1006 Provision of independent indicators for equipment (typically rudder, propulsion, thrusters) may be omitted when the required information is provided in mutually redundant conning displays at the required workstations. See DNV Rules Pt.4 Ch.9.

Guidance note:

Rudder, pitch and RPM indicators are required to be type approved as such and use of conning display to replace such indicators will imply that the conning need to be approved for this. For vessels applicable for EC MED this implies wheel marking.

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

B 1100 Internal communication system

1101 Automatic telephone system shall be provided. See Pt.3 Ch.3 Sec.10 C503

B 1200 External communication system

1201 At least two fixed independent VHF systems shall be provided for simultaneously use from relevant workstations.

1202 NAUT-OSV(A): At least two fixed independent UHF systems shall be provided for simultaneously use from relevant workstations.

B 1300 CCTV systems

1301 CCTV system shall provide the operator with true colour pictures of relevant areas for compensating lack of direct visual viewing.

1302 The monitor size shall be adequate for easy viewing from the operator's position.

Guidance note:

Picture size should be: The minimum length of the shortest side of the picture should be 1/9 of the reading distance in cm. i.e. if the distance from the operator to the monitor is 3 meters, the monitors shortest side should be 33 cm (33 X 33 cm display if square and 33 X 44 cm if 4:3 format).

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

1303 NAUT-OSV(A): All cameras which are required by these rules and which are mounted on open deck exposed to sea water mist, shall be equipped with fresh water lens wash and wipers or other means for cleaning.

B 1400 NAUT-OSV(A): Search lights

1401 At least 2 remotely controlled searchlights shall be provided to illuminate areas of interest in a horizontal sector of 360° around the vessel with vertical adjustment allowing view of the sea close to the ship's side and up to 35° above the horizon.

C. Electrical Power Supply

C 100 Main electrical power supply

101 The power supply requirements in this chapter are additional to those given in Pt.4 Ch.8

102 The power supplies to the distribution panels shall be arranged with automatic changeover facilities between the two sources. Failure of one of the power supplies to the distribution

panels shall initiate an alarm (audible and visual signal).

C 200 Stand-by power supply

201 Following equipment shall be provided with a transitional source of power with a capacity to keep the equipment running during a black-out period of at least 10 minutes.

- one radar with ARPA (including the antenna) at Workstation for navigation
- position-fixing system – GPS or GLONASS
- ECDIS at Workstation for navigation.

202 At least one gyro compass shall be provided with a transitional source of power with a capacity to keep it running for 30 minutes.

203 The UPS's used to supply bridge equipment shall have automatic bypass functionality.

204 Appropriate means for bypassing the UPS manually, in case of failure in the automatic bypass, shall be provided.

205 Failure of the UPS shall initiate an alarm (audible and visual signal).

SECTION 5 ERGONOMICS AND HUMAN-MACHINE INTERFACE

A. Human - Machine Interface

A 100 General

101 All equipment and indicators shall be designed with due regard to the human operator. Controls and indicators shall be in accordance with relevant Rules in Pt.4 Ch.9 and be so constructed that they can be efficiently operated by suitably qualified personnel.

102 Human factor principles shall be an integrated part of engineering from early design phase for equipment, controls and indicators.

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

104 Operation of controls and equipment shall 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.

105 Information and controls shall be arranged in logical groups, and shall be co-ordinated with the geometry of the vessel, when this is relevant.

B. Controls

B 100 Control devices

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

102 Controls shall be arranged in functional groups.

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

104 Controls shall give clear feedback when passing step-wise positions or neutral positions.

Guidance note:

Levers should give noticeable resistance when passing neutral position. Switches should give clear feedback when in new position.

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105 Controls for thrusters and propulsion shall use consistent user interface.

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

Guidance note:

When azimuth thrusters are main propulsion system, means should be provided for control of these in transit mode as described above and this tiller, lever or joystick should be clearly distinguish in shape/ form from the main azimuth thruster control. This means may not necessarily control the thruster(s) more than +/- 35 degrees.

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B 200 Operation of controls

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

202 The operation of a control shall not obscure the related indicator where observation of the indicator is necessary for making the adjustment.

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

204 Controls shall be designed and arranged to avoid inadvertent operation. If controls are designed with special operation (e.g. double click or long time press) they shall be clearly distinct from other similar controls with similar design.

B 300 Identification of controls

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

Guidance note:

Symbols as specified in IEC 60417 or in the other relevant standards may be used in addition to the identification in English.

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C. Presentation of Information

C 100 General

101 Displays and indicators shall present the simplest information consistent with their function, information irrelevant to the task shall not be displayed, and extraneous text and graphics shall not be present.

102 During all operations, the system's state shall be observable with essential data displayed.

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

104 The mode of the systems in use shall be displayed.

105 It shall 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.

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

C 200 Menus

201 Menus shall be grouped according to the task.

202 Items of any kind which appear the same shall behave consistently.

203 The user shall not have to remember information when moving from one part of a menu to another.

204 Frequently used operations shall be available in the upper menu level, on dedicated software or hardware buttons.

205 Main display shall be available with a single operator action.

C 300 Text/ symbols

301 Displayed text shall be clearly legible to the user and easy to understand.

302 Simple natural language shall be used wherever possible. The equipment shall employ marine terminology.

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

C 400 Illumination

401 All information shall 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.

Guidance note:

All ship's bridge instruments should show a light text on a dark non-reflecting background at night. The contrast should be within 1:3 and 1:10.

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

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

Guidance note:

Alarm indicator lights should be equipped with red lights of wavelength 620 nanometres or higher.

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404 Colour coding of functions and signals shall be in accordance with international standards.

Guidance note:

ISO 2412 "Shipbuilding: Colours of indicator lights", Table A4 lists recommended colour codes for system functions.

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

- warning and alarm indicators shall show no light in normal position (indication of a safe situation). All instruments shall be fitted with permanent internal or external light source to ensure that all necessary information is visible at all times

- means shall be provided to avoid light and colour changes upon, e.g. start-up and mode changes, which may affect night vision
- all information shall be presented on a background of high contrast, emitting as little light as possible by night.

D. Readability of Information

D 100 General

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

102 The operation of a control shall not obscure indicator elements where observation of these elements is necessary for adjustments to be made.

D 200 Location

201 The information presented shall be clearly visible to the user and permit easy and accurate reading at a practicable distance in the light conditions normally experienced at the location of the workstation by day and by night.

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

Guidance note:

Character height in mm should be not less than 3.5 times the reading distance in m. Letter width should be 0.7 times the letter height, e.g.:

Character height for reading distance 2 m: $2 \times 3.5 = 7$ mm
Character width for letter height 7 mm: $7 \times 0.7 = 4.9$, i.e. 5 mm
Resulting minimum character size: 7 mm x 5 mm.

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203 Each instrument shall 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.

204 Instrument letter type shall be of simple, clear-cut design.

Guidance note:

- Internationally used and recommended letter type is Helvetica medium. However, light-emitting diode text matrices are acceptable.
- In descriptive text, lower case letters are easier to read than capitals.

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SECTION 6 BRIDGE EQUIPMENT TESTS

A. On Board Testing of Bridge Equipment

A 100 General

101 After installation of equipment in ships requesting class notation **NAUT-OSV(T)** or **NAUT-OSV(A)**, on-board testing of the equipment shall be performed in order to ascertain that the equipment, as installed, operates satisfactorily.

102 It should be noted that reliable figures for all aspects of equipment performance or accuracy cannot be established by the on board testing required for classification. Therefore, to ensure that equipment performance is in accordance with specifications, ship owners and ship yards are advised to choose equipment that is type approved.

A 200 Test program

201 A detailed program for the on board testing of this equipment shall be submitted for approval at the earliest possible stage before sea trials.

202 The test program shall be in accordance with the requirements for on board testing given in this section, and shall specify in detail the tests to be performed for each type of equipment.

A 300 General requirements for the testing of all types of bridge equipment

301 Prior to testing, all equipment shall be checked and calibrated by a representative of the manufacturer or the equipment supplier.

302 Prior to testing, all equipment, etc., necessary for the observation and recording of test results, shall be made available. Charts for the area where the sea trials shall take place must be available. Large-scale charts for the area where the ship is berthed must be available.

303 Equipment and systems that shall be subject to the tests are required to ascertain that all controls, indicators, displays, etc. operate in accordance with their specifications and meet the rule requirements.

304 Failure conditions shall be simulated on equipment and systems.

305 Power supply alarms, UPS capacity/ battery discharge test and bypass functionality shall be tested.

306 A demonstration including start-up of the individual systems and changeover from normal conditions to failure conditions shall be carried out.

307 Failure conditions of computer system(s), especially power failure, shall be simulated as realistically as possible. Manual re-starts and, if relevant, automatic re-start and automatic back-up shall be tested. Successive power breaks shall be simulated.

308 If computer system(s) is used to carry out secondary functions, testing of the system shall be carried out with all primary functions in operation and with maximum load from both primary and secondary functions.

309 Tests, additional to the approved test program, may be required carried out by the surveyor.

A 400 Heading measuring and information system

401 The settle point error of the master compass(es) and the alignment with the ship's centre line shall be determined using e.g. the bearing (direction) of the quay at which the ship is berthed.

402 The bearing repeaters' alignment with the ship's centre line shall be checked. A bearing dioptré must be available.

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

404 The monitoring functions of the compass system shall be tested.

405 The means for correcting errors caused by speed and latitude shall be tested.

A 500 Steering System

501 Proper functioning, including ergonomics/ HMI and effect of failures, of the following shall be tested:

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

A 600 Automatic steering system

601 The heading-keeping/ track keeping performance of the autopilot/ Track control system shall be tested at full sea speed. Adaptive autopilots shall also be tested at reduced speed.

602 The performance of the autopilot shall be checked for a change in heading of 10° and 60° to both sides. The overshoot angle shall be observed.

603 The off heading alarm/ off track alarm shall be tested.

604 The rate-of-turn or radius function shall be tested.

605 Change of operational steering mode shall be tested.

606 The override function shall be tested in all steering modes.

A 700 Rudder indicator(s)

701 The rudder indicator(s) on the bridge shall be checked against the indicator on the rudderstock.

A 800 Rate-of-turn indicator

801 The rate-of-turn indicator shall be tested and, if necessary, calibrated.

A 900 Speed log

901 The speed log shall be checked for accuracy and, if necessary, calibrated.

A 1000 Echo sounder

1001 Function testing of the echo sounder shall be carried out. Depth shall be measured at a fixed position for exact comparison of accuracy and at full speed ahead on all range scales available.

1002 The depth warning or alarm shall be tested.

A 1100 Radar system

1101 Function testing of the radar shall be carried out. The various ranges, presentation modes and the basic radar functions shall be tested.

1102 Testing of the Chart radar functionality shall be performed to verify consistent reference position, orientation and scale. Official ENC data to be loaded before testing.

1103 The accuracy of bearing of the radars shall be tested by the reading of at least 4 fixed positions on the display at a

known position of the ship.

1104 The accuracy of range measurement shall be tested by measuring the distance to at least 2 fixed positions at each range while the ship is in a known position.

1105 The heading marker shall be checked against a visible target dead ahead and adjusted if necessary.

1106 Failure mode by disconnecting a fuse shall be observed.

1107 Inter-switching facilities, including bypass function, shall be tested.

1108 Performance monitors shall be checked.

1109 Self-check programs shall be run.

1110 Indication on the display of the bearing and distance to the object, as well as the heading of own ship, shall be tested.

1111 When manoeuvring the ship, the normal functioning of the ARPA, including automatic acquisition, shall be checked.

1112 The trial manoeuvre function of the ARPA shall be tested.

1113 Tests shall 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.

1114 Input from speed sensors shall be checked.

A 1200 Sound reception system

1201 The sound reception system shall be tested by measuring and comparing the sound level outside and inside the wheelhouse. The directional indication shall be tested.

Guidance note:

The fundamental frequency of the sound signal used in testing the system should be within the range 70 to 820 Hz.

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A 1300 Electronic position-fixing systems

1301 All electronic position-fixing fitted system(s) shall be function-tested.

1302 The accuracy of the electronic position-fixing system(s) shall be checked.

1303 Interference from transmitting systems such as VHF's, radars, active VHF TV antennas shall be tested.

A 1400 Automatic Identification System (AIS)

1401 The AIS shall be function tested to verify proper inter-connection to own ship navigational sensors.

1402 The correct setting of static information (Ship Name, Call sign, MMSI number etc.) shall be verified.

A 1500 Electronic chart display and information system (ECDIS)

1501 The accuracy, functionality and the alarm or warning functions of the ECDIS shall be tested. Performance of automatic functions, such as positioning of the ship by means of dead reckoning and GPS, plotting of the track and updating of the data base, shall be included in the tests together with the following operations:

- route planning
- altering of the route while underway
- positioning by bearings and ranges
- manual adjustment of the ship's position on the screen
- scale changes and zooming functions.

Official ENC data to be loaded before testing.

1502 The ECDIS back-up system shall be tested for proper

interconnection with the primary ECDIS. Route planning, route monitoring, including alarms, shall be tested.

1503 Self-check programs shall be run.

A 1600 Conning display

1601 The performance of conning display(s) function shall be tested, including the accuracy and readability of the data displayed.

A 1700 Propulsion System

1701 Proper functioning, including ergonomics/ HMI and effect of failures, of the propulsion system shall be tested.

A 1800 Communication systems

1801 The communication systems shall be tested for proper function.

1802 The automatic telephone system and internal communication system between workstations shall be tested.

1803 The priority function for the telephones in the wheelhouse and engine control room over the other extensions shall be tested.

1804 VHF systems shall be tested.

1805 UHF systems shall be tested.

A 1900 Central alarm system

1901 The alarm announcement function of the central alarm system shall be tested for verifying correct alarm syntax, audibility level and acknowledgement function.

1902 It shall be tested that all equipment providing alarms on the bridge is connected to the central alarm system and provides two-way communication for silencing of audible alarms in accordance with approved drawings and schematics.

A 2000 Watch monitoring and alarm transfer system

2001 The off-track monitoring system shall be tested. It shall be checked that the off-track alarm is transferred to the places specified if it is not acknowledged within the pre-set limit.

2002 The traffic-monitoring function of the ARPA (guard zones and CPA or TCPA) shall be tested. It shall be checked that the warning is transferred if not acknowledged within the pre-set limit.

2003 The off-heading monitoring system shall be tested. It shall be checked that the off-heading alarm from the heading control system and the compass deviation alarm from the compass monitor is transferred to the places specified if it is not acknowledged within the pre-set limit.

2004 It shall be checked that the wheel over point approach alarm from the ECDIS is transferred to the places specified if it is not acknowledged within the pre-set limit.

2005 The watch monitoring (dead-man) alarm system shall be tested and the transfer of alarms checked.

A 2100 CCTV system

2101 The CCTV system shall be tested for verifying appropriate reproduction on the indoor monitor, including colour correctness, brightness, dimming facilities (if the monitor can degrade the OOW's night vision) and display size. It shall further be verified that the picture is free of flickering.

2102 Means for cleaning the camera lens to be tested for cameras located in areas exposed to salt-mist.

A 2200 Window clear view devices

2201 The means for maintaining clear view through bridge windows shall be tested.

