



Guidelines For Classification And Construction

Part 4 Special Equipment and Systems

Volume 2

GUIDELINES FOR THE BRIDGE ARRANGEMENT AND EQUIPMENT ON SEAGOING SHIPS

Consolidated Edition 2022

Biro Klasifikasi Indonesia



Guidelines For Classification And Construction

Part 4 Special Equipment and Systems

Volume 2

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Consolidated Edition 2022

Biro Klasifikasi Indonesia



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Foreword

This Guidelines is consolidated edition 2022 of Guidelines for the Bridge Arrangement and Equipment on Seagoing Ships Part 4 – Special Equipment and Systems, Volume 2.

In this edition there are no new amendments added, only consolidate the 2018 edition and GCN No.1. The summary of previous edition and amendments including the implementation date are indicated in Table below:

	Edition / Rule Change Notice (RCN)	Effective Date	Link
1.	Edition 2018	1 st July 2018	
3.	GCN No. 1, November 2021	1 st January 2022	

Note: Full previous edition and amendments including its amendment notice is available through link above.

This Guidelines is available to be downloaded at www.bki.co.id. Once downloaded, this Guidelines will be uncontrolled copy. Please check the latest version on the website.

Further queries or comments concerning this Guidelines are welcomed through communication to BKI Head Office.

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Section 1 General Regulations and Information

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A. Scope

1. General

1.1 The Class Notation **NAV-O** comprises the technical requirements for an ergonomic bridge design and arrangement on seagoing ships; in providing ergonomic solutions for the bridge equipment and layout, in order to provide for consistent, reliable and efficient bridge operations and can be applied to demonstrate compliance of a ship with the principles and aims of SOLAS regulation V/15, IMO MSC/Circ.982 and IACS Rec. 95.

1.2 The scope for class notation **NAV-O** is related to the ergonomic and technical design of the bridge. This notation has been developed to realize a successful ergonomic design of the bridge and the equipment on the bridge, which will improve the reliability and efficiency of navigation. Additionally, these Guidelines contain ergonomic requirements as well as a functionally oriented bridge layout to support watchkeeping personnel in their tasks by a user-centered design of the bridge equipment and layout.

1.3 Class Notation **NAV-OC** while fulfilling all requirements of **NAV-O** in addition especially focuses on increased availability and integrity of the information presented on the bridge and thereby improve the situational awareness of the bridge team.

Moreover, requirements for an interconnection of the integrated navigation system (INS) and the ship-shore communication link is incorporated supporting a secure infrastructure for data exchange with sea traffic management services ashore and facilitating remote condition monitoring and maintenance of the INS.

2. Range of application

These **NAV-O** or **NAV-OC** requirements can be applied to new and existing seagoing ships classed with BKI

3. Regulations, rules, standards

3.1 Reference documents

3.1.1 Mandatory regulations:

- International Convention for the Safety of Life at Sea, 1974, as amended – here V/12, 15, 19, 20, 22, 24, 25, 27, 28;
- International Regulations for Preventing Collisions at Sea (COLREG), 1972 as amended;
- IMO MSC.252(83) Adoption of the revised performance standards for integrated Navigation systems (INS);
- MSC.191(79) Performance standards for the presentation of navigation-related information on shipborne navigational displays;
- A.694(17) General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids;
- MSC.128(75) Performance Standards for Bridge Navigational Watch Alarm systems (BNWAS);

- IMO Res. A.1021(26) Code on alerts and indicators;
- IEC Test Standards, IEC 872, 936, 1023, 60945, 61924, 62288 and 61162 as amended;

3.1.2 Non-mandatory guidelines (except parts thereof which are explicitly mentioned in [Section 2-4](#) of these Guidelines):

- MSC/Circ.982 Guidelines on Ergonomic Criteria for Bridge Equipment and Layout;
- IACS Recommendation No.95 for the Application of SOLAS Regulation V/15 – Bridge Design, Equipment Arrangement and Procedures (BDEAP);
- ISO 8468 Ship's bridge layout and associated equipment – Requirements and guidelines;
- SN.1/Circ.265 Guidelines on the application of SOLAS V/15 to INS, IBS and bridge design;
- SN.1/Circ.288 Guidelines for bridge equipment and systems, their arrangement and integration (BES).

4. Equivalent equipment

Other technical equipment and systems not mentioned in these Guidelines, as well as newly developed equipment and systems may be used provided that they are accepted by BKI as being at least equivalent.

5. Exemptions

Whenever a small vessel or a vessel of special construction cannot comply fully with these Guidelines due to structural restrictions, any requirements not complied may be accepted by BKI.

B. Notations Affixed to the Characters of Classification

1. Ships whose bridges are configured in compliance with these Guidelines and equipped in accordance with [Section 4, B.1](#) may have the notation “NAV-O” appended to the character of classification.
2. Ships whose bridges are configured in compliance with these Guidelines and equipped in accordance with [Section 4, B.2](#) and [C](#) may have the notation “NAV-OC” appended to the character of classification.

C. Definitions

Alarm transfer system

Functionality of the Bridge Navigational Watch Alarm System (BNWAS) to actuate the “emergency call” in case of an unacknowledged alarm after a time defined by the user unless otherwise specified by IMO.

Bridge

The area from which the vessel is navigated, controlled and operated, including wheelhouse and bridge wings.

Bridge alert management system (BAMS)

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

Bridge deck

Deck on which the bridge is arranged.

Bridge wings

Those parts of the bridge on both sides of the wheelhouse which in general extend to the ship's side.

Category A and category B alerts

Category A alerts are alerts where graphical information at the task station directly assigned to the function generating the alert is necessary, as decision support for the evaluation of the alert related condition. For example: Crossing safety contour on ECDIS and CPA/TCPA alarm on Radar.

Category B alerts are alerts where no additional information for decision support is necessary besides the information which can be presented at the CAM-HMI. For example: System Fail alerts like ECDIS system malfunction, Gyro failure, BNWAS failure, etc.

Central alert management system (CAM)

Harmonized system for the monitoring, handling, distribution and presentation of alerts on the bridge of from equipment and systems used for navigation. The CAM may be a stand-alone system or part of an INS. The CAM may be part of a bridge alert management system for the monitoring, handling, distribution and presentation of all mandatory alarms to be displayed on the navigating bridge.

Central alert management – human machine interface (CAM-HMI)

The BAMS interface for presentation and handling of alerts on the bridge

Conning position (as required by SOLAS V/22)

Place on the bridge wheelhouse with a commanding view providing the necessary information for conning, and which is used for by navigators, including pilots, when monitoring and directing the ship's movements.

Note:

The Panama Canal pilot conning positions No.1 - No.5, required by the Panama Canal Regulations may be at different locations and are not relevant for SOLAS or NAV-O

Commanding view

Location on the bridge from where the visibility criteria of SOLAS V/22 are fulfilled and where the required navigational indicators can be observed.

Docking workstation

Workstation in the bridge wings from which the ship can be operated during berthing, lock passage, pilot transfer, etc.

Field of vision

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

Helmsman

Designated person who actuates the rudder and controls the heading of the ship under way

Integrated navigation system (INS)

INS comprises navigational tasks such as "Route planning", "Route monitoring", "Collision avoidance", "Navigation control data", "Navigation status and data display" and "Alert management", including the respective sources, data and displays which are integrated into one navigation system.

Monitoring workstation

Workstation from where equipment and environment can be checked constantly; when several crew are working on the bridge it serves for relieving the navigator at the navigating and manoeuvring workstation and/or for carrying out control and advisory functions by the master and/or pilot.

Navigating and manoeuvring workstation

Main workstation for ship's command 350 mm behind the radar console. It is conceived for working in seated/standing position with optimum visibility and integrated presentation of information and operating equipment. It is designed to operate the ship safely and efficiently, in particular when a fast sequence of action is required.

Officer of the watch

Person responsible for safe navigating, operating of bridge equipment and manoeuvring of the ship.

Planning and documentation workstation

Workstation at which voyages are planned and where all facts of ship's operation are documented.

Radio communication workstation

Workstation for external communication distress, safety and general communication.

Safety workstation

Workstation at which monitoring displays and operating elements of systems serving the ship's own safety are concentrated.

Ships length

The length over all.

Totally enclosed bridge

A bridge without open bridge wings, meaning that bridge wings form an integral part of an enclosed wheelhouse.

Tracking

The process of observing the sequential changes in the position of a target, to establish its motion.

Wheelhouse

Enclosed area of the bridge.

Within the reach of the officer of the watch in sitting position

Operation and control units within the reach of the officer of the watch shall be within a radius of 1000 mm around the seated officer (see [Fig. 1.1](#)).

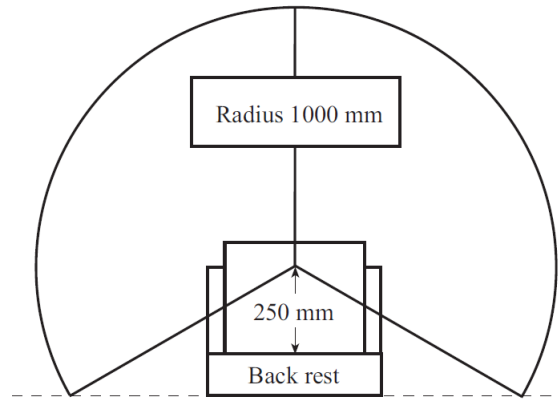


Fig. 1.1 Within the reach of the officer of the watch in seated position

Within the perception area of the officer of the watch

Bridge equipment which can be clearly observed from the relevant workstation.

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Section 2 Documents, Surveys

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A. Documents for Approval

To ensure conformity with the Guidelines the following drawings and documents are to be submitted in form of soft copy (electronic) for approval:

- 1) Navigation bridge visibility including line of sight and the horizontal field of vision from the workstation for navigation and manoeuvring, monitoring, manual steering and docking.
- 2) Arrangement of windows and blind sectors caused by obstructions outside the wheelhouse. related to the above mentioned workstations
- 3) Arrangement on bridge deck showing consoles, window inclination, wiper arrangement, etc.
- 4) Configuration of consoles/ console layout, list of equipment, include approval information
- 5) Block diagrams showing the functionally connected appliances, as well as their power supply.
- 6) Drawings, specifications of the performance of the watch alarm system.
- 7) Drawings showing the design of the watch alarm system and the through-connection of the alarms from the bridge to the accommodation.
- 8) Failure analysis, showing that the system is designed on “fail-to-safe principle” (NAV-OC only)
- 9) Operation and installation manual (on request)

B. Delivery plans and documents

One copy each of the following technical documents is to be supplied on board:

- 1) Specification of equipment
- 2) Operation and maintenance manuals
- 3) Instructions for function testing on board.

C. Test and Surveys

1. Tests

1.1 All tests shall be carried out according to test programs approved by BKI.

1.2 The tests and visual examinations shall verify that all relevant Guidelines requirements are met. The tests shall cover requirements given by these Guidelines and applicable IMO performance standards. The test programs shall specify in detail how the various functions shall be tested and what shall be observed during the tests.

1.3 The onboard testing to be completed during installation and commissioning shall include:

- 1) verification of proper interfacing and data protocol of individual equipment
- 2) establishment of correct parameters for filters, integrity monitoring, alarm limits, control parameters (time constants, set points, lengths, heights, etc.)

- 3) verification of correct functionality of system applications and integration of components, including the ability of the integrated navigation system to keep any controlled process within the specified tolerances
- 4) verification of fall-back-modes and emergency operation of essential navigational functions.

1.4 Testing in accordance with [1.3](#) shall be carried out at the manufacturer's works as far as practical in order to limit the necessary testing on board to a minimum [Section 4, B.1](#)

1.5 The tests shall demonstrate that the essential navigational functions are available and operable on designated back-up means in a situation where the normal navigational system configuration is disabled as far as practical.

2. Surveys

Vessels with Class Notation **NAV-O** or **NAV-OC** are subject to following regular surveys:

2.1 Initial Surveys

An initial survey of the bridge arrangement including functional tests of the equipment will be carried out onboard on basis of these Guidelines and approved documents, before the Class Notation **NAV-O** or **NAV-OC** may be granted.

2.2 Renewal survey

Functional checks of the equipment and systems necessary for the Class Notation **NAV-O** or **NAV-OC** will be carried out at 5-yearly intervals within the timeframe of the class renewal survey.

2.3 Intermediate survey

A survey in the same scope as the renewal survey as specified in [2.2](#), but within the timeframe of the intermediate class survey.

2.4 Occasional survey

An occasional survey is to be carried out on board after modification of bridge equipment or arrangement. BKI shall be informed about any alterations of the vessel which may affect the visibility from the bridge.

Section 3 Bridge Configuration

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A. Workstations

1. These Guidelines apply to the navigating and manoeuvring workstation and the monitoring workstation, the workstation for manual steering and the docking workstations.
2. For the planning and documentation workstation, the safety workstation and the radio communication workstation, the requirements and guidelines of ISO 8468, IACS REC.95 and MSC/Circ.982 are recommended.
3. A combination of workstations may be permitted if reasonable and practical.
4. At each workstation all information are to be displayed, and all units and appliances be installed, which are required for the safe performance of all tasks dedicated to the workstation.
5. Workstations for navigating and manoeuvring and for monitoring should be arranged within an area spacious enough for two persons to carry out the tasks in close cooperation, but sufficiently close together to enable the watch officer to control and safely carry out all the tasks from one working area under normal operating conditions.

B. Field of Vision

1. The view of the sea surface from the navigating and manoeuvring workstation and the monitoring workstation shall not be obscured by more than two ship lengths, or 500 m, whichever is the less, forward of the bow to 10° on either side under all conditions of draught, trim and deck cargo, e.g. containers (see [Fig. 3.1](#)).
2. A field of vision around the vessel of 360° shall be obtained by an observer with an eye height of 1800 mm moving within the confines of the wheelhouse.
3. The horizontal field of vision from the navigating and manoeuvring workstation shall extend over an arc of not less than 225°, that is from right ahead to not less than 22,5° abaft the beam on either side of the ship (see [Fig. 3.2](#)).

The horizontal field of vision from the monitoring workstation shall extend over an arc of not less than 202,5°, that is from 22,5° abaft the beam on one side of the ship through right ahead and to abeam on the other side of the ship (see [Fig. 3.3](#)).

The 225° field of vision shall not be limited by curtains or other unnecessary obstructions inside the wheelhouse.

The straight view directly ahead from the navigating and manoeuvring workstation and monitoring workstation shall not be obscured by obstructions inside or outside of the wheelhouse.

4. From each docking workstation (bridge wing) the horizontal field of vision should extend over an arc of at least 225°, that is at least 45° on the opposite bow through right ahead to right astern.

5. From the main steering position (workstation for manual steering) the horizontal field of vision shall extend over an arc from right ahead to at least 60° on each side of the ship.

No obstruction by cargo, cargo gear or window frames shall be directly ahead of the manual steering workstation.

(IMO Res. A708)

6. The workstation for manual steering shall preferably be located on the ship's centre-line. If the view ahead is obstructed by large masts, cranes, etc., the steering station shall be located a distance to starboard of the centre-line, sufficient to obtain a clear view ahead. If the workstation for manual steering is located off the centre-line, special steering references for use by day and night shall be provided, e.g. sighting marks forward.

7. No blind sector caused by cargo, cargo gear or other obstructions outside of the wheelhouse forward of the beam which obstructs the view of the sea surface as seen from the navigating and manoeuvring workstation, shall exceed 10°. The total arc of blind sectors shall not exceed 20°. The clear sectors between blind sectors shall be at least 5°.

However in the view described in 1. each individual blind sector shall not exceed 5°. The total arc of additional blind sectors between the beam and 22,5° abaft the beam on either side should not exceed 10°, allowing a total of 30° within the required total field of vision of 225°. A clear sector of at least 5° shall extend from 22,5° abaft the beam and forward on either side of the ship. (see Fig. 3.4)

8. Visibility shall not be obstructed by regular container stowage above the line of visibility, forward of the bridge. Only blind sectors that cannot be avoided due to unusual structure and size of the cargo units on deck and fixed structures necessary for cargo handling or the operation of the ship may be included in the blind sector limits allowed by SOLAS V/22 and 7. of this Section.

9. The ship's side should be visible from the bridge wing. Bridge wings should be provided out to the maximum beam of the ship.

This requirement is accomplished when the bridge wings are extended up to 400 mm less than the maximum beam of the ship and the bridge crew can lean over the side to have an unobstructed view.

The requirement shall also be fulfilled when the sea surface at the lowest draught and a transverse distance of 500 mm and more from the maximum beam throughout the ship's length is visible from the side of the bridge wing (see Fig. 3.5).

Ships of specific construction are exempted – see MSC.1/Circ.1350.

Note:

Bridge wings which are extending beyond the vessel's hull are considered as protrusions by the Panama Canal Authority (ACP). Such protrusions may interfere with the safe Panama Canal transit and are therefore subject to all applicable regulations and limitations.

10. The view point to be used for calculation of the required view and field of vision (see Fig. 3.1 and 3.2) shall be the workstation navigating / manoeuvring which is 350 mm behind the radar screen and based on an eye height of 1800 mm (see Fig. 3.6).

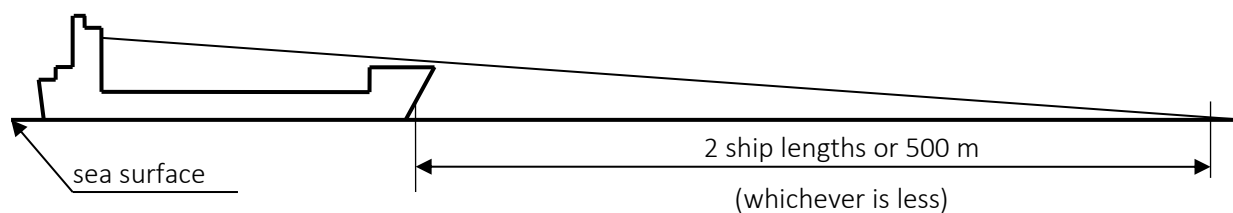


Fig. 3.1 Forward View

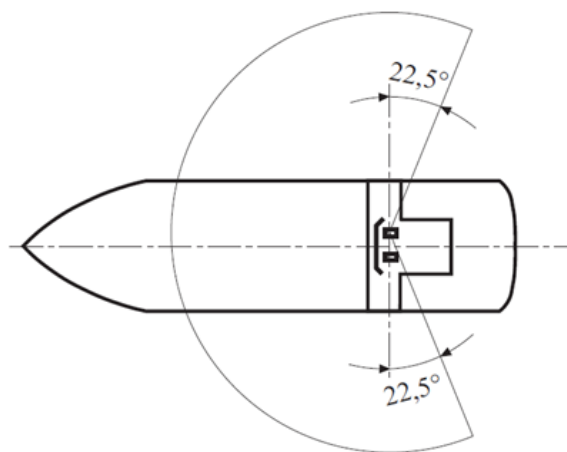


Fig.3.2 Field of vision at navigating and manoeuvring workstation (example for off-centre location on starboard-side)

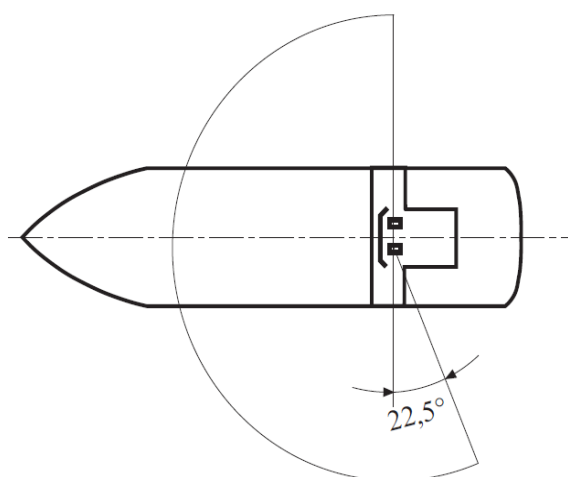


Fig. 3.3 Field of vision from monitoring workstation (example for off-centre location on port-side)

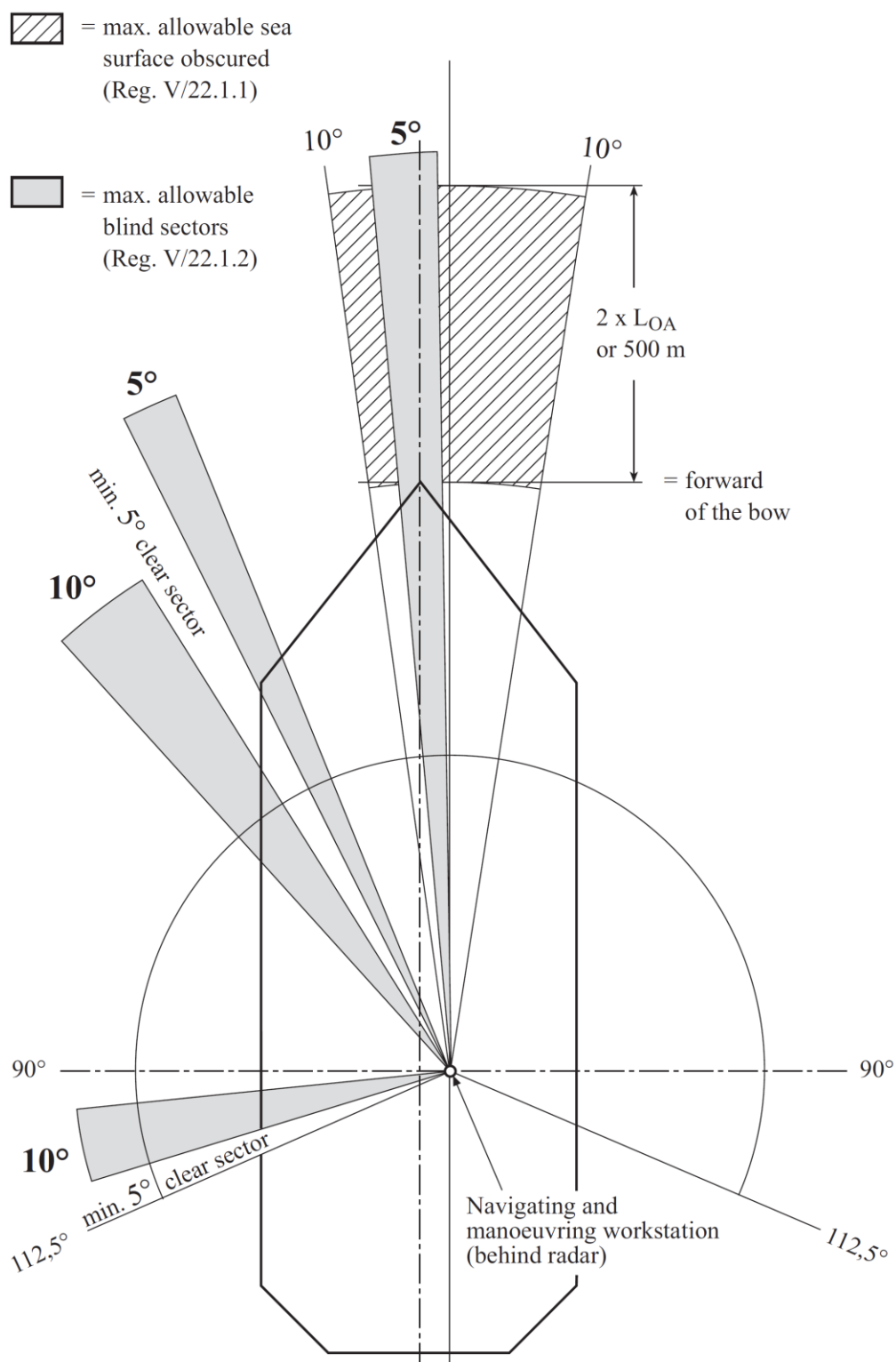


Fig. 3.4 Field of vision

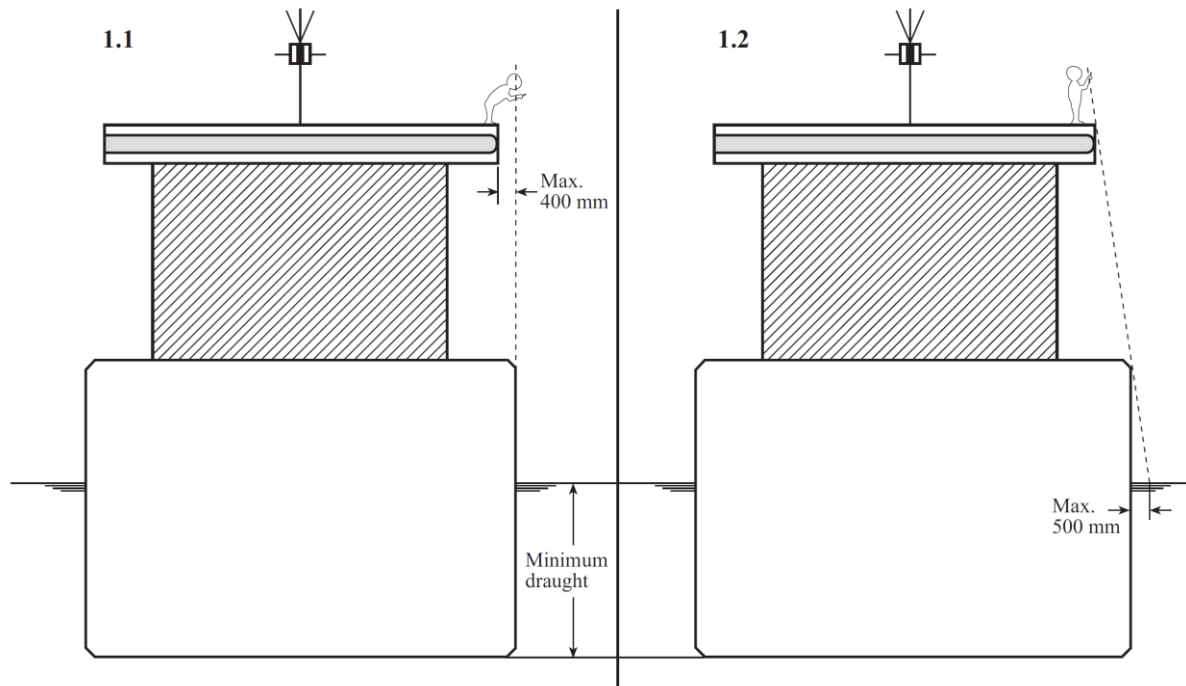


Fig.3.5 Maximum permitted blind sector at the view of the ships side

C. Structural Arrangements

1. Wheelhouse height

The clear height between the bridge deck surface covering and the underside of the deck head beams shall be at least 2250 mm. The lower edge of deck head mounted equipment shall be at least 2100 mm above the deck in open areas, passageways and at standing workstations.

2. Windows

2.1 The height of the lower edge of the front windows above the deck shall allow a forward view over the bow in accordance with B.1 for a person in a sitting position at the workstation for navigating and manoeuvring or monitoring and should not be more than 1000 mm.

2.2 The upper edge of the front windows shall allow a forward view of the horizon for a person in a standing position with an eye height of 1800 mm at the navigating and manoeuvring workstation and the monitoring workstation when the ship is pitching in heavy seas (see Fig. 3.6).

The minimum height of the upper edge of front windows above the deck surface shall be 2000 mm.

2.3 Framing between windows shall be kept to a minimum and not be installed immediately forward of any workstation. If stiffeners between windows are to be covered, this shall not cause further obstructions of the field of vision from any position inside the wheelhouse.

2.4 Windows especially those in front of the navigating and manoeuvring workstations and the monitoring workstations shall be as wide as possible. The divisions (plate strip) between front windows shall not exceed 150 mm, greater breadths up to 200 mm are acceptable if it is proved that this is necessary for reasons of strength or to avoid vibrations. If stiffeners are used, divisions shall not exceed 100 mm in width and 120 mm in depth.

2.5 All bridge windows within the required field of vision (225°) from the navigating and manoeuvring workstation and the monitoring workstation shall be inclined from the vertical plane to avoid reflections.

Bridge front windows shall be inclined from the vertical plane top out, at an angle of not less than 15° and not more than 25°.

Bridge side windows shall be inclined from the vertical plane top out, at an angle of not less than 5°. Windows in the bridge wing doors may be arranged vertically. Windows outside the 225° field of vision, and aft facing windows shall also be inclined not less than 4° ~ 5° if they may cause reflections.

2.6 The windows shall be of clear glass. The use of polarized or tinted glass or glass causing unreasonable refraction is not permitted.

2.7 It shall be possible to watch the area in front of the bridge superstructure from the wheelhouse. Therefore a close approach to at least one front window shall be possible.

2.8 All bridge front windows shall be provided with efficient cleaning, de-icing and de-misting devices.

In case of a totally enclosed bridge also the aft facing windows and the side windows (except sliding windows) at the docking stations shall be provided with such devices.

The use of clear view screens (rotating windows) is not required. However, if fitted, they shall not be installed in windows in front of any workstation.

On windows in the front bulkhead, which are in line with the view from the workstations, wipers may be omitted ([Fig. 3.7](#)), unless required for the manual steering workstation and/or the pilot's conning position.

2.9 To ensure a clear view and to avoid reflections in bright sunshine, sunscreens with minimum colour distortion should be provided at all bridge windows. Such screens should be readily removable and not permanently installed.

3. Consoles

3.1 Consoles within the required field of vision of the workstation for navigating and manoeuvring and the workstation for monitoring shall not obstruct the horizontal line of sight in seated position. The upper edge of the consoles should not exceed 1200 mm (see [Fig. 3.6](#)).

3.2 If access ways are provided between different workstation, these shall in general have a clear width of not less than 700 mm. The workstation operating area shall be part of the workstation and not of the access way.

3.3 If there are any consoles or installations placed away from the bridge front bulkhead or if a console is separated from other installations, the distance to the front bulkhead or any other console shall be sufficient for two persons to pass each other. The distance of a passageway between the front bulkhead and any consoles should preferably be at least 1000 mm, but in no case less than 800 mm.

3.4 If chairs are provided for the navigating and manoeuvring workstation and the monitoring workstation, they shall be capable of rotating with the foot rest being arrested and adjustable in height and capable of being arrested on the floor and should also be capable of being moved clear of the operating areas.

D. Working Environment

1. Toilet facilities shall be provided on the bridge or within easy access of the navigating bridge deck primarily for those on duty.

2. Wheelhouse and bridge wing floors shall be on one level, without steps and should have a non-slip surface.
3. There shall be no sharp edges, protuberances, pillars, tripping hazards or other obstacles, which could cause injury to personnel.
4. Sufficient hand or grab rails shall be fitted to enable personnel to move or stand safely in bad weather. Means for securing of stairway openings shall be given special consideration.
5. Red light shall be used to maintain dark adaption whenever possible in areas or on items of equipment, other than the chart table, requiring illumination in the operational mode. This light should be variable from 0 to 20 lux and be provided at all workplaces.
6. The requirements and guidelines of MSC/ Circ.982 for work environment are recommended.

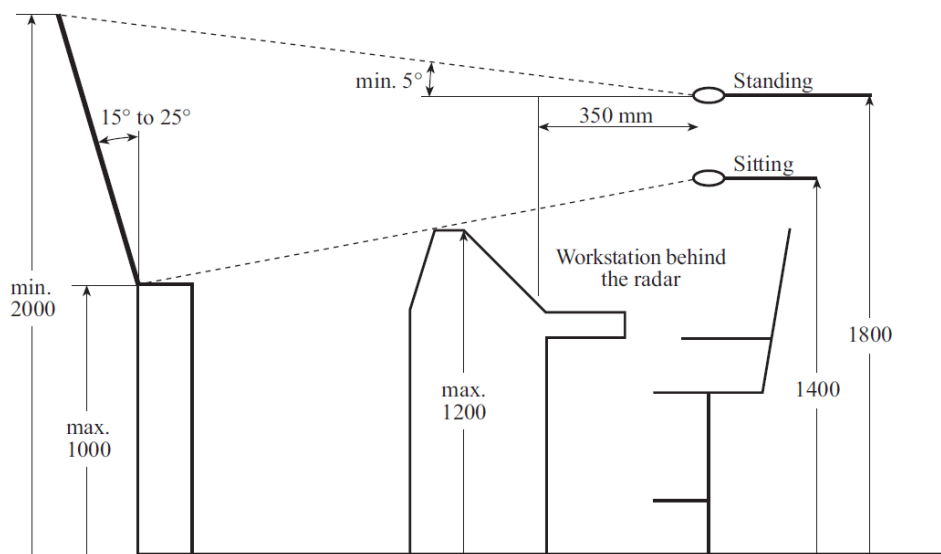


Fig. 3.6 Minimum size of the bridge front window and visibility from the navigating and manoeuvring workstation and monitoring workstation

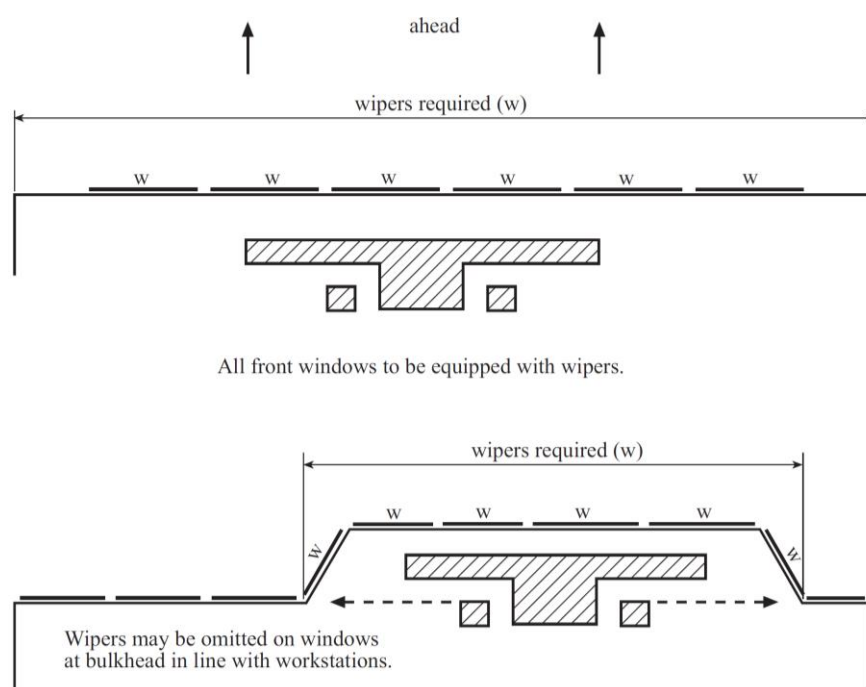


Fig. 3.7 Requirements for cleaning devices (windows wipers)

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Section 4 Bridge Equipment

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A. General

1. Ships shall be equipped in accordance with SOLAS 1974, as amended, Chapter V, Regulation 19 "Carriage requirements for shipborne navigational systems and equipment" and Regulation 20 "Voyage Data Recorders".

2. With reference to SOLAS V/18.1 required navigational systems and equipment shall be of a type approved by the Administration. Navigational systems for Class Notation **NAV-OC** shall be of a type approved by the Administration according to the related standards¹.

All electrical and electronic equipment on the bridge or in the vicinity of the bridge, where a type approval is not required, shall be tested for electromagnetic compatibility.

3. Systems or equipment as listed in the [Rules for Electrical Installations \(Pt.1, Vol.IV\) Sec.21.E](#) shall be type tested, e.g. steering gear control system.

B. System Requirements

1. Class Notation NAV-O

In addition to SOLAS carriage requirements, the ship shall be fitted with:

- Second Electronic Position Fixing System (EPFS – e.g. GPS, GLONASS, GALILEO, etc.)
- Central alert management system including alarm transfer system
- Electronic Chart Display and Information System - ECDIS and back-up ECDIS
- Second gyro compass, ships of 10000 GT and upwards
- Heading control system (HCS)
- Weather information system
- Wind speed and direction indicator

2. Class Notation NAV-OC

In addition to the equipment required in [1.](#), one of the following alternatives applies:

2.1 For Class Notation **NAV-OC** the following tasks and control functions from the IMO performance standard MSC.252(83) shall be provided:

- Collision avoidance

¹ IMO Res.A.694(17), IMO Res. MSC.191(79), IMO Res. MSC.252(83), IEC 60945, IEC 61162 Series, IEC 61924-2, IEC 62288

- Route planning and monitoring
- If a Track Control System (TCS) is installed it shall be of category C
- Central alert management (Module C)

2.2 Alternatively the following systems, equipment and functionalities shall be provided:

- If a Track Control System is installed, it shall be of category C
- Sensor data management to collect and distribute navigational and control data. Data shall be checked for validity, plausibility and latency.
- Consistent common reference system to ensure the consistency and integrity of data. A single consistent common reference point shall be used for all spatially related information. For consistency of measured ranges and bearings, the recommended reference location should be the conning position. Alternative reference locations e.g. the pivot point for heading or track control systems may be used.
- Central alert management and alert transfer system
- Central display for the indication of navigation and control data (conning display).

C. Sensor Requirements

1. The following sensors and functionalities shall be provided independent of SOLAS the carriage requirements:

- ARPA functionality shall be provided for all installed Radars on the bridge.
- At least one Radar shall be capable to display parts of Electronic Navigation Charts (ENC) and other vector chart information to aid safety of navigation and position monitoring. Alternatively at least one ECDIS shall be capable to display a Radar overlay.
- At least one of the EPFS shall be a DGPS or other GNSS receiver with the same or better accuracy and availability.
- Anemometer to indicate the relative and true wind speed and direction information.

2. A loss or a failure of one sensor shall not result in a loss of the redundant sensor or fall-back arrangement.

3. A bidirectional alert interface shall be provided by each required sensor to indicate any required alert on an external central alert management system. Each sensor shall have the capability for an immediate remote acknowledgement, except category A alerts, and temporarily silence from an external alert management system.

4. The following back-up and fall-back arrangements of [Table 4.1](#) shall be observed:

Table 4.1 Back-up and fall-back arrangements

Sensor	Data	Back-up	Fall-back (equipment which may be available in case of a complete sensor loss)
Gyro	Heading	Gyro 2	Magnetic compass ¹⁾
EPFS	Position, Time, Date	EPFS 2	Dead reckoning and radar bearing
SDME (WT)	Speed	SDME (BT) if provided	EPFS
Echo sounder	Depth		ECDIS and/or Paper Chart
RADAR		RADAR 2	AIS
Data interface (if provided)		Data interface 2 (if provided)	
¹⁾ Not to be used for radar and track control.			

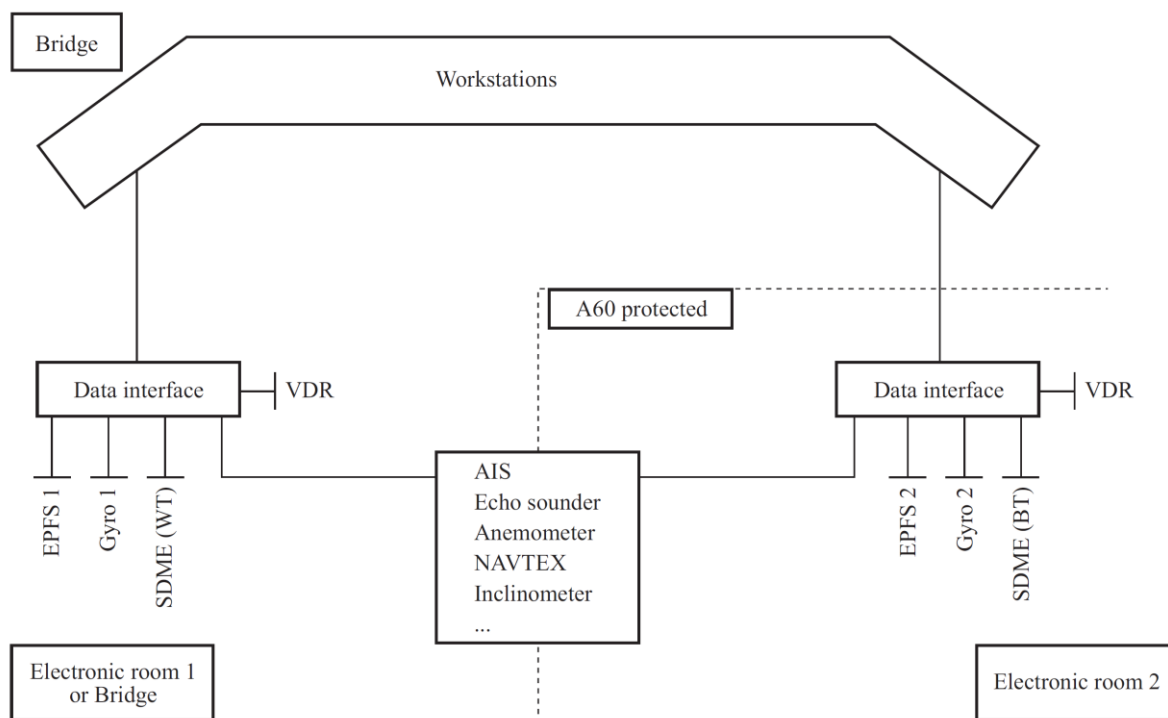


Fig. 4.1 Example for a sensor configuration

D. Arrangement of Equipment

1. Navigating and manoeuvring workstation

1.1 The following tasks and control functions shall be accessible and within the reach of the officer of the watch from a seated position (see [Section 1, Fig. 1.1](#)):

- 9 GHz ARPA radar with operation controls. The 9 GHz radar shall be inter switchable with the 3 GHz radar at the monitoring workstation
- ECDIS with operation controls and radar overlay

- Heading and track control system with manual override
- Control of main engine(s), incl. emergency manoeuvre and emergency stop
- Steering mode selector switch for steering gear
- Intercom to docking workstations (if the distance is greater than 10 m)
- Call system for master and navigation officers (telephone / internal communication system)
- VHF equipment including GMDSS distress alarm management (external communication)
- Automatic Identification System (AIS) terminal, if it's a stand-alone system. If the AIS information is shown in the radar or ECDIS it may be positioned within the perception area of the officer of the watch.
- Control of whistle and manoeuvring light
- Acknowledge push button for watch alarm system (BNWAS)
- Control of general alarm
- Control of window wipers in front of workstation
- Control of console lighting

1.2 The following equipment shall be within reach from seated or standing position:

- Control of thrusters
- Rudder pump selector switch for steering gear

1.3 The following information shall be easily readable from the navigating and manoeuvring workstation for the officer of the watch. It can be achieved by stand-alone instruments in the bridge console or by a centralized multifunction conning display, which is recommended:

- Gyro compass heading
- Rate-of-turn, if available
- Rudder angle
- Propeller revolutions
- Pitch, if a pitch propeller is fitted
- Thrust : force and direction
- Speed (longitudinal and lateral if provided)
- Water depth
- Position
- Time
- Wind : direction and speed
- Sound reception device, if totally enclosed bridge
- NAVTEX, if provided without printer

1.4 The following instruments, indicators and displays providing information easily accessible from the navigating and manoeuvring workstation:

- Whistle automatic control system
- Navigation- and signal light controller
- Emergency stop of installations to be stopped in case of fire (air condition, ventilation and refrigerating installation)
- Remote control and monitoring of watertight doors, external openings and fire doors (open/closed), if available

- Remote control of emergency fire pump
- Anti-rolling device, if available

2. Monitoring workstation

2.1 The following tasks and control functions shall be provided and within the reach of the officer from a seated or standing position (see [Fig. 1.1](#)):

- 3 GHz ARPA radar with operation controls. This radar shall be inter-switchable with the 9 GHz radar at the navigating and manoeuvring workstation.
- Control of whistle and manoeuvring light
- Acknowledge push button for watch alarm system (BNWAS)
- Control of window wipers in front of workstation
- Intercom to docking workstations (if the distance is greater than 10 m)
- Call system for master and navigation officers (telephone / internal communication system)
- VHF equipment (external communication)

2.2 The following information shall be easily readable from the monitoring workstation:

- Gyro compass heading
- Rate-of-turn, if available
- Rudder angle
- Propeller revolutions
- Pitch if a pitch propeller is fitted
- Thrust : force and direction
- Speed (longitudinal and lateral for ships of 10000 GT and more if provided)
- Water depth
- Time
- Wind : direction and speed
- Sound reception device, if totally enclosed bridge

2.3 Instruments, indicators or displays mentioned under paragraphs [1.1](#) to [2.2](#) and which are required at more than one workstation, shall be arranged so that it they can be easily reached, respectively easily readable from all relevant workstations. If this is not achievable such equipment shall be duplicated.

3. Manual steering workstation

3.1 The following equipment shall at least be provided within the reach of the helmsman:

- Steering wheel or other means of controlling the heading of the ship manually
- Control of window wiper in front of workstation
- Intercom to docking workstations (if the distance is greater than 10 m), suitable for hands-free operation

3.2 The communication equipment may be a suitable wireless system (e.g. UHF) or a PA talk-back system or similar fixed installation. Dimmer for indicators listed in [3.3](#).

3.3 The following indicators shall at least be easily readable for the helmsman, when manually steering the vessel:

- Rudder angle

- Gyro compass heading
- Magnetic compass heading
- Rate-of-turn, if available

4. Docking workstation

4.1 The following equipment shall at least be provided within the reach of the operating officer:

- Control of whistle and manoeuvring light
- Intercom to enable two-way communication with wheelhouse workstations for manual steering, navigating and manoeuvring, monitoring and to manoeuvring stations. The intercom shall be capable of hands-free operation
- Acknowledge push button for watch alarm system (BNWAS)
- Control of wipers for front and rear windows of workstation (If the ship has a totally enclosed bridge)

4.2 The following information shall be easily readable from the docking workstation:

- Rudder angle
- Propeller revolutions
- Pitch, if a pitch propeller is fitted
- Thruster speed and direction
- Gyro compass heading (may be covered by applicable gyro compass bearing repeaters)

Note:

A conning display or multifunction display may be used and is recommended.

5. General bridge equipment within wheelhouse

Following general equipment shall be provided within the wheelhouse:

- Main control unit of BNWAS
- Control of window washing and heating system
- Control of wheelhouse heating and cooling
- Main control unit of whistle
- Weather information system

Note:

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

6. Integrated Navigation System tasks and functions

6.1 Collision avoidance Radar ARPA, AIS

6.2 Route planning, route monitoring ECDIS, echo sounder

6.3 Navigation control data or navigation status and data display HCS, TCS, EPFS, SDME, Gyro compass

E. Central Alert Management System

1. A centralized alert management system according to module C of MSC.252(83) (Performance Standards for Integrated Navigation Systems) or MSC.302(87) (Performance Standard for Bridge Alert Management) shall be provided.
2. The general requirements from the IMO Resolution MSC.1021(26) (Code on Alerts and Indicators) has to be observed.
3. The classification of alerts shall be in compliance with MSC.252(83) Table 2. It shall be possible to acknowledge all alarms and warnings by a single operator action, except for category A (danger of collision or danger of grounding). A temporarily silence of an audible alert should be possible for all alerts.
4. A Bridge Navigational Watch Alarm System (BNWAS) complying with MSC.128(75) Performance Standards for Bridge Navigational Watch Alarm systems (BNWAS) and IEC Test Standards, IEC 60945, 61924, 62288 and 61162 as amended, including alarm transfer system shall be provided for the following unacknowledged alerts:
 - Failure HCS
 - System failure gyro compass
 - Loss of position EPFS
 - System failure SDME
 - Depth alarm from Echo sounder
 - Aggregated steering gear alarm
 - Imminent slow-down or shut-down of propulsion system
 - Failure / loss of navigation lights

F. Power Supply

1. The radio and navigational equipment and systems shall be directly supplied from both the main source of electrical power and the emergency source of electrical power with automated changeover by separate power supply circuits with provision to preclude inadvertent shut-down.
2. In addition to the following equipment / systems should be supplied from a transitional source of electrical power for a duration of not less than 45 s:
 - One 9GHz (X-Band) Radar including transceiver and antenna
 - Gyro compass systems
 - EPFSs
 - ECDIS
 - SDME
 - Echo sounder
 - Sensor management

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