

# TÜRK LOYDU



## Chapter 21 – Navigation Bridge Visibility, Bridge Arrangement and Equipment July 2019

This latest edition incorporates all rule changes. The latest revisions are shown with a vertical line. The section title is framed if the section is revised completely. Changes after the publication of the rule are written in red colour.

Unless otherwise specified, these Rules apply to ships for which the date of contract for construction as defined in TL- PR 29 is on or after 1<sup>st</sup> of July 2019. New rules or amendments entering into force after the date of contract for construction are to be applied if required by those rules. See Rule Change Notices on TL website for details.

"General Terms and Conditions" of the respective latest edition will be applicable (see Rules for Classification and Surveys).

If there is a difference between the rules in English and in Turkish, the rule in English is to be considered as valid. This publication is available in print and electronic pdf version. Once downloaded, this document will become UNCONTROLLED. Please check the website below for the valid version.

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**Navigation Bridge Visibility, Bridge Arrangement and Equipment**

	<b>Page</b>
<b>Section 1 – General Regulations and Information</b>	
A. Scope .....	1-1
B. Notations Affixed To The Characters Of Classification.....	1-7
<b>Section 2 – Documents, Surveys</b>	
A. Documents for Approval.....	2-2
B. Delivery Plans and Documents .....	2-2
C. Surveys .....	2-2
<b>Section 3 – Bridge Configuration</b>	
A. Workstations.....	3-2
B. Field Of Vision .....	3-2
C. Structural Arrangements .....	3-6
D. Working Environment .....	3-8
<b>Section 4 – Bridge Equipment</b>	
A. General .....	4-2
B. System Requirements .....	4-2
C. Sensor Requirements.....	4-3
D. Arrangement Of Equipment.....	4-4
E. Central Alert Management System.....	4-9
F. Power Supply .....	4-10

## AMENDMENTS

Revision	RCS No.	EIF Date*
Section 01	<a href="#">04/2019</a>	01.01.2020
Section 03	<a href="#">04/2019</a>	01.01.2020
Section 04	<a href="#">04/2019</a>	01.01.2020

\* Entry into Force (EIF) Date is provided for general guidance only, EIF dates given in Rule Change Summary (RCS) are considered valid. In addition to the above stated changes, editorial corrections may have been made.

**SECTION 1**

**GENERAL REGULATIONS AND INFORMATION**

	<b>Page</b>
<b>A. SCOPE</b> .....	<b>1-1</b>
<b>B. NOTATIONS AFFIXED TO THE CHARACTERS OF CLASSIFICATION</b> .....	<b>1-7</b>

## A. Scope

### 1. General

The Class Notation **NAV** comprises the technical requirements for an ergonomic bridge design and arrangement on seagoing ships and can be applied to demonstrate compliance of a ship with the principles and aims of **SOLAS** regulation V/15, IMO MSC/Circ.982, TL- G 95, and TL- I SC 235.

Class Notation **NAV-INS** while fulfilling all requirements of **NAV** in addition especially focuses on increased availability and consistency of the bridge equipment.

International or national requirements for the manning and familiarisation of the bridge team and provision of an outlook shall remain unaffected.

### 2. Range of application

These **NAV/NAV-INS** Rules can be applied to seagoing ships classed with Türk Loydu, contracted for construction as defined in TL- PR No.29 on or after 1<sup>st</sup> February 2013.

For ships with keel laying before this date the former version of the rules with Class Notation **NAV-O/NAV-OC** may be applied.

### 3. Regulations, rules, standards

#### 3.1 Reference documents

##### 3.1.1 Mandatory regulations:

International Convention for the Safety of Life at Sea (**SOLAS**), 1974, as amended – here V/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), **as amended by IMO MSC.452(99)**.

MSC.191(79) Performance standards for the presentation of navigation-related information on shipborne navigational displays, **as amended by MSC.466(101)**.

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).

IEC Test Standards, IEC 60945, 61924-2, 62288 and 61162 as amended.

IMO Res. A.1021(26) Code on alerts and indicators.

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

MSC/Circ.982 Guidelines on Ergonomic Criteria for Bridge Equipment and Layout.

TL- G 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. Definitions

Terms used in the requirements are defined below:

**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:** that area from which the navigation and control of the ship is exercised, including the wheelhouse and bridge wings.

**Bridge wings:** Those parts of the bridge on both sides of the wheel- house 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 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 support is necessary. 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 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.

**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.

**Conning position (as required by SOLAS V/22):** Place on the bridge with a commanding view, used for monitoring and directing the ships 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/NAV-INS*

**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.

**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.

**Manual steering workstation:** Workstation from which the ship can be steered by a helmsman.

**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, back-up officer 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 position with optimum visibility and integrated presentation of information and operating equipment. It shall be designed to operate the ship safely and efficiently.

**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 distress, safety and general communication.

**Safety workstation:** Workstation at which monitoring displays and operation elements of systems serving the ship's own safety are concentrated.

**Ships length:** Ship length means 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.

**Wheelhouse:** Enclosed area of the bridge

**Within the reach of the officer of the watch:** 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 Figure 1.1).

**Within the perception area of the officer of the watch:** Bridge equipment which can be clearly observed from the relevant workstation.

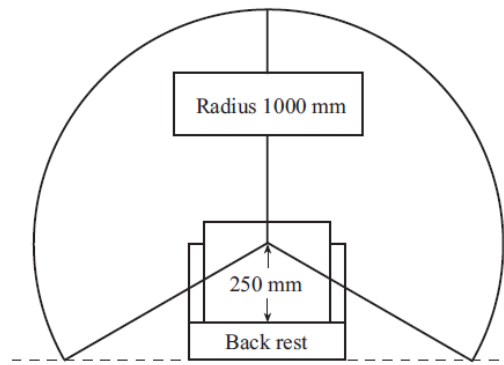
## 5. Equivalent equipment

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

## 6. Exemptions

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





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

**Figure 1.1**

**B. Notations Affixed to the Characters of Classification**

1. Ships whose bridges are configured in compliance with these Rules and equipped in accordance with Section 4, B.1. may have the Notation **NAV** appended to the Character of Classification.
2. Ships whose bridges are configured in compliance with these Rules and equipped in accordance with Section 4, B.2. and C. may have the Notation **NAV-INS** (integrated navigation system) appended to the Character of Classification.

**SECTION 2**

**DOCUMENTS, SURVEYS**

	<b>Page</b>
<b>A. DOCUMENTS FOR APPROVAL</b> .....	<b>2-2</b>
<b>B. DELIVERY PLANS AND DOCUMENTS</b> .....	<b>2-2</b>
<b>C. SURVEYS</b> .....	<b>2-2</b>

**A. Documents for Approval**

The following technical documents are to be submitted in paper form in triplicate to Türk Loydu 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 incl. approval information.
5. Block diagrams showing the functionally connected appliances, as well as their power supply.
6. Failure analysis, showing that the system is designed on "fail-to-safe principle" (**NAV-INS** only).

**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. Surveys**

Vessels with Class Notation **NAV/NAV-INS** are subject to following regular surveys:

**1. Initial survey**

An initial survey of the bridge arrangement including functional tests of the equipment will be carried out on board on basis of these Rules and approved documents, before the Class Notation **NAV/NAV-INS** may be granted.

**2. Renewal survey**

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

**3. Intermediate survey**

A survey in the same scope as the renewal survey as specified in 2., but within the timeframe of the intermediate class survey.

**4. Occasional survey**

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

**SECTION 3****BRIDGE CONFIGURATION**

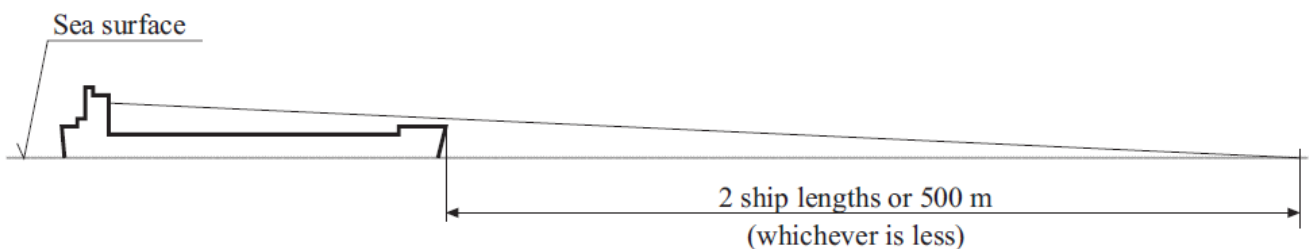
	<b>Page</b>
<b>A. WORKSTATIONS</b> .....	<b>3-2</b>
<b>B. FIELD OF VISION</b> .....	<b>3-2</b>
<b>C. STRUCTURAL ARRANGEMENTS</b> .....	<b>3-6</b>
<b>D. WORKING ENVIRONMENT</b> .....	<b>3-8</b>

### A. Workstations

1. These Rules apply to the navigating and manoeuvring workstation, 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, TL- G 95 and MSC/Circ.982 are recommended.
3. A combination of workstations may be permitted if reasonable and practical.
4. The layout of the bridge shall not impair the required field of vision and the reception of external sound signals.
5. At each workstation all information are to be displayed and all units and appliances are to be installed which are necessary for the safe performance of all tasks of this place.
6. 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  $10^\circ$  on either side under all conditions of draught, trim and deck cargo, e.g. Containers (see Figure 3.1).
2. There should be a field of vision around the vessel of  $360^\circ$  obtained by an observer moving within the confines of the wheelhouse.



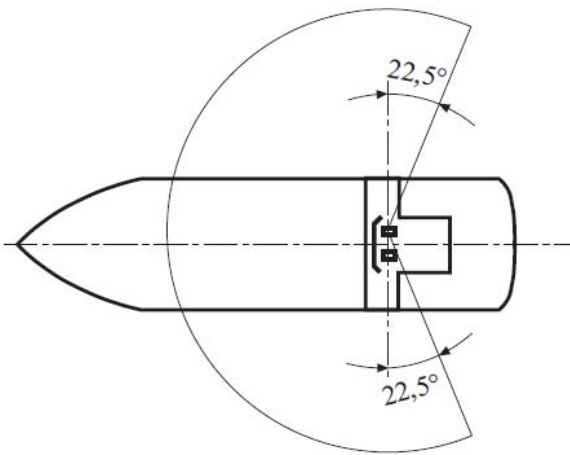
**Figure 3.1 Forward view**

3. The horizontal field of vision from the navigating and manoeuvring workstation shall extend over an arc of not less than  $225^\circ$ , that is from right ahead to not less than  $22,5^\circ$  abaft the beam on either side of the ship (see Figure 3.2).

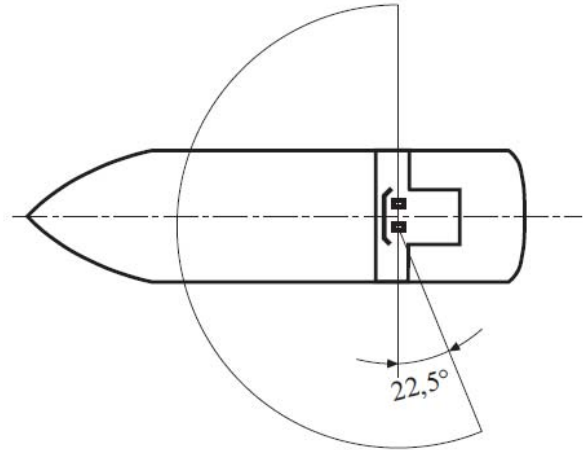
The horizontal field of vision from the monitoring workstation shall extend over an arc of not less than  $202,5^\circ$ , that is from  $22,5^\circ$  abaft the beam on one side of the ship through right ahead and to abeam on the other side of the ship (see Figure 3.3).

The  $225^\circ$  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 obstructed.



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



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

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 and then from right ahead to right astern through 180° on the same side of the ship.

5. From the main steering position (workstation for manual steering) the horizontal field of vision should 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.

6. The workstation for manual steering should preferably be located on the ship's centre-line. If the view ahead is obstructed by large masts, cranes, etc., the steering station should 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 centreline, special steering references for use by day and night should 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 Figure 3.4)

8. Visibility shall not be obstructed by regular container stowage above the line of visibility. 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 item 7.

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.

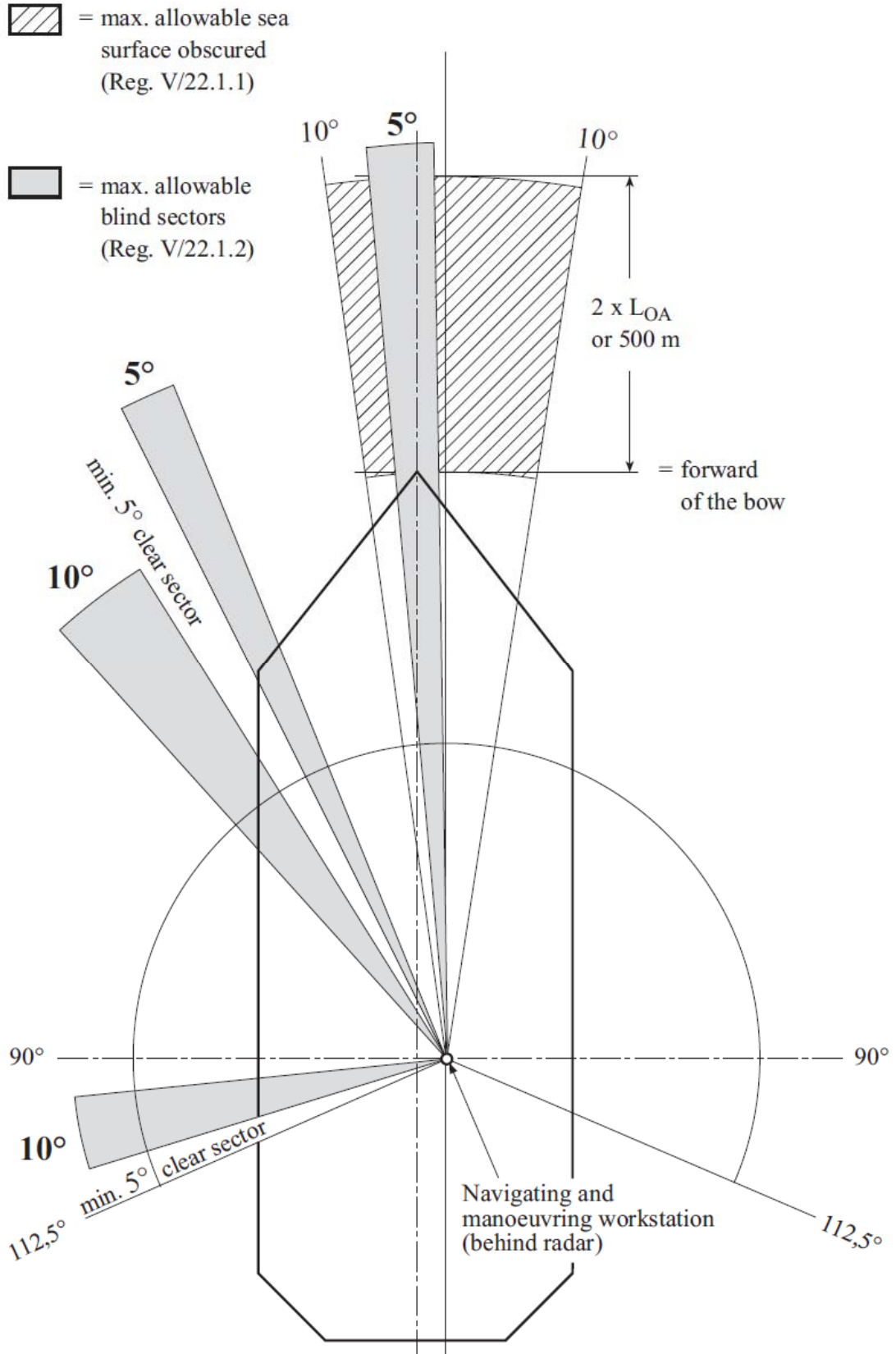
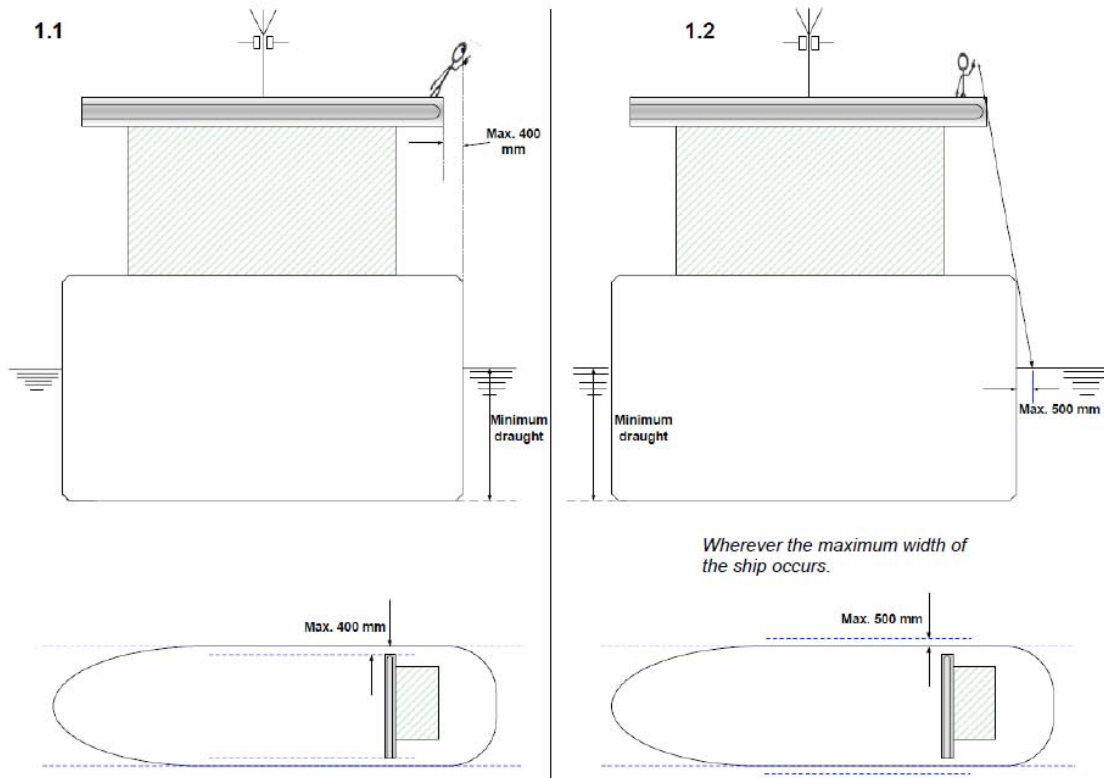


Figure 3.4 Field of vision



**9.1** 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.

**9.2** 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 Figure 3.5).



**Figure 3.5 Maximum permitted blind sectors at the view of the ships side**

**9.3** For particular types of ships(1), such as tug/tow boat, offshore supply vessel (OSV), rescue ship, work ship (e.g. floating crane), in meeting the requirements of SOLAS regulation V/22.1.6, the bridge wings shall at least extend to a location from which the sea surface, at the lowest seagoing draught and at a transverse distance of 1500 mm from the maximum beam throughout the ship's length, is visible. If this ship type is changed to a type other than those addressed in this paragraph, then the interpretation in this paragraph would no longer apply.

**9.4** The use of a remote camera system may be accepted for ships of unconventional design, other than those mentioned in paragraph above, as means for achieving the view of the ship's side from the bridge wing, provided:

- the installed remote camera system is to be redundant from the circuit breaker to the camera and screen, including communication cables, i.e. the system is to provide on each side of the ship redundancy of:
  - the power cables and circuit breakers from the main switchboard to the camera and the screen;
  - the camera;

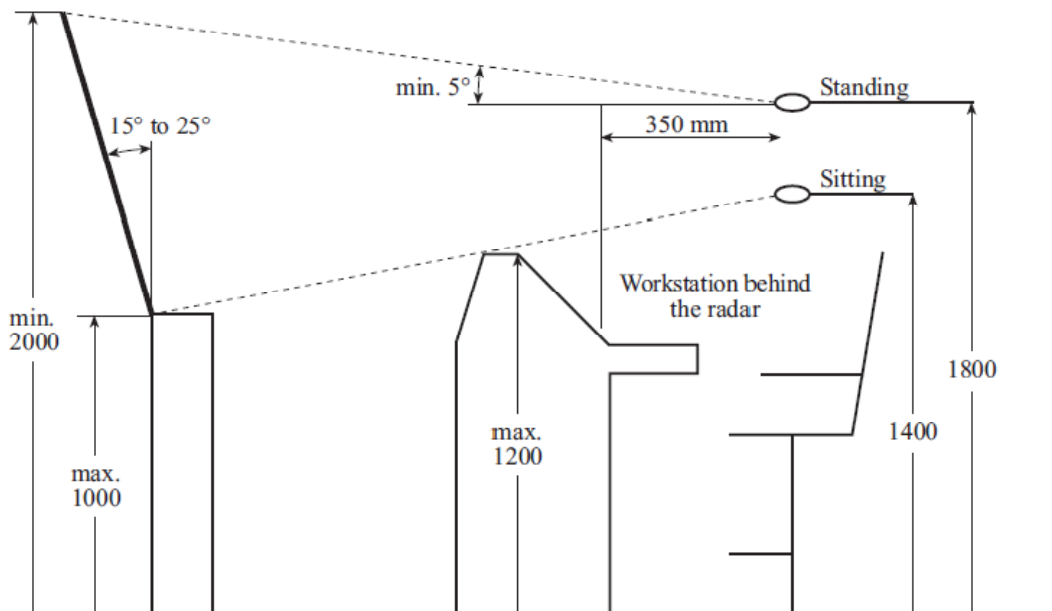
(1) Ships that are designed such that, in normal operations, they come along side, or operate in close proximity to, other vessels or offshore structures at sea.

- the screen;
  - the transmission lines from the camera to the display screen; and
  - the components associated with these lines and cables;
- the remote camera system is powered from the ship's main source of electrical power and is not required to be powered by the emergency source of electrical power;
- the remote camera system is capable of continuous operation under environmental conditions as per TL- R E10;
- the view provided by the remote camera system complies with the requirements of regulation V/22.1.6 and is also displayed at locations where the manoeuvring of the ship may take place;
- the upper edge of the ship's side abeam is directly visible by the observer from locations where the manoeuvring of the ship may take place.

*Note: Items 9.3 and 9.4 are in line with MSC.1/Circ.1350/Rev.1.*

**10.** The view point to be used for calculation of the required view and field of vision (see Figure 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 Figure 3.6).

**11.** For the ship borne radar equipment the requirements of the "Guidelines for the Installation of Ship Borne Radar Equipment" (SN1/Circ.271) shall apply. Special attention shall be paid on the radar visibility and the reduced blind sectors.



**Figure 3.6** Minimum size of the bridge front window and visibility from the navigating and manoeuvring workstation and monitoring workstation

### 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

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.

3. 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 Figure 3.6).

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

4. 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.

5. 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.

6. All bridge windows through which the officer of the watch looks ( $225^\circ$ ) 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  $15^\circ$  and not more than  $25^\circ$ .

Bridge side windows shall be inclined from the vertical plane top out, at an angle of not less than  $5^\circ$ . Windows in the bridge wing doors may be arranged vertically.

Windows outside the  $225^\circ$  and aft facing windows shall also be inclined not less than  $5^\circ$  if they may cause reflections.

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

8. It should 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.

9. 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 (Figure 3.7), unless required for the manual steering workstation and/or the pilot's conning position.

**10.** 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.

**11.** Consoles within the required field of vision of the workstation for navigating and manoeuvring and the workstation for monitoring should not obstruct the horizontal line of sight in seated position. The upper edge of the consoles should not exceed 1200 mm (see Figure 3.6).

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

**13.** 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 should 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.

**14.** Chairs are to be provided for the navigating and manoeuvring workstation as well as for the monitoring workstation. They shall be capable of rotating with the foot rest being arrested and adjustable in height. Chairs shall be 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.

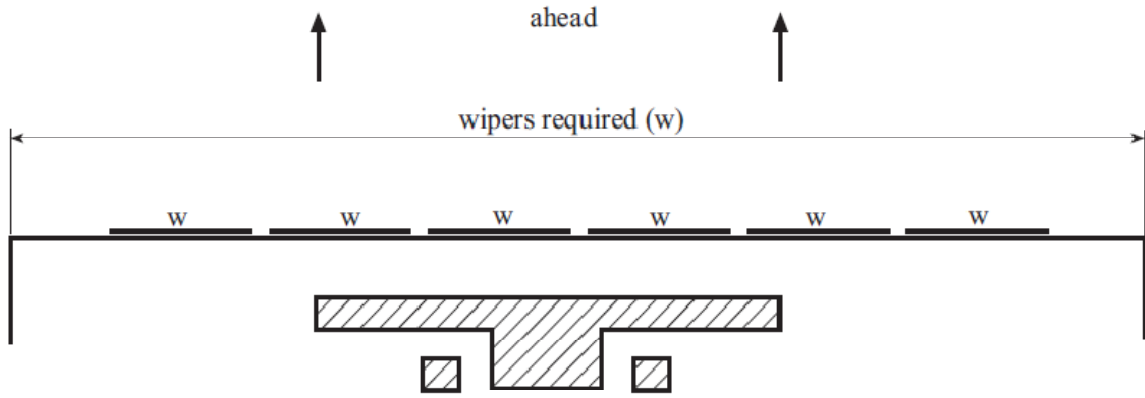
**2.** Wheelhouse and bridge wing floors shall be on one level, without steps and should have a non-slip surface.

**3.** There should be no sharp edges, protuberances, pillars, tripping hazards or other obstacles, which could cause injury to personnel.

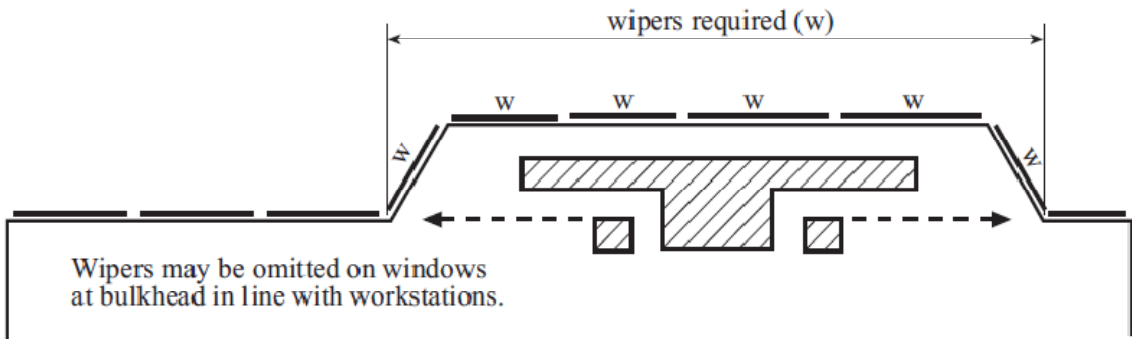
**4.** Sufficient hand or grab rails shall be fitted to enable personnel to move or stand safely in bad weather. Protection of stairway openings should be given special consideration.

**5.** Red light should be used to maintain dark adaptation 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 work-places.

**6.** The requirements and guidelines of MSC/ Circ.982 for work environment are recommended.



All front windows to be equipped with wipers.



Wipers may be omitted on windows at bulkhead in line with workstations.

Figure 3.7 Requirements for cleaning devices (windows wipers)

**SECTION 4****BRIDGE EQUIPMENT**

	<b>Page</b>
<b>A. GENERAL</b> .....	<b>4-2</b>
<b>B. SYSTEM REQUIREMENTS</b> .....	<b>4-2</b>
<b>C. SENSOR REQUIREMENTS</b> .....	<b>4-3</b>
<b>D. ARRANGEMENT OF EQUIPMENT</b> .....	<b>4-4</b>
<b>E. CENTRAL ALERT MANAGEMENT SYSTEM</b> .....	<b>4-9</b>
<b>F. POWER SUPPLY</b> .....	<b>4-10</b>

## A. General

1. Ships shall be equipped in accordance with **SOLAS 1974**, as amended, Chapter V, Regulation 19 and 20.
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-INS** shall be of a type approved by the administration according to the related standards\*.

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 Türk Loydu Rules for Electrical Installation, Section 21, E, and **TL- R E 10** shall be Türk Loydu type tested. E.g. Steering gear control system.

## B. System Requirements

### 1. Class Notation NAV

Ships shall be fitted in addition to the carriage requirements with a:

- Second Electronic Position Fixing System (EPFS – e.g. GPS, GLONASS, GALILEO, etc.)
- Central alert management system including alarm transfer system
- ECDIS and back-up ECDIS
- Second gyro compass, ships of 10.000 GT and upwards
- Heading control system (HCS)
- Second HCS or track control system (TCS), ships of 50.000 GT and upwards

### 2. Class Notation NAV-INS

In addition to the equipment required in 1. one of the following alternatives applies:

**2.1** For Class Notation **NAV-INS** the following tasks and control functions from the IMO performance standard MSC.252(83), **as amended by MSC.452(99)** shall be provided:

- Collision avoidance
- Route planning and -monitoring
- If a Track Control System (TCS) is installed it shall be of category C

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\* *IMO Res.A.694(17), IMO Res. MSC.191(79), as amended by IMO Res. MSC.466(101), IMO Res. MSC.252(83), as amended by IMO Res. MSC.452(99), IEC 60945, IEC 61162 Series, IEC 61924-2, IEC 62288*

- 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 from 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 and other vector chart information to aid for navigation and position monitoring. Alternatively at least one ECDIS shall be capable to display a Radar overlay.
- Two gyro compasses to determine, display and transmit heading information. (Applies to all ships of 10.000 GT and upwards).
- Speed and distance measurement equipment (SDME) to determine, display and transmit the speed and distance through the water and the speed and distance over ground information (SDME for ships of 10.000 GT and more),
- 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 keep 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.



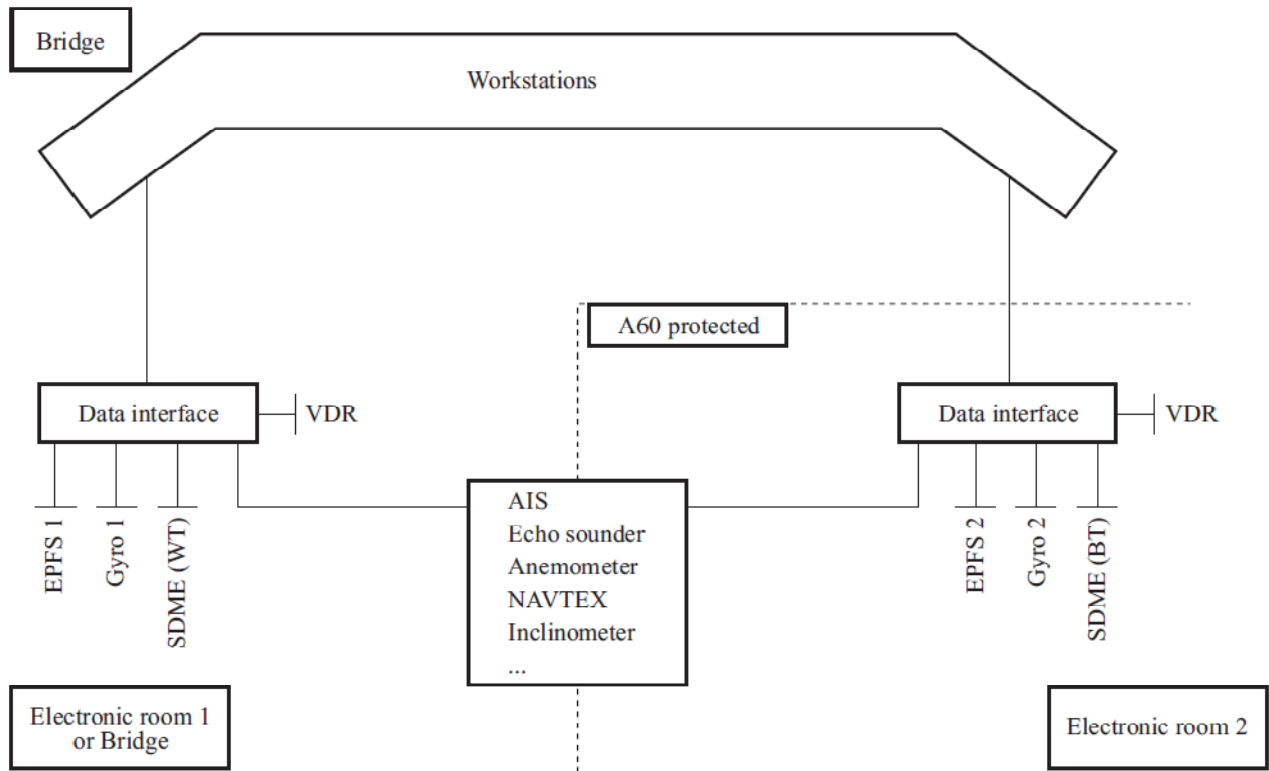


Figure 4.1 Example for a sensor configuration

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

Table 4.1 Back-up and fall-back arrangements

Sensor	Data	Back-up	Fall-back
Gyro	Heading	Gyro 2	Magnetic compass
EPFS	Position, Time, Date	EPFS 2	Dead reckoning and radar bearing
SDME (WT)	Speed	SDME (BT)	EPFS
Echo sounder	Depth		ECDIS and/or Paper Chart
RADAR		RADAR 2	AIS
Data interface		Data interface 2	

**D. Arrangement of Equipment**

**1. Navigating and manoeuvring workstation**

The following tasks and control functions shall be accessible and within the reach of the officer of the watch from his bridge chair (see Section 1, Figure 1.1):

**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 and shall be supported by an UPS.

**1.2** ECDIS with operation controls and radar overlay**1.3** Heading and track control system with manual override**1.4** Control of main engine(s), incl. emergency manoeuvre and emergency stop**1.5** Control of thruster(s)**1.6** Steering mode selector switch for steering gear**1.7** Rudder pump selector switch for steering gear**1.8** Intercom to docking workstations (if the distance is greater than 10 m)**1.9** Call system for master and navigation officers (telephone / internal communication system)**1.10** VHF equipment including GMDSS distress alarm management (external communication)**1.11** 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.

**1.12** Control of whistle and manoeuvring light**1.13** Acknowledge push button for watch alarm system (BNWAS)**1.14** Control of centralized alert management system**1.15** Control of general alarm**1.16** Control of window wipers in front of workstation**1.17** Control of console lighting

**1.18** The following indication and equipment shall be provided near the navigating and manoeuvring workstation within the perception area of the officer of the watch. It can be achieved by stand alone instruments in the conning or bridge console or by a centralized multifunction 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 for ships of 10.000 GT and more)
- Water depth
- Position
- Time
- Wind direction and speed
- Sound reception device, if totally enclosed bridge
- NAVTEX, if without printer

The following indication and equipment (items 1.19 -1.24) shall be provided within the perception area of the officer of the watch from his bridge chair:

**1.19** Whistle automatic control system

**1.20** Navigation- and signal light controller

**1.21** Emergency stop of installations to be stopped in case of fire (air condition, ventilation and refrigerating installation)

**1.22** Remote control and monitoring of watertight doors, external openings and fire doors (open/closed), if available

**1.23** Remote control of emergency fire pump

**1.24** Anti-rolling device, if available

## **2. Monitoring workstation**

The following tasks and control functions shall be accessible and within the reach of the monitoring officer from his bridge chair (see Section 1, Figure 1.1):

**2.1** ARPA radar with operation controls

The 3 GHz radar shall be inter switchable with the 9 GHz radar at the navigating and manoeuvring workstation.

**2.2** Control of whistle and manoeuvring light

- 2.3 Acknowledge push button for watch alarm system (BNWAS)
- 2.4 Control of window wipers in front of workstation
- 2.5 Intercom to docking workstations (if the distance is greater than 10 m)
- 2.6 Call system for master and navigation officers (telephone / internal communication system)
- 2.7 VHF equipment (external communication)
- 2.8 The following indication and equipment shall be provided within the perception area of 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 10.000 GT and more)
  - Water depth
  - Time
  - Wind direction and speed
  - Sound reception device, if totally enclosed bridge

Equipment or indication mentioned under paras. 2.2 to 2.8 and which is required at more than one workstation, shall be arranged so that it can be easily reached respectively observed from all relevant workstations. If this is not achievable such equipment or indicators/displays shall be duplicated.

- 2.9 Central alert management system

### 3. Manual steering workstation

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

- 3.1 Steering wheel or other means of controlling the heading of the ship manually
- 3.2 Control of window wiper in front of workstation

- 3.3 Intercom to docking workstations (if the distance is greater than 10 m)
- 3.4 Dimmer for indicators listed in 3.5.
- 3.5 The following indicators shall at least be provided within the perception area of the helmsman:
- Rudder angle
  - Gyro compass heading
  - Magnetic compass heading
  - Rate-of-turn, if available

#### 4. Docking workstation

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

- 4.1 Control of main engine(s)
- 4.2 Control of thruster(s)
- 4.3 Control of rudder(s)
- 4.4 Control of whistle and manoeuvring light
- 4.5 Intercom to workstations for navigating / manoeuvring, monitoring, manual steering.
- 4.6 Acknowledge push button for watch alarm system (BNWAS)
- 4.7 If the ship has a totally enclosed bridge: control of window wipers in front and aft of workstation

The following indication shall be provided within the docking workstation:

- Rudder angle
- Propeller revolutions
- Pitch, if a pitch propeller is fitted
- Thruster speed
- Gyro compass heading
- Rate-of-turn, if available
- Speed (longitudinal and lateral for ships of 10.000 GT and more)

- Wind direction and speed if totally enclosed bridge

A conning display or multi function display may be used and is recommended.

#### **5. General bridge equipment within wheelhouse**

- 5.1 Main control unit of BNWAS
- 5.2 Control of window washing and heating system
- 5.3 Control of wheelhouse air-conditioning
- 5.4 Main control unit of whistle

#### **6. INS 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) **as amended by MSC.452(99)** (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 **A.1021(26)** (Code on Alerts and Indicators) has to be observed.
3. The classification of alerts shall be in compliance with MSC.252(83) **as amended by MSC.452(99)** 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) including alarm transfer system shall be provided for the following unacknowledged alerts:
  - Failure HCS
  - Sensor failure, wheel over line and cross track failure TCS
  - 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, and

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