



RULES FOR
CLASSIFICATION OF

**SHIPS / HIGH SPEED, LIGHT CRAFT AND
NAVAL SURFACE CRAFT
NEWBUILDINGS**

SPECIAL EQUIPMENT AND SYSTEMS
ADDITIONAL CLASS

PART 6 CHAPTER 17

**SAFETY OF NAVIGATION FOR NAVAL
VESSELS**

JANUARY 2005

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INTRODUCTION

General

The Board approved this new chapter 29 November 2004.

The rules come into force on 1 July 2005.

This chapter is valid until superseded by a revised chapter.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 REQUIREMENTS

A. Classification

A 100 Objective

101 The Rules for Safety of Navigation for Naval Vessels puts forth a set of requirements and guidelines in compliance with the principles and aims of The International Convention for the Safety of Life at Sea (SOLAS), Chapter V (Safety of Navigation), and The International Code of Safety for High-Speed Craft (HSC), Chapter 13 (Shipborne Navigational systems and equipment and voyage data recorders) and Chapter 15 (Operating compartment layout) as amended.

102 The aims of SOLAS Ch. V Regulation 15 on principles related to bridge design, design and arrangement of navigational systems and equipment and bridge procedures have, as far as practicable for naval vessels, been applied as recommended in Unified Interpretation SC 181 of the International Association of Class Societies (IACS).

A 200 Application

201 Unless expressly provided otherwise, these rules apply to all naval vessels on all voyages, except:

- vessel of less than 24 meters of length (length over all (LOA))
- submarines.

Special requirements for naval vessels built to fulfil SOLAS requirements are laid down in Sec.2 D.

Special requirements for naval vessels built to fulfil HSC Code requirements are laid down in Sec.2 E.

All other requirements are applicable to all naval vessels.

202 The vessels will be assigned the Class Notation **NAUT-NAVY** when the relevant requirements (ref. A201) in these rules are complied with.

A 300 Structure of the rules

301 The rules are structured to:

- establish functional requirements to the greatest possible extent
- give guidance as to how requirements which are expressed in terms of functional criteria can be met by technical solutions.

302 A functional requirement is as far as possible expressed without entering quantification. The functional requirements have a principle status and will only be adjusted if the functions to be carried out on the bridge are altered.

303 A Guidance note, as far as possible, quantifies approvable solutions, but *does not* exclude the application of alternative solutions provided the functional requirements are met. A Guidance note will be amended whenever technical development or operational experience forms the basis for better options.

A 400 General

401 For the application of these rules, wherever the term *Administration* is quoted, this shall be read as the Naval Flag Authority. Wherever the *Society* is quoted, this shall be read as the Classification Society.

402 Navigational equipment installed, not necessarily required by the rules, that may have an impact on safety of main functions as listed in Pt.1 Ch.1 Sec.1 A200 shall be certified in accordance with the requirements of Pt.4 Ch.9.

403 Early involvement in the bridge design phase is of great importance for the classification work. After a client has requested DNV class, efforts should be made to establish contact between the client's bridge design team and the classification team. Preliminary sketches giving a bridge design overview should be forwarded to the relevant approval centre for comments as soon as possible.

A 500 Definitions

501 For the purpose of these rules:

1. *Alarm*: An alarm or alarm system, which announces by audible and visual means a condition requiring attention.
 - 1.1 *Accept*: Manual silencing of an audible alarm.
 - 1.2 *Acknowledge*: Action for silencing of audible alarm and bringing visual alarm to steady state.
 - 1.3 *Cancel*: Manual stopping of a visual alarm after the cause has been eliminated.
2. *Bridge*: The area from which the navigation and control of the vessel is exercised, including the wheelhouse and bridge wings.
 - 2.1 *Bridge wings*: Those parts of the bridge on both sides of the vessel's wheelhouse which, in general, extend to the vessel's side.
 - 2.2 *Navigating bridge*: Area of a wheelhouse or enclosed bridge allocated navigating functions and control of the vessel, and which includes any additional bridge workstation to be used by the officer of the watch.
 - 2.3 *Totally enclosed bridge*: A bridge without open bridge wings, meaning that bridge wings form an integral part of an enclosed wheelhouse.
 - 2.4 *Wheelhouse*: Enclosed area of the bridge.
 - 2.5 *Bridge team*: Designated persons from the vessel's crew, and the pilot if onboard, taking actively part in the safe navigation, manoeuvring and operation of the vessel.
3. *Bridge functions*: Functions comprising tasks related to operation of the vessel and carried out on the bridge.
 - 3.1 *Primary bridge functions*: Functions related to determination, execution and maintenance of safe course, speed and position of the vessel 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 safety systems
- external and internal communication related to safety in bridge operations including distress situations
- pilotage functions.

- 3.2 *Additional bridge functions*: Functions related to vessel operations which shall be carried out on the bridge in addition to primary functions, but not necessarily by the watch officer. Examples of such functions are:

- extended communication functions
- monitoring and control of sensors and weapon systems
- monitoring and control of ballasting and cargo operations (e.g. replenishment at sea)
- monitoring and control of machinery

- monitoring and control of domestic systems.
- 4. *Close to:* Within functional reach (inside the wheelhouse).
- 5. *Collision avoidance functions:* Detection and plotting of other vessels and moving objects; determination and execution of course and speed deviations to avoid collision.
- 6. *Commanding view:* View without obstructions which could interfere with the navigator's ability to perform his main tasks, covering at least the field of vision required for safe performance of collision avoidance functions (225°).
- 7. *Conning station or position:* Place in the wheelhouse with a commanding view, providing the necessary information for command and control and which is used by navigators, including pilots, when monitoring and directing the vessel's movements.
- 8. *Docking:* Manoeuvring the vessel alongside a berth while controlling mooring operations.
- 9. *Manoeuvring:* Operation of steering systems and propulsion machinery as required to move the vessel into predetermined directions, positions or tracks.
- 10. *Monitoring:* Act of constantly checking information from instrument displays and environment in order to detect any irregularities.
- 11. *Navigation:* Planning of the vessel's route and determination of position and course of the vessel, execution of course alterations and speed changes.
- 12. *Operating conditions:*
- 12.1 *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 workload for the navigator.
- 12.2 *Irregular operating conditions:* When external conditions cause excessive workload for the navigator.
- 12.3 *Abnormal operating conditions:* When malfunction of technical systems requires operation of backup systems on the bridge, or when it occurs 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.
- 12.4 *Emergency situations:* When incidents seriously affect internal operating conditions of the vessel and the ability to maintain safe course and speed (fire, vessel system technical failure, structural damage).
- 12.5 *Distress situations:* Loss of propulsion and/or steering, or when the vessel is not seaworthy due to other reasons (situation prior to abandon ship situation).
- 13. *Route planning:* Pre-determination of course lines, radius turns and speed in relation to the waters to be navigated.
- 14. *Workstation:* A workplace 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.
- 15. *Workstation for monitoring:* A workstation facilitating equipment and a commanding view for observation of the vessel's heading and speed, the waters and traffic, incorporating means as required for positioning of the vessel, and if located close to the front windows may serve as conning station for the master and a pilot carrying out control and advisory functions.
- 16. *Workstation for navigating and manoeuvring:* A workstation 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 vessel.
- 17. *Workstation for radio communication:* A workplace for operation and control of equipment for Global Maritime Distress and Safety System (GMDSS), and shipboard communication for vessel operations.

- 18. *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 vessel.

A 600 Approval of drawings

601 In order to achieve a full overview of the bridge design and understanding of particular details on individual drawings, it is of outmost importance that a full set of drawings is submitted at the time of approval. Drawings shall be submitted by the shipbuilder to the responsible approval centre for approval in accordance with the list of drawings below:

- 1) Field of vision drawings showing:
 - a) The horizontal field of vision from the various workstations, including the arc of individual blind sectors and the sum of blind sectors forward of the beam.
 - b) The vertical field of vision over the bow from the conning station and the workstation for navigation and manoeuvring, including the line of sight under the upper edge of the window from standing working position at the workstation.
 - c) Window arrangement, including inclination, dimensions, framing and height of lower and upper edge above bridge deck surface as well as the height of the deck head.
- 2) Bridge layout drawings showing:
 - a) The bridge layout, including the configuration and location of all primary and additional bridge workstations.
 - b) The size and shape of workstation consoles including console foundations.
- 3) Equipment location drawings showing:
 - a) Location of instruments and equipment in all workstation consoles.
 - b) Location of equipment located elsewhere on the bridge.
- 4) List of equipment showing:
 - a) All relevant bridge equipment with specification of type, model, manufacturer, supplier and type approval reference with extension date or copy of valid certificates, when applicable.
- 5) Manuals or instructions for equipment installed for the use of bridge personnel shall be submitted for information upon request.

A 700 Tests and trials

701 A program for the on board testing of the bridge equipment and systems required to be carried, as well as additional navigation equipment installed, shall be submitted for approval at the earliest possible stage before sea trials.

702 Equipment and systems shall be subject to the tests required to ascertain that all controls, indicators, displays, etc., operate in accordance with their specifications and meet applicable requirements (see Sec.4).

703 Failure conditions shall be simulated as realistically as possible on equipment and systems.

A 800 Exemptions and equivalents

801 The Society may grant to individual vessels exemptions or equivalents of a partial or conditional nature, when any such vessel is engaged on a voyage where the maximum distance of

the vessel from the shore, the length and nature of the voyage, the absence of general navigation hazards, and other conditions affecting safety are such as to render the full application of this chapter unreasonably or unnecessary, provided that the Naval Flag Authority has taken into account and can document the effect such exemptions and equivalents may have upon the safety of the vessel and of all other vessels.

A 900 References

901 The International Convention for the Safety of Life at Sea (SOLAS), Chapter V (Safety of Navigation), the International Code of Safety for High-Speed Craft (HSC Code) Chapter 13 (Shipborne navigational systems and equipment and voyage data recorders) and Chapter 15 (Operating compartment layout) and Unified Interpretation SC 181 (BDEAP) of the International Association of Class Societies (IACS) as amended.

SECTION 2 DESIGN OF WORKPLACE

A. General

A 100 General requirements

101 The design and layout of the bridge from which the crew operate the vessel shall be such as to permit bridge team members to perform their duties in a correct manner without unreasonable difficulty, fatigue or concentration, and to minimize the likelihood of injury to the crew in both normal and emergency conditions.

B. Bridge and Workstation Arrangement

B 100 General requirements

101 Navigation, communications and other functions essential to the safe operation of the vessel, its engines and systems shall be the main tasks performed from the vessel's navigating bridge. The configuration of workstations and consoles shall provide a workplace for rational and user-friendly placing of equipment, with the aim of:

- facilitating the tasks to be performed by the bridge team in making full appraisal of the situation and in navigating the vessel safely under all operational conditions
- promoting effective and safe bridge resource management
- enabling the bridge team to have convenient and continuous access to essential information
- allowing for expeditious, continuous and effective information processing and decision-making by the bridge team
- preventing or minimizing excessive or unnecessary work and any condition or distraction on the bridge which may cause fatigue or interfere with the vigilance of the bridge team.

Functions related to naval and military operations, e.g. the operation of weapons and weapon systems, shall not be in conflict with the safe performance of the main tasks listed above, if performed from the navigating bridge.

102 A functional workstation designed in accordance with the established overall operational and ergonomic requirements 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
- consoles designed for operations at specific workplaces in standing and seated position:
 - enabling installation of equipment to be within reach (see Fig. 1) from the working position
 - avoiding obstruction of the view through bridge windows from seated position
- chairs suiting ergonomic requirements for efficient use of installed equipment and maintenance of field of vision, if chairs shall be installed.

Guidance note:

See Sec.1 A300:

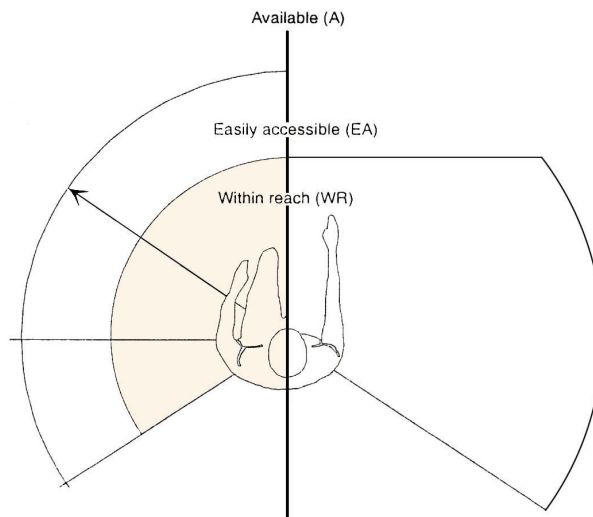


Fig. 1
Within reach

Within reach from a seated position is defined as within 1 000 mm and within 800 mm for frequently used equipment.

Within reach from a standing position is defined as within 800 mm in the forward direction and within 1 400 mm in sideways directions.

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103 All information, controls, facilities and field of vision required to carry out each of the tasks safely and efficiently shall be provided at the corresponding workstations.

B 200 Arrangement of navigational systems and equipment

201 Instruments, instrument panels and controls shall be permanently mounted in consoles or other appropriate places, taking into account operation, maintenance and environmental conditions. However, this shall not prevent the use of new control or display techniques, provided the facilities offered are not inferior to recognized standards.

202 All instruments shall be logically grouped according to their functions. In order to reduce to a minimum the risk of confusion, instruments shall not be rationalized by sharing functions or by inter-switching.

203 Instruments required for use by any member of the bridge team shall be plainly visible and easily read:

- with minimum practicable deviation from his normal seating position and line of vision; and
- with the minimum risk of confusion under all likely operating conditions.

204 Instruments essential for the safe operation of the vessel shall be clearly marked with any limitation if this information is not otherwise clearly presented to the navigators.

205 Instruments and 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 instrument or display shall be duplicated.

B 300 Console configuration

301 Consoles shall principally be divided into two areas:

- a vertical (slanting) part for location of information displays to be easily readable (see Fig. 2)
- a horizontal part (desktop) for controls, switches and buttons to be within easy reach from the working position.

Guidance note:

See Sec.1 A300:

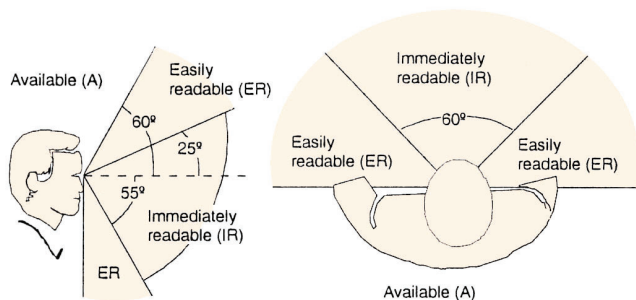


Fig. 2
Easily readable

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302 The height of console desktops at the workplaces for navigation, manoeuvring, traffic surveillance and monitoring shall enable easy use of equipment required for safe performance of the tasks to be performed from both standing and sitting position.

Guidance note:

See Sec.1 A300:

To provide a functional reach from standing position, the height of console desktops above bridge deck surface should be 800 mm and not less than 750 mm. The sitting height is governed by the elbow height in relation to console desktop.

To provide a functional reach of equipment and easy operation of controls from sitting position, the elbow height of the operator should preferably be 50 mm higher than the console desktop and

not less than the height of the desktop.

To provide the elbow height required for persons of different size and build in relation to the console desktop, it should be possible to adjust the height of the seat. It should be possible to adjust chair armrests accordingly, if installed, and to fold the armrests away, ref. 401.

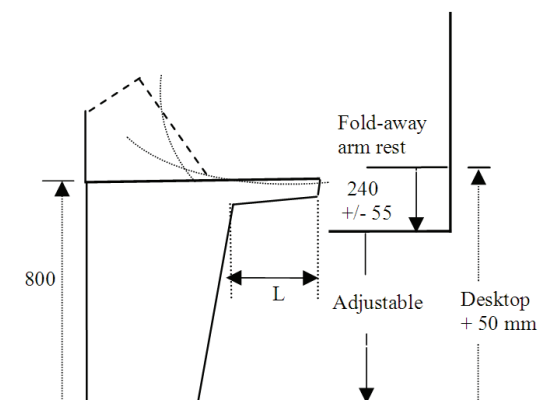


Fig. 3
The console in front of a seated working position shall provide sufficient leg room.

The leg room (L) should have a depth of 450 mm and not less than required for a person sitting at a working position 350 mm from the console (chair backrest 440 mm from the edge of the console, requiring a leg room depth of at least 230 mm.)

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303 The top of the consoles forming the front workstations shall not be higher than 1 200 mm, including the foundation of the consoles, for efficient use in standing position and shall not obstruct the field of vision over the lower edge windows in front of the workstation from sitting position.

Guidance note:

See Sec.1 A300:

The console height should not exceed 1 200 mm. This console height may be accepted for installation at a distance of 350 mm or more from the window, also if it interferes with the line of sight from an eye height of 1 400 mm, providing the height of the chair can be adjusted to compensate for the interference.

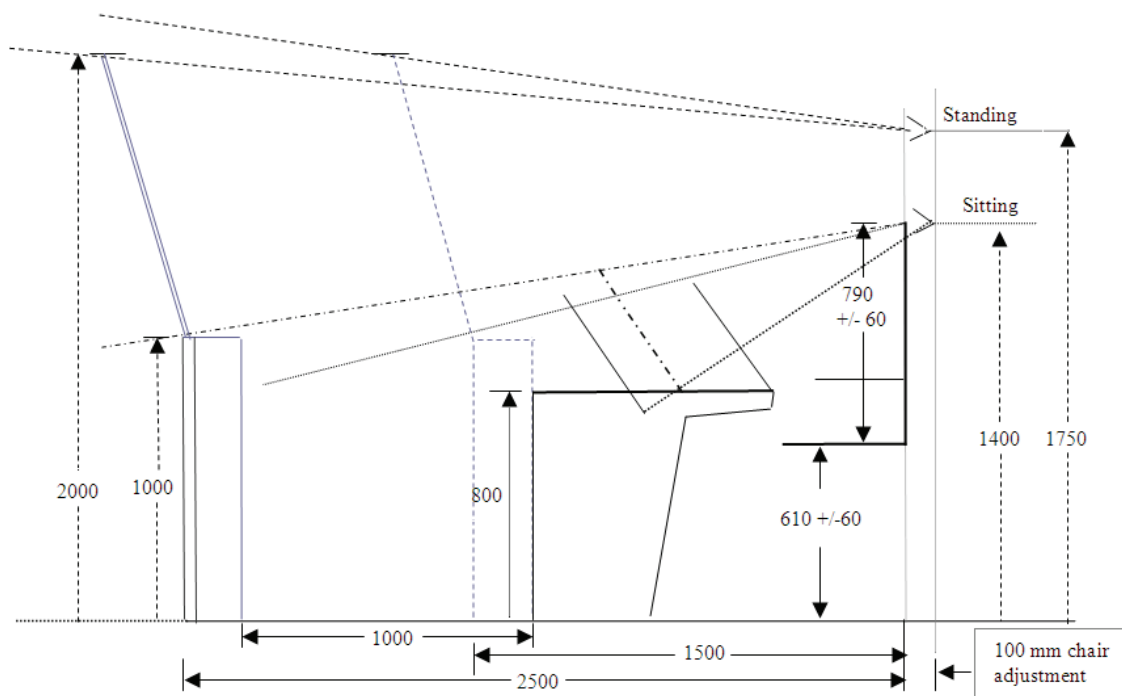


Fig. 4
Console height

See Fig.6 for eye heights at standing position.

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304 Consoles within the required field of vision aft of the front workstation consoles shall not obstruct the horizontal line of sight from the sitting eye height.

Guidance note:

See Sec.1 A300:

The height of the consoles should be 100 mm lower than the horizontal line of sight from a seated position and should not exceed 1 300 mm. If printers, or other equipment, are installed on top of the console, the total height should not exceed the prescribed 1 300 mm.

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B 400 Chairs

401 When a chair is installed at a workplace for operations in both standing and seated position, it shall be fastened to rails allowing movement of the seat to enable easy reach of equipment when seated and sufficient room to stand in front of the console when the chair is pushed back/aside. It shall be possible to adjust the height of the seat to suit users of different heights for optimum view and reaching distance. Armrests, if provided, shall be of fold away type and preferably adjustable in height.

Guidance note:

See Sec.1 A300:

The seat height of the chair should be adjustable from 550 to 670 mm above the deck surface. A movement in fore-aft direction should allow the front edge of the seat to be positioned at the edge of the front console and to allow a free space of at least 700 mm between the chair and console when moved in aft direction. Armrests should preferably be adjustable from 185 and 295 mm above the seat if installed.

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B 500 Additional workstations

501 Workstations for additional functions which shall be used by the watch officer, shall provide the field of vision required to maintain efficient look-out (see D301 for vessel built to fulfil SOLAS requirements and E301 for vessels built to fulfil HSC Code requirements) and enable monitoring of the vessel's heading and rudder angle.

502 The location of a workstation for additional functions regarded essential for safe operation of the vessel and to be used by other personnel than the watch officer shall not in any way influence the performance of primary bridge functions.

503 Workstations for additional functions not essential to the safe operation of the vessel, its engines, weapons and sensors, or furniture arranged for meetings or relaxation inside the wheelhouse shall not be installed within the area of the navigating bridge or within field of vision outside this area, which are required for traffic surveillance from workstations. If such workstation or furniture arrangement is installed close to these areas, the use of it shall in no way influence the performance of primary bridge functions, either by use of light, noise disturbance or visual distraction. Ref. IMO Res. A 708 (17).

C. Bridge Configuration

C 100 General requirements

101 On vessels of unconventional design which, in the opinion of the Administration, cannot comply with this sub-section, arrangements shall be provided to achieve a level of visibility that is as near as practical to that prescribed.

Guidance note:

See Sec.1 A300:

A vessel of a special design, dictated by the special purpose and function of the vessel, may be regarded as a "vessel of unconventional design" (e.g. Stealth vessels). The Society will take into consideration the special nature of the vessel, its service and trade when evaluating the effects an exemption may have upon the safe navigation of the vessel, the safety of all other vessels

and the environment.

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C 200 Field of vision

201 It shall be possible to observe all objects of interest for the navigation such as ships and lighthouses, in any direction by providing a horizontal field of vision to the horizon of 360° within the confines of the bridge.

Guidance note:

See Sec.1 A300:

It should be possible to obtain the view of 360° from the bridge by using not more than two positions, one on each side of the workstation for navigating and manoeuvring.

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202 When practicable and where it is considered necessary by the Society, the field of vision from the workstation for navigating and manoeuvring shall permit the navigators from this

position to utilize leading marks astern of the vessel for track monitoring.

Guidance note:

See Sec.1 A300:

The horizontal field of vision from the workstation for navigating and manoeuvring should extend over an arc from dead astern to at least 5° on each side. No blind sectors should occur within the required field of vision higher than 1 200 mm above the bridge deck surface. An adequate optical device or camera may be accepted for the purpose of achieving the required field of vision astern.

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203 The workstation for navigating and manoeuvring and the main conning position shall provide a field of vision enabling maintenance of visual traffic surveillance, extending over a forward arc of not less than 225°, that it is from right ahead to 22.5° abaft the beam on either side. See Fig. 5.

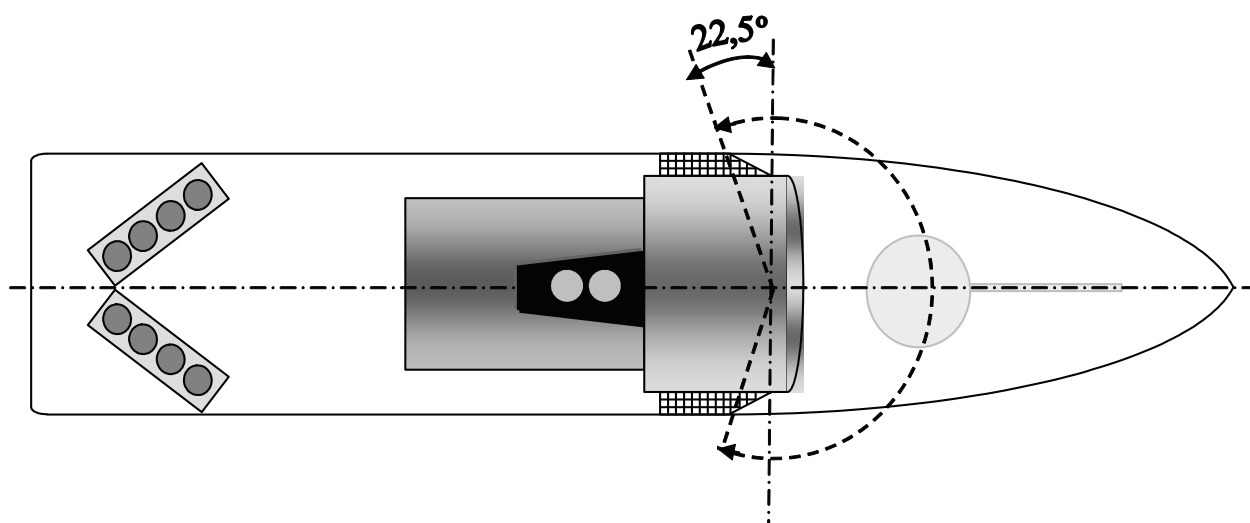


Fig. 5
Field of vision from the workstation for navigating and manoeuvring and the main conning position

Guidance note:

See Sec.1 A300:

All workstations to be used by the officer of the watch should provide a forward field of vision of 225°, see Fig. 5. A blind sector covering the view abaft the beam on port side may be accepted for workstations to be used infrequently by the watch officer for short periods at a time and for workstations to be used by assisting officers.

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204 Workstations for monitoring, navigating and manoeuvring shall provide the required field of vision from a seated working position and shall not be located directly behind large masts, cranes etc. which obstruct the view right ahead from the workstation.

205 The lower and upper edge of windows shall not present an obstruction to the view forward of the bow seen from a seated as well as a standing position at the workstations for monitoring, navigating and manoeuvring.

Guidance note:

See Sec.1 A300:

The height of the lower edge of windows above the floor surface should not exceed 1 000 mm within the required field of vision and the height of the upper edge should be at least 2 000 mm.

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206 The upper edge of the front windows shall allow a forward view of the horizon for a person with a height of eye of 1 800 mm at the navigating and manoeuvring workstation when the vessel is pitching in heavy seas. If 1 800 mm height of eye is considered unreasonable and impractical, a reduction of the height may be accepted, but not to less than 1 600 mm.

Guidance note:

See Sec.1 A300:

A vertical angle of view of not less than 5° above a horizontal line from a standing eye height of 1 750 mm should be provided according to Fig. 6.

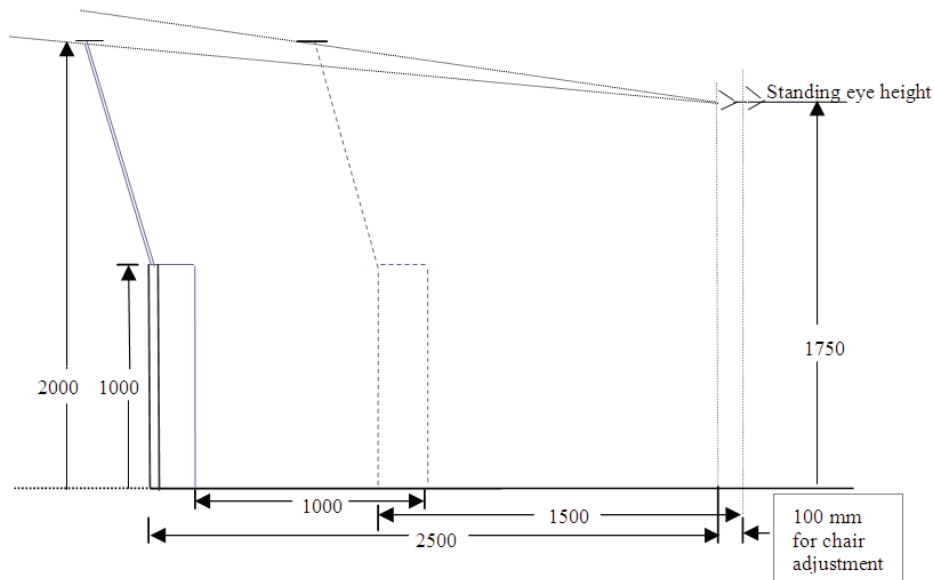


Fig. 6
Eye heights at standing position

With front windows at an angle of 15° , a vertical angle of view of 5° from an eye height of 1 750 mm may be provided at a distance of 2 600 mm from the front bulkhead, allowing for a passageway of 1 000 mm in front of workstation consoles. As a point of reference, the standing eye height of a 95th percentile Northern European or North American male is approximately 1 750 mm and stature of the same 95th percentile is approximately 1 860 mm.

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C 300 Blind sectors

301 Blind sectors caused by deck equipment, weapon systems, 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 workstations for navigating and manoeuvring and monitoring. The total arc of blind sectors within this field of vision shall not exceed 30° .

Guidance note:

See Sec.1 A300:

To help reducing the size of internal blind sectors caused by bridge wing bulwarks and divisions between windows in bridge wing bulkheads, such bulwarks and bulkheads should be located in a line of sight seen from the working position at the front workstations. See Fig.7 and Fig.12.

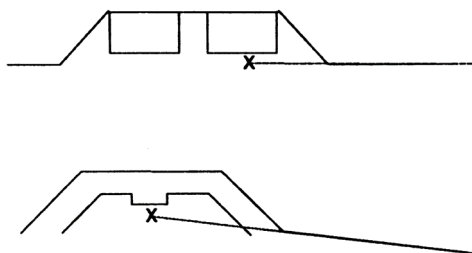


Fig. 7
Front bulkhead of bridge wing in line of sight from the workstation

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302 Over an arc from dead ahead to at least 10° on each side of the bow, the total blind sector shall not exceed 5° . Elsewhere, each individual blind sector within the required field of vision shall not exceed 10° .

303 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.

Guidance note:

See Sec.1 A300:

In order to comply with the requirements to field of vision from the main workstations in 203 (Fig. 5), requiring a field of vision of 225° and not less than 22.5° abaft the beam, a clear sector should extend from 22.5° abaft the beam and forward on either side of the vessel.

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C 400 Clear view through windows

401 Windows shall meet the following requirements:

- 1) Bridge windows shall be angled to reduce unwanted reflections.

Guidance note:

See Sec.1 A300:

To help avoid reflections, the bridge front windows should be inclined from the vertical plane top out, at an angle of not less than 10° and not more than 25° . The rear and side windows should be inclined from the vertical plane top out, at an angle of 4° ~ 5° to help avoid reflections.

Vessels of unconventional design (see 101), e.g. Stealth vessels, that, according to the Administration, is not suitable to be fitted with angled windows might be exempted from this requirement if the arrangement of light sources meets the requirements of Sec.3 A505, and also all other unwanted reflections, such as sun reflection on navigational displays, are avoided without inclination of the windows.

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- 2) Divisions between windows shall be kept to a minimum and not be placed in front of any workstation, for example the radars. If stiffeners between windows shall be covered,

this shall not cause further obstruction of the field of vision from any position inside the wheelhouse.

Guidance note:

See Sec.1 A300:

The division between windowpanes, especially within the required field of vision, should not exceed 150 mm. If stiffeners are used, divisions should not exceed 100 mm in width and 120 mm in depth. The width of windowpanes within the field of vision required for traffic surveillance should not be less than 1 200 mm in order to limit the number of stiffeners.

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- 3) Polarized and tinted windows shall not be fitted.
- 4) To enable visual observations through windows to be maintained under all weather conditions, all windows within the required field of vision from the working position at workstations to be used by bridge personnel, including pilots, shall provide a clear view regardless of weather conditions.

Guidance note:

See Sec.1 A300:

The following means should be installed to provide a clear view through windows:

- sunscreens of roller blind type
- heavy duty blade type wipers and fresh water window washing
- efficient de-icing and de-misting systems.

Technical systems installed should comply with appropriate ISO standards*

A catwalk or other means to help maintenance of window wipers and manual cleaning of bridge front windows should be provided.

* ISO 17899 Marine electric window wipers.

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402 The windows shall be made of material which will not break into dangerous fragments if fractured.

D. Requirements Specific for SOLAS Vessels

D 100 General

101 This sub section gives specific requirements for naval vessels to demonstrate a safety level for Safety of Navigation according to The International Convention for the Safety of Life at Sea (SOLAS), Chapter V (Safety of Navigation) as amended.

D 200 Bridge configuration

201 Workstations for performance of primary bridge functions including conning position for pilotage shall be provided for:

- navigating and manoeuvring (and traffic surveillance)
- monitoring
- manual steering
- docking (preferably on bridge wings when practical)
- planning (of voyage, routes, vessel operations)
- safety (monitoring and emergency operations)
- communication (internal and external)
- conning (pilot)*.

*See also Guidance note of 305

Guidance note:

See Sec.1 A300:

The workstation for monitoring may be combined with:

- a workplace for navigation (route monitoring /position-fix-

ing) when the workstation for navigating and manoeuvring provides individual workplaces for traffic surveillance and navigation (chart work)

- a backup workstation for navigation and a conning position, enabling navigation, traffic surveillance and manoeuvring at one workplace.

The workstation(s) for docking may be combined with the workstation(s) for navigating and manoeuvring and traffic surveillance.

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202 Additional workstations may be arranged for performance of other functions than those related to primary bridge functions when relevant.

Guidance note:

See Sec.1 A300:

The main types of additional bridge workstations may be divided into three distinct categories based on purpose and functions and whether they should be operated by the watch officer or not: A and B.

A. Workstations for functions regarded essential to the safe operation of the vessel, its engines and systems:

- a) to be monitored and controlled by the watch officer
- b) to be used by other personnel than the watch officer.

B. Workstations for functions not regarded essential to safe operation of the vessel and to be used by other personnel than the watch officer, but located on the bridge for practical reasons.

The type of tasks to be performed at the individual workstation and the operating procedures employed may conclude whether a workstation of category A should be of type a) or b). Workstations of category A, type a) are not supposed to include tasks that may prevent the officer in charge of primary bridge functions to leave a workstation for additional functions instantly at any time during operations.

See also B500.

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203 The workstations for primary bridge functions shall be arranged to serve their functions under all operating conditions and different manning of the bridge and provide the field of vision required for visual observations and easy cooperation between bridge personnel, promoting effective and safe bridge resource management.

204 Workstations for navigating and manoeuvring, including traffic surveillance and monitoring shall 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.

Guidance note:

See Sec.1 A300:

The workstation for navigating and manoeuvring should be arranged to allow an assisting officer to carry out route monitoring, which may include position-fixing and chart work, and course adjustments when ordered, while the officer in charge concentrates on traffic situations and adjustment of course and speed as required to follow the route and avoid danger of collision.

The workplaces should be adjacent to enable easy communication and cooperation when two navigators operate the workstation, and to provide the watch officer with a workstation for safe and efficient performance of all the tasks when he is the only navigator on the bridge and should use both the workplace for route monitoring/position-fixing and the workplace for traffic surveillance/manoeuvring.

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205 Workplaces for performance of navigation, traffic sur-

veillance and monitoring shall be arranged for working in standing as well as seated position with optimum field of vision.

D 300 Workstation arrangement and field of vision

301 From the conning position and the workstation for navi-

gating and manoeuvring, the view of the sea surface forward of the bow to 10° on either side under any ballast or cargo condition shall not be obscured by more than 2 vessel lengths (2 x LOA) or 500 metres, whichever is the less. See Fig. 8.

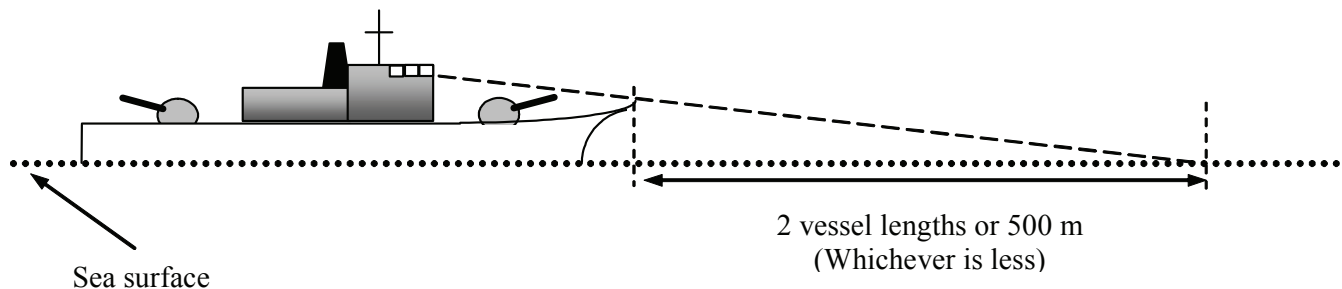


Fig. 8
View of the sea surface (drawing is not in scale)

Guidance note:

See Sec.1 A300:

For calculation purposes the applied loading condition of the vessels should be a “worst case condition” (with respect to view of the sea surface forward of the bow) recommended for ocean passages.

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302 The workstation for manual steering shall preferably be located on the vessel's centre line and shall not interfere with the functions to be performed by the officer of the watch. The steering position shall provide a forward field of vision not less than 60° to each side. If large masts, cranes, etc., obstruct the view in front of the workstation, the workstation shall be located some distance to starboard of the centre line, sufficiently to obtain a clear view ahead. See Fig. 9.

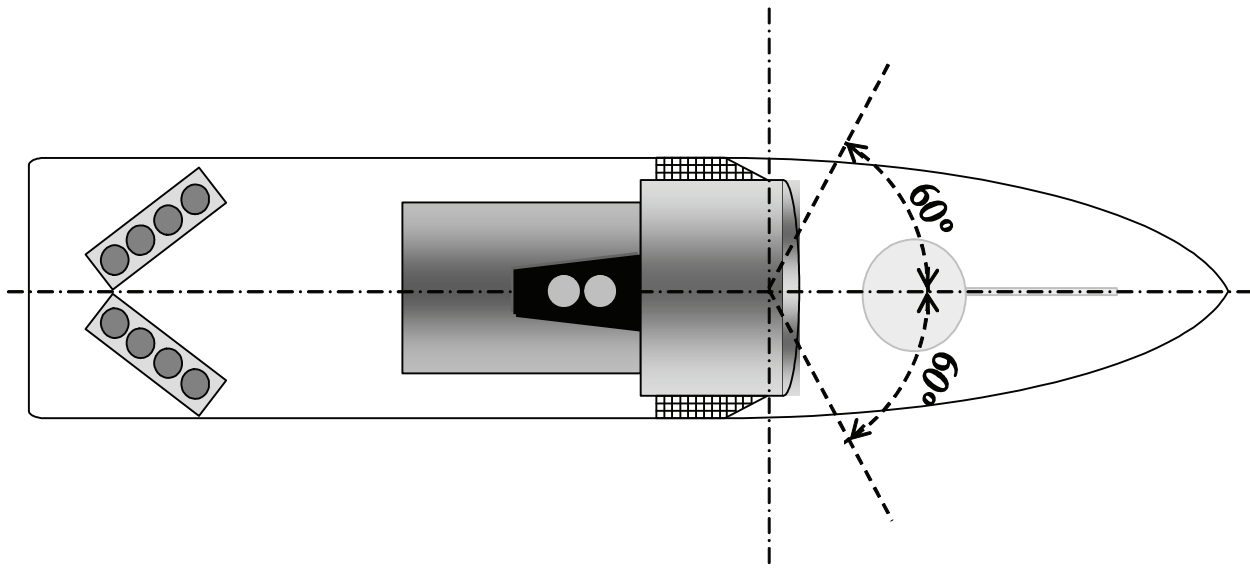


Fig. 9
Field of vision from the workstation for manual steering

303 When the workstation for manual steering is located off centre, or the bow of the vessel cannot be seen from the steering position, special steering references (sighting marks) shall be installed forward of the steering position. The steering references shall be installed in line parallel to the vessel's centre line for use by day and by night.

304 The vessel's side shall be visible from the bridge wing. Equipment for docking operations from the bridge wings, or a workstation console if installed, shall be located to enable visual observations required for safe manoeuvring of the vessel, monitoring of tug and mooring operations and shall provide a field of vision from not less than 45° on opposite bow to right astern from the working position as shown in Fig. 10.

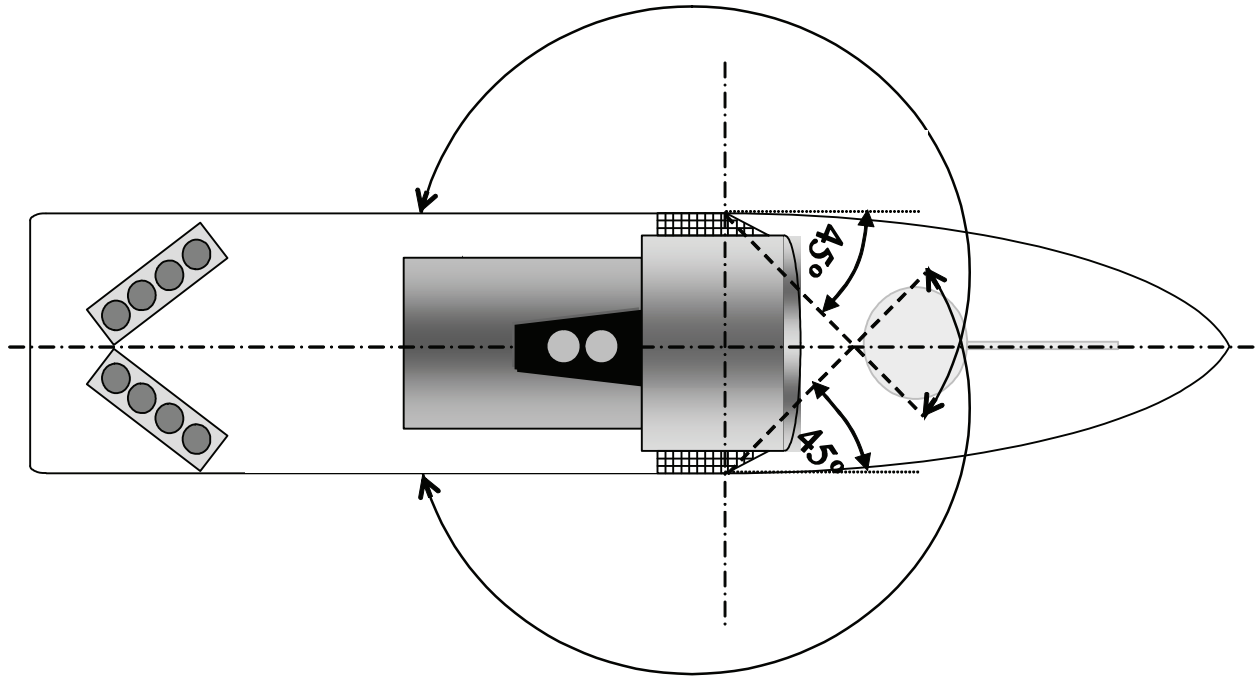


Fig. 10
Field of vision from the workstation for docking when provided at the bridge wings

Guidance note:

See Sec.1 A300:

To fulfil the requirement of 304 the bridge wing should extend to the maximum beam of the vessel.

For low freeboard vessel, the vessel's side may be visible from the bridge wing even if the bridge wing does not extend to the maximum beam of the vessel.

For other types of vessels where the bridge wings does not fully extend to the maximum beam of the vessel or, where no bridge wings are provided, alternative solutions (e.g. near hull monitoring systems such as CCTV) making the vessel's side visible from the bridge may be accepted.

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305 The main conning position shall be located close to the front centre window to provide a commanding external view, including a view of the sea surface sufficiently close to both sides of the vessel's bow for safe directing of the steering in narrow canals and buoy lanes.

Guidance note:

See Sec.1 A300:

The position for the conning station may be met by the worksta-

tion for monitoring/backup navigation when located sufficiently close to the forward centre window provided the workstation is installed in addition to a complete workstation for navigation, traffic surveillance and manoeuvring and therefore not required by the vessel's personnel during pilotage (See Guidance note of 201).

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306 It shall be possible to watch the area in front of the bridge superstructure from the wheelhouse.

Guidance note:

See Sec.1 A300:

There should be a close approach access to at least one front window providing the view of the area in front of the bridge superstructure.

The figure below shows the principles for bridge layout with front workstations arranged for operations in seated and standing position and with bridge wing bulkheads in line of sight from the working positions. Close approach access to front windows is maintained.

A bridge area which may be regarded outside the navigating bridge and the sectors of required *field of vision from workstations* are indicated.

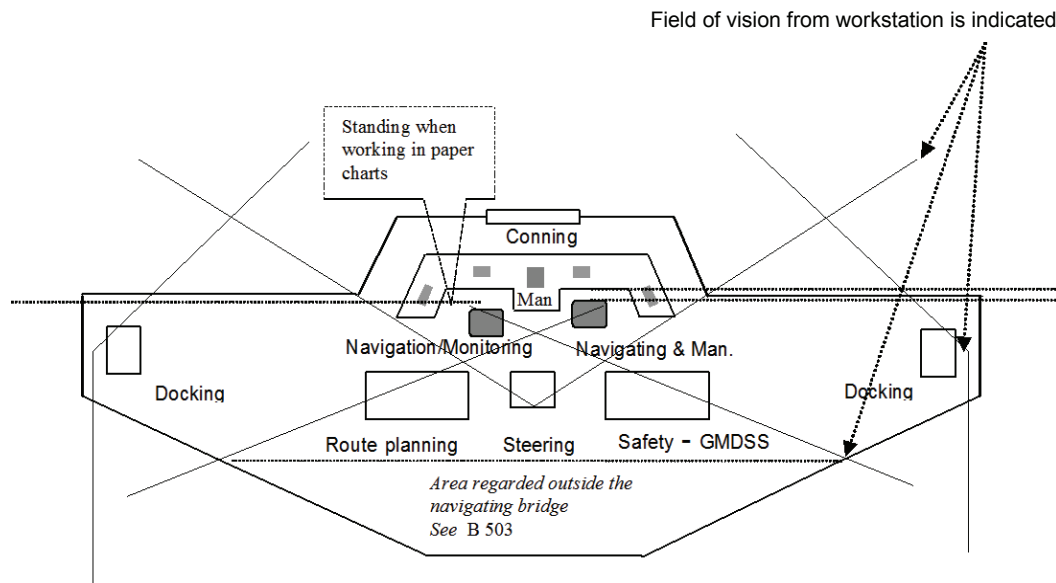


Fig. 11
Location of workstations and required fields of vision
(Position-fixing in paper charts - Passageway and conning position in front.)

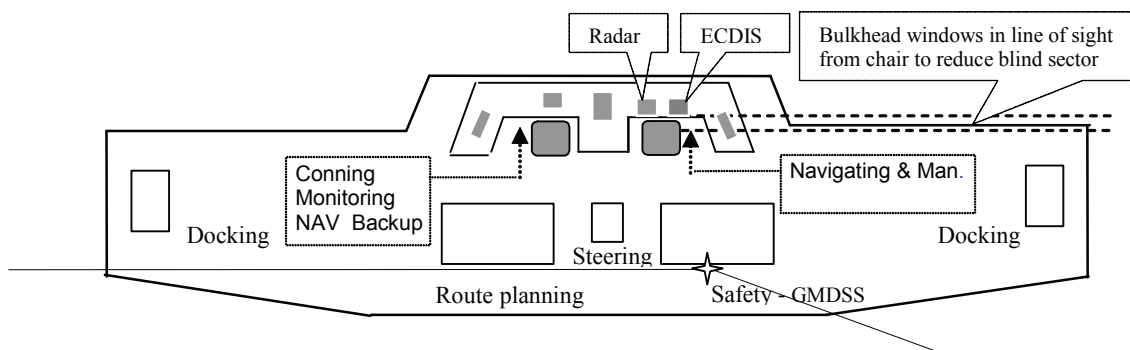


Fig. 12
Required field of vision from the workstation for radio communication and safety operations when to be controlled and infrequently used for short periods of time by the watch officer
(Navigation based on electronic chart system (ECDIS/WECDIS) - Conning position at console.)

Note to Fig.12: Location of ECDIS/WECDIS at the workstation for navigating and manoeuvring (incl. traffic surveillance) enables position-fixing at this position and makes the area a complete workstation (WS) for the navigation function and manoeuvring. This leaves the workstation for navigation backup/monitoring available for conning when installed at the front bulkhead. Close approach access to front windows is maintained.

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D 400 Arrangement of navigational systems and equipment

401 The type and number of navigational systems and equipment to be carried shall at least incorporate the items specified in Sec.4, and shall be installed at the various workstations with the aim of:

- facilitating the tasks to be performed by the bridge team in making full appraisal of the situation and in navigating the vessel safely under all operational conditions
- enabling the bridge team to have convenient and continu-

ous access to essential information that is presented in a clear and unambiguous manner, using standardized symbols and coding systems for controls and displays

- indicating the operational status of automated functions and integrated components, systems and/or sub-systems
- minimizing the risk of human error and detecting such error if it occurs through monitoring and alarm systems, in time for the bridge team to take appropriate action.

The relative location of individual equipment and their placement in relation to the distance from the working position of the user are governed by:

- type and range of equipment to be installed
- equipment relationship with tasks to be performed at the various workstations
- importance of equipment functions and frequency of use
- workstation and console configurations
- size of equipment and space available for installation.

402 Other means than those specified in Sec. 4 may be per-

mitted, provided they serve the same functions and are approved in accordance with Sec.4 A300.

403 The workstation for navigating and manoeuvring shall have working positions for position-fixing, manoeuvring and traffic surveillance as close as possible for efficient use by the officer of the watch, but also enabling the tasks to be performed by two navigators in close cooperation.

Guidance note:

See Sec.1 A300:

The working position for operating the radar with collision avoidance functions should be regarded the main working position at this workstation. Controls for course and speed adjustments should be located within reach from this position to enable collision avoidance manoeuvres without losing view of the traffic, and means for position-monitoring/-fixing should be readily available.

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404 The location of equipment at the workstations (see also

403) for navigating, manoeuvring, traffic surveillance and monitoring shall enable easy use of all controls, switches and buttons from standing position and easy use of primary means for route monitoring, traffic surveillance, heading and speed adjustments, internal and external communication, including the vessel's whistle and change of steering mode, from seated position.

Work in paper charts and manoeuvring requiring the use of lateral thrusters may be performed in standing position only, but controls for thruster systems shall be grouped with controls for propulsion and manual steering.

Guidance note:

See Sec.1 A300:

The position for operation of radars and the position at the centre console for harbour manoeuvres are regarded the main working positions at the workstation for navigating and manoeuvring. Fig.13 indicates location of main categories of equipment that should be within reach from the front workstation comprising three workplaces.

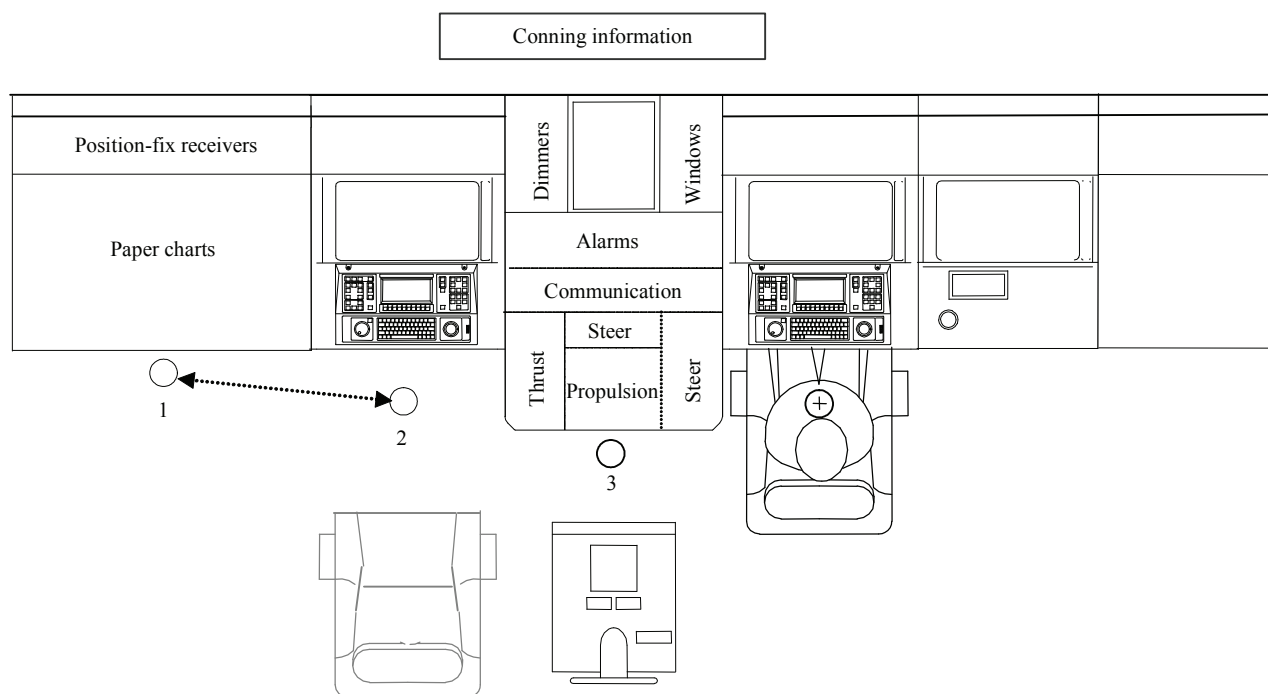


Fig. 13

Example of principle location of main equipment in a centre console which includes manoeuvring functions

The following working positions are identified in the figure:

- 1) working position for position fixing
- 2) working position for operation of radar
- 3) working position for manoeuvring.

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D 500 Passageways and clear deck head heights

501 Bridge passageways shall facilitate the expected movement of the bridge team between individual workstations, bridge entrances, exits and windows in carrying out the bridge tasks safely and effectively including the maintenance of equipment.

502 A clear route across the wheelhouse, from bridge wing to bridge wing for two persons to pass each other, shall be provided.

Guidance note:

See Sec.1 A300:

The width of the passageway should be 1 200 mm and not less than 700 mm at any single point of obstruction.

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503 The distance between separate workstation areas shall be sufficient to allow unobstructed passage for persons not working at the stations.

Guidance note:

See Sec.1 A300:

The width of such passageways should not be less than 700 mm, including persons sitting or standing at their workstations.

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504 The distance from the bridge front bulkhead, or from any console and installation placed against the front bulkhead to any console or installation placed away from the bridge

front, shall be sufficient for one person to pass a stationary person.

Guidance note:

See Sec.1 A300:

Where there is a passageway between the front bulkhead and front workstation consoles, its width should preferably be 1 000 mm and not be less than 800 mm. When the front workstation is placed against the front bulkhead, the guidelines of 503 may be applicable or 502 if there is a passageway providing a clear route from bridge wing to bridge wing aft of the workstation.

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505 The distance between bridge wing consoles and bulkheads shall be as little as possible for easy operation of controls from both a position behind and beside the console giving optimum view of the vessel's side and the mooring operations. If the bridge wing console is not mounted against the bulkhead, the distance shall be wide enough for one person to pass between the console and the bulkhead.

Guidance note:

See Sec.1 A300:

The width of the passageway should be 600 mm.

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506 The clear deck head height in the wheelhouse shall take into account the installation of deck head 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:

- a) The clear height between the bridge deck surface covering and the underside of the deck head covering shall be at least 2 250 mm.
- b) The lower edge of deck head-mounted equipment in open areas and passageways, as well as the upper edge of door openings to bridge wings and other open deck areas shall be at least 2 100 mm above the deck.
- c) The height of entrances and doors to the wheelhouse from adjacent passageways shall not be less than 2 000 mm.

E. Requirements Specific for HSC Code Vessels

E 100 General

101 This sub section gives specific requirements for naval vessels to demonstrate a safety level for Safety of Navigation according to The International Code of Safety for High-Speed Craft (HSC), Chapter 13 (Shipborne Navigational systems and equipment and voyage data recorders) and Chapter 15 (Operating compartment layout) as amended.

E 200 Bridge configuration

201 The navigating bridge shall be provided with an integrated workstation for conning, navigation, manoeuvring and communication and so arranged that it can accommodate those persons required to navigate the vessel safely.

202 The arrangement of equipment and means for navigation,

manoeuvring, control, communication and other essential instruments shall be located sufficiently close together to enable both the officer in charge and any assisting officer to receive all necessary information and to use the equipment and controls, as required, while they are seated. If necessary, the equipment and means serving these functions shall be duplicated.

203 If a separate workstation for supervision of engine performance is placed on the navigating bridge, the location and use of this workstation shall not interfere with the primary functions to be performed on the navigating bridge.

204 The design and layout of the navigating bridge from which the bridge team operate the vessel and the relative positions of the primary controls shall be assessed against the essential operational manning level. Where minimum manning levels are proposed, the design and layout of the primary and communication controls shall form an integrated operational and emergency control centre from which the vessel can be controlled under all operational and emergency events by the bridge team without the necessity for any bridge team member to vacate the navigating bridge.

E 300 Workstation arrangements and field of vision

301 The view of the sea surface from the workstation for monitoring and navigating and manoeuvring, when the navigators are seated, shall not be obscured by more than one vessel length forward of the bow to 90° on either side irrespective of the vessel's draught, trim and deck equipment or cargo.

302 The field of vision from the docking workstation, if remote from the workstation for navigating and manoeuvring, shall permit one navigator to safely manoeuvre the vessel to a berth.

303 In vessels where the Administration considers the provision of a safety belt necessary for use by the bridge team, it shall be possible for those bridge team members, with their safety belts correctly worn, to comply with B204 except in respect of controls which it can be shown will only be required on very rare occasions and which are not associated with the need for safety restraint.

304 The relative positions of the primary controls and the seats shall be such that each bridge team member, with the seat suitably adjusted and without prejudicing compliance with A101, can:

- without interference, produce full and unrestricted movement of each control both separately and with all practical combinations of movement of other controls; and
- at all workstations, exert adequate control forces for the operation to be performed.

305 When a seat at a station from which the vessel may be operated has been adjusted so as to suit the occupant, subsequent change of seat position to operate any control shall not be acceptable.

306 The integrated navigating bridge shall contain equipment which provides relevant information to enable the officer in charge and any assisting officer to carry out navigational and safety functions safely and efficiently.

SECTION 3 BRIDGE WORKING ENVIRONMENT

A. Requirements for Bridge Working Environment

A 100 General requirements

101 The bridge shall be designed and arranged with the aim of:

- preventing or minimizing any condition or distraction which may cause fatigue or interfere with the vigilance of the bridge team.

Internal environmental conditions on the bridge that may affect human performance are:

- temperature
- humidity
- ventilation
- noise
- vibration
- illumination and type of lighting
- glare and reflection
- interior colours
- occupational safety.

A 200 Ventilation

201 The enclosed bridge or wheelhouse shall be equipped with an air conditioning or ventilation system for regulation of temperature and humidity.

Guidance note:

See Sec.1 A300:

It should be possible to maintain a temperature which is not less than 18°C in cold climates and does not exceed 27°C in tropical climates, and to maintain the relative air humidity in the range of 20% – 60%, preferably maintaining 45% humidity at 21°C and not less than 20% at any temperature.

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202 Ventilation system with suitable air flow velocity and rate of air circulation shall be provided. Direction of air flow from air conditioning and heating systems towards workplaces shall be avoided.

Guidance note:

See Sec.1 A300:

The preferred air velocity is 0.3 m/s and should not exceed 0.5 m/s.

The recommended rate of air circulation for enclosed spaces is 6 complete changes per hour.

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A 300 Noise

301 Excessive levels of noise interfering with voice communication, causing fatigue and degrading overall system reliability, shall be avoided.

Guidance note:

See Sec.1 A300:

The sound level measured 1 m from the outlets of air distribution systems should not exceed 55 dB(A).

Noise levels produced by individual bridge equipment should not exceed 60 dB(A) at 1 m.

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A 400 Vibrations

401 Vibrations when the vessel is at normal transit speeds

shall not affect the reading of indicators or the comfort of personnel.

A 500 Lighting

501 A satisfactory level of lighting shall be available to enable the operating personnel to adequately perform all their tasks both at sea and in port, by day and night. There shall be only a limited reduction in the illumination of essential instruments and controls under likely system fault conditions.

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

Guidance note:

See Sec.1 A300:

White light used at the workstation areas should be variable from 0 to 500 lux.

Red or white light used at the bridge during dark hours (night) should be continuously variable from 0 to 10 lux.

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503 The brightness of the lighting that may be required for continuous operations during darkness and in entrances to the bridge shall be adjustable to suit the operations and ease visual adaptation to darkness.

504 It shall be possible to dim equipment displays and indicators providing information to individual workstations and lighting covering the workstation area, at the workstation in use.

505 Light sources shall be arranged and located in a way that prevents glare, stray image and mirror effects in bridge windows and deck head areas above workstations. High contrast in brightness between work area and surroundings shall be avoided. Non-reflective or matt surfaces shall be used to reduce indirect glare to a minimum.

Guidance note:

See Sec.1 A300:

Deck head areas above workstations and the surfaces of console tops and instruments should have a dark colour of matt, anti-gloss type minimizing light reflection. The colour of bridge bulkheads should have a calm and matt appearance.

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A 600 Safety of personnel

601 To reduce the risk of personnel injury during bridge operations:

- the wheelhouse floor, bridge wings and upper bridge decks shall have non-slip surfaces
- hand- or grab-rails shall be installed as required at workstations, passageways and entrances, enabling personnel to move and stand safely when the vessel is rolling and pitching in heavy weather
- chair deck rails installed at workstations shall be provided with anti-trip skirting board or be flush mounted
- stairway openings shall be protected if not sufficiently lit or otherwise indicated during darkness
- doors shall be fitted with devices to prevent them moving, whether they are open or closed
- the bridge area shall be free of physical hazards* to bridge personnel.

Guidance note:

See Sec.1 A300:

* There should be no sharp edges or protuberances that could cause injury to personnel. The bridge deck should be free of trip hazards; such as curled up carpet edges, loose gratings or equipment.

Means should be provided for properly securing portable equipment.

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602 Personnel safety equipment to be stored on the bridge shall be clearly marked and easily accessible.

SECTION 4 CARRIAGE REQUIREMENTS FOR NAVIGATIONAL SYSTEMS AND EQUIPMENT

A. General

A 100 General

101 Navigational systems and equipment shall be designed with the aim of:

- presenting the information in a clear and unambiguous manner, using standardized symbols and coding systems for controls and displays
- indicating the operational status of automated functions and integrated components, systems and/or sub-systems
- minimizing the risk of human error and detecting such error if it occurs, through monitoring and alarm systems, in time for the bridge team to take appropriate action.

102 The information provided by navigational systems and equipment shall be so displayed that the probability of misreading is reduced to a minimum. Navigational systems and equipment shall be capable of giving readings to an optimum accuracy.

103 Navigational equipment and systems offering alternative modes of operation shall indicate the actual mode in use.

104 The navigational equipment and systems referred to in these rules shall be so installed, tested and maintained as to minimize malfunction.

105 The system architecture of an integrated navigational system* shall be so provided that failure of one sub-system is brought to immediate attention of the officer in charge of the navigational watch by audible and visible alarm, included means providing situation awareness by indication of operational status of automated functions and the individual equipment. In case of failure in one part of an integrated navigational system, it shall be possible to operate every other individual item of equipment or part of the system separately.

Guidance note:

See Sec.1 A300:

* Refer to resolution MSC.86(70), annex 3 - Performance standard for Integrated navigational systems.

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106 One of the two mutually independent sources of power required in Pt.5 Ch.14 Sec.8 C300 or power from an accumulator battery other than the starting battery shall be capable of providing the navigational equipment as required in these rules with electrical power for a period of at least 12 hours after breakdown of the primary source of electrical power. Where such provision is unreasonable or impracticable, the Society if satisfied that an adequate standard of safety would be maintained, may waive this requirement for vessel of less than 5 000 gross tonnage.

107 The secondary source of power may be either a generator or an accumulator battery.

A 200 Electromagnetic compatibility (EMC)

201 Administrations shall ensure that all electrical and elec-

tronic equipment on the bridge or in the vicinity of the bridge, on vessels constructed on or after 1 July 2002, are tested for electromagnetic compatibility taking into account the recommendations developed by the International Maritime Organization (IMO)*.

Guidance note:

See Sec.1 A300:

* Refer to the General requirements for Electromagnetic Compatibility for all Electrical and Electronic Ship's Equipment adopted by the International Maritime Organization (IMO) by resolution A.813(19).

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202 Electrical and electronic equipment shall be so installed that electromagnetic interference does not affect the proper function of navigational systems and equipment.

203 Portable electrical and electronic equipment shall not be operated on the bridge if it may affect the proper function of navigational systems and equipment.

Guidance note:

See Sec.1 A300:

The EMC conditions specified in IEC publication 60945 apply to navigation and communication equipment. The EMC conditions specified in IEC publication 60533 apply to other equipment.

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A 300 Approval, surveys and performance standards of navigational systems and equipment

301 Systems and equipment, including associated back-up arrangements, where applicable, installed to meet the requirements of B "Carriage requirements" shall be of an approved type and shall conform to appropriate performance standards not inferior to those adopted by the International Maritime Organization (IMO). *

Guidance note:

See Sec.1 A300:

* Refer to the following recommendations adopted by the International Maritime Organization (IMO) by the resolutions indicated:

<i>Equipment</i>	<i>SOLAS</i>	<i>HSC Code</i>
Shipborne radio equipment	Recommendations on general requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for Electronic Navigational Aids (resolution A.694(17))	
AIS	Recommendation on Performance Standards for a universal shipborne automatic identification system (AIS) (resolution MSC.74(69), annex 3)	
VDR	Recommendation on Performance Standards for voyage data recorders (VDRs) (resolution A.86(20))	
Radar equipment	Recommendation on performance standards for radar equipment (resolution MSC.64(67), annex 4)	Recommendation on performance standards for navigational radar equipment for high-speed craft (resolution A.820(19))
Automatic Radar Plotting Aids (ARPA)	Performance standards for automatic radar plotting aids (resolution A.823(19))	
ATA	Recommendation on performance standards for "Auto Tracking" (resolution MSC.64(67), annex 4, appendix 1)	
Radar reflectors	Recommendation on Performance Standards for radar reflectors (resolution A.384(X))	
ECDIS	Recommendation on Performance Standards for Electronic Chart Display and Information Systems (ECDIS) (resolution A.817(19)), as amended by resolutions MSC.64(67), annex 5 and MSC.86(70), annex 4, as appropriate	
Loran-C and Chayka	Recommendation on Performance Standards for shipborne Loran-C and Chayka receivers (resolution A.818(19))	
GPS	Recommendation on Performance Standards for shipborne global positioning system receiver equipment (resolution A.819(19)) as amended by resolution MSC.112(73)	
GLONASS	Recommendation on Performance Standards for shipborne GLONASS receiver equipment (resolution MSC.53(66)) as amended by resolution MSC.113(73)	
DGPS/DGLONASS	Recommendation on Performance Standards for shipborne DGPS and DGLONASS maritime radio beacon receiver equipment (resolution MSC.64(67), annex 2) as amended by resolution MSC.114(73)	
GPS/GLONASS	Recommendation on Performance Standards for combined GPS/GLONASS receiver equipment (resolution MSC.74(69), annex 1) as amended by resolution MSC.115(73)	
Gyro compass	Recommendation on performance standards for gyro compasses (resolution A.424(XI))	Recommendation on performance standards for Gyro-compasses for high-speed craft (resolution A.821(19))
THD	Recommendations on Performance Standards for marine transmitting heading devices (THDs) (resolution MSC.116(73)).	
Magnetic compass	Recommendation on Performance Standards for magnetic compasses (resolution A.382(X))	
Heading Control Systems	Recommendation on Performance Standards for heading control systems (resolution MSC.64(67), annex 3)	Recommendation on performance standards for automatic steering aids (automatic pilots) for high-speed craft (resolution A.822(19)).
Track Control Systems	Recommendation on Performance Standards for track control systems (resolution MSC.74(69), annex 2)	
Rate-of-turn indicators	Performance Standards for rate-of-turn indicators (resolution A.526(13))	
Echo sounding equipment	Recommendation on Performance Standards for echo-sounding equipment (resolution A.224(VII), as amended by resolution MSC.74(69), annex 4)	Recommendation on performance standards for echo-sounding equipment (resolution A.224(VII) as amended by MSC.74(69), annex 2)
Devices to indicate speed and distance	Recommendation on Performance Standards for devices to indicate speed and distance (resolution A.824(19)), as amended by resolution MSC.96(72)	
Signalling lamps	Recommendation on Performance Standards for daylight signalling lamps (resolution MSC.95(72))	
Sound reception systems	Recommendation on Performance Standards for sound reception systems (resolution MSC.86(70), annex 1)	
Night vision equipment	Recommendation on performance standards for night vision equipment for high-speed craft (resolution MSC.94(72))	
Unification of Performance standards for navigation equipment	Recommendation on unification of Performance Standards for navigational equipment (resolution A.575(14))	
Accuracy	Recommendation on accuracy standards for navigation (resolution A.529(13))	

The quality of the human engineering part of the design of equipment and alarm functions shall be determined in performance tests and trials carried out during the approval process.

Alteration of hardware and software of type approved equipment requires review of the documentation by the type approving authority and may include re-testing to a certain extent, depending on the type of changes.

If the heading control system is connected to equipment which is able to give heading/course change orders to the autopilot (e.g. GPS or ECDIS/WECDIS), this system shall be approved as a track control system.

Non-type approved military equipment serving the functions of the equipment required in B may be used for navigational purposes based on a case by case approval, or, when applicable, if

certified in accordance with Sec.1 A402.

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302 Systems and equipment installed prior to the adoption of performance standards by the International Maritime Organization (IMO) may subsequently be exempted from full compliance with such standards at the discretion of the Society, having due regard to the recommended criteria adopted by the International Maritime Organization (IMO). However, for an electronic chart display and information system (ECDIS) to be accepted as satisfying the chart carriage requirement of B1501, that system shall conform to the relevant performance standards not inferior to those adopted by the International Maritime Organization (IMO) in effect on the date of installa-

tion, or, for systems installed before 1 January 1999, not inferior to the performance standards adopted by the International Maritime Organization (IMO) on 23 November 1995 *.

Guidance note:

See Sec.1 A300:

* Recommendation on Performance Standards for Electronic Chart Display and Information System (ECDIS) (resolution A.817(19))

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303 The Society shall require that the manufacturers have a quality control system audited by a competent authority to ensure continuous compliance with the type approval conditions. Alternatively, the Society may use final product verification procedures where the compliance with the type approval certificate is verified by a competent authority before the product is installed on board vessels.

304 Before giving approval to systems or equipment embodying new features not covered by this chapter, the Society shall ensure that such features support functions at least as effective as those required by this chapter.

305 When equipment, for which performance standards have been developed by the International Maritime Organization (IMO), is carried on vessels in addition to those items of equipment required by these regulations, B200-B1800, such equipment shall be subject to approval and shall as far as practicable comply with performance standards not inferior to those adopted by the International Maritime Organization (IMO).

B. Carriage Requirements

B 100 General requirements

101 This sub-section establishes the minimum range and types of equipment and systems that vessels to be built in accordance with these rules need to install. This chapter covers items of equipment which relate to the navigation of the vessel as distinct from the safe functioning of the vessel. The following items set out the minimum requirements.

102 When "other means" are permitted such means must be approved according to A.

103 The instruments and controls shall be provided with means for screening and dimming in order to minimize glare and reflections and prevent them being obscured by strong light.

104 A failure of one piece of equipment shall not reduce the vessel's ability to meet the requirements in 201, 202 and 1501.

105 Equipment essential for the performance of primary bridge functions shall, unless powered from a battery source, be provided with an uninterruptible power supply (UPS) with a capacity to keep the equipment running during a black-out period of at least 60 s. For a black-out lasting from 60 s up to 30 minutes the equipment may shut down, but shall be automatically reinstated upon recovery. The equipment regarded essential for the performance of primary bridge functions in this context are:

- gyro compass and bearing repeaters (at least one of each)
- position fixing systems (e. g. GPS)
- electronic chart systems (ECDIS/WECDIS)
- 9 GHz radar with automatic radar plotting aid (ARPA).

B 200 Heading information system

201 All naval vessels, irrespective of size, shall have two gyro compasses, or other means, to determine the vessel's heading and display the reading at the steering position and at the conning position. The gyro compasses, or other means, shall meet the requirements of 104 and 105.

Guidance note:

See Sec.1 A300:

One of the gyro compasses may be replaced by a transmitting heading device (THD)

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202 All naval vessels, irrespective of size, shall have a gyro compass bearing repeater, or other means, to take bearings over an arc of the horizon of 360°, using the gyro compass or other means referred to in 201. The gyro compass bearing repeater, or other means, shall meet the requirements of 104 and 105.

203 A connection of the optical bearing device to the ECDIS/WECDIS shall be provided.

204 All naval vessels, irrespective of size, shall have means of correcting heading and bearings to true at all times.

205 All naval vessels, irrespective of size, shall have a telephone, or other means, to communicate heading information to the emergency steering position, if provided.

206 All naval vessels, irrespective of size, shall have a gyro compass heading repeater, or other means, to supply heading information visually at the emergency steering position, if provided.

B 300 Speed and distance measuring device

301 All naval vessels, irrespective of size, shall be fitted with a speed and distance measuring device, or other means, to indicate speed and distance through the water.

Guidance note:

See Sec.1 A300:

A trip counter connected to the speed log should be available for easy use for the navigator.

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302 All naval vessels of 50 000 gross tonnage and upwards shall, in addition to meeting the requirements of 301, have a speed and distance measuring device, or other means, to indicate speed and distance over the ground in the forward and athwartships direction.

B 400 Echo-sounding device

401 All non-amphibious naval vessels shall be fitted with an echo sounding device, or other electronic means, to measure and display the available depth of water.

B 500 Radar installations

501 All naval vessels, irrespective of size, shall have a radar reflector, or other means, to enable detection by vessels navigating by radar at both 9 and 3 GHz.

Guidance note:

See Sec.1 A300:

The radar reflector may be an active radar beacon (beacon type) with on/of functionality or of a removable type.

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502 All naval vessels, irrespective of size, shall have a 9 GHz radar with automatic radar plotting aid (ARPA), to plot automatically the range and bearing of other targets to determine collision risk, to display the range and bearing of radar transponders and of other vessels, obstructions, buoys, shorelines and navigational marks to assist in navigation and in collision avoidance. The 9 GHz ARPA radar shall meet the requirements of 105.

Guidance note:

See Sec.1 A300:

The radar display shall as far as practicable comply with performance standards not inferior to those adopted by the Interna-

tional Maritime Organization (IMO), but smaller displays than required in the standards may be allowed to obtain the function in a smaller wheelhouse.

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503 All naval vessels of 3 000 gross tonnage and upwards shall, in addition to meeting the requirements of 502, have a 3 GHz radar or where considered appropriate by the Administration a second 9 GHz radar, with automatic radar plotting aid (ARPA), to plot automatically the range and bearing of other targets to determine collision risk, to display the range and bearing of radar transponders and of other vessels, obstructions, buoys, shorelines and navigational marks to assist in navigation and in collision avoidance, which are functionally independent of those referred to in 502.

Guidance note:

See Sec.1 A300:

The 3 GHz radar should be a preferred additional solution to secure optimal radar coverage and operation in all types of weather.

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504 Each radar installation provided shall be suitable for the intended vessel speed, motion characteristics and commonly encountered environmental conditions.

505 Each radar installation shall be mounted so as to be as free as practicable from vibration.

B 600 Electronic positioning systems

601 All naval vessels, irrespective of size, shall have a receiver for a global navigation satellite system, or other means, suitable for use at all times throughout the intended voyage to establish and update the vessel's position by automatic means. The global positioning system, or other means, shall meet the requirements of 105.

B 700 Rate-of-turn indicator and rudder angle indicator

701 All naval vessels, irrespective of size, shall have rudder, propeller, thrust, pitch and operational mode indicators, or other means, to determine and display rudder angle, propeller revolutions, the force and direction of thrust and, if applicable, the force and direction of lateral thrust and the pitch and operational mode (all to be readable from the conning position).

702 All naval vessels of 500 gross tonnage and upwards shall, in addition to meeting the requirements of 701, have a rate of turn indicator, or other means, to determine and display the rate of turn.

B 800 Steering arrangement and propulsion indicator(s)

801 The steering arrangement shall be so designed that the naval vessel turns in the same direction as that of the wheel, tiller, joystick or control lever.

802 All naval vessels, irrespective of size, shall be provided with means to indicate the mode of the propulsion system(s).

B 900 Heading control system (HCS)

901 All naval vessels, irrespective of size, shall have a heading or track control system, or other means, to automatically control and keep to a heading and/or straight track.

902 Provision shall be made to change from the automatic to manual mode by a manual override.

B 1000 Sound reception system

1001 All naval vessels, irrespective of size, shall have, when the vessel's bridge is totally enclosed and unless the Society determines otherwise, a sound reception system, or other means, to enable the officer in charge of the navigational watch to hear sound signals and determine their direction.

Guidance note:

See Sec.1 A300:

A look-out, located outside the enclosed bridge, with adequate means for communication with the navigating bridge may be regarded as an acceptable solution to fulfil this requirement.

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B 1100 Automatic identification system (AIS)

1101 All naval vessels of 300 gross tonnage and upwards shall be fitted with an automatic identification system (AIS).

Guidance note:

See Sec.1 A300:

A display for graphical presentation of the AIS information should be provided.

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1102 The AIS shall be interfaced to the ARPA according to IEC/PAS 60936-5.

B 1200 Voyage data recorder (VDR)

1201 To assist in casualty investigations, all naval vessels of 3 000 gross tonnage and upwards, when engaged on international voyages, shall, unless the Administration determines otherwise, be fitted with a voyage data recorder (VDR).

1202 The voyage data recorder system, including all sensors, shall be subjected to an annual performance test. The test shall be conducted by an approved testing or servicing facility to verify the accuracy, duration and recoverability of the recorded data. In addition, tests and inspections shall be conducted to determine the serviceability of all protective enclosures and devices fitted to aid location. A copy of the certificate of compliance issued by the testing facility, stating the date of compliance and the applicable performance standards, shall be retained on board the vessel.

B 1300 Searchlight and daylight signalling lamp

1301 All naval vessels, irrespective of size, shall be provided with at least one adequate searchlight, which shall be controllable from the navigating bridge.

1302 All naval vessels, irrespective of size, shall have a portable daylight signalling lamp, to communicate by light during night and day, provided and maintained ready for use at the navigating bridge at all times. The energy source of electrical power shall not solely be dependent upon the vessel's power supply.

B 1400 Night vision equipment

1401 When operational conditions justify the provision of night vision equipment, such equipment shall be provided.

Guidance note:

See Sec.1 A300:

Night vision equipment may be imperative for vessels participating in operations with restrictions to visual (e.g. use of navigation lights) and radio/radar emissions. Furthermore, for vessels operating in areas where floating objects (e.g. naval vessels, special operations forces (kayak, dingy etc.), pleasure crafts, canoes, timber etc.) without navigation lights are common and thus constitutes a navigational hazard, night vision equipment should be operated by a dedicated person. The location and use should not interfere with the darkness adaptation of the navigators.

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B 1500 Nautical charts and nautical publications

1501 The vessel shall be provided with an Electronic Chart Display and Information System (ECDIS) or a Warship ECDIS (WECDIS), with an appropriate chart database for the waters to be navigated, and nautical publications to plan and

display the vessel's route for the intended voyage and to plot and monitor positions throughout the voyage.

The ECDIS or WECDIS shall meet the requirements of 104 and 105.

1502 Back-up arrangements shall be provided to meet the functional requirements of 1501.

Guidance note:

See Sec.1 A300:

An appropriate folio of paper nautical charts may be used as a back-up arrangement for ECDIS/WECDIS. Other back-up arrangements for ECDIS/WECDIS are acceptable (see appendix 6 to resolution A.817(19), as amended).

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1503 If an appropriate folio of paper nautical charts is used as a back-up arrangement for ECDIS/WECDIS, the navigating bridge shall be provided with a suitable table for chart work. There shall be facilities for lighting the chart. Chart-table lighting shall be screened.

Guidance note:

See Sec.1 A300:

The chart table should be large enough to accommodate all nautical chart sizes in common use internationally. The effective area of the desktop should be at least 1 200 mm x 750 mm.

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B 1600 Communication facilities

1601 Such means as are necessary shall be provided to enable the crew to communicate between, and have access to, each other and with other occupants of the vessel in both normal and emergency conditions.

1602 Means to communicate between the navigating bridge and spaces containing essential machinery, including any emergency steering position, irrespective of whether the machinery is remotely or locally controlled, shall be provided.

1603 Means for making public address and safety announcements from control stations to all areas to which crew have access shall be provided.

1604 Provisions shall be made for means to monitor, receive and transmit radio safety messages at the navigating bridge.

1605 The location of the radio equipment shall not interfere with the primary navigational functions at the primary workstations for navigation and manoeuvring.

B 1700 Bridge alarm management

1701 An alarm system shall be provided, indicating any fault requiring attention and shall:

- activate an audible and visual alarm on the navigating bridge for any situation which requires action by or attention of the officer of the watch
- as far as practicable be designed on the self-monitoring principle.

The bridge alarm system shall be designed with the overall aim of:

- minimizing the risk of human error in bridge operations and detecting such error, if it occurs, through monitoring and alarm systems, in time for the bridge team to take appropriate action.

The overall aim includes the aim of:

- enabling the officer on watch to devote full attention to the safe navigation of the vessel
- enabling immediate identification of any abnormal situation requiring action to maintain safe navigation of the vessel

- avoiding distraction by alarms which require attention but have no direct influence on the safe navigation of the vessel and which do not require immediate action to restore or maintain the safe navigation of the vessel.

Alarms and indicators on the navigating bridge shall be minimized and only alarms and indicators required by appropriate IMO Resolutions should be placed on the navigating bridge, unless permitted by the Administration. Ref. IMO Resolution A830/3.16.

1702 A method of accepting all alarms on the bridge (both the source of alarm and alarms of other equipment caused by the loss of sensor input) shall be provided at the navigating and manoeuvring workstation to avoid distraction. The system shall enable immediate identification of the alarm sources without requiring any operator action and enable immediate silencing of the alarms by single operator action.

Guidance note:

See Sec.1 A300:

A bridge management system should include grouping of alarms and indicators, separating alarms that affect safety of navigation and alarms that do not influence safety of navigation.

The group of alarms related to safety of navigation should incorporate all system alarms, equipment alarms and operational warnings that are critical to safety of navigation, including the detection of:

- operator disability
- danger of collision
- heading deviations
- deviations from the route
- danger of grounding
- propulsion failure
- steering gear failure.

Essential equipment and systems to be incorporated in such an alarm system should include:

- bridge watch monitoring system
- heading information system
- heading / track control system
- position-fixing systems
- electronic chart system, if installed
- radar with electronic target plotting functions
- relevant machinery alarms for early warning.

All groups of bridge alarms and warnings should be centralised in a common panel or screen at the workstation for navigating and manoeuvring.

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1703 Acknowledgement of an alarm at either the instrument or an alarm panel shall cancel the audible warning at both sources and change the visual alarm from flashing to constant light.

1704 Permanently inhibiting individual alarms shall not be possible, but manual suppression of local audible alarms may be accepted when this is clearly and constantly indicated at the equipment and the unit is part of the alarm management system.

Guidance note:

See Sec.1 A300:

Local audible alarms may be manually suppressed by means of an on/off switch located on or close to the equipment or by other means, e.g. electronically. The off-position should enable suppression of the audible alarm when the equipment is part of a central alarm system and the on-position should engage the local alarm when the equipment serves as a stand-alone unit.

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1705 If an alarm channel in a computer-based system is inhibited manually, then this shall be clearly indicated by a visual signal.

1706 Audible alarms shall be maintained until they are accepted and the visual identification of individual alarms should

remain until the fault has been corrected.

1707 Alarm indications shall be red, or if on displays, red or otherwise highlighted. If alarm messages are displayed on colour VDUs, the alarm status shall remain visible in the event of the failure of one colour of the display system.

Guidance note:

See Sec.1 A300:

The following method of indication should be applied:

- 1) Active alarm status:
Red, blinking and audible
- 2) Active alarm status acknowledged:
Red, static (cancelling the audible alarm)
- 3) Active warning message - not critical:
Yellow, static (may be accompanied by a short audible attention signal)
- 4) Normal condition:
No light (indication of a safe situation).

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1708 The alarm system shall be able to indicate more than one fault at the same time, and the acknowledgement of any alarm shall not inhibit another alarm, meaning that if an alarm has been acknowledged and a second fault occurs before the first is rectified, the audible and visual alarms shall operate again.

1709 A new alarm condition shall be clearly distinguishable from those existing and already acknowledged by indicating new alarms by a flashing light, and existing and accepted alarms by a constant light.

Guidance note:

See Sec.1 A300:

In colour graphic systems, it should not be possible to distinguish between the status of alarms and warnings by means of colour only.

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1710 Provisions shall be made for functional testing of required alarms and indicators.

1711 The alarm system shall be continuously powered and shall have an automatic change-over to stand-by power supply in case of loss of normal power supply.

1712 Failure of the normal or backup power supply of the alarm system shall be indicated by an alarm.

1713 Loss of system communication shall be indicated by an alarm.

B 1800 Other navigational aids

1801 All vessels shall be equipped with navigation lights, shapes and means of making sound signals complying with the International Regulations for Preventing Collisions at Sea with later amendments (COLREG).