

PROPOSED AMENDMENTS TO RESOLUTION MSC.232(82)
(as proposed by IHO (NCSR 7/22/5, paragraph 23.4))

DRAFT MSC RESOLUTION

**ADOPTION OF THE REVISED PERFORMANCE STANDARDS FOR
ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)**

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

RECALLING ALSO resolution A.886(21), by which the Assembly resolved that the function of adopting performance standards and technical specifications, as well as amendments thereto shall be performed by the Maritime Safety Committee and/or the Marine Environment Protection Committee, as appropriate, on behalf of the Organization,

RECALLING ALSO regulations V/19 and V/27 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, which requires all ships to carry adequate and up-to-date charts, sailing directions, lists of lights, notices to mariners, tide tables and all other nautical publications necessary for the intended voyage,

NOTING that the up-to-date charts required by SOLAS regulations V/19 and V/27 can be provided and displayed electronically on board ships by electronic chart display and information systems (ECDIS), and that the other nautical publications required by regulation V/27 may also be so provided and displayed,

RECOGNIZING the need to improve the previously adopted, by resolution A.817(19), as amended, performance standards for ECDIS in order to ensure the operational reliability of such equipment and taking into account the technological progress and experience gained,

HAVING CONSIDERED the recommendation made by the Sub-Committee on Safety of Navigation, at its fifty-second session,

1 ADOPTS the Revised performance standards for electronic chart display and information systems (ECDIS), set out in the Annex to the present resolution;

2 RECOMMENDS Governments ensure that ECDIS equipment:

(a) [if installed on or after 1 January 2024, conform to performance standards not inferior to those specified in the Annex to the present resolution;- and](#) 


(b) if installed on or after 1 January 2009 [but before 1 January 2024](#), conform to -performance standards not inferior to those specified in the Annex to [resolution MSC.232\(82\)](#)~~the present resolution;~~ -and

(bc) if installed on or after 1 January 1996 but before 1 January 2009, conform to performance standards not inferior to those specified in the Annex to resolution A.817(19), as amended by resolutions MSC.64(67) and MSC.86(70).

ANNEX

REVISED PERFORMANCE STANDARDS FOR ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)

1 SCOPE OF ECDIS

- 1.1 The primary function of the ECDIS is to contribute to safe navigation.
- 1.2 ECDIS with adequate back-up arrangements may be accepted as complying with the up-to-date charts required by regulations V/19 and V/27 of the 1974 SOLAS Convention, as amended.
- 1.3 ECDIS should be capable of displaying all **chart information** necessary for safe and efficient navigation originated by, and distributed on the authority of, government authorized hydrographic offices.
- 1.4 ECDIS should facilitate simple and reliable updating of the electronic navigational chart.
- 1.5 ECDIS should reduce the navigational workload compared to using the paper chart. It should enable the mariner to execute in a convenient and timely manner all route planning, route monitoring and positioning currently performed on paper charts. It should be capable of continuously plotting the ship's position.
- 1.6 The ECDIS display may also be used for the display of radar, radar tracked target information, AIS and other **appropriate data layers** to assist in route monitoring.
- 1.7 ECDIS should have at least the same reliability and availability of presentation as the paper chart published by government authorized hydrographic offices.
- 1.8 ECDIS should provide appropriate alarms or indications with respect to the information displayed or malfunction of the equipment (see appendix 5).
- 1.9 When the relevant chart information is not available in the appropriate form (see section 4), some ECDIS equipment may operate in the Raster Chart Display System (RCDS) mode as defined in appendix 7. RCDS mode of operation should conform to performance standards not inferior to those set out in appendix 7. 

2 APPLICATION OF THESE STANDARDS

- 2.1 These performance standards should apply to all ECDIS equipment carried on all ships, as follows:
 - dedicated standalone workstation.
 - a multifunction workstation as part of an INS.
- 2.2 These performance standards apply to ECDIS mode of operation, ECDIS in RCDS mode of operation as specified in appendix 7 and ECDIS backup arrangements as specified in appendix 6.
- 2.3 Requirements for structure and format of the chart data, encryption of chart data as well as the presentation of chart data are within the scope of relevant IHO standards, including those listed in **appendix 1**.

- 2.4 In addition to the general requirements set out in resolution A.694(17)*, the presentation requirements set out in resolution MSC.191(79), ECDIS equipment should meet the requirements of these standards and follow the relevant guidelines on ergonomic principles adopted by the Organization¹.

3 DEFINITIONS

For the purpose of these performance standards:

- 3.1 *Electronic Chart Display and Information System (ECDIS)* means a navigation information system which with adequate back-up arrangements can be accepted as complying with the up-to-date chart required by regulations V/19 and V/27 of the 1974 SOLAS Convention, as amended, by displaying selected information from a system electronic navigational chart (SENC) with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required display additional navigation-related information.
- 3.2 *Electronic Navigational Chart (ENC)* means the database, standardized as to content, structure and format, issued for use with ECDIS by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution, and conform to IHO standards. The ENC contains all the chart information necessary for safe navigation and may contain **supplementary information in addition to that contained in the paper chart (e.g. sailing directions)** which may be considered necessary for safe navigation.
- 3.3 **System Electronic Navigational Chart (SENC)** means a database, in the manufacturer's internal ECDIS format, resulting from the lossless transformation of the entire ENC contents and its updates. It is this database that is accessed by ECDIS for the display generation and other navigational functions, and is equivalent to an up-to-date paper chart. The SENC may also contain information added by the mariner and information from other sources.
- 3.4 *Standard Display* is the display mode intended to be used as a minimum during route planning and route monitoring. The chart content is listed in appendix 2.
- 3.5 *Display Base* means the chart content as listed in appendix 2 and which cannot be removed from the display. It is not intended to be sufficient for safe navigation.
- 3.6 Further information on ECDIS definitions may be found in IHO Hydrographic Dictionary - ~~Special~~ Publication S-32 (see appendix 1).

* Refer to Publication IEC 60945.

¹ MSC/Circ.982.

MODULE A - DATABASE

4 PROVISION AND UPDATING OF CHART INFORMATION

- 4.1 The chart information to be used in ECDIS should be the latest edition, as corrected by official updates, of that issued by or on the authority of a Government, government-authorized Hydrographic Office or other relevant government institution, and conform to IHO standards².
- 4.2 The contents of the SENC should be adequate and up-to-date for the intended voyage to comply with regulation V/27 of the 1974 SOLAS Convention as amended.
- 4.3 It should not be possible to alter the contents of the ENC or SENC information transformed from the ENC.
- 4.4 Updates should be stored separately from the ENC.
- 4.5 ECDIS should be capable of accepting official updates to the ENC data provided in conformity with IHO standards. These updates should be automatically applied to the SENC. By whatever means updates are received, the implementation procedure should not interfere with the display in use.
- 4.6 ECDIS should also be capable of accepting updates to the ENC data entered manually with simple means for verification prior to the final acceptance of the data. They should be distinguishable on the display from ENC information and its official updates and not affect display legibility.
- 4.7 ECDIS should keep and display on demand a record of updates including time of application to the SENC. This record should include updates for each ENC until it is superseded by a new edition.
- 4.8 ECDIS should allow the mariner to display updates in order to review their contents and to ascertain that they have been included in the SENC.
- 4.9 ECDIS should be capable of accepting both non-encrypted ENCs and ENCs encrypted in accordance with the IHO Data Protection Scheme³.

² IHO ~~Special Publication S-52 and S-57~~ Appendix B.1 – ENC Product Specification and ~~S-101 – ENC Product Specification~~ (see appendix 1).

³ IHO ~~Special Publication S-63 -~~ Data Protection Scheme (for S-57 ENCs) and S-100, Part 15 - Data Protection Scheme (for S-100 products). (see appendix 1).

MODULE B – OPERATIONAL AND FUNCTIONAL REQUIREMENTS

5 DISPLAY OF SENC INFORMATION

- 5.1 ECDIS should be capable of displaying all SENC information. An ECDIS should be capable of accepting and converting an ENC and its updates into a SENC. The ECDIS may also be capable of accepting a SENC resulting from conversion of ENC to SENC ashore, in accordance with IHO [Resolution 4/2002 as amended](#)⁴. This method of ENC supply is known as SENC delivery.
- 5.2 SENC information available for display during route planning and route monitoring should be subdivided into the following three categories, Display Base, Standard Display and All Other Information (see appendix 2).
- 5.3 ECDIS should present the Standard Display at any time by a single operator action.
- 5.4 When an ECDIS is switched on following a switch off or power failure, it should return to the most recent manually selected settings for display.
- 5.5 It should be easy to add or remove information from the ECDIS display. It should not be possible to remove information contained in the Display Base.
- 5.6 For any operator identified geographical position (e.g. by cursor picking) ECDIS should display on demand the information about the chart objects associated with such a position.
- 5.7 It should be possible to change the display scale by appropriate steps e.g. by means of either chart scale values or ranges in nautical miles.
- 5.8 It should be possible for the mariner to select a safety contour from the depth contours provided by the SENC. ECDIS should emphasize the safety contour over other contours on the display, however:
- .1 if the mariner does not specify a safety contour, this should default to 30m. If the safety contour specified by the mariner or the default 30 m contour is not in the displayed SENC, the safety contour shown should default to the next deeper contour;
 - .2 if the safety contour in use becomes unavailable due to a change in source data, the safety contour should default to the next deeper contour; and
 - .3 in each of the above cases, an indication should be provided.
- 5.9 It should be possible for the mariner to select a safety depth. ECDIS should emphasize soundings equal to or less than the safety depth whenever spot soundings are selected for display.
- 5.10 The ENC and all updates to it should be displayed without any degradation of their information content.
- 5.11 ECDIS should provide a means to ensure that the ENC and all updates to it have been correctly loaded into the SENC.

⁴ IHO ~~Miscellaneous~~ Publication M-3 - [Resolutions of the IHO](#).

5.12 The ENC data and updates to it should be clearly distinguishable from other displayed information, including those listed in appendix 3.

6 SCALE

6.1 ECDIS should provide an indication if:

- .1 the information is displayed at a larger scale than that contained in the ENC;
or
- .2 own ship's position is covered by an ENC at a larger scale than that provided by the display.

7 DISPLAY OF OTHER NAVIGATIONAL INFORMATION

7.1 Radar information and/or AIS information may be transferred from systems compliant with the relevant standards of the Organization. Other navigational information may be added to the ECDIS display. However, it should not degrade the displayed SENC information and it should be clearly distinguishable from the SENC information.

7.2 It should be possible to remove the radar information, AIS information and other navigational information by single operator action.

7.3 ECDIS and added navigational information should use a common reference system. If this is not the case, an indication should be provided.

7.4 Radar

7.4.1 Transferred radar information may contain a radar image and/or tracked target information.

7.4.2 If the radar image is added to the ECDIS display, the chart and the radar image should match in scale, projection and in orientation.

7.4.3 The radar image and the position from the position sensor should both be adjusted automatically for antenna offset from the conning position.

8 DISPLAY MODE AND GENERATION OF THE NEIGHBOURING AREA

8.1 It should always be possible to display the SENC information in a "north-up" orientation. Other orientations are permitted. When such orientations are displayed, the orientation should be altered in steps large enough to avoid unstable display of the chart information.

8.2 ECDIS should provide for true motion mode. Other modes are permitted.

8.3 When true motion mode is in use, reset and generation of the chart display of the neighbouring area should take place automatically at own ship's distance from the edge of the display as determined by the mariner.

8.4 It should be possible to manually change the displayed chart area and the position of own ship relative to the edge of the display.

- 8.5 If the area covered by the ECDIS display includes waters for which no ENC at a scale appropriate for navigation is available, the areas representing those waters should carry an indication (see appendix 5) to the mariner to refer to the paper chart or to the RCDS mode of operation (see appendix 7).

9 COLOURS AND SYMBOLS

- 9.1 IHO recommended colours and symbols should be used to represent SENC information⁵.
- 9.2 The colours and symbols other than those mentioned in 9.1 should comply with the applicable requirements contained in the IMO standards for navigational symbols⁶.
- 9.3 SENC information displayed at the scale specified in the ENC should use the specified size of symbols, figures and letters⁵.
- 9.4 ECDIS should allow the mariner to select whether own ship is displayed in true scale or as a symbol.

10 DISPLAY REQUIREMENTS

- 10.1 ECDIS should be capable of displaying information for:
- .1 route planning and supplementary navigation tasks; and
 - .2 route monitoring.
- 10.2 The effective size of the chart presentation for route monitoring should be at least 270mm x 270 mm.
- 10.3 The display should be capable of meeting colour and resolution recommendations of IHO⁵.
- 10.4 The method of presentation should ensure that the displayed information is clearly visible to more than one observer in the conditions of light normally experienced on the bridge of the ship by day and by night.
- 10.5 If information categories included in the Standard Display (See appendix 2) are removed to customize the display, this should be permanently indicated. Identification of categories which are removed from the Standard Display should be shown on demand.

11 ROUTE PLANNING, MONITORING AND VOYAGE RECORDING

- 11.1 It should be possible to carry out route planning and route monitoring in a simple and reliable manner.
- 11.2 The largest scale data available in the SENC for the area given should always be used by the ECDIS for all alarms or indications of crossing the ship's safety contour

⁵ [IHO Special Publication S-52 - Specifications for Chart Content and Display Aspects of ECDIS and S-101 - Portrayal Catalogue](#) (~~Appendix 2~~ (see appendix 1))

⁶ SN.1/Circ.243/Rev.2

and of entering a prohibited area, and for alarms and indications according to appendix 5.

11.3 Route Planning

11.3.1 It should be possible to carry out route planning including both straight and curved segments.

11.3.2 It should be possible to adjust a planned route alphanumerically and graphically including:

- .1 adding waypoints to a route;
- .2 deleting waypoints from a route; and
- .3 changing the position of a waypoint.

11.3.3 It should be possible to plan one or more alternative routes in addition to the selected route. The selected route should be clearly distinguishable from the other routes.

11.3.4 An indication is required if the mariner plans a route across an own ship's safety contour.

11.3.5 An indication should be given if the mariner plans a route closer than a user-specified distance from the boundary of a prohibited area or a geographic area for which special conditions exist (see appendix 4). An indication should also be given if the mariner plans a route closer than a user-specified distance from a point object, such as a fixed or floating aid to navigation or isolated danger.

11.3.6 It should be possible for the mariner to specify a cross track limit of deviation from the planned route at which an automatic off-track alarm should be activated.

11.4 Route monitoring

11.4.1 For route monitoring the selected route and own ship's position should appear whenever the display covers that area.

11.4.2 It should be possible to display a sea area that does not have the ship on the display (e.g. for look ahead, route planning), while route monitoring. If this is done on the display used for route monitoring, the automatic route monitoring functions (e.g. updating ship's position, and providing alarms and indications) should be continuous. It should be possible to return to the route monitoring display covering own ship's position immediately by single operator action.

11.4.3 ECDIS should give an alarm if, within a specified time set by the mariner, own ship will cross the safety contour.

11.4.4 ECDIS should give an alarm or indication, as selected by the mariner, if, within a specified time set by the mariner, own ship will cross the boundary of a prohibited area or of a geographical area for which special conditions exist (see appendix 4).

11.4.5 An alarm should be given when the specified cross track limit for deviation from the planned route is exceeded.

- 11.4.6** An indication should be given to the mariner if, continuing on its present course and speed, over a specified time or distance set by the mariner, own ship will pass closer than a user-specified distance from a danger (e.g. obstruction, wreck, rock) that is shallower than the mariner's safety contour or an aid to navigation.
- 11.4.7** The ship's position should be derived from a continuous positioning system of an accuracy consistent with the requirements of safe navigation. Whenever possible, a second independent positioning source, preferably of a different type, should be provided. In such cases ECDIS should be capable of identifying discrepancies between the two sources.
- 11.4.8** ECDIS should provide an alarm when the input from position, heading or speed sources is lost. ECDIS should also repeat, but only as an indication, any alarm or indication passed to it from position, heading or speed sources.
- 11.4.9** An alarm should be given by ECDIS when the ship reaches a specified time or distance, set by the mariner, in advance of a critical point on the planned route.
- 11.4.10** The positioning system and the SENC should be on the same geodetic datum. ECDIS should give an alarm if this is not the case.
- 11.4.11** It should be possible to display alternative routes in addition to the selected route. The selected route should be clearly distinguishable from the other routes. During the voyage, it should be possible for the mariner to modify the selected sailing route or change to an alternative route.
- 11.4.12** It should be possible to display:
- .1 time-labels along a ship's track manually on demand and automatically at intervals selected between 1 and 120 minutes; and
 - .2 an adequate number of: points, free movable electronic bearing lines, variable and fixed range markers and other symbols required for navigation purposes and specified in appendix 3.
- 11.4.13** It should be possible to enter the geographical co-ordinates of any position and then display that position on demand. Also, it should be possible to select any point (features, symbol or position) on the display and read its geographical co-ordinates on demand.
- 11.4.14** It should be possible to adjust the displayed geographic position of the ship manually. This manual adjustment should be noted alpha-numerically on the screen, maintained until altered by the mariner and automatically recorded.
- 11.4.15.1** ECDIS should provide the capability to enter and plot manually obtained bearing and distance lines of position (LOP), and calculate the resulting position of own ship. It should be possible to use the resulting position as an origin for dead-reckoning.
- 11.4.15.2** ECDIS should indicate discrepancies between the positions obtained by continuous positioning systems and positions obtained by manual observations.

11.5 Voyage recording

11.5.1 ECDIS should store and be able to reproduce certain minimum elements required to reconstruct the navigation and verify the official database used during the previous 12 hours. The following data should be recorded at one minute intervals:

- .1 to ensure a record of own ship's past track: time, position, heading, and speed; and
- .2 to ensure a record of official data used: ENC source, edition, date, cell and update history.

11.5.2 In addition, ECDIS should record the complete track for the entire voyage, with time marks at intervals not exceeding 4 hours.

11.5.3 It should not be possible to manipulate or change the recorded information.

11.5.4 ECDIS should have a capability to preserve the record of the previous 12 hours and of the voyage track.

12 CALCULATIONS AND ACCURACY

12.1 The accuracy of all calculations performed by ECDIS should be independent of the characteristics of the output device and should be consistent with the SENC accuracy.

12.2 Bearings and distances drawn on the display or those measured between features already drawn on the display should have accuracy no less than that afforded by the resolution of the display.

12.3 The system should be capable of performing and presenting the results of at least the following calculations:

- .1 true distance and azimuth between two geographical positions;
- .2 geographic position from known position and distance/azimuth; and
- .3 geodetic calculations such as spheroidal distance, rhumb line, and great circle.

13 PERFORMANCE TESTS, MALFUNCTIONS ALARMS AND INDICATIONS

13.1 ECDIS should be provided with means for either automatically or manually carrying out on-board tests of major functions. In case of a failure, the test should display information to indicate which module is at fault.

13.2 ECDIS should provide a suitable alarm or indication of system malfunction.

14 BACK-UP ARRANGEMENTS

Adequate back-up arrangements should be provided to ensure safe navigation in case of an ECDIS failure; see appendix 6.

- .1 Facilities enabling a safe take-over of the ECDIS functions should be provided in order to ensure that an ECDIS failure does not develop into a critical situation.

- .2** A back-up arrangement should provide means of safe navigation for the remaining part of a voyage in the case of an ECDIS failure.

MODULE C – INTERFACING AND INTEGRATION

15 CONNECTIONS WITH OTHER EQUIPMENT⁷

- 15.1** ECDIS should not degrade the performance of any equipment providing sensor inputs. Nor should the connection of optional equipment degrade the performance of ECDIS below this standard.
- 15.2** ECDIS should be connected to the ship's position fixing system, to the gyro compass and to the speed and distance measuring device. For ships not fitted with a gyro compass, ECDIS should be connected to a marine transmitting heading device.
- 15.3** ECDIS may provide a means to supply SENC information to external equipment.

16 POWER SUPPLY

- 16.1** It should be possible to operate ECDIS and all equipment necessary for its normal functioning when supplied by an emergency source of electrical power in accordance with the appropriate requirements of chapter II-1 of the 1974 SOLAS Convention, as amended.
- 16.2** Changing from one source of power supply to another or any interruption of the supply for a period of up to 45 seconds should not require the equipment to be manually re-initialized.

⁷ Publication IEC 61162.

Appendix 1

REFERENCE DOCUMENTS

The following international organizations have developed technical standards and specifications, as listed below, for use in conjunction with this standard. The latest edition of these documents should be obtained from the organization concerned:

INTERNATIONAL MARITIME ORGANIZATION (IMO)

Address: International Maritime Organization
4 Albert Embankment
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Phone: +44 207 735 76 11
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E-mail: info@imo.org
Web: <http://www.imo.org>

Publications

IMO resolution MSC.191(79) on Performance Standards for the presentation of navigation related information on shipborne navigational displays

IMO resolution A.694(17) on Recommendations on general requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids

[IMO resolution MSC.466\(101\) on Amendments to the Performance standards for the presentation of navigation-related information on shipborne navigational displays \(resolution MSC.191\(79\)\)](#)

[IMO SN.Circ./207 \(1999\) on Differences between RCDS and ECDIS](#)

IMO SN/Circ.243 (2004) on Guidelines for the Presentation of Navigation-related Symbols, Terms and Abbreviations

[IMO SN.1/Circ.243/Rev.2 on Guidelines for the presentation of navigational-related symbols, terms and abbreviations](#)

IMO MSC/Circ.982 (2000) on Guidelines on ergonomic criteria for bridge equipment and layout

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Publications

~~Special Publication~~[IHO Publication No.](#) S-52, Specifications for Chart Content and Display Aspects of ECDIS

~~Special Publication~~[IHO Publication No.](#) S-52 appendix 1, Guidance on Updating the Electronic Navigational Chart

~~Special Publication~~[IHO Publication No.](#) S-52 appendix 2, Colour and Symbol Specifications for ECDIS

~~Special Publication~~[IHO Publication No.](#) S-32, Hydrographic Dictionary

~~Special Publication~~[IHO Publication No.](#) S-57, IHO Transfer Standard for Digital Hydrographic Data

[IHO Publication S-100, IHO Universal Hydrographic Data Model](#)

[IHO Publication S-101 – ENC Product Specification](#)

~~Special Publication~~[IHO Publication No.](#) S-61, IHO Product specification for Raster Navigational Charts (RNC)

~~Special Publication~~[IHO Publication No.](#) S-63, IHO Data Protection Scheme

[IHO Miscellaneous Publication No.](#) M-3, *Resolutions of the IHO*

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Publications

IEC Publication 61174, Electronic Chart Display and Information Systems (ECDIS) - Operational and Performance Requirements, Method of Testing and Required Test Results.

IEC Publication 60945, General Requirements for Shipborne Radio Equipment Forming Part of the Global Maritime Distress and Safety System and Marine Navigational Equipment.

IEC Publication 61162, *Digital Interfaces - Navigation and Radiocommunication Equipment On board Ship.*

[IEC Publication 62288, Maritime Navigation and Radiocommunication Equipment and Systems – Presentation of navigation related information – General requirements, methods of test and required test results.]

[NO CHANGES TO OTHER APPENDICES CONTAINED IN THIS RESOLUTION]