RESOLUTION MSC.530(106) (adopted on 7 November 2022)
PERFORMANCE STANDARDS FOR ELECTRONIC CHART DISPLAY AND
INFORMATION SYSTEMS (ECDIS)

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ANNEX 22

RESOLUTION MSC.530(106)
(adopted on 7 November 2022)

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 FURTHER 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,

RECALLING resolutions A.817(19), as amended, and MSC.232(82), which have provided performance standards for electronic chart display and information systems (ECDIS),

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 ECDIS, and that the other nautical publications required by regulation V/27 may also be so provided and displayed,

NOTING ALSO the recent developments and enhancement of ECDIS, including new electronic navigational chart transfer functionality in the performance standards, is the necessary step towards the implementation of the e-navigation concept of harmonized maritime services,

RECOGNIZING the need to improve the revised performance standards, previously adopted by resolution MSC.232(82), 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 Navigation, Communications and Search and Rescue, at its ninth 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 to ensure that ECDIS equipment:

    (a)   if installed on or after 1 January 2029, conforms to performance standards not inferior to those specified in the annex to the present resolution;

    (b)   if installed on or after 1 January 2026 but before 1 January 2029, conforms either to performance standards not inferior to those specified in the annex to the present resolution or to performance standards not inferior to those specified in the annex to resolution MSC.232(82);

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    (c)   if installed on or after 1 January 2009 but before 1 January 2026, conforms to performance standards not inferior to those specified in the annex to resolution MSC.232(82); and

    (d)   if installed on or after 1 January 1996 but before 1 January 2009, conforms 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);

3   AGREES that, for the purpose of this resolution, the expression *installed on or after 1 January 2029* means:

    (a)   for ships for which the building contract is placed on or after 1 January 2029, or in the absence of the contract, constructed on or after 1 January 2029, any installation date on the ship; or

    (b)   for ships other than those prescribed in (a) above, a contractual delivery date for the equipment or, in the absence of a contractual delivery date, the actual delivery date of the equipment to the ship on or after 1 January 2029.

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ANNEX

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

1 SCOPE OF ECDIS

1.1 The primary function of ECDIS is to contribute to safe navigation.

1.2 ECDIS with adequate backup arrangements may be accepted as complying with the up-to-date charts and nautical publications required by regulations V/19 and V/27 of the 1974 SOLAS Convention. For the purpose of this document, the definition of electronic navigational data service (ENDS) encompasses the nautical charts and nautical publications as defined in SOLAS chapter V and IHO standards in force.

1.3 ECDIS should be capable of displaying all nautical information necessary for safe and efficient navigation, originated and distributed by or on the authority of a government, authorized hydrographic office or other relevant government institution, as required by SOLAS regulations V/19 and V/27.

1.4 ECDIS should facilitate simple and reliable updating of the ENDS.

1.5 ECDIS should reduce the navigational workload compared to using the paper chart and paper nautical publications. It should enable the mariner to execute in a convenient and timely manner all route planning, route monitoring and positioning. It should be capable of continuously indicating, monitoring and recording 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 provide appropriate alerts or indications with respect to the information displayed or malfunction of the equipment (see appendix 5). ECDIS should meet the requirements of the *Performance standards for bridge alert management* (resolution MSC.302(87)).

1.8 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:

      .1   dedicated stand-alone workstation; and

      ,2   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.

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2.3   Requirements for structure, format, encryption presentation of the ENDS 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)[1] and the presentation requirements set out in resolution MSC.191(79), as amended, ECDIS equipment should meet the requirements of these standards and follow the relevant guidelines on ergonomic principles adopted by the Organization.[2]

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 backup arrangements can be accepted as complying with the up-to-date nautical chart and nautical publications required by SOLAS regulations V/19 and V/27, by displaying selected information from a system database 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 conforming to IHO standards. The ENC contains all the nautical chart information necessary for safe navigation.

3.3   *Electronic navigational data service (ENDS)* means a special-purpose database compiled from nautical chart and nautical publication data, 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 conforming to IHO standards; and, which is designed to meet the requirement of marine navigation and the nautical charts and nautical publications carriage requirements in SOLAS regulations V/19 and V/27. The navigational base layer of ENDS is the electronic navigational chart (ENC).

3.4   *System database* means a database, in the manufacturer's internal ECDIS format, resulting from the lossless transformation of the ENDS 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 up-to-date ENDS.

3.5   *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.

3.6   *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.

3.7   Further information on ECDIS definitions may be found in IHO Hydrographic Dictionary Publication S-32 (see appendix 1).

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[1]   MSC/Circ.982.

[2]   Refer to Publication IEC 60945.

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MODULE A – DATABASE

4   PROVISION AND UPDATING

4.1   The ENDS information to be used in ECDIS should be issued by or on the authority of a government, government-authorized hydrographic office or other relevant government institution, and conform to IHO standards as listed in appendix 1.

4.2   The contents of the system database should be adequate and up to date for the intended voyage to comply with SOLAS regulations V/19 and V/27.

4.3   It should not be possible to alter the contents of the ENDS or system database information transformed from the ENDS. The display of the content of ENDS should be compliant with IHO standards including rules set for interoperability.

4.4   ECDIS should be capable of accepting official updates to the ENDS provided in conformity with IHO standards. These updates should be automatically applied to the system database. By whatever means updates are received, the implementation procedure should not interfere with the display in use.

4.5   ECDIS should also be capable of accepting updates to the ENDS data entered manually with simple means for verification prior to the final acceptance of the data. They should be distinguishable on the display from ENDS information and its official updates and not affect display legibility.

4.6   ECDIS should keep and display on demand a record of updates including time of application to the system database. This record should include updates for each ENDS until it is superseded by a new edition.

4.7   ECDIS should allow the mariner to display updates in order to review their contents and to ascertain that they have been included in the system database.

4.8   ECDIS should be capable of accepting ENDS in accordance with the IHO Data Protection Scheme.[3]

MODULE B – OPERATIONAL AND FUNCTIONAL REQUIREMENTS

5   DISPLAY OF SYSTEM DATABASE INFORMATION

5.1   An ECDIS should be capable of accepting and converting an ENDS and their updates into a system database. ECDIS should be capable of displaying and processing all system database information as specified by IHO. The ECDIS may also be capable of accepting a system database resulting from conversion ashore, in accordance with IHO resolutions.[4]

5.2   System database 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.

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[3]   IHO 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).

[4]   IHO Publication M-3 – Resolutions of the IHO.

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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 information provided by the system database. 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 30 m. If the safety contour specified by the mariner or the default 30 m contour is not in the displayed system database, 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;

　　　　.3　　in each of the above cases, an indication should be provided; and

　　　　.4　　the mariner should be able to select a permanent display of safety contour and safety depth settings.

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　　It should be possible to use dynamic water level adjustment and an indication should be provided.

5.11　　The ENDS and all updates to it should be displayed without any degradation of their information content.

5.12　　ECDIS should provide a means to ensure that the ENDS and all updates to it have been correctly loaded into the system database.

5.13　　The ENDS 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;

　　　　.2　　own ship's position is covered by an ENC at a larger scale than that provided by the display; or

　　　　.3　　information at own ship's position is not displayed because of applying scale minimum for display.

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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 system database information and it should be clearly distinguishable from the system database 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 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 system database 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 system database information.[5]

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[5] IHO Publication S-52 - Specifications for Chart Content and Display Aspects of ECDIS and S-101 – Portrayal Catalogue (see appendix 1) and S-98.

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 symbols.[6]

9.3   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 270 mm x 270 mm.

10.3   The display should be capable of meeting the colour and resolution recommendations of IHO.[5]

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, route monitoring in a simple and reliable manner.

11.2   The largest scale data available in the system database for the area given should always be used by the ECDIS for all alerts or indications of crossing the ship's safety contour and of entering a prohibited area, and for alerts 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.

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6   SN.1/Circ.243/Rev.2.

5   IHO Publication S-52 - Specifications for Chart Content and Display Aspects of ECDIS and S-101 – Portrayal Catalogue (see appendix 1) and S-98.

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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   A graphical indication is required if the mariner plans a route closer than a user-specified distance from own ship's safety contour.

11.3.5   A graphical indication should be given if the mariner plans a route closer than a user-specified distance from the boundary of a user-selectable category of prohibited area or geographic area for which special conditions exist (see appendix 4). A graphical indication should also be given if the mariner plans a route closer than a user-specified distance from a user-selectable category of point objects, such as a fixed or floating aid to navigation or isolated danger. The user-selectable categories should be the same as the user selections for the display of objects and be based on IHO standards. There should be a permanent indication when any user-selectable categories are deselected. Details of the deselection should be available on demand.

11.3.6   It should be possible for the mariner to select that the indications of 11.3.4 and 11.3.5 take into account accuracy information of relevant hydrographic information, as defined by IHO standards.

11.3.7   It should also be possible to perform a complete route check to support the appraisal and planning process according to the applicable parts of resolution A.893(21). Detected objects should be available for review in graphical form and, on demand, in textual form.

11.3.8   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 alerts 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   It should be possible to select that ECDIS gives an alarm and related graphical indication if, within a specified time or distance set by the mariner, own ship will pass closer than a user-selected distance from the safety contour. There should be a permanent indication when the safety contour alarm is deselected.

11.4.4   ECDIS should give a warning or caution, or indication, as selected by the mariner, and related graphical indication if, within a specified time or distance set by the mariner, own ship will pass closer than a user-selected distance from the boundary of a user-selectable category of prohibited area or of a geographical area for which special conditions exist (see appendix 4). The user-selectable categories should be the same as user selections for the display of objects and be based on IHO standards. There should be a permanent indication when any user-selectable categories are deselected. Details of the deselection should be available on demand.

11.4.5   An alarm should be given when the specified cross track limit for deviation from the selected route, if defined by the mariner when route planning, is exceeded.

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11.4.6   ECDIS should give a warning or caution or indication as selected by the mariner and related graphical indication 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 user-selectable category of danger (e.g. obstruction, wreck, rock) that is shallower than the mariner's safety contour or a user-selectable category of aid to navigation. The user-selectable categories should be the same as user selections for the display of objects and be based on IHO standards. There should be a permanent indication when any of the user-selectable categories are deselected. Details of the deselection should be available on demand.

11.4.7   A graphical indication should be given if the current or the next leg of the selected route passes closer than a user-specified distance from the safety contour.

11.4.8   A graphical indication should be given if the current or the next leg of the selected route goes closer than a user-specified distance from the boundary of a user-selectable category of prohibited area or a geographic area for which special conditions exist (see appendix 4). A graphical indication should also be given if the selected route goes closer than a user-specified distance from a user-selectable category of point objects, such as a fixed or floating aid to navigation or isolated danger. The user-selectable categories should be the same as user selections for the display of objects and be based on IHO standards.

11.4.9   It should be possible for the mariner to select that the indications of 11.4.3, 11.4.4, 11.4.6, 11.4.7 and 11.4.8 take into account accuracy information of relevant hydrographic information, as defined by IHO standards.

11.4.10 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.

11.4.11 ECDIS should provide a warning when the input from position, heading or speed sources is lost. ECDIS should also repeat, but only as an indication, any alerts or indication passed to it from position, heading or speed sources.

11.4.12 A warning 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.

11.4.13 The positioning system and the system database should be on the same geodetic datum. ECDIS should give a warning if this is not the case.

11.4.14 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 route or change to an alternative route.

11.4.15 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.

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11.4.16 It should be possible to enter the geographical coordinates 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 coordinates on demand.

11.4.17 It should be possible to adjust the displayed geographic position of the ship manually. This manual adjustment should be indicated alphanumerically on the screen, maintained until altered by the mariner and automatically recorded.

11.4.18 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.

11.4.19 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;

.2   to ensure a record of official data used: ENC source, edition, date, cell and update history.; and

.3   any changes in safety contour, look ahead and route monitoring alert settings.

11.5.2   ECDIS should output the information listed in 11.5.1.2 and 11.5.1.3 to a voyage data recorder

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

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

11.5.5   ECDIS should have a capability to preserve the record of the previous 12 hours and 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 system database 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.

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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 ALERTS AND INDICATIONS

13.1   ECDIS should be provided with means for either automatically or manually carrying out onboard 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 warning or indication of system malfunction.

14   BACKUP ARRANGEMENTS

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

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

.2   A backup 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 EQUIPMENT[7]

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 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 system database 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 SOLAS chapter II-1.

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.

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[7]   Publication IEC 61162.

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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   Phone: +44 207 735 76 11
4 Albert Embankment   Fax: +44 207 587 32 10
London SE1 7SR   Email: info@imo.org
United Kingdom   Web: http://www.imo.org

Publications

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

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*

Resolution MSC.302(87) on *Performance standards for bridge alert management*

SN.1/Circ.207 on *Differences between RCDS and ECDIS*

SN.1/Circ.243/Rev.2 on *Guidelines for the presentation of navigation-related symbols, terms and abbreviations*

MSC/Circ.982 on *Guidelines on ergonomic criteria for bridge equipment and layout*

INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO)

Address: Directing Committee   Phone: +377 93 10 81 00
International Hydrographic Organization
BP 445   Fax: +377 93 10 81 40
MC 98011 Monaco Cedex   Email: info@iho.int
Principality of Monaco   Web: http://www.iho.int

Publications

IHO Publication S-52, Specifications for Chart Content and Display Aspects of ECDIS

IHO Publication S-52 appendix 1, Guidance on Updating the Electronic Navigational Chart

IHO Publication S-52 appendix 2, Colour and Symbol Specifications for ECDIS

IHO Publication S-32, Hydrographic Dictionary

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

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IHO Publication 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

IHO Publication S-98 – Data Product Interoperability in S-100 Navigation Systems

IHO Publication S-61, IHO Product specification for Raster Navigational Charts (RNC)

IHO Publication S-63, IHO Data Protection Scheme

IHO Publication M-3, Resolutions of the IHO

https://iho.int/en/standards-in-force

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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.

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APPENDIX 2

SYSTEM DATABASE INFORMATION AVAILABLE FOR DISPLAY DURING ROUTE PLANNING AND ROUTE MONITORING

1   Display base to be permanently shown on the ECDIS display, consisting of:

    .1   coastline (high water);

    .2   own ship's safety contour;

    .3   isolated underwater dangers of depths less than the safety contour which lie within the safe waters defined by the safety contour;

    .4   isolated dangers which lie within the safe water defined by the safety contour, such as fixed structures, overhead wires, etc.;

    .5   scale, range and north arrow;

    .6   units of depth and height; and

    .7   display mode.

2   Standard display consisting of:

    .1   display base;

    .2   drying line;

    .3   buoys, beacons, other aids to navigation and fixed structures;

    .4   boundaries of fairways, channels, etc.;

    .5   visual and radar conspicuous features;

    .6   prohibited and restricted areas;

    .7   chart scale boundaries;

    .8   indication of cautionary notes;

    .9   ships' routeing systems and ferry routes; and

    .10   archipelagic sea lanes.

3   All other information, to be displayed individually on demand, for example:

    .1   spot soundings;

    .2   submarine cables and pipelines;

    .3   details of all isolated dangers;

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  .4 details of aids to navigation;

  .5 contents of cautionary notes;

  .6 ENC edition date;

  .7 most recent chart update number;

  .8 magnetic variation;

  .9 graticule; and

  .10 place names.

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APPENDIX 3

NAVIGATIONAL ELEMENTS AND PARAMETERS

1 Own ship.

    .1 Past track with time marks for primary track.

    .2 Past track with time marks for secondary track.

2 Vector for course and speed made good.

3 Variable range marker and/or electronic bearing line.

4 Cursor.

5 Event.

    .1 Dead reckoning position and time (DR).

    .2 Estimated position and time (EP).

6 Fix and time.

7 Position line and time.

8 Transferred position line and time.

9 Tidal data

    .1 Predicted tidal stream or current vector with effective time and strength.

    .2 Calculated tidal stream or current vector with effective time and strength.

10 Danger highlight.

11 Clearing line.

12 Planned course and speed to make good.
13 Waypoint.

14 Distance to run.

15 Planned position with date and time.

16 Position and time of "wheel over".

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APPENDIX 4

AREAS FOR WHICH SPECIAL CONDITIONS EXIST

The following are the areas which ECDIS should detect and provide an alert or indication under sections 11.3.7 and 11.4.4:

Traffic separation zone

Inshore traffic zone

Restricted area

Caution area

Offshore production area

Areas to be avoided

User defined areas to be avoided

Military practice area

Seaplane landing area

Submarine transit lane

Anchorage area

Marine farm/aquaculture

Particularly sensitive sea area (PSSA)

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APPENDIX 5

ALERTS AND INDICATORS

Section	Requirements	Information
11.4.3	Alarm	Pass closer than set distance from the safety contour
11.4.4	Warning or Caution, or Indication	Pass closer than set distance from an area with special conditions
11.4.5	Alarm	Deviation from route
11.4.6	Warning or Caution, or Indication	Pass closer than set distance from a danger in route monitoring mode
11.4.11	Warning	Positioning system failure
11.4.12	Warning	Approach to critical point
11.4.13	Warning	Different geodetic datum
13.2	Warning or Indication	Malfunction of ECDIS
5.8.3	Indication	Default safety contour
6.1.1	Indication	Information overscale
6.1.2	Indication	Larger scale ENC available
6.1.3	Indication	Information not displayed due to scale minimum
7.3	Indication	Different reference system
8.5	Indication	No ENC available
10.5	Indication	Customized display
11.3 6	Indication	Route planning closer than set distance from the safety contour
11.3.7	Indication	Route planning closer than set distance specified area
11.4.7	Indication	Monitored route pass closer than set distance from the safety contour
11.4.8	Indication	Monitored route pass closer than set distance from a specified area or danger
13.1	Indication	System test failure

In this Performance Standard the definitions of Indicators and Alerts provided in resolution A.1021(26) *Code on Alerts and Indicators, 2009* and resolution MSC.302(87) *Performance standards for bridge alert management* apply.

Alert: Audible and/or visual announcement of a condition requiring attention. Priorities of alert are alarm, warning and caution.

Indication: Visual indication giving information about the condition of a system or equipment.

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APPENDIX 6

BACKUP REQUIREMENTS

1 INTRODUCTION

As prescribed in section 14 of this performance standard, adequate independent backup arrangements should be provided to ensure safe navigation in case of ECDIS failure. Such arrangements include:

      .1   facilities enabling a safe takeover of the ECDIS functions in order to ensure that an ECDIS failure does not result in a critical situation; and

      .2   a means to provide for safe navigation for the remaining part of the voyage in case of ECDIS failure.

2 PURPOSE

The purpose of an ECDIS backup system is to ensure that safe navigation is not compromised in the event of ECDIS failure. This should include a timely transfer to the backup system during critical navigation situations. The backup system should allow ships to be navigated safely until the termination of the voyage.

3 FUNCTIONAL REQUIREMENTS

3.1 Required functions and their availability

3.1.1 Presentation of chart information

The backup system should display in graphical (chart) form the relevant information of the hydrographic and geographic environment which are necessary for safe navigation.

3.1.2 Route planning

The backup system should be capable of performing the route planning functions, including:

      .1   taking over of the route plan originally performed on the ECDIS; and

      .2   adjusting a planned route manually or by transfer from a route planning device.

3.1.3 Route monitoring

The backup system should enable a takeover of the route monitoring originally performed by the ECDIS, and provide at least the following functions:

      .1   plotting own ship's position automatically, or manually on a chart;

      .2   taking courses, distances and bearings from the chart;

      .3   displaying the planned route;

      .4   displaying time labels along ship's track; and

      .5   plotting an adequate number of points, bearing lines, range markers, etc. on the chart.

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3.1.4 Display information

If the backup is an electronic device, it should be capable of displaying at least the information equivalent to the standard display as defined in this performance standard.

3.1.5 Provision of chart information

.1 The chart information to be used in the backup arrangement should be the latest edition, as corrected by official updates, of that issued by or on the authority of a government, authorized hydrographic office or other relevant government institution, and conform to IHO standards.

.2 It should not be possible to alter the contents of the electronic chart information.

.3 The chart or chart data edition and issuing date should be indicated.

3.1.6 Updating

The information displayed by the ECDIS backup arrangements should be up to date for the entire voyage.

3.1.7 Scale

If an electronic device is used, it should provide an indication:

.1 if the information is displayed at a larger scale than that contained in the database; and

.2 if own ship's position is covered by a chart at a larger scale than that provided by the system.

3.1.8 If radar and other navigational information are added to an electronic backup display, all the corresponding requirements for radar information and other navigation information of this performance standard should be met.

3.1.9 If an electronic device is used, the display mode and generation of the neighbouring area should be in accordance with section 8 of this performance standard.

3.1.10 Voyage recording

The backup arrangements should be able to keep a record of the ship's actual track, including positions and corresponding times.

3.2 Reliability and accuracy

3.2.1 Reliability

The backup arrangements should provide reliable operation under prevailing environmental and normal operating conditions.

3.2.2 Accuracy

Accuracy should be in accordance with section 12 of this performance standard.

3.3   Malfunctions, alerts and indications

If an electronic device is used, it should provide a suitable warning or indication of system malfunction.

4   OPERATIONAL REQUIREMENTS

4.1   Ergonomics

If an electronic device is used, it should be designed in accordance with the ergonomic principles of ECDIS.

4.2   Presentation of information

If an electronic device is used:

.1   colours and symbols should be in accordance with the colours and symbols requirements of ECDIS; and

.2   the effective size of the chart presentation should be not less than 270 mm x 270 mm or 270 mm diameter.

5   POWER SUPPLY

If an electronic device is used:

.1   the backup power supply should be separate from the ECDIS; and

.2   it should conform to the requirements in this ECDIS performance standard.

6   CONNECTIONS WITH OTHER EQUIPMENT

6.1   If an electronic device is used, it should:

.1   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; and

.2   not degrade the performance of any equipment providing sensor input.

6.2   If radar with selected parts of the ENC chart information overlay is used as an element of the backup, the radar should comply with resolution MSC.192(79).

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APPENDIX 7

RCDS MODE OF OPERATION

Whenever in this appendix reference is made to any provisions of the annex related to ECDIS, the term ECDIS should be substituted by the term RCDS, system database by SRNC and ENC by RNC, as appropriate.

This appendix refers to each paragraph of the performance standards for ECDIS (i.e. the annex to which this part is appendix 7) and specifies which paragraphs of the annex either:

.1   apply to RCDS; or

.2   do not apply to RCDS; or

.3   are modified or replaced as shown in order to apply to RCDS.

Any additional requirements applicable to RCDS are also described.

1   SCOPE

1.1   Paragraph applies to RCDS.

1.2   When operating in RCDS mode, an appropriate portfolio of up-to-date paper charts (APC) should be carried on board and be readily available to the mariner.

1.3 - 1.6 Paragraphs apply to RCDS.

1.7   RCDS should provide appropriate alerts or indications with respect to the information displayed or malfunction of the equipment (see table 1 of this appendix).

1.8   Refers to appendix 7 and applies to RCDS.

2   APPLICATION OF THESE STANDARDS

2.1 - 2.4 Paragraphs apply to RCDS.

3   DEFINITIONS

3.1   *Raster chart display system* (RCDS) means a navigation information system displaying RNCs 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   *Raster navigational chart* (RNC) means a facsimile of a paper chart originated by, or distributed on the authority of, a government-authorized hydrographic office. RNC is used in these standards to mean either a single chart or a collection of charts.

3.3   Paragraph does not apply to RCDS.

3.4   *System raster navigational chart database* (SRNC) means a database resulting from the transformation of the RNC by the RCDS to include updates to the RNC by appropriate means.

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3.5 - 3.6 Paragraphs do not apply to RCDS.

3.7 Paragraph applies to RCDS.

3.8 Appropriate portfolio of up-to-date paper charts (APC) means a suite of paper charts of a scale to show sufficient detail of topography, depths, navigational hazards, aids to navigation, charted routes and routeing measures to provide the mariner with information on the overall navigational environment. The APC should provide adequate look ahead capability. Coastal States will provide details of the charts which meet the requirement of this portfolio, and these details are included in a worldwide database maintained by the IHO. Consideration should be given to the details contained in this database when determining the content of the APC.

MODULE A – DATABASE

4   PROVISION AND UPDATING OF CHART INFORMATION

4.1 The RNC used in RCDS should be the latest edition of that originated by, or distributed on the authority of, a government-authorized hydrographic office and conform to IHO standards. RNCs not on WGS 84 or PE-90 should carry metadata (i.e. additional data) to allow geo-referenced positional data to be displayed in the correct relationship to SRNC data.

4.2 The contents of the SRNC should be adequate and up to date for that part of the intended voyage not covered by ENC.

4.3 It should not be possible to alter the contents of the RNC.

4.4 - 4.7 All paragraphs apply to RCDS.

4.8 Paragraph does not apply to RCDS.

MODULE B – OPERATIONAL AND FUNCTIONAL REQUIREMENTS

5   DISPLAY OF SRNC INFORMATION

5.1 RCDS should be capable of displaying all SRNC information.

5.2 SRNC information available for display during route planning and route monitoring should be subdivided into two categories:

.1   the RCDS standard display consisting of RNC and its updates, including its scale, the scale at which it is displayed, its horizontal datum, and its units of depths and heights; and

.2   any other information such as mariner's notes.

5.3 - 5.4 Paragraphs apply to RCDS.

5.5 It should be easy to add to, or remove from, the RCDS display any information additional to the RNC data, such as mariner's notes. It should not be possible to remove any information from the RNC.

5.6 - 5.10 Paragraphs do not apply to RCDS.

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5.11   Paragraph applies to RCDS.

5.12   RCDS should provide a means to ensure that the RNC and all updates to it have been correctly loaded into the system RNC.

5.13   The RNC and all updates to it should be clearly distinguishable from other displayed information, including those listed in appendix 3.

5.14   There should always be an indication if the ECDIS equipment is operating in RCDS mode.

6   SCALE

This section applies to RCDS.

7   DISPLAY OF OTHER NAVIGATIONAL INFORMATION

7.1- 7.4 All paragraphs apply to RCDS.

8   DISPLAY MODE AND GENERATION OF THE NEIGHBOURING AREA

8.1   It should always be possible to display the SRNC in "chart-up" orientation. Other orientations are permitted.

8.2 - 8.4 All paragraphs apply to RCDS.

8.5   Paragraph refers to RCDS mode of operation.

9   COLOURS AND SYMBOLS

9.1   IHO recommended colours and symbols should be used to represent SRNC information.

9.2   Paragraph applies to RCDS.

9.3   Paragraph applies to RCDS.

10   DISPLAY REQUIREMENTS

10.1 - 10.2 Paragraphs apply to RCDS.

10.3   Paragraph does not apply to RCDS.

10.4   Paragraph applies to RCDS.

10.5   Paragraph does not apply to RCDS.

10.6   RCDS should be capable of displaying, simply and quickly, chart notes which are not located on the portion of the chart currently being displayed.

11   ROUTE PLANNING, MONITORING AND VOYAGE RECORDING

11.1   Paragraphs apply to RCDS.

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11.2   Paragraph does not apply to RCDS.

11.3   Route planning

11.3.1-11.3.3 Paragraphs apply to RCDS.

11.3.4-11.3.7 Paragraphs do not apply to RCDS.

11.3.8   Paragraph applies to RCDS.

11.4   Route monitoring

11.4.1   Paragraph applies to RCDS.

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 in 11.4.11 and 11.4.12 should be continuous. It should be possible to return to the route monitoring display covering own ship's position immediately by single operator action.

11.4.3-11.4.4 Paragraphs do not apply to RCDS.

11.4.5   Paragraph applies to RCDS.

11.4.6-11.4.9 Paragraphs do not apply to RCDS.

11.4.10-11.4.12 Paragraphs apply to RCDS.

11.4.13 The RCDS should only accept positional data referenced to the WGS 84 or PE-90 geodetic datum. RCDS should give a warning if the positional data is not referenced to one of these datum. If the displayed RNC cannot be referenced to the WGS 84 or PE-90 datum then a continuous indication should be provided.

11.4.14-11.4.18   Paragraphs apply to RCDS.

11.4.20 RCDS should allow the user to manually align the SRNC with positional data. This can be necessary, for example, to compensate for local charting errors.

11.4.21 It should be possible to activate an automatic warning when the ship crosses a point or line, or is within the boundary of a mariner entered feature within a specified time or distance.

11.5   Voyage recording

11.5.1-11.5.4 All paragraphs apply to RCDS.

12   CALCULATIONS AND ACCURACY

12.1-12.3 All paragraphs apply to RCDS.

12.4   RCDS should be capable of performing transformations between a local datum and WGS 84 datum.

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13 PERFORMANCE TESTS, MALFUNCTION ALARMS AND INDICATIONS

13.1-13.2 All paragraphs apply to RCDS.

14 BACKUP ARRANGEMENTS

All paragraphs apply to RCDS.

MODULE C – INTERFACING AND INTEGRATION

15 CONNECTIONS WITH OTHER EQUIPMENT

15.1-15.3 All paragraphs apply to RCDS.

16 POWER SUPPLY

16.1-16.2 All paragraphs apply to RCDS

Table 1

ALERTS AND INDICATORS IN THE RCDS MODE OF OPERATION

Paragraph	Requirement	Information
11.4.5	Alarm	Deviation from route
11.4.21	Warning	Approach to mariner entered feature, e.g. area, line
11.4.11	Warning	Position system failure
11.4.12	Warning	Approach to critical point
11.4.13	Warning or indication	Different geodetic datum
13.2	Warning or indication	Malfunction of RCDS mode
5.13	Indication	ECDIS operating in the raster mode
6.1	Indication	Larger scale information available, or overscale
6.1.2	Indication	Larger scale RNC available for the area of the ship

Note: The definitions of alerts and indicators are given in appendix 5.

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