

INTERNATIONAL HYDROGRAPHIC ORGANIZATION



SPECIFICATIONS FOR CHART CONTENT AND DISPLAY ASPECTS OF ECDIS

Draft 6th Edition

Special Publication No. 52

published by the
International Hydrographic Bureau
MONACO

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~~ANNEX A REFERENCE TABLE BETWEEN S52 AND THE IMO PERFORMANCE STANDARDS FOR ECDIS (PS) A.1~~

ANNEX ~~AB~~ **IMO PERFORMANCE STANDARDS FOR ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEMS (ECDIS)** ~~AB.1~~

APPENDICES (published as separate IHO documents by the International Hydrographic Bureau)

Appendix 1: Guidance on Updating the Electronic Navigational Chart.
(~~by the IHO/CHRIS Updating Working Group~~)

Appendix 2: Colour and Symbol Specifications for ECDIS
(~~maintained~~ by the IHO/CHRIS Colours and Symbols ~~Maintenance~~ Working Group)

~~**Appendix 3:** Glossary of ECDIS related Terms.
(by the IHO/CHRIS Glossary Working Group)~~

1 INTRODUCTION

1.1 Historical Background

- (a) *In 1986 the North Sea Hydrographic Commission completed a study on the consequences of the development of Electronic Chart Display and Information Systems (ECDIS) for Hydrographic Offices.*

Its conclusions were, amongst others:

- (1) *Specifications for standardized data content, format and updating procedures should be arrived at by a new IHO ECDIS Working Group as a matter of high priority.*
 - (2) *To assure the integrity of Electronic Navigational Charts (ENC's), their production should be the responsibility of the Hydrographic Offices; the ENC's will be made available in a standard format and all equipment should be designed to accept it.*
 - (3) *When official ENC's are available, ECDIS users should be required to carry them in full, and ECDIS manufacturers or other intermediaries should not make preliminary selections of data before supplying them to the mariners.*
- (b) *It was then decided to establish an International Hydrographic Organization (IHO) Committee on ECDIS (COE*).*
- (c) *As several manufacturers were now developing these systems, it was of immediate importance to all concerned (Hydrographic Offices, mariners, national shipping authorities, manufacturers) to have at least a first draft of the IHO and International Maritime Organization (IMO) guidance for both the Electronic Navigation Chart (ENC) and its display systems.*
- (d) *For that reason the COE*-chairman asked the Netherlands Hydrographer to prepare a working paper on ECDIS specifications, to be further discussed in the COE*.*
- (e) *The aim of this working paper was to evolve and recommend:*
- (1) *Minimum and supplementary data content of the ENC and required characteristics of that data base such as the cataloguing of sea areas, density of digitization of chart data and reliability and worldwide compatibility of chart data and other nautical information produced.*
 - (2) *Minimum and supplementary content of the ENC Display, standards of symbols, colours and their standardized assignment to features, scale limitations of data presentation, and appropriate compatibility with paper chart symbols as standardized in the Chart Specifications of the IHO.*
 - (3) *Methods for the timely updating of the ENC, and means to ensure worldwide compatibility of the correction system data.*
 - (4) *Criteria for a standard format for exchange of digital data for the ECDIS between*

* Now redefined as "CHRIS", Committee on Hydrographic Requirements for Information Systems

Hydrographic Offices and for supply to the data user, and procedures and financial aspects of such an exchange and supply.

(f) A first draft of the specifications was presented to IHO Member State Hydrographers in May 1987 at the 13th International Hydrographic Conference in Monaco. This draft was also widely distributed to National Shipping Authorities, mariner associations and manufacturers, for comment. Since then, S-52 and its relevant appendices have been updated several times and this is the 6th edition of S-52. ~~The 5th edition was necessary to reflect changes in related standards.~~

(g) In parallel with the development of the IHO Specifications, the IMO/IHO Harmonizing Group on ECDIS developed Provisional Performance Standards for ECDIS which were first published in May 1989 by the IMO.

An amended version of the Provisional Performance Standards was prepared in the light of experience and was presented in September 1993 to the IMO Sub-Committee on the Safety of Navigation, which endorsed it and submitted the Performance Standards for ECDIS to the IMO Maritime Safety Committee, for approval and submission to the 1995 IMO Assembly for adoption. ~~The current version of the Performance Standards has been promulgated as MSC Circular 637, dated 27 May 1994. The Performance Standard was adopted by IMO resolution A.817(19) dated 23 November 1995. The Performance Standards have incorporated many of the elements of the original IHO Specification. For that reason, S-52 now only provides the details of the hydrographic requirements for ECDIS.~~

~~(h) While many of the general elements of S-52 were being incorporated in the IMO Performance Standards, the specifics were being expanded in S-52 Appendix 2 "Colour & Symbol Specifications" into a model for presenting all chart and navigational objects on the ECDIS display, according to the developing IMO requirements. IHO published a provisional edition of S-52 App.2 in 1991 and the first operational edition, complete with Annex A "Presentation Library", was issued in 1994.~~

(i) The IHO Committee on Hydrographic Requirements for Information Systems (CHRIS) developed S-57, "IHO Transfer Standard for Digital Hydrographic Data". S-57 describes the standard to be used for the exchange of ENC data. S-57 was adopted as the official IHO standard by the XIVth International Hydrographic Conference, Monaco, 4-15 May 1992.

(k) An important milestone in the development of ECDIS specifications was the introduction of the „ENC Product Specification“. The „ENC Product Specification“ is included in S-57 as Appendix B1 and gives detailed specifications for the ENC structure and content.

~~(l) In 1997 the IMO Sub-Committee on the Safety of Navigation adopted the so called „dual fuel“ Raster Chart Display System (RCDS) ECDIS mode, accepting official raster data (Raster Navigational Chart or RNC) together with an appropriate folio of paper charts as meeting a vessel's chart carriage requirements in the absence of S57 vector chart data coverage for the operating area. The Performance Standards were amended appropriately and the IHO published S-61 containing the RNC product specification.~~

~~(m) The revision of the 1974 SOLAS Convention in December 2000 accepts ECDIS as legal equipment to fulfil the carriage requirement for nautical publications on board of vessels subject to the SOLAS regulations.~~

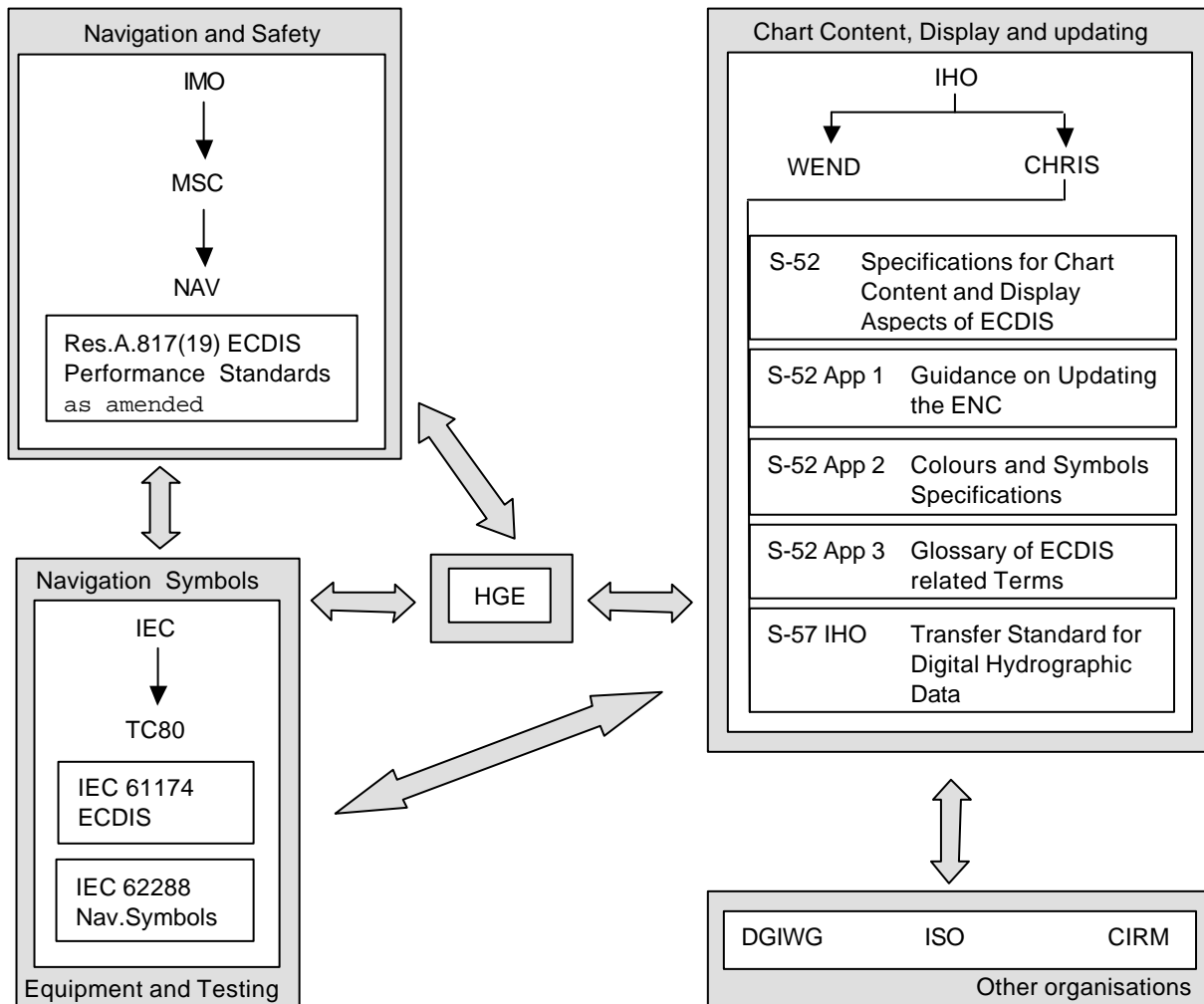
~~(n) The CHRIS Committee decided on its 15th. Session in May 2003 to remove all operational requirements for ECDIS from this Specification (S-52) as well as the detailed description of "Navigational Symbols" from Appendix 2 of this Specification in order to hand these over to the sole responsibility of IEC TC80. IEC TC80 will incorporate the operational requirements in the upcoming new edition 3 of IEC 61174 „ECDIS Performance Standards, methods of testing and required test results“ and the navigational symbols in the upcoming new standard IEC 60288 „Presentation of navigation related information“.~~

From now on S-52 and Appendix 2 in particular is focused on the display aspects and the colour and symbol definition of chart information on ECDIS. In order to maintain consistent display procedures for charted and operational information S-52, Appendix 2 will continue the provision of appropriate entries in colour tables, viewing groups, look-up tables and conditional procedures for the presentation of navigational symbols.

1.2 International organizations involved in ECDIS standardization

As stated in the Historical Background, the IHO Specifications for ECDIS have been developed in parallel with the IMO Performance Standards. Various other international organizations have also played important parts in the development of the IHO Specifications and the IMO Standard. The International Electrotechnical Commission (IEC), in particular, has developed a series of tests and test results which ~~will are be~~ used to ascertain if systems meet the IMO Standards and IHO Specifications. The relationship of the various Working Groups, Organizations and Publications is outlined schematically in Figure 1.

Figure 1. International organizations involved in ECDIS standardization



- IMO : International Maritime Organization
 MSC : Maritime Safety Committee
 NAV : Safety of Navigation Sub-Committee
 HGE : Harmonization Group on ECDIS
 IHO : International Hydrographic Organization
 WEND : World Wide Electronic Navigational Chart Database
 CHRIS : Committee on Hydrographic Requirements for Information Systems
 IEC : International Electrotechnical Commission
 TC80 : IEC committee on Maritime Navigation and Radiocommunications Equipment and Systems
~~WG7 : IEC working group on ECDIS~~
 DGIWG : Digital Geographic Information Working Group
 ISO : International Organization for Standards
 CIRM : Comité International Radio-Maritime

1.3 **Function and Use of S-52 and its Appendices**

- (a) The IHO has produced Specifications for the chart content and display aspects of ECDIS that appear in this publication (S-52) and its appendices, in order to ensure that hydrographic data supplied by its Member States' HO is used in a manner that will enhance the safety and efficiency of navigation by satisfying the requirements set out in the IMO Performance Standards for ECDIS.
- (b) The objective stated in (a) is also met through the publication of the „IHO Transfer Standard for Digital Hydrographic Data“ (S-57) which includes the „ENC Product Specification“.
- (c) S-52 should be read with the IMO Performance Standards and with its own Appendices. It should also be read in conjunction with [the ENC Product Specification in S-57](#).
- (d) Users of these Specifications should also refer to publications of the International Electrotechnical Commission (IEC) when dealing with equipment design and tests. Details of these publications are to be found in paragraph 2.3.
- (e) Not all operational aspects of the updating mechanism of ECDIS contained in Appendix 1“Guidance on Updating the Electronic Navigational Chart” are mandatory for an ECDIS and should primarily be read as guidance. Since Appendix 1 was drafted, much practical experience with ECDIS and its updating mechanisms have been gained and advanced requirements for operational behaviour of ECDIS updating mechanisms contained in IEC61174 may supersede the guidance given in Appendix 1 of this Specification.

2 CONCEPT, LIMITATIONS AND DEFINITIONS OF ECDIS

2.1 Concept and limitations

It may be noted that the concept of ECDIS is outlined in the introduction section of the IMO Performance Standards. The following contains additional IHO requirements for ECDIS.

- (a) ~~ECDIS, used together with official data, may be accepted as complying with the up-to-date charts is accepted as fulfilling the carriage requirements for nautical publications~~ required by regulation V/19~~20~~ of the 1974 SOLAS Convention ~~amended in 2000~~. It may be noted that electronic chart systems not meeting these ~~ECDIS specifications of IHO and IMO, or ECDIS using non-official data, are named and classified~~ known as ECS (Electronic Chart Systems).
- (b) Chart information may be used in conjunction with radar ~~image~~ on ECDIS. Integration of ~~tracked~~ radar targets provided ~~by for a~~ collision avoidance radar (ARPA) ~~and targets tracked by AIS (Automatic Identification System)~~ into the ECDIS display is another option.
- (c) ~~The colours and symbols defined in Appendix 2 of this Specification are conceptually based on the familiar symbology of conventional paper charts. However, due to the special conditions of the ECDIS chart display as a computer generated image for use as a real-time ship-handling display, as well as with regard to the size of the monitor, its resolution and the limited number of distinguishable colours, the ECDIS presentation of ENC data does not imitate the appearance of a conventional paper chart closely. Instead, there are considerable differences in symbology in shape, colour and size, and the in the placement of text in particular. The display of the ENC data and the conventional paper chart do not necessarily have to be identical in their appearance.~~
- ~~(d) It is recognized that mariners would benefit from unrestricted choice of an own ship safety contour. This may not be possible with the initial ENC, but may be introduced as more detailed data becomes available~~
- ~~(e) It should be recognized that ECDIS, complying with the up-to-date charts required by regulation V/20 of the 1974 SOLAS Convention, provides a record for legal purposes.~~
- (d#) ECDIS combines chart and ~~navigation~~ positioning information. It should be realized that modern navigation systems (e.g. differential GPS ~~without selected availability~~) may offer a more accurate positioning than was available to position some of the surveys from which the ~~digital chart data~~ ENC ~~was/were~~ derived.

2.2 Definitions

Terms used in S-52 and its Appendices, as well as those used in the IMO Performance Standards, are defined in Appendix 3 : Glossary of ECDIS - related Terms.

2.3 Useful references (to use with this Specification)

References (in addition to Annex and Appendices) to this Specification are:

- (a) IMO Performance Standards for ECDIS (IMO Resolution A.817 (19) as amended). Always to be referred to when applying these Specifications (see annex B.A).
- (b) Chart Specifications of the IHO and IHO Regulations for International Charts (INT specs), IHO Publication M-4.
- (c) Technical Resolutions of the IHO (TR's), IHO Publication M-3.
- (d) IHO Transfer Standard for Digital Hydrographic Data, IHO Publication S-57.
- (e) IEC Publication 61174 "Electronic Chart Display and Information System (ECDIS) - Operational and Performance Requirements, Methods of Testing and Required Test Results" .
- (f) IEC Publication 60945 "General Requirements for Shipborne Radio Equipment Forming Part of the Global Maritime Distress and Safety System and Marine Navigational Equipment".
- (g) IEC Publication 61162, "Digital Interfaces - Navigational and Radiocommunications Equipment On board Ship".
- (h) future IEC Publication 62288 "Presentation of navigation related information".

~~3. ENC CONTENT AND STRUCTURE~~

~~3.1 ENC Content~~

- ~~(a) ENC data should be delivered using the IHO Transfer Standard for Digital Hydrographic Data (IHO publication S-57).~~
- ~~(b) The ENC should include, as a minimum, all information relevant to navigation at present depicted on the paper chart. Certain data infrequently used by the mariner and not affecting safety of navigation need not be included (e.g. cemeteries).~~
- ~~(c) The ENC should be encoded according to the specifications given in the „ENC Product Specification“, S-57 Appendix B.1.~~
- ~~(d) By identifying any object (point, line or area) with a cursor on the chart display, the object description and all available attributes should be displayed in text in common language terms.~~
- ~~(e) Some textual HO information, which is presently contained in separate publications (e.g. Sailing Directions and Light Lists) may also be incorporated in the ENC.~~

~~3.2 Accuracy requirements~~

~~A data quality indicator should be included in the ENC, which allows a quantitative estimate of the accuracy of important chart features, to be used in combination with estimates of position accuracy from satellite navigation in assessing safe distance from hazards, in order that the mariner may be informed of the quality of the information he uses.~~

~~3.3 System ENC (SENC) (Amended December 2001)~~

- ~~(a) The Transfer Standard, is designed for the distribution of digital chart data. It is recognized that it is not the most efficient means of storing, manipulating or preparing data for display. Each manufacturer of ECDIS systems may design his own storage formats or data structure to allow its system to meet the performance requirements stated in this specification. The resulting database is called the System ENC (SENC).~~
- ~~(b) It is mandatory that official HO data (ENC) be available and any ECDIS must be capable of accepting and converting the official HO data (ENC) to the internal storage structure of the individual ECDIS (System ENC or SENC). Such data includes both that in the ENC and that delivered in digital format to update the ENC. This conversion process does not imply real time processing of HO supplied data.~~
- ~~(c) An official copy of the HO data, distributed as an ENC or contained within an externally generated SENC, is to be kept on board. The SENC generated on board, by ENC to SENC conversion, or ashore is used for actually operating the ECDIS. Through the same conversion process, official updates are added to the System ENC.~~

~~The information content of the SENC should include all that of the ENC corrected by official updates (see Appendix 1).~~

|

3.4 Use and restrictions of data

~~(a) If the area covered by the ECDIS display includes waters for which no HO ENC at a scale appropriate for navigation exists, the areas representing those waters should carry an indication to the mariner to refer to the paper chart (see Appendix 2).~~

~~(b) The following restrictions also apply:~~

~~(1) The precision of HO supplied data should be maintained, e.g. HO data provided in degrees and decimal degrees, when converted to manufacturer specific formats and structures and used in calculations, should also be maintained to that accuracy.~~

~~(2) It is the responsibility of the Hydrographic Offices to optimize the ENC data in terms of data organization and volume.~~

~~Should the manufacturer use point reduction or smoothing operations in order to compress the chart information in the SENC, the resultant image of the chart displayed at ENC scale should not differ from the ENC image by more than the display resolution.~~

~~(3) HO data will be supplied in a cell structure (see para 3.6). If this cell structure is modified, it is the ECDIS manufacturers responsibility to maintain cell dependent characteristics.~~

~~(c) If the mariner does not specify a safety contour, this should default to 30 m. If the safety contour specified by the mariner is not in the SENC, the safety contour shown should default to the next deeper contour.~~

~~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. In each of the above cases, the mariner should be informed.~~

3.5 Navigational purpose

~~ENC data is compiled for a variety of navigational purposes (e.g. approach, berthing). An individual ENC cell should be compiled for a single navigational purpose. The navigational purpose categories are defined in the „ENC Product Specification“, S 57 Appendix B.1.~~

3.6 Cell Structure and coding

~~ENC data should be organized in cells, both for data manipulation in ECDIS, and for chart correction.~~

~~The Cell system is described in the „ENC Product Specification“, S 57 Appendix B.1.~~

3.7 Language

~~In the "International ENC", as opposed to the INT Chart, the exchange language should be English. If other languages and/or alphabets are required this should be a supplementary option.~~

~~Display of non-English information should not degrade the chart presentation.~~

|

~~4. UPDATES.~~

~~(a) Official HO updates should be distinguished from local ones.~~

~~(b) Appendix 1, "Guidance on Updating the Electronic Navigational Chart" describes the model of updating as well as the minimum capability of the ECDIS for the various updating methods.~~

3 DISPLAY OF INFORMATION

5.1 Display categories

Display categories for chart information are:

Standard display

"The SENC information that should be shown when a chart is first displayed on the ECDIS and depending upon the needs of the mariner, the level of the information it provides for route planning or route monitoring may be modified by the mariner."

Display base

*"The level of SENC information which can not be removed from the display, consisting of information which is required at all times in all geographic areas and all circumstances. It is not intended to be sufficient for safe navigation."
(the Display base is a subset of the Standard display)*

All other information

"Chart information not contained in the standard display, displayed only on demand."

The detailed allocation of objects to these categories is listed in Appendix 2.

3.1 General arrangements

- (a) Appendix 2: "Colour and Symbol Specifications for ECDIS" and the "Presentation Library", specifies the colours, symbols, linestyles and text for ECDIS as well as the rules for presentation on ECDIS. Appendix 2 also outlines considerations in designing the ECDIS display.

The authoritative "official" version of the Presentation Library is published in human-readable form on a CD-ROM. The machine-readable digital version may also be available depending on a volunteering industry partner who keeps it up to date.

The ECDIS Chart 1 is issued together with the Presentation Library as a graphic file in TIFF-format and may also be available as collection of the varying objects contained in a special cell in pseudo-S-57 format containing additional cartographic objects.

A digital version of the Colours and Symbols Library is available for use in conjunction with S-57.

- ~~(b) Some additional symbols and colours have been provided by the International Electrotechnical Commission (IEC) for features not printed on paper charts but necessary for navigation, such as chartwork (tracks, waypoints, time tags etc.).~~

- (b) Additional navigational symbols necessary for navigation, such as the own ship symbol, tracks, waypoints, time tags etc. are provided by the IEC 61174 Standard for ECDIS. Navigational Symbols are not part of Appendix 2 of this Specification.

5.23 Priority layers

(c) The display categories specified in the IMO Performance Standards and the IHO priorities of the various types of chart information (alarms, updates, mariners and non-HO chart data, etc.) are applied to every object by the display category and draw priority assignments of the look-up tables and symbolisation procedures of Appendix 2 of this Specification.

~~(a) Layers are required to establish the priority of data on the display. The general rule for the priority between different categories of information is given below:~~

- ~~(1) ECDIS visual alarms/indications (e.g. caution, overscale)~~
- ~~(2) HO data: points/lines and areas + official updates~~
- ~~(3) N.t.M.'s, manual input and Radio Navigational Warnings~~
- ~~(4) HO caution (ENC cautions)~~
- ~~(5) HO colour fill area data~~
- ~~(6) HO's on demand data~~
- ~~(7) Radar information~~
- ~~(8) Mariners data: points/lines and areas~~
- ~~(9) Manufacturer's data: points/lines and areas~~
- ~~(10) Mariners colour fill area data~~

~~(b) Notes:~~

- ~~(1) This list is not intended to indicate a drawing sequence, but to specify that the information content of category n+1 must not obscure the information content of category n, or any higher category (i.e. n-1, etc).~~
- ~~(2) category (7) should have a radar off switch to facilitate its removal.~~

5.3 Display categories

(d) Display categories for chart information are defined in the IMO Performance Standards for ECDIS (IMO PS) as follows:

- Standard display
"The SENC information that should be shown when a chart is first displayed on the ECDIS and depending upon the needs of the mariner, the level of the information it provides for route planning or route monitoring may be modified by the mariner."
- Display base
"The level of SENC information which can not be removed from the display, consisting of information which is required at all times in all geographic areas and all circumstances. It is not intended to be sufficient for safe navigation. "

(the Display base is a subset of the Standard display)

- All other information
"Chart information not contained in the standard display, displayed only on demand."

The detailed allocation of objects to these categories is listed in Appendix 2 [of the IMO PS](#).

3.2 Display requirements and basic information to be displayed functions

(a) Graphic Display requirements

Size:	minimum effective size of the area for chart display 270 x 270 mm.
Resolution:	Minimum lines per mm (L) given by $L = 864/s$, where s is the smaller dimension of the chart display area (e.g. for the minimum chart area, $s = 270$ mm and the resolution is $L = 3.20$ lines per mm, giving a "picture unit" size of 0.312 mm).
Colours:	64

(b) Information should be displayed in the ECDIS on one or more physical screens, which may be divided into more than one chart display. Information may be displayed automatically, on demand or as a result of ~~hand entry~~ [mariners selection](#).

(c) Redraw during route monitoring to follow the ship's progress, including scale changes due to change in the scale of the chart information, should take less than 5 seconds. Demands by the mariner that cannot be predicted by the ECDIS, such as draw at a different scale or in a different area may take more than 5 seconds. In the latter case:

- the mariner should be informed;
- the display should continue route monitoring until the new information is ready to draw within 5 seconds.

~~In addition to the IMO Performance Standards the following basic display functions rules apply:~~

~~(a) The units for depth should always be on the same screen as the chart display.~~

(d) The following information should be shown on demand on the same screen as the chart display or on an additional graphic or text display:

- Positional data and time;
- legend;
- object description and associated attributes (result of "cursor query") [in human readable language, including the meaning given in the Presentation Library for any symbol selected by cursor-pick](#);
- textual information from ~~SENC~~ [e.g. cell name, compilation date, date of issue](#);
- record of ENC-updates;
- ~~list of abbreviations (from NT 1) digital chart 1 symbol collection~~; [ECDIS Chart 1 \(see Appendix 2 of this Specification\)](#)
- ~~colour differentiation diagram (see Appendix 2 of this Specification)~~
- ~~black adjust symbol for contrast adjustment (see Appendix 2 of this Specification)~~
- ~~result from navigational computations~~;
- ~~list of categories which are removed from Standard Display~~;

- Edition number of symbol library in use (see Appendix 2 of this Specification), ~~should be shown on demand on the same screen as the chart display or on an additional graphic or text display.~~

- (~~ee~~) Navigators notes should be shown as a result of a hand-entry on the same screen as the chart display or on an additional graphic or text display.

~~(d) Alarms and indications~~

~~Under certain conditions ECDIS should inform the mariner (by means of an alarm or indication) of specific dangers or faults and changes in operation that could affect the safety of navigation.~~

~~The conditions are listed in the appendices 4 and 5 of the IMO Performance Standards for ECDIS.~~

~~(e) North up/Course up~~

~~In course up display, the orientation should be altered in steps large enough to avoid unstable display of the chart information.~~

3.3 Use and restrictions of data

- (a) If the area covered by the ECDIS display includes waters for which no HO ENC at a scale appropriate for navigation exists, the areas representing those waters should carry an indication to the mariner to refer to the paper chart (see Appendix 2 of this Specification).

- (b) The following restrictions also apply:

(1) The precision of HO supplied data should be maintained, e.g. HO data provided in degrees and decimal degrees, when converted to manufacturer specific formats and structures and used in calculations, should also be maintained to that accuracy.

(2) It is the responsibility of the Hydrographic Offices to optimize the ENC data in terms of data organization and volume.

Should the manufacturer use point reduction or smoothing operations in order to compress the chart information in the SENC, the resultant image of the chart displayed at ENC scale should not differ from the ENC image by more than the display resolution.

- (c) In the "International ENC", as opposed to the INT Chart, the exchange language should be English. If other languages and/or alphabets are required this should be a supplementary option. Display of non-English information should not degrade the chart presentation.

- (d) Supplementary Information

Additional information from non-HO sources, may be displayed providing this does not degrade the display of ENC data. This additional information should be distinguished from the ENC data (see Appendix 2 of this Specification).

- (e) Tidal adjustment

Depth information should only be displayed as it has been provided in the ENC and not adjusted by

tidal height.

4 CARTOGRAPHIC FRAMEWORK

6.1 Horizontal Datum

- (a) ~~In order to combine positional information from many different sources in one (regional) data base, only one horizontal datum should be used.~~
- (b) ~~In accordance with IHO Technical Resolution B1.1, this datum should be WGS 84. This is also the appropriate datum for using Global Positioning Systems (GPS).~~
- (c) ~~IHO's should use the official IHO guidance* or equivalent for conversion of local datums to WGS 84.~~

6.2 Vertical datum

~~Depth data acquired from digitizing different charts or otherwise collected may be referenced to different vertical datums.~~

~~The ENC should define each area for which a particular vertical datum applies.~~

4.1 Navigational purpose and scale

- (a) The ENC ~~will~~ may often contain data that is ~~at present normally~~ obtained by digitizing paper charts and other documents. If data derived from different scales appears on the display, the boundary between different scales should be clearly indicated (see Appendix 2 of this Specification).

The ENC ~~should~~ defines each area for which a particular compilation scale applies. It is this scale which should be used when deciding if data is being displayed „overscaled“.

- (b) When the display can not be completely covered with ENC data for the selected navigational purpose, the remaining part of the display should be filled with data based on a more general navigational purpose (if available).
- (c) A graphical index of the navigational purpose of available data should be shown on demand (see Appendix 2 of this Specification).
- (d) Data shown on the display should always be of the same scale. If a scale boundary is shown on the display, the information shown in the overscale area should not be relied upon at the scale of the display. The overscale area should be identified as specified in Appendix 2 of this Specification.
- (e) The manufacturer should give the navigator the ability to use intermediate scales or ranges, or zoom in between scales or ranges (Display scale may be specified in terms of range from the ship, e.g. 6NM, as in radar displays).
- (f) If the SCAMIN attribute is defined in the ENC it should be used by the ECDIS to avoid cluttering.

* User's Handbook on Datum Transformations involving WGS-84, IHO Publication S-60.

- (g) ~~A scale bar should be provided as part of the display base for navigating on a large scale (1:80 000 and larger).~~

~~This is intended to give an immediate impression of scale and of the proximity of charted objects, rather than for accurate distance measurement, which should be made by means of the cursor.~~

~~For chart displays at a scale smaller than 1:80 000, a latitude bar should be shown on the border of the standard display.~~

4.2 Units

- (a) Units to be used on ECDIS displays:
- (1) Position: latitude and longitude in degrees, minutes and decimal minutes.
 - (2) Depth: metres and decimetres.
 - (3) Height: metres.
 - (4) Distance: nautical miles and decimal miles, or metres.
 - (5) Speed: knots and decimal knots.
- (b) Units used in 4.2 (a) above should be indicated in the display legend. There should be no ambiguity about the units in use at a particular time.

4.3 Legend

A standard legend of general information relating to the area displayed, applicable to the ships position, should be shown on a graphic or text display. This legend should contain at minimum:

~~(1)~~ — units for depth

~~(2)~~ — units for height

~~(13)~~ scale or range of display; in addition, overscale indication where appropriate

~~(24)~~ data quality indicator

~~(35)~~ sounding/vertical datum

~~(46)~~ horizontal datum

~~(57)~~ the value of the safety depth if used

~~(68)~~ the value of the safety contour selected by the mariner, as well as the value of the safety contour displayed (which may be different from that selected by the mariner)

~~(79)~~ magnetic variation

~~(810)~~ date and number of last update affecting the chart cells currently in use

~~(911)~~ edition number and date of issue of the ENC |

~~(1012)~~ chart projection |

~~7. MINIMUM PERFORMANCE REQUIREMENTS IN RELATION TO THE ENC~~

~~In addition to the requirements in the IMO Performance Standards, the following apply:~~

~~7.1 Calculations~~

- ~~(a) The system should be capable of performing at least the following calculations:~~
- ~~(1) geographical co ordinates to display co ordinates and vice versa.~~
 - ~~(2) transformation between local datum and WGS 84 (see 6.1c)~~
 - ~~(3) true distance and azimuth between two geographical positions.~~
 - ~~(4) geographic position from known position and distance/azimuth.~~
 - ~~(5) projection calculations such as true distance, rhumb line, convergence and great circle.~~
- ~~(b) The accuracy of these calculations should be such that there should be no visible distortion on the display between the following:~~
- ~~(1) rhumb line and chart data~~
 - ~~(2) great circle and chart data~~
- ~~(c) All calculations should be based on data for the most detailed navigational purpose, available for the area in the ENC.~~

~~6.47.2 Display requirements and basic information to be displayed~~

~~Graphic Display requirements~~

~~Size: minimum effective size of the area for chart display 270 x 270 mm.~~

~~Resolution: Minimum lines per mm (L) given by $L = 864/s$, where s is the smaller dimension of the chart display area (e.g. for the minimum chart area, $s = 270$ mm and the resolution is $L = 3.20$ lines per mm, giving a "picture unit" size of 0.312 mm).~~

~~Colours: 64~~

~~Information should be displayed in the ECDIS on one or more physical screens, which may be divided into more than one chart display. Information may be displayed automatically, on demand or as a result of hand entry.~~

~~Redraw during route monitoring to follow the ship's progress, including scale changes due to change in the scale of the chart information, should take less than 5 seconds. Demands by the mariner that cannot be predicted by the ECDIS, such as draw at a different scale or in a different area may take more than 5 seconds. In the latter case:~~

~~-the mariner should be informed;~~

~~the display should continue route monitoring until the new information is ready to draw within 5 seconds.~~

~~In addition to the IMO Performance Standards the following rules apply:~~

~~(a) The units for depth should always be on the same screen as the chart display.~~

~~(b) The following information:~~

~~Positional data and time;~~

~~legend;~~

~~object description and associated attributes (result of "cursor query");~~

~~textual information from SENC;~~

~~record of ENC updates;~~

~~list of abbreviations (from INT 1);~~

~~result from navigational computations;~~

~~list of categories which are removed from Standard Display;~~

~~symbol library (see Appendix 2);~~

~~should be shown on demand on the same screen as the chart display or on an additional graphic or text display.~~

~~(c) Navigators notes should be shown as a result of a hand entry on the same screen as the chart display or on an additional graphic or text display.~~

~~(d) Alarms and indications~~

~~Under certain conditions ECDIS should inform the mariner (by means of an alarm or indication) of specific dangers or faults and changes in operation that could affect the safety of navigation.~~

~~The conditions are listed in the appendices 4 and 5 of the IMO Performance Standards for ECDIS.~~

~~(e) North up/Course up~~

~~In course up display, the orientation should be altered in steps large enough to avoid unstable display of the chart information.~~

~~(f) Supplementary Information~~

~~Additional information from non HO sources, may be displayed providing this does not degrade the display of ENC data. This additional information should be distinguished from the ENC data (see Appendix 2).~~

~~(g) Tidal adjustment~~

~~Depth information should only be displayed as it has been provided in the ENC and not adjusted by tidal height.~~

~~8. MINIMUM CONFIGURATION~~

~~To fulfil these specifications, the following minimum configuration is required:~~

- ~~(a) 1 CPU, capable of providing a sufficient combination of computer memory and graphics memory to perform the following:~~

~~Redraw during route monitoring to follow the ship's progress, including scale changes due to change in the scale of the chart information, should take less than 5 seconds. Demands by the mariner that cannot be predicted by the ECDIS, such as draw at a different scale or in a different area may take more than 5 seconds. In the latter case:~~

- ~~_____ the mariner should be informed;~~
- ~~_____ the display should continue route monitoring until the new information is ready to draw within 5 seconds.~~

- ~~(b) Data storages for:~~

- ~~(1) _____ the System ENC, compiled by the ECDIS,~~
- ~~(2) _____ Updates.~~

- ~~(c) 1 Graphic Display.~~

~~Size: _____ minimum effective size of the area for chart display 270 x 270 mm.~~

~~Resolution: _____ Minimum lines per mm (L) given by $L = 864/s$, where s is the smaller dimension of the chart display area (e.g. for the minimum chart area, $s = 270$ mm and the resolution is $L = 3.20$ lines per mm, giving a "picture unit" size of 0.312 mm).~~

~~Colours: _____ 64~~

- ~~(d) 1 Text Display.~~

- ~~(e) Data Input Devices, capable of reading the ENC, HO updates and test data sets to certify processing of the ENC. Capability of entering mariner's notes and corrections manually. Dedicated key and cursor function.~~

- ~~(f) A facility, equivalent to display, to certify processing of the ENC.~~

- ~~(g) Interface with clock, electronic equipment and electronic update media and other ships equipment when desired.~~