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Working Party on Inland Water Transport

Fiftieth session
Geneva, 11-13 October 2006
Item 8(b) of the provisional agenda

ESTABLISHMENT OF COMMON PRINCIPLES AND TECHNICAL REQUIREMENTS
FOR A PAN-EUROPEAN RIVER INFORMATION SERVICES (RIS)

Recommendation on Electronic Chart Display and
Information System for Inland Navigation (Inland ECDIS)

Transmitted by the (European) Expert Group on Inland ECDIS

Note: Annexed below is draft edition 2.0 of the Standard for Electronic Chart Display and Information System for Inland Navigation (Inland ECDIS) received from the (European) Expert Group, amending TRANS.SC.3/156. The Working Party may wish to consider the draft in the light of the discussion held on this item at the thirtieth session of the Working Party SC.3/WP.3 (see ECE/TRANS/SC.3/WP.3/60, paras. 12-15) taking also into account the comments and proposals to be received from Governments and intergovernmental organizations concerned and decide on the updating of the International Standard for Inland ECDIS as set out in its resolution No. 48 appearing in TRANS/SC.3/156.

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[*]   Reissued for technical reasons.

Annex

Draft Edition 2.0 of 2 June 2006

Standard

**Electronic Chart Display and Information System
for Inland Navigation (Inland ECDIS)**

Preface

1.   Reflections and experiments have been made in several countries of the European Union (EU) to use telematics for the support of inland navigation. This aim was especially pursued in the scope of the EU research and development project INDRIS. A pilot project on the Rhine river was started in Germany in 1998 under the name of ARGO. In ARGO and INDRIS, the radar image on the display in the skipper's wheelhouse is overlaid by an electronic chart. This is an approach to higher safety and more efficiency of inland navigation.

2.   It turned out in the discussions that only an internationally agreed procedure will be successful, since a skipper cannot be expected to employ different equipment in each country. This was the reason why the internationally introduced *Electronic Chart Display and Information System (ECDIS)* - originally developed for maritime navigation - was also considered for inland navigation. The latest versions of the IMO, IHO and IEC standards for ECDIS were introduced in 1996. ECDIS is a well matured system now. The idea was to adopt ECDIS for inland navigation and to supplement some distinct inland features, but not to change the original ECDIS standard. In this way, it will be possible to have compatibility between the original - Maritime - ECDIS and Inland ECDIS. This is important for the estuaries of the rivers, where sea vessels as well as inland vessels navigate.

3.   The *Concerted Action on Inland Navigation*, an institution of the 4th Framework Programme for Transport Research and Development of the European Union, appointed a Working Group and an Inland ECDIS Expert Group in 1998 with the development of an Inland ECDIS Standard. The experience of ARGO and INDRIS had to be taken as the basis for the new standard.
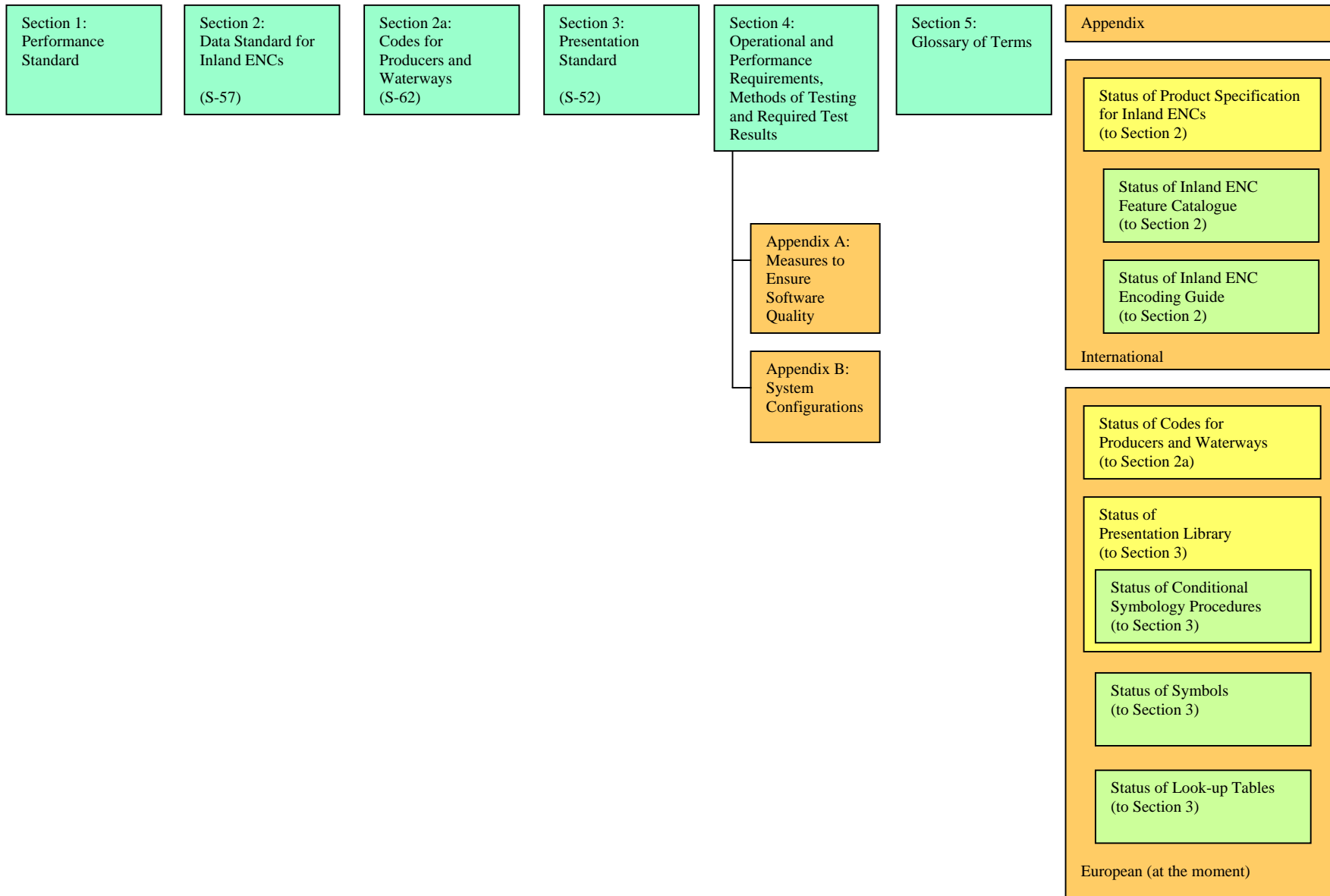
4.   The Expert Group had the following members:

- Mr. Christian Krajewski (chairman), Mr. Kersten Gevers, Mr. Eric Rottmann, Mr. Hermann Haberkamp, Dr. Arne Driescher (from 2000), Dr. Reinhard Zimmermann (until 1999) of Germany,
- Mr. Peter Kluytenaar (deputy chairman), Mrs. Lea Kuiters, Mr. Ron Wardenier (until 2000) of The Netherlands and
- Mr. Bernd Birklhuber of Austria.

The Expert Group submitted its first proposal on 1 January 1999.

5.   In the year 2000, the competent committees of the Central Commission for the Navigation on the Rhine (CCNR) in Strasbourg installed an Ad-hoc Working Group for Inland ECDIS with the order to draft the Inland ECDIS Standard of CCNR.

6.   The Ad-hoc Working Group started with the results of the Expert Group as the basis for their further work.

7.   Since the 4th Framework Programme of the European Union ended in the year 2000, the Expert Group reported to the Ad-hoc-Working Group of CCNR afterwards.

8.   The Inland ECDIS Standard has been adopted not only by CCNR, but also by the Danube Commission, the UN/ECE and PIANC and has become the first standard in the area of inland navigation, which has been recognized by all these organizations.

9.   Within the 5th framework program of the European Union the research and development project COMPRIS (Consortium Operational Management Platform River Information Services) started the data production in France, Belgium, Slovakia, Hungary, Croatia, Serbia and Montenegro, Romania and the Ukraine, and did further development of the Inland ECDIS Standard and Inland ECDIS based applications within work package 3, Spatial Information. These developments have been focused on the information side of Inland ECDIS with special regard to voyage planning in accordance with the requirements of the draft of the European RIS directive.

10.   As the Inland ECDIS Standard has not been recognised by IHO so far, there are already some incompatibilities between edition 3.1 of S-57 and the Inland ECDIS Standard. In order to ensure the future compatibility of Inland ECDIS and S-57 it is necessary to obtain recognition by IHO. A harmonization group with the United States of America and some companies from Canada has been set up in conjunction with the COMPRIS project to get a better basis for a worldwide recognition of Inland ECDIS. The Inland ENC Harmonization Group (IEHG) has received a mandate as a task force of the Inland ECDIS expert group. The Russian Federation joined the Harmonization Group in 2004. The US Army Corps of Engineers (USACE) had been using pure S-57 to produce ENCs for all its inland waterways, but had detected, that some real world entities of inland navigation cannot be encoded properly within S-57 and had become interested in the European approach therefore. On the other hand the USACE had already produced a very detailed Encoding Guide, which was much more detailed and user friendly then the section "Use of the object catalogue" of the Inland ECDIS Standard. IEHG amended the Encoding Guide with the additional features and attributes, did a thorough check, which features and attributes are really needed, and where it is possible to follow the American approach of using pure S-57 to encode the same real world entities and introduced all the amendments of COMPRIS and the harmonization process in the documents of the Inland ECDIS standard. The proposal was delivered to the Inland ECDIS expert group in October 2005.

11.   The Inland ECDIS expert group decided to use a digital register as it is planned for S-100 of IHO for Edition 2.0 of the Inland ECDIS Standard.

Section 1:
Performance
Standard

Section 2:
Data Standard for
Inland ENCs

(S-57)

Section 2a:
Codes for
Producers and
Waterways
(S-62)

Section 3:
Presentation
Standard

(S-52)

Section 4:
Operational and
Performance
Requirements,
Methods of Testing
and Required Test
Results

Section 5:
Glossary of Terms

Appendix A:
Measures to
Ensure
Software
Quality

Appendix B:
System
Configurations

Appendix

Status of Product Specification
for Inland ENCs
(to Section 2)

Status of Inland ENC
Feature Catalogue
(to Section 2)

Status of Inland ENC
Encoding Guide
(to Section 2)

International

Status of Codes for
Producers and Waterways
(to Section 2a)

Status of
Presentation Library
(to Section 3)

Status of Conditional
Symbology Procedures
(to Section 3)

Status of Symbols
(to Section 3)

Status of Look-up Tables
(to Section 3)

European (at the moment)

(Maritime) ECDIS	Inland ECDIS (Edition 2.00, xx.xx.200x)	OPEN ECDIS FORUM **http://ienc.openecdis.org** (actual status)

IMO A.817(19) Performance Standards for ECDIS, November 1995
 	
   Appendix 1: Reference Documents
   Appendix 2: SENC Information
   Appendix 3: Navigational Elements and Parameters
   Appendix 4: Areas for which special conditions exist
   Appendix 5: Alarms and Indicators
	Section 1: Performance Standard	

IHO S-57: Transfer Standard for Digital Hydrographic Data, Edition 3.1, November 2000
 	
   Part 1: General Introduction
   Part 2: Theoretical Data Model
   Part 3: Data Structure
 	
   Appendix A: IHO Object catalogue
     Introduction
     Chapter 1: Object Classes
     Chapter 2: Attributes
     Annex B: Attributes/Object Classes Cross Reference
 	
   Appendix B: Product specifications
   Appendix B.1: ENC Product Specification
     Annex A: Use of The Object Catalogue for ENC
     Annex B: Example of CRC Coding
   Appendix B.2: IHO Object Catalogue Data Dictionary Product
       Specification
	Section 2: Data Standard for Inland ENCs	Inland ENC Feature Catalogue
		
		Product Specification for Inland ENCs
		   IENC Encoding Guide

IHO S-62 ENC Producer Codes, Edition 2.2, March 2006	**Section 2a:** Codes for Producers and Waterways	Codes for Official Producers OEF (https://www.openecdis.org): Codes for (Private) Producers and Waterways (not part of the Inland ECDIS Standard)

IHO S-52 Specification for Chart Content and Display Aspects of ECDIS, Edition 5, December 1996
 	
   Appendix 1:   Guidance on Updating the Electronic Chart
        Annex A. Definication and Acronyms
        Annex B: Current Updating Practice for Paper Charts
        Annex C: Estimate of Data Volume
   Appendix 2:   Colour & Symbol Specifications for ECDIS
        Annex A: IHO ECDIS Presentation Library
    Part I: Use of the Presentation Library
    Part II: Mariners Navigation Objects
    Part III: Supplementary Features
        Annex B: Calibration of Colour CRTs
        Annex C: Maintaining the Calibration of Colour CRTs
   Appendix 3: Glossary of ECDIS-Related Terms
	Section 3: Presentation Standard	Presentation Library for Inland ECDIS
		   Look-up Tables
		   Symbols
		   Conditional Symbology Procedures

IEC 1174: ECDIS - Operational and Performance Requirements, Methods of Testing and Required Test Results, December 1996	**Section 4**:Operational and Performance
	   Requirements,
	Methods of Testing and Required Test Results
	
	   Appendix A: Measures to Ensure Software Quality
	   Appendix B: System Configurations	

	Section 5: Glossary of Terms	

	Appendix: Status of Product Specification for
	   Inland ENCs including
	   Status of Feature Catalogue
	   Status of IENC Encoding Guide
	
	   Status of Codes for Producers and
	     Waterways
	
	   Status of Presentation Library for
	   Inland ECDIS including
	     Status of Lookup Tables
	     Status of Symbols
	     Status of Conditional Symbology Procedures	

SECTION 1

Performance Standard for Inland ECDIS

1   Introduction (Primary Functions and Performance)

(a)   Inland ECDIS shall contribute to safety and efficiency of inland shipping and thereby to protection of the environment.

(b)   Inland ECDIS shall reduce the navigational workload as compared to traditional navigation and information methods.

(c)   Inland ECDIS (Operating System Software, Application Software and Hardware) shall have a high level of reliability and availability at least of the same level as other means of navigation, for the navigation mode as specified in Section 4 of this standard.

(d)   Inland ECDIS can be designed for both, information mode and navigation mode, or for information mode only.

(e)   Inland ECDIS shall use chart information as specified by Sections 2 and 3 of this Standard.

(f)   Inland ECDIS shall facilitate simple and reliable updating of the Inland ENC.

(g)   Inland ECDIS shall provide appropriate alarms or indications with respect to the information displayed or malfunction of the equipment.

(h)   Inland ECDIS shall meet the requirements of this performance standard.

2   Definitions

2.1   Terms (see also section 5 of this Standard: Glossary)

For the Inland ECDIS performance standard the following definitions apply:

(a)   **Inland ECDIS** means an electronic chart display and information system for inland navigation, displaying selected information from an Inland System Electronic Navigational Chart (Inland SENC) and, optionally, information from other navigation sensors.

(b)   **Inland Electronic Navigational Chart (Inland ENC)** means the database, standardised as to content, structure and format, issued for use with Inland ECDIS. The Inland ENC complies with the IHO standards S-57 and S-52, enhanced by the additions and clarifications of this standard for Inland ECDIS. The Inland ENC contains all essential chart information and may also contain supplementary information that may be considered as helpful for navigation.

(c)   **Inland System Electronic Navigational Chart (Inland SENC)** means a database, resulting from the transformation of the Inland ENC by Inland ECDIS, for appropriate use, updates to the Inland ENC by appropriate means and other data added by the skipper. It is

this database that is actually accessed by the Inland ECDIS for display generation and other navigational functions. The Inland SENC may also contain information from other sources.

(d)   **Minimum Information Density (display base)** means the minimum amount of SENC information that is presented and which cannot be reduced by the operator, consisting of information that is required at all times in all geographic areas and under all circumstances.

(e)   **Standard Information Density (standard display)** means the default amount of SENC information that shall be visible when the chart is first displayed on Inland ECDIS first.

(f)   **All Information Density (all display)** means the maximum amount of SENC information. Here, in addition to the standard display, also all other features are displayed, individually on demand.

(g)   **User-defined settings** means the possibility to use and store a profile of display and operation controls-settings.

(h)   **Integrated Display** means a head-up, relative-motion picture consisting of the SENC overlaid with the radar-image with matching scale, offset and orientation.

(i)   **Navigation Mode** means the use of the Inland ECDIS for conning the vessel with overlaid radar image.

(j)   **Information Mode** means the use of the Inland ECDIS for information purposes only without overlaid radar image.

2.2   References

(a)   IHO Special Publication No. S-57 "IHO Transfer Standard for Digital Hydrographic Data", Edition 3.1, November 2000

(b)   IHO Special Publication No. S-62 "ENC Producer Codes", Edition 2.2, March 2006

(c)   IHO Special Publication No. S-52 "Specifications for Chart Content and Display Aspects of ECDIS", 5th Edition, December 1996, including:

- S-52 Appendix 1 "Guidance on Updating the Electronic Chart", 3rd Edition, July 1997,
- S-52 Appendix 2 "Colour and Symbols Specifications for ECDIS", Edition 4.2, March 2004 and
- S-52 Appendix 3 "Glossary of ECDIS-related Terms", 3rd Edition, December 1997

(d)   IMO Resolution A.817(19) "Performance Standards for Electronic Chart Display and Information Systems (ECDIS)", November 1995

(e)   IEC-Guideline 1174 "ECDIS -- Operational and performance requirements, methods of testing and required test results", December 1996

(f)   CCNR resolutions 1989-II-33, 34 and 35 (Minimum requirements, test conditions, installation and performance testing of radar equipment and rate-of-turn indicators for Rhine navigation, version of 1.1.2004)

3   Contents, Provision and Updating of Chart Information

3.1   Contents and Provision of Inland ENCs

(a)   The chart information to be used in Inland ECDIS shall be the latest edition of information.

(b)   Provisions shall be made to prevent the user from altering the contents of original Inland ENC editions.

(c)   If the chart is intended to be used for navigation mode (Ch. 5.2), at least the following features shall be included in the ENC:

- bank of waterway (at mean water level)
- shoreline construction (e.g. groyne, longitudinal control dam, training wall – any facility that is considered a hazard to navigation)
- contours of locks and dams
- boundaries of the fairway / navigation channel (if defined)
- isolated dangers in the fairway / navigation channel under water
- isolated dangers in the fairway / navigation channel above water level, such as bridges, overhead cables etc.
- official aids-to-navigation (e.g. buoys, beacons, lights, notice marks)
- waterway axis with kilometres and hectometres or miles.

(d)   If the chart is intended to be used for navigation mode (ch 5.2), the respective competent authority decides for each waterway or harbour which of the above named features are to be verified.

3.2   Updates

(a)   Inland ECDIS shall be capable of accepting updates to the Inland ENC data provided in conformity with the agreed standards. These updates shall be applied to the SENC automatically. The implementation procedure shall not interfere with the display in use.

(b)   Inland ECDIS shall allow display of updates, so that the skipper may review their contents and ascertain that they have been included in the SENC.

(c)   Inland ECDIS shall be capable of revoking automatically applied updates of the Inland ENC data.

(d)   Original Inland ENC editions and later updates shall never be merged.

(e)   The Inland ENC and all updates to it shall be displayed without any degradation of their information content.

(f)   The Inland ENC data and updates to it shall be clearly distinguishable from other information.

(g)   Inland ECDIS shall ensure that the Inland ENC and all updates to it have been correctly loaded into the SENC.

(h)   Inland ECDIS shall keep a record of updates, including the time of application to the SENC.

(i)   The contents of the SENC to be used shall be adequate and up to date for the intended voyage.

4   Presentation of Information

4.1   Display Requirements

(a)   The display method shall ensure that the displayed information is clearly visible to more than one observer in the typical conditions of light experienced in the wheelhouse of a vessel by day and night.

(b)   The display size of the chart presentation shall be at least 270 mm by 270 mm for equipment designed and admitted for the Navigation Mode. In Information Mode ergonomic aspects shall determine the size.

(c)   The display requirements shall be met whether in landscape or in portrait format.

4.2   Display Ranges (Scales)

(a)   In Information Mode (ref. to Ch. 5.1), it is recommended to use the same ranges as specified in the Navigation Mode.

(b)   In Navigation Mode (ref. to Ch. 5.2), only the successive switchable ranges (scales) specified in Section 4, ch. 4.7 of this Standard are allowed.

4.3   Image Positioning and Orientation

(a)   In Information Mode all kinds of chart orientation are allowed (see Ch. 5.1)

(b)   In Navigation Mode the chart shall be automatically positioned and oriented in the relative motion, head-up orientation with the own ship's position in the screen centre or off-centred (see Ch. 5.2).

4.4   Display of SENC Information

(a)   The display of SENC information shall be divided into the following three display categories:

- Display Base
- Standard Display
- All Display

The membership of the feature classes in the display categories is given in detail in the Look-up Tables of IHO S-52, Appendix 2, Annex A (Presentation Library) and in the "Presentation Library for Inland ECDIS" (see Look-up Tables), which is published at http://ienc.openecdis.org.

(b)　The Display Base category has to contain at least the following features:

- bank of waterway (at mean water level)
- shoreline construction (e.g. groyne, longitudinal control dam, training wall – any facility that is considered a hazard to navigation)
- contours of locks and dams
- boundaries of the fairway / navigation channel (if defined)
- isolated dangers in the fairway / navigation channel under water
- isolated dangers in the fairway / navigation channel above water level, such as bridges, overhead wires etc.
- official aids-to-navigation (e.g. buoys, lights and beacons)

(c)　The Standard Display category has to contain at least the following features:

- the objects of Display Base category
- prohibited and restricted areas
- piers for commercial vessels (cargo and passenger)
- kilometre and hectometre or mile marks on the banks

(d)　The All Information Display category has to display all features that are contained in the Inland SENC, individually on demand.

(e)　When invoking the Inland ECDIS, it shall come up with the Standard Information Density at an appropriate range available in the SENC for the displayed area

(f)　Inland ECDIS shall be switchable to the Standard Information Density at any time by a single operator action.

(g)　Inland ECDIS shall clearly indicate the information density currently in use at all times.

(h)　Time variable depth information in the ENC has to be displayed independently of the above named three display categories.

4.5　Display of Radar Information

(a)　In Navigation Mode the radar image shall have the highest display priority and it is only allowed to be presented in the relative motion, head-up mode. If the system is also type approved for maritime ECDIS, true motion and north-up mode may be implemented. If such a system is used in true motion and/or north-up mode on European inland waterways, it is considered to be working in Information Mode.

(b)　The under laid SENC shall match in position, range and orientation. The radar image and the position from the position sensor shall both be adjustable for the antenna offset to the conning position.

(c)   The overlaid radar image has to conform to the minimum requirements as specified in Section 4, ch. 4.14 of this Standard.

(d)   The overlaid radar-image may contain additional navigational information. Any additional navigational information and tracking and tracing symbols should however in no way degrade the display of the original radar content.

4.6   Display of Other Navigational Information

(a)   Inland ECDIS and additional navigational information shall use a common reference system.

(b)   It shall be possible to display the skipper's own ship's position on the screen.

(c)   It shall be possible for the skipper to select safety limits.

(d)   Inland ECDIS shall emphasize the falling short of the safety limits.

4.7   Colours and Symbols

(a)   The display of colours and symbols to represent SENC information shall at least be able to comply with the regulations of Section 3 of this Standard. Additionally other user-selectable symbol sets are allowed.

(b)   To present navigational elements and parameters as listed in the IMO Resolution A.817(19), Appendix 3 other colours and symbols than those mentioned in 4.7.a must be used.

4.8   Data and Display Accuracy

(a)   The accuracy of the calculated data that are presented shall be independent of the display characteristics and shall be consistent with the SENC accuracy.

(b)   The Inland ECDIS shall provide an indication whether the display uses a smaller display range than the accuracy of the Inland ENC data offers (over-scale indication).

(c)   The accuracy of all calculations performed by Inland ECDIS shall be independent of the characteristics of the output device and shall be consistent with the SENC accuracy.

(d)   Bearings and distances drawn on the display or those measured between features already drawn on the display shall have an accuracy no less than that afforded by the resolution of the display.

5   Operation

5.1   Information Mode

(a)   Information Mode is intended to be used for information only and not for navigation.

(b)   In Information Mode all kinds of chart orientation, rotation, zooming and panning are allowed. However, it is recommended to use the same fixed ranges as in the Navigation Mode and the chart orientation whether

- to north, or
- to the fairway axis at the actual position, or
- to the actual ships-heading.

(c)   It should be possible to scroll the chart manually on the screen with the fairway axis in line with the vertical screen axis.

(d)   Inland ECDIS may be connected to a positioning sensor to scroll the chart picture automatically and to display the section of chart matching the actual surrounding, namely in the operator-selected range.

(e)   It is recommended to only display information regarding the position and orientation of other vessels, gathered by communication links like AIS or AI-IP, if they are up-to-date (nearly real-time) and accurate. The presentation of the position and the orientation of other vessels by

- a directed triangle or
- a true outline (to scale)

are strongly discouraged if the heading of these other vessels is not available. A generic symbol is recommended.

5.2   Navigation Mode

(a)   In Navigation Mode, the Inland ECDIS display shall be integrated with the own ship's radar information. The radar information shall be clearly distinguishable from the SENC information.

(b)   The integrated display must be in accordance with the requirements for radar on inland waterways as specified in Section 4, ch. 4.14 of this Standard.

(c)   The chart and the radar image must match in size, position and orientation within the limits as specified in Section 4, ch. 3.4 and 8.3.2 of this Standard.

(d)   The Integrated Display shall only be presented in the head-up orientation. Other orientations are permitted in systems with an additional maritime ECDIS type approval. If such a system is used in true motion and/or north-up mode on European inland waterways, it is considered to be working in Information Mode.

(e)   It shall be possible for the operator to adjust the displayed position of the vessel so that the radar image matches the SENC display.

(f)   It shall be possible to remove either the ECDIS or the radar information by a single operator action temporarily.

(g)   The vessel's position shall be derived from a continuous positioning system of which the accuracy is consistent with the requirements of safe navigation.

(h)   Navigation Mode must provide an indication when the input from the position-fixing system is lost. Navigation Mode shall also repeat, but only as an indication, any alarm or indication passed to it from a position fixing system.

(i)   The positioning system and the SENC shall be based on the same geodetic datum.

(j)   In navigation mode, the data according to ch. 3.1.c of this standard shall always be visible and shall not be obscured by other objects.

(k)   Information regarding the position and orientation of other vessels, gathered by other communication links than the own radar, are permitted to be displayed only if they are up-to-date (nearly real-time) and meet the accuracy that is required for the support of tactical and operational navigation.

(l)   As tracking and tracing information (for example AIS) of other vessels is useful for the planning of the passing, but of no use during passing itself, T&T (AIS) symbols shall not disturb the radar image during passing and shall be faded out therefore. Preferably the application should allow the skipper to define the area where the symbol is faded out.

(m)   The presentation of the position and the orientation of other vessels by

*   a directed triangle or
*   a true outline (to scale)

are permitted only if the heading of these other vessels is available. In all other cases a generic symbol shall be used (a square is recommended, a circle should be used for inland applications only).

5.3   Operation and Control Elements

(a)   Inland ECDIS shall be designed following ergonomic principles for user-friendly operation.

(b)   The Inland ECDIS equipment shall have a minimum of operation and control elements (see Section 4).

(c)   Operation and control elements, and indicators for connected sensors, may be integrated in Inland ECDIS.

(d)   Standard settings and user-defined settings shall be retrievable easily.

6   Connections with other Equipment

(a)   Inland ECDIS shall not affect the performance of any connected equipment adversely. Similarly the connection of optional equipment shall not degrade the performance of Inland ECDIS.

(b)   Inland ECDIS shall be capable of generating information to other systems, e.g. for the purpose of electronic reporting.

(c)   The relevant requirements of controls and indicators to connected equipment shall be fulfilled.

7   Indications and Alarms

7.1   Built in Test Equipment (BITE)

Inland ECDIS shall be provided with means for carrying out on board tests of major functions either automatically or manually. In case of a failure, the module at fault shall be shown.

7.2   Malfunctions

Inland ECDIS shall provide a suitable alarm or indication of system malfunctions (ref. to Section 4, ch. 9).

8   Fallback Arrangements

8.1   Insufficient accuracy of the SENC-positioning

In Navigation Mode the SENC shall be automatically switched off, if the SENC positioning does not match the radar picture within the limits of Section 4, ch. 5.1 and 5.2.

8.2   Defects

(a)   If the Inland ECDIS system has an evident defect, it shall provide a suitable alarm (ref. to Section 4, ch. 4.16 and 9 of this Standard).

(b)   Facilities enabling a safe take-over of the Inland ECDIS functions shall be provided in order to ensure that an Inland ECDIS failure does not result in a critical situation.

9   Power Supply in Navigation Mode

(a)   The Inland ECDIS shall have its own separate fused power supply.

(b)   Interruptions of the power supply for a period up to 5 minutes shall not have any influence on correct operation and shall not require restarting of the equipment manually.

10   Maintenance

This section of this edition 2.x of the standard will be updated by means of the following two documents:

Clarifications Document

This contains improvements to the wording of the standard. These are editorial amendments, which do not result in any substantive change to the standard.

Corrections and Extensions Document

This contains changes to the standard to correct factual errors and to make necessary amendments or extensions to the standard.

SECTION 2

Data Standard for Inland ENCs

Data Standard

1 Scope

This "Data Standard for Inland ENCs" describes the standard to be used

- for the exchange of digital hydrographic data between national inland waterway authorities and
- for its distribution to manufacturers, skippers and other users.

This Data Standard shall be used for the production of Inland ENCs. The transfer and distribution has to take place in such a way that none of the information is lost.

This Data Standard is based on the "IHO Transfer Standard for Digital Hydrographic Data", Special Publication No. 57, Edition 3.1 with all Appendices and Annexes (see comparison table in the preface of this Inland ECDIS Standard), in brief "S-57".

This Data Standard describes the necessary additions and clarifications to S-57 and the application of S-57 for the purpose of use in Inland ECDIS applications.

2 Theoretical data model

The description of the theoretical data model as contained in S-57 Part 2 applies to the theoretical data model of Inland ENCs without any changes or amendments.

3 Data Structure

The description of the data structure as contained in S-57 Part 3 applies to the data structure of Inland ENCs without any changes or amendments.

4 Product Specification

The Inland ENC Product Specification is a set of specifications intended to enable chart producers to produce a consistent Inland ENC, and manufacturers to use that data efficiently in an Inland ECDIS that satisfies the Performance Standard for Inland ECDIS (Section 1).

An Inland ENC must be produced in accordance with the rules defined in this Specification and must be encoded using:

- the Inland ENC Feature Catalogue and
- the rules described in the Inland ENC Encoding Guide.

The up-to-date Inland ENC Product Specification and its annexes are published at http://ienc.openecdis.org. The Appendix of this standard is containing the status quo of the Inland ENC Product Specification and its annexes at the moment of adoption of this edition of the standard.

Official Inland ENCs have to be produced in accordance with the latest version of the standard and the Product Specification at http://ienc.openecdis.org. Official Inland ENCs, which have been produced in accordance with Edition 1.02 of the Inland ECDIS Standard (also published at http://ienc.openecdis.org) before the enter into force of this standard remain valid until new editions are published in accordance with Edition 2.x.

5   Definitions

Definitions of terms may be found in

- S-57, part 1, clause 5
- the "Glossary of ECDIS Related Terms" in Appendix 3 to S-52
- the "Glossary of Terms" in Section 5 of this standard.

6   Maintenance

This section of this edition 2.x of the standard will be updated by means of the following two documents:

Clarifications Document

This contains improvements to the wording of the standard. These are editorial amendments, which do not result in any substantive change to the standard.

Corrections and Extensions Document

This contains changes to the standard to correct factual errors and to make necessary amendments or extensions to the standard.

These documents, and the associated maintenance mechanism, do not apply to the Product Specification for Inland ENC (including its annexes). The maintenance procedure for the Product Specification for Inland ENC (including its annexes) is described in the Product Specification and its annexes.

SECTION 2a

Inland ECDIS Data Standard

Codes for Producers and Waterways

In addition to IHO–S-62 ENC Producer Codes

Codes for producers of Inland ENCs as well as the registration procedure are published at www.openecdis.org.

Codes for official producers of Inland ENCs, which are not mentioned in IHO S-62, as well as the registration procedure are additionally published at http://ienc.openecdis.org.

If administrations or private companies decide to produce Inland ENCs, they shall register a producer code at the "Open ECDIS Forum" at www.openecdis.org.

If administrations decide to produce official Inland ENCs, they shall additionally register an official producer code via the IEHG discussion forum at http://ienc.openecdis.org. This application has to contain the legal base for the official status of the producer.

The members of the Inland ECDIS Expert Group are requested to react as soon as possible. A veto against a proposal has to contain an explanation for the objection. If there is no veto within six weeks, the proposal is adopted. If there is a veto, the following procedures are possible:

- The party, which has transmitted the proposal, can decide to withdraw the proposal.
- If an updated proposal is transmitted, it is handled as a new proposal.
- If the party, which has transmitted the proposal, wants to keep up the original proposal without any changes, the proposal will be discussed and decided upon at the next meeting of the Inland ECDIS expert group.

The following Codes for Waterways are <u>recommended</u> for use in the file name of IENCs:

Waterway Name	Waterway Code	Remark
Danube	D	(with Sulina branch)
Danube	DA	Chilia branch
Danube	DCC	Cernavoda canal
Neckar	NE	
Main	MA	
Mosel	MO	
Elbe	EL	
Rhine	RH	
Nederrijn / Lek	RL	
Waal	WA	
Drava	DR	
Tisza	TI	
Sava	SA	
Dunarea Veche	DV	
Dunarea Barcea	DB	
Sf. Gheorghe-Arm	GA	
Olt	OL	
Sio-chatorna	SI	
Balaton	BA	
Danube	DUM	Mosoni-Duna
Danube	DUS	Szenterei-Duna
Danube	DUK	Rackevei-Duna

Additional waterway codes can be registered via the "Open ECDIS Forum" at www.openecdis.org.

SECTION 3

Presentation Standard for Inland ECDIS

1   Introduction

1.   This "Presentation Standard for Inland ECDIS" describes the standard to be used for the presentation of Inland ECDIS data. The presentation has to take place in such a way that none of the information is lost.

2.   This Presentation Standard is based on the document "S-52, Specification for Chart Content and Display Aspects of ECDIS" of the IHO, Edition 5.0 of December 1996, with all Appendices and Annexes (see "Comparison of the structures of the standards for (Maritime) ECDIS and Inland ECDIS" in the preface of this Standard for Inland ECDIS).

3.   This Presentation Standard describes the necessary additions and clarifications to S-52 and the application of S-52 for the purpose of use in Inland ECDIS applications.

4.   This Presentation Standard is organized as follows:

- this section 3 of the Inland ECDIS Standard,
- the "Presentation Library for Inland ECDIS" which is published at http://ienc.openecdis.org with additions and clarifications to be applied to S-52, Appendix 2, Annex A.

5.   Definitions of terms may be found in

- IHO-S-57, Part 1, clause 5,
- the "Glossary of ECDIS-Related Terms" in Appendix 3 to S-52,
- the "Glossary for Inland ECDIS" in Section 5 of this Inland ECDIS Standard.

2   Introduction to the Presentation Library for Inland ECDIS

S-57 data sets do not contain any information about how it is going to be presented. The chart presentation is generated online in the Inland ECDIS application. For that purpose, the Inland ECDIS application uses machine-readable symbolization instructions for each feature, which is drawn on the screen. For the presentation of ENCs the IHO S-52 standard is mandatory. The S-52 standard contains all rules which are necessary for the symbolization and presentation of ENCs on the screen.

Since the features, attributes and attribute values for ENCs were extended for Inland ENCs an extension of the S-52 standard is necessary as well in order to be able to display also the Inland specific features. All extensions apply to the Edition 3.3 of the IHO ECDIS Presentation Library (Annex A of Appendix 2 of S-52).

2.1   Components of S-52 and Inland ECDIS Presentation Library

The major components of the S-52 presentation library are:

- A library of symbols, line styles and fill styles
- A colour coding scheme which includes the IHO colour tables for day, dusk and night time
- A set of symbology command words from which machine readable instructions can be assembled. The result is a symbology instruction, which is processed to symbolise ENC features in turn.
- A set of conditional symbology procedures to decide the appropriate symbolisation in cases determined by the mariner's selection (e.g. safety contour) or for complex symbols (e. g. top marks on buoys and beacons)
- A set of look-up tables that link feature descriptions from the ENC to the appropriate symbology instructions depending on whether:

  a. the link is straight forward, i.e. a direct relationship between an feature's description and its presentation such as a buoy or a land area. In this case, the look-up table provides the symbology instruction to show a symbol, an area fill, or a line style.

  b. the link is conditional, i.e. depending on circumstances, for example a depth area, whose colour fill depends on the choice of the safety contour. In this case the look-up table refers the decision to a conditional symbology procedure that selects the appropriate symbology instructions later.

Inland ECDIS uses all S-52 components plus extensions in:

- Lookup tables
- Symbol library
- Conditional symbology procedures

Only the extensions are described in the Presentation Library for Inland ECDIS at http://ienc.openecdis.org.

2.2   Look-up tables

For each geometry type (point, line, area) there is a separate look-up table. Each entry in a look-up table consists of the following fields:

1. 6-character code of the feature class (acronym)
2. Attribute combination
3. Symbolization instructions
4. Display priority, 0-9 (comparable with drawing layers)
5. Radar code
6. Display category (Display base, standard, all other)
7. "Viewing group", more refined grouping of features than the display categories

"LNDMRK","CATLMK17|","SY(TOWERS01)","7","O","OTHER","32250"

Figure 1 - Example entry of a look-up table

In this case the feature LNDMRK is shown by the symbol TOWERS01 with priority 7, if the attribute CATLMK equals 17. The feature lies over the radar.

The presentation of features in a specific area that are contained in different cells of the same usage follows the entries in the look-up tables.

The Inland ECDIS Presentation Library provides five look-up tables:

- paper chart point symbols
- simplified point symbols
- line symbols
- plain area boundary symbols
- symbolized area boundary symbols

The lookup tables are supplied in digital form at http://ienc.openecdis.org.

2.3   Conditional symbology procedures (CS)

CS are generated for features of which the symbolization

- depends on application settings, e.g. safety contour,
- depends on other features, e.g. top marks and their structure,
- is too complex to be defined in a direct look-up table entry.

CS Procedures, which have to be modified or implemented in an Inland ECDIS additional to the CS Procedures of S-52 are published at http://ienc.openecdis.org.

2.4   Colours

Colours used in an ECDIS are defined in an absolute, monitor independent way (CIE coordinates). This ensures that ECDIS charts look similar on monitors of different suppliers. By means of a colour calibration software which must be used by the manufacturer, CIE values are converted into RGB values.

Commercial displays usual in the trade are seen as matching this requirements.

Because of the different lighting conditions on the bridge of a ship, it is necessary to offer presentations with different brightness. For each level a separate colour table exists.

The represented colour scheme shall be chosen on the basis of ergonomically and physiological factors and the representation of indications in different colours shall not result in mixed colours by superimposing.

2.5   Presentation of notice marks

Notice marks which are located at the river bank are presented in the chart displayed by generic symbols (notmrk01, notmrk02 and notmrk03). This does not apply to the notice marks on bridges.

Additionally applications are required to be able to display the detailed symbol, which is similar to the real world indication, and the full set of object information of a user-selected notice mark.

Notice marks that are located at bridges, shall be symbolized according to the orientation of the bridge.

Notice marks which specify distances or a velocity will not be symbolized with the number itself, but only with that symbol which gives the general regulation or information.

3 Maintenance

This section of this edition 2.x of the standard will be updated by means of the following two documents:

Clarifications Document

This contains improvements to the wording of the standard. These are editorial amendments, which do not result in any substantive change to the standard.

Corrections and Extensions Document

This contains changes to the standard to correct factual errors and to make necessary amendments or extensions to the standard.

These documents, and the associated maintenance mechanism, do not apply to the Presentation Library for Inland ECDIS. The maintenance procedure under No. 7 of the Product Specification for Inland ENC applies in principle to the maintenance of the Presentation Library too. In this case - unlike the described maintenance procedure - only the European Inland ECDIS Expert Group maintains the Presentation Library for Inland ECDIS.

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SECTION 4

**Operational and Performance Requirements,
Methods of Testing and Required Test Results**

</div>

1   Introduction

1.1   Scope of this document

This section 4 of the Inland ECDIS Standard specifies the minimum requirements contained in section 1 and describes the test procedures and the required results concerning the hardware, the software, the functions, the operation, the display and the interfaces to other equipment on board of ships.

1.2   Normative references

References to the following normative documents are made in this document in addition to the references in section 2, ch. 2.2 of this standard:

EN 60945 (1997)	Marine navigational equipment; General requirements - Methods of testing and required test results
IEC 1174:	ECDIS - Operational and performance requirements, methods of testing and required test results
ISO 9000 (1987)	Quality management and quality assurance standard
CCNR Decision 1989-II-33:	Standard on the minimum requirements and on the required test results for navigational radar equipment in the Rhine navigation
CCNR Decision 1989-II-34:	Standard on the minimum requirements and on the required test results for rate-of-turn indicators in the Rhine navigation
CCNR Decision 1989-II-35:	Standard on the installation and on functional tests of navigational radar equipment and of rate-of-turn indicators in the Rhine navigation
EU-Directive 1999/5/EC:	Radio Equipment and Telecommunications Terminal Equipment and the Mutual Recognition of their Conformity

2   Operating modes and system configuration

2.1   Operating modes

(a)   The Inland ECDIS Standard distinguishes two operating modes: **navigation mode** and **information mode**.

(b)   Inland ECDIS equipment designed for operating in **navigation mode** has to fulfil the requirements of this standard and the standards on navigational radar equipment and rate-of-turn indicators to be proven by conformity tests.

(c)   For Inland ECDIS equipment designed for **information mode** only, the requirements of this section 4 are to be understood as a recommendation.

2.2   System configurations

2.2.1 Inland ECDIS equipment, stand-alone-system without connection to radar

In this configuration only operation in **information mode** is possible (see Appendix B, Fig. 1).

2.2.2 Inland ECDIS equipment, parallel installation and connection to radar

This configuration allows operation in **information mode** as well as in **navigation mode** (see Appendix B, Fig. 2).

2.2.3 Inland ECDIS equipment, monitor shared with connected radar equipment

In special cases, it is possible to share one display for the Inland ECDIS equipment and for the radar equipment. The prerequisite for this is a monitor with matching graphic parameters for both video signals, and a video switch, which allows a fast switchover of the video sources, and – if needed - a mechanical rotation of the display to the required orientation (see Appendix B, Fig. 3).

This configuration allows operation in **information mode** as well as in **navigation mode**

2.2.4 Radar equipment with integrated Inland ECDIS functionality

This is a radar installation with integrated Inland ECDIS functionality that can be operated in **information mode** as well as in **navigation mode** (see Appendix B, Fig. 4).

3   Performance requirements

3.1   ware performance

(a)   Inland ECDIS equipment shall be designed and manufactured to withstand typical environmental conditions prevailing on board of a vessel without any degradation in quality and reliability. Furthermore, it shall not disturb other communication and navigation equipment.

(b)   In the configuration as described in paragraph 2.2.4 all components of inland ECDIS equipment, installed inside the wheelhouse, shall fulfil the requirements of the class b) "protected from weather" equipment as specified in the standard EN 60945 with the exception that the test temperature range is limited to 0° C to +40° C (whereas the test temperature range in EN 60945 is specified from – 15° C to + 55° C) unless specified differently in this document. For the configurations described in paragraph 2.2.2 and 2.2.3 CE conformity is sufficient.

3.2   tware performance

Operation, visualisation, and functionality of Inland ECDIS equipment are usually realised by software. Taking this into account, the software shall be designed, developed, implemented, and tested according to the generally accepted state of the art. Therefore, the manufacturer shall fulfil the software requirements described in Appendix A to this document.

3.3 Performance of operation controls

(a)   The operation of the system shall be simple, appropriate and conform to common human interface standards.

(b)   The number of operational controls shall be as low as possible and restricted to the required number.

(c)   Wireless remote controls are not admitted.

(d)   The ON/OFF switch is to perform and to be arranged in such a way that inadvertent operation is not possible.

(e)   The symbols of the operating controls need a minimum character height of 4 mm and have to be readable under all conditions that may exist in a wheelhouse.

(f)   The brilliance and the illumination of the operating controls should be adjustable to the required value.

3.4 Display performance

3.4.1 Display dimensions

In **navigation mode** the minimum chart and radar display area is 270 mm x 270 mm.

3.4.2 Display orientation

(a)   A rectangular display may be mounted in landscape or in portrait orientation under the prerequisite that the above-mentioned minimum dimensions are fulfilled.

(b)   Because of the limited space available in the typical wheelhouse of an inland vessel and the fact that a vessel usually follows the fairway-axis, the display shall be installed preferably in the portrait orientation.

3.4.3 Display resolution

A display resolution of 5 m in the 1,200 m range is required. This leads to a maximum pixel dimension of 2.5 m x 2.5 m, i.e. about 1,000 pixels at the short edge of the display.

3.4.4 Display colours

The system shall be able to display ergonomically proven colour combinations for day and night.

3.4.5 Display brilliance

The brilliance of the display shall be adjustable to every operational required value. This is especially valid for the lowest value during operation at night.

3.4.6 Picture renewal

(a)   The picture renewal rate shall not be shorter than that of the radar picture (≥ 24 pictures per minute).

(b)   Between two consecutive renewals no fluctuations of brilliance may occur.

(c)   On raster scan displays, the frame repetition rate may not be lower than 60 Hz.

3.4.7 Display technology

Preferably such display systems shall be used that are insensitive to the magnetic fields that may occur in the wheelhouse of an inland vessel.

4   Operational functions

4.1   Operating mode

(a)   If the equipment is able to work in both operation modes it shall provide the possibility to switch between **navigation mode** and **information mode**.

(b)   The operation mode in use shall be displayed.

(c)   Suitable measures are required to prevent inadvertent switching off of the **navigation mode**.

4.2   Equipment pre-sets (store/recall)

(a)   After invoking, the Inland ECDIS equipment shall come up with a moderate brilliance pre-set which neither blinds in a dark environment nor makes the picture invisible in a bright environment.

(b)   Other parameters may come up with their values at the time before switching off or from stored settings.

4.3   Presentation of SENC information

SENC = System Electronic Navigational Chart

(a)   The radar picture shall be clearly distinguishable from the chart independently of the chosen colour table.

(b)   Only a monochrome presentation of the actual radar picture is permitted.

(c)   The presentation of chart information shall not mask or degrade important parts of the radar picture. This has to be ensured by appropriate entries into the look-up tables (ref. to section 3 of this standard, clause 2.2, field "radar code").

(d)   In **navigation mode**, chart and radar picture presentation shall have the same scale.

(e)   The heading line must be always visible.

(f)   Additionally, the mariner's own ship's contour and the safety contours may be inserted.

4.4   Chart orientation, positioning and shifting

(a)   In **navigation mode**, only the chart orientation "relative motion, head up" and the "centred" or "off centred" presentations, as required for the radar picture, are permitted.

(b)   In **information mode**, at least the chart orientations north and parallel to the waterway axis as well as positioning are recommended. By connection of a positioning sensor, the displayed part of the chart can automatically follow the mariner's own ship's position.

4.5   Position and bearing of the own ship

(a)   In **navigation mode**, the own ships position shall always be visible in the display area, whether "centred" or "off centred" as specified in the CCNR radar requirements.

(b)   The heading line, which runs from the display centre to the top and which always shall be visible, shall represent the heading of the mariner's own ship.

4.6   Information density

The information density shall be at least adjustable to the three switch steps: "Minimum", "Standard" and "All Information". The latter displays all other features in addition to the "Standard" display, individually on demand. All corresponding visible features are defined in the "Performance Standard" and the "Presentation Standard" (-> "Presentation Library for Inland ECDIS") (Sections 1 and 3 of the Inland ECDIS Standard).

4.7   Ranges/range rings

(a)   In **navigation** mode the following fixed ranges and range rings are prescribed according to the radar regulations:

Range	Range rings
500 m	100 m
800 m	200 m
1.200 m	200 m
1.600 m	400 m
2.000 m	400 m

(b)   Both, smaller as well as larger ranges with a minimum of four and a maximum of six range rings are permitted.

(c)   Inland ECDIS equipment in **navigation** mode shall have fixed range rings with the above-mentioned intervals and at least <u>one</u> variable range marker (VRM).

(d)   Switching on/off of fixed and variable range markers shall be independent of each other and their display has to be clearly distinguishable.

(e)   The position of the VRM and the corresponding displayed distance shall use the same increments and resolution.

(f)   The functions of the VRM and the electronic bearing line (EBL) may <u>additionally</u> be realised by a cursor and by a corresponding numerical display, showing range and bearing of the cursor position.

(g)   For **information mode** the same ranges are recommended.

4.8   Picture brilliance

(a)   The brightness of the display shall be adjustable to the operationally necessary value. This applies in particular to operation in darkness.

(b)   Chart and radar picture require separate brightness controls.

(c)   Because of the strongly different environment brightness of bright day and dark night, another control for the basic brightness of the display shall be available additionally to the colour tables in the menu.

4.9   Picture colours

At least the colour combinations included in the IHO-S-52 Presentation Library, ch. 4 and 13 (*colour tables*) for bright day, white-back day, black-back day, dusk and night shall be supported.

4.10 Pick report

(a)   In **navigation** mode, it shall be possible to get all underlying textual and/or graphical information concerning user selections of the features that are displayed in the chart.

(b)   This additional textual and/or graphical information shall not hamper the view of the waterway in the navigational chart.

4.11 Measuring features

(a)   Measuring features for distances and bearings are required.

(b)   Resolution and accuracy shall at least be the same as those of the display, but may not suggest better values than those of the chart data.

4.12 Input and editing of skippers' own chart entries

(a)   Inland ECDIS equipment shall allow input, storing, modifying, and deletion of additional chart information by the skipper (*skippers' own features*).

(b)   These own chart entries shall be distinguishable from the SENC data, and may not overlay or degrade the radar picture.

4.13 Loading and updating of SENC's

(a) All **manual** activities concerning loading or updating of charts shall be possible only outside the navigation mode.

(b) **Automatic** updating shall not downgrade the performance of the navigation display.

(c) A **rollback function** has to be implemented to allow restoring to the last working combination.

4.14 Radar picture presentation and overlay

(a) The radar image representation is mandatory for operation in the navigation mode.

(b) The dimensions, resolution and attributes of the radar presentation shall fulfil the relevant radar requirements.

(c) The radar picture must not be degraded by other contents of the picture (see clause 4.3.c)

(d) Provided the functional requirements are fulfilled, overlaying of different information layers is permitted.

(e) The overlay of information regarding the position and orientation of other vessels is only allowed when:

- the information is up-to-date (nearly real-time) and
- the age of the information does not exceed 5 seconds

(f) The overlaid information derived from tracking and tracing devices regarding the position and orientation of other vessels shall be faded out at a user-definable range.

(g) The presentation of the position and the orientation of other vessels by

- a directed triangle or
- a true outline (to scale)

  are permitted only if the heading of these other vessels is available. In all other cases a generic symbol shall be used (a square is recommended, a circle should be used for inland applications only).

(h) It shall be possible to switch off the chart and any other information layer and to display only the radar picture by one easily accessible control element or menu area.

(i) If the quality and plausibility monitors of the Inland ECDIS equipment detect that the chart cannot be oriented and/or positioned with the accuracy required by this document, an alarm shall be presented on the display and the chart shall be switched off automatically.

4.15 Inland ECDIS functions with immediate access

(a) The following operational functions require direct access:

- RANGE
- BRILLIANCE
- COLOURS
- INFORMATION DENSITY

(b) These functions need either own control elements or own menu areas, which are arranged in the highest menu level and are permanently visible.

4.16 Permanent visible function parameters

The following function parameter shall be always visible:

- actual RANGE
- sensor STATUS (radar tuning, position quality, alarms)
- selected WATER LEVEL (if available)
- selected SAFETY DEPTH (if available)
- selected INFORMATION DENSITY

5   Service functions

Service functions have to be protected by password or other suitable measures against unauthorised access and shall not be selectable in navigation mode.

5.1 Static correction of the chart position

(a) The position of the mariner's own ship shall be presented "centred" or "off centred" on the display in accordance with the radar requirements. The chart position shall match the radar image. Assuming an absolute position's input the permissible static difference between actual radar position and displayed radar centre shall not exceed 1 m.

(b) It shall be possible to correct an offset error (distance between the positions of the position sensor and the radar sensor).

5.2 Static correction of the chart orientation

(a) The difference between the heading line orientation and the ship's axis shall not be greater than ± 1.0 deg.

(b) Chart and radar image shall have the same orientation. The static directional error between heading line and chart orientation shall be less than ± 0.5 deg.

5.3 Configuration of interfaces

(a) It shall be possible to configure interfaces for connected sensors, actors and signals (*An actor transforms an electrical quantity into another physical quantity (e.g. optical). An actor is the opposite of a sensor*).

(b)   Interfaces shall comply with existing interface specifications like the NMEA 01/83 standard and the interface specifications for rate of turn indicators (20 mV/deg/min).

6   Hardware test and required certificates

(a)   The test consists of a comparison between the equipment under test (EUT) and the requirements of this document.

(b)   Proved equivalent tests, and proved and documented test results will be accepted without renewed tests.

6.1   Compatibility with the environmental requirements

(a)   Inland ECDIS equipment, as described in paragraph 2.2.4, shall fulfil the requirements of the Standard EN 60 945 concerning the environmental conditions (humidity, vibration and temperature; the latter reduced according to chapter 3.1 of this document) and concerning electromagnetic compatibility.

(b)   The provider or his representative is obliged to submit a relevant conformity declaration of an accredited laboratory.

6.2   Equipment documentation

The technical documentation will be checked to be complete, appropriate, and understandable, and to be sufficient for unproblematic installation, configuration and operation of the equipment.

6.3   Interfaces

(a)   All interfaces shall be documented correctly and completely.

(b)   Electronic Circuits need to be designed failsafe, mechanically as well as electronically, and may not have degrading repercussions on connected equipment.

6.4   Characteristic of operation controls

All operation controls will be checked regarding the ergonomic and functional mode of operation and shall fulfil the requirements of this document.

6.5   Characteristic of the display

The display shall fulfil all requirements of this document concerning dimension, displayable colours, resolution, and variation of brilliance.

7   Test of the chart presentation, operation and functionality

7.1   Preparation of the equipment under test (EUT)

The EUT will be installed, assembled and connected according to the installation manual. After switching on the test SENC will be loaded.

7.2　Test of the operation modes

All operating modes as described in the operating manual will be successively invoked and tested. The requirements of chapter 4 shall be fulfilled.

7.3　Test of the displayed features

Whether all features included in the test SENC are visible and correctly displayed will be tested. For this test, the information density will be switched to "all features". The system shall be capable to at least display all features according to the "Presentation Standard for Inland ECDIS" (Section 3 of the Inland ECDIS Standard). Additionally other user-selectable symbol sets are allowed.

7.4　Test of the scale dependent information density (SCAMIN)

(a)　Whether the SCAMIN functionality (*the minimum scale at which the feature may be used for ECDIS presentation)* is installed correctly will be tested.

(b)　For this test, the range will be used at which the feature shall be visible according to its SCAMIN enumeration (ref. to the IHO-S-57 Attribute Catalogue and the IHO-S-52 Users Manual to the Presentation Library, ch. 8.4).

7.5　Test of brilliance variation

The Inland ECDIS equipment will be operated in a dark room and the brilliance will be brought to its lowest level. The brilliance of the features shall not exceed a value of 15 cd/m^2, and the background a value of 0,5 cd/m^2.

7.6　Test of the colours

All user selectable S-52 colour tables will be sequentially tested to conform to this document.

7.7　Test of the measurement functions

(a)　All <u>numeric</u> displayed values of the electronic bearing line (EBL) and the variable range marker (VRM) shall exactly match with the <u>analogue</u> positions of the EBL and the VRM (or correspond with the cursor co-ordinates).

(b)　The resolution and increments of the numerical display shall be identical with the analogue values of EBL and VRM.

7.8　Test of the chart update function

(a)　Before and after every test step the version numbers of the loaded SENCs and updates will be recalled as described in the operation manual and showed on the display.

- Step 1: Loading of the test SENC,
- Step 2: Update of the test SENC,
- Step 3: Test of the roll-back function,

- Step 4: Loading of a new SENC.

After an update it should be possible to recall and display all concerning features.

7.9 Test of displayed features in more than one cell of the same usage for the same area

It will be tested whether all features included in the test SENC and in the additional overlay test SENC are visible and correctly displayed. For this test the information density will be switched to "all features". It will be tested whether it is possible to select one or more specific cells for presentation if there are several cells from different producers for the same area with the same usage.

8 Test of radar picture presentation and operation

8.1 Preparations

(a) For the test purposes, the manufacturer or provider has to provide a serial interface at the system to be approved (*Equipment under test* - EUT) which delivers the same actual values (as NMEA 01/83 strings) of position and heading that are used to position and orient the chart.

(b) During the test, a reference system will be used of which position and heading values are compared with those of the EUT.

(c) The EUT will be connected to any type approved radar equipment (to the choice of the provider).

(d) The radar picture will be adjusted in range and bearing with reference to the heading line.

8.2 Test of the radar picture without underlaid chart

(a) If the Inland ECDIS equipment displays the radar picture but the radar operation control remains at the radar equipment (App. B, figures 2 and 3), the radar picture of the inland ECDIS equipment will be considered as the "daughter display" of an item of radar equipment. In that case, the radar picture has to fulfil <u>the display and picture-relevant requirements</u> of the requirements for radar and rate-of-turn indicators.

(b) If the EUT is a radar installation with integrated Inland ECDIS functionality (Appendix B, figure 4), <u>all requirements</u> of the standards for radar equipment and rate-of-turn indicators have to be fulfilled.

8.3 Test of the radar picture, overlaid information from other vessels and the underlying chart

The Inland ECDIS equipment will be installed in a reference environment. This can be real (on a ship) or simulated. Position and orientation information of other vessels (conform the Inland AIS standard) will be applied with several information ages.

8.3.1 Test of the radar overlay

(a)   The radar image shall not be degraded by the chart picture (ref. to ch. 4.3.c).

(b)   The overlay of information regarding the position and orientation of other vessels is only displayed when:

- the information is up-to-date (nearly real-time) and
- the age of the information does not exceed 5 seconds

(c)   The overlay of information derived from tracking and tracing devices regarding the position and orientation of other vessels is faded out at a user-definable range.

(d)   The position and the orientation of other vessels by

- a directed triangle or
- a true outline (to scale)

is displayed only when the heading of these other vessels is available. For all other vessels a generic symbol is used (a square is recommended, a circle should be used for inland applications only).

(e)   It is possible to switch off the chart and any other information layer and to display only the radar picture by one easily accessible control element or menu area.

(f)   The chart picture shall be renewed not later than the radar picture.

8.3.2 Test of the chart positioning and orientation

(a)   The static offset of the chart position shall be less than $\pm$ 5 m in all ranges up to 2,000 m.

(b)   The static azimuth orientation offset error between radar and chart image shall be less than $\pm$ 0,5 deg.

(c)   The correction of these parameters shall be demonstrated in the service mode.

(d)   The dynamic deviation of the chart orientation at rates of turn less than $\pm$ 60 deg./min shall be less than $\pm$ 3 deg.

(e)   These tests will be performed visually or by evaluation of measured data.

8.3.3 Test of scale conformity

The chart's information will be compared with well-known reference points contained in the radar picture in order to test whether the chart scale sufficiently conforms to the radar scale.

9   Test of alarms and indications

(a)   The alarms generated from Inland ECDIS equipment itself as well as the passed alarms delivered by the connected sensors to the ECDIS will be tested.

(b)　The test procedure comprises the following situations:

- any error in the Inland ECDIS equipment (built-in test equipment - BITE),
- missing positioning signal,
- missing radar signal,
- missing rate of turn signal,
- missing heading signal,
- radar map matching not possible.

10　Test of fall back arrangements

(a)　This test shall demonstrate the reaction of the Inland ECDIS equipment to a failure of any internal or external component and the possible and required actions by the operator.

(b)　In addition, the operating manual will be checked to determine whether the measures required by the operator are described adequately and appropriately.

11　Maintenance

This section of this edition 2.x of the standard will be updated by means of the following two documents:

Clarifications Document

This contains improvements to the wording of the standard. These are editorial amendments, which do not result in any substantive change to the standard.

Corrections and Extensions Document

This contains changes to the standard to correct factual errors and to make necessary amendments or extensions to the standard.

SECTION 4

**Operational and Performance Requirements,
Methods of Testing and required Test Results**

**Appendix A
Measures to Ensure Software Quality**

1   General requirements

Software used in navigation mode is assumed to be a safety-relevant part of a navigation system. Providers of navigation systems have to make sure that all software components used in navigation mode allow secure navigation in every situation.

1.1   Software design requirements

Software components have to be clearly designed by means of established software design methods. The design specification must indicate how safety requirements are addressed in the software design.

A software style guide has to be provided that specifies code writing style, documentation style, modularization, conflict analyses and testing of software components. For every software component documents describing specification and design are required.

1.2   Implementation requirements

Implementation of software modules has to be done by qualified developers, fully understanding the design and safety requirements.

If more than one developer is working on the navigation system software, a version control system has to be used that guarantees conflict-free development.

The implementation has to be according to the design specification and has to reflect the software style guide. Moreover, well known implementation problems (depending on the language used) have to be addressed in the implementation. This includes but is not restricted to:

- null pointer handling,
- uninitialised variables,
- range checking,
- array size verification,
- memory allocation and de-allocation,
- exception handling.

If parallel processing is used (e.g. multiple threads, tasks or processes) problems of conflict-free processing have to be addressed in the implementation. This includes but is not restricted to:

- race conditions,
- re-entrance problems,
- priority inversion,
- deadlocks.

1.3 Test requirements

In accordance with the design specification, software modules have to be tested. The test results have to be compared with the design guidelines and documented in test reports.

Tests have to incorporate module as well as system tests. Providers of a navigation system have to use extensive simulator-based tests to ensure stability of their system. The simulator must allow the simulation of a complete navigation environment including all required external sensors.

1.4 Third party components requirements

Third party components (OEM products, OEM means original equipment manufacturer) include software not developed by the navigation system provider. This includes but is not restricted to
- static or dynamic linked libraries,
- computer aided design and engineering tools producing source or object code,
- operating systems.

Third party software components have to be chosen according to the general safety requirements. The navigation system provider has to prove that third party components meet the high standards necessary for safe navigation either by providing acceptable quality certificates or by extensive and provable testing of the components.

1.5 Requirements for additional services in navigation mode

Navigation systems may support additional services in navigation mode if they are useful. These services must not interfere with navigation mode.

The navigation system provider is responsible for additional test equipment, necessary to verify interface specification, protocol specification and compliance tests with the Inland ECDIS standard.

1.6 Language

Additional national versions of a type-approved Inland ECDIS shall reapply for type approval to be checked for the translation of the user interface.

1.7 Documentation requirements for users

The documentation (manuals) has to contain comprehensive information on installation, operation and service of the navigation system. The presentation of user-relevant information shall be made clear, understandable and without unnecessary technical terms. The user manual shall be available in the official CCNR languages. The technical documentation may be made available in English only.

2 Methods of testing and required results

2.1 Navigation mode operation test

2.1.1 Performance requirements

Navigation systems must make reliable estimations of position and heading. Moreover, the estimation of position and heading has to be checked by the system for conformity with the required accuracy.

Position and heading information has to be calculated and displayed for the same reference position. This should normally be the centre of the radar antenna. A new position estimate must at least be available with every revolution of the radar antenna.

2.1.1.1 Position

The navigation system has to estimate and display the position of the ship. The following minimal requirements have to be fulfilled under normal operation conditions:

(a)   The average position estimation shall not deviate more than 5 meters from the true position and shall cover all systematic errors.

(b)   The standard deviation σ has to be less than 5 meters and shall be based on random errors only.

(c)   The system shall be capable to detect deviations of more than 3σ within 30 seconds.

These results have to be verified by a realistic test of at least 60 min.

2.1.1.2 Heading

The navigation system has to estimate and display the heading of the ship.

The following minimal requirements have to be fulfilled:

(a)   The average heading angle estimation shall not deviate more than 1 degree from the radar heading direction and shall cover all systematic errors. The offset between ship heading direction and radar heading shall be less than 1 degree.

(b)   The standard deviation σ has to be less than 2 degrees and shall be only based on random errors.

These results have to be verified by a realistic test of at least 60 min.

2.1.2 Sensor failure

Navigation systems have to check proper operation of the position and heading estimation online. Problems have to be detected within 30 seconds. In case of malfunction, the navigation system has to inform the user about the problem and its consequence for navigation.

If reliable navigation is not possible the navigation chart should not be displayed.

2.1.3 Performance test interface

A navigation system provider has to equip navigation systems during the compliance test with a standard NMEA interface sending the position and heading information used by the navigation system. This information has to be encoded by NMEA sentences known as GGA and PAT.

Example: GGA - Global Position System Fix Data

$GPGGA,123519,4807.038,N,01131.324,E,1,08,0.9,545.4,M,46.9,M, , *42<CR><LF>

123519	Fix taken at 12:35:19 UTC. (This field has to provide the time of the position estimation.)
4807.038,N	Latitude 48 deg 07.38' N (This field has to provide the latitude of the fix.)
01131.324,E	Longitude 11 deg 31.324' E (This field has to provide the longitude of the fix.)
1	Fix quality (0 = invalid, 1 = GPS fix, 2 = DGPS fix (This field can have any valid value.)
08	Number of satellites being tracked. (This field can have any valid value.)
0.9	Horizontal dilution of position (This field can have any valid value.)
545.4,M	Altitude, Metres, above mean sea level. (This field is can have any valid value.)
46.9,M	Height of geoid (mean sea level) above WGS 84 ellipsoid. (This field can have any valid value.)
(empty field)	Time in seconds since last DGPS update. (This field can have any valid value.)
(empty field)	DGPS station ID number. (This field can have any valid value.)

Example: PAT - Position and altitude message
**   (Ashtech proprietary position and altitude message.)**

$GPPAT,223924.0,3922.2871,N,12159.4503,W,+/-00253.2,121.673,+/-002.59, +/-004.61,.....
...0.0031, 0.0205, 0<CR><LF>

223924.0	UTC of position. (This field has to provide the time of the position estimation.)
3922.2871,N	Latitude 39 deg 22.2871' N (This field has to provide the Latitude of the fix.)
12159.4503,W	Longitude 121 deg 59.4503' W (This field has to provide the Longitude of the fix.)
+/-00253.2	Altitude in meters. (This field can have any valid value.)
121.673	Heading in degrees. (This field has to provide the heading angle use by the navigation system.)
+/-002.59	Pitch in degrees. (This field can have any valid value.)
+/-004.61	Roll in degrees. (This field can have any valid value.)
0.0031	Attitude phase measurement error MRMS (meters). (This field can have any valid value.)
0.0205	Attitude baseline length rms error, BRMS (meters). (This field can have any valid value.)
0	Attitude reset flag ((0: good attitude, 1: rough estimate or bad attitude). (This field can have any valid value.)

Both strings have to be sent over the same NMEA interface at least every second. The position and heading have to be according to the definitions in section 2.1.1.1 and section 2.1.1.2 of this Appendix.

2.2 General software tests

2.2.1 Equipment documentation

The following documents have to be provided for admittance and have to be shipped with every navigation system:

- Users manual,
- Installation manual,
- Service manual.

The following documents and files have to be provided during the admittance procedure and are not required for end users:

- design specification,
- software style guide,
- certificates of third party software components or test and simulation protocols.

The documents and files provided must allow a complete verification of compliance with the Inland ECDIS standard.

2.2.2 Endurance test

The navigation system must pass an endurance test of 48 hours of uninterrupted operation under normal operation conditions. The system has to provide standard interfaces for performance and resource monitoring during operation. Monitoring the system must show no indication of system instability, memory leaking or any kind of performance loss over time. Navigation systems supporting additional services while running in navigation mode provide the necessary test equipment including all documents mentioned in chapter 1.7 of this Appendix.

3 Changes to certified systems

3.1 General requirements

Navigation systems installed on board must be functionally equivalent to a system certified by authorities. For every system the navigation system provider must ship a statement of compliance with the Inland ECDIS standard and its functional equivalence to the certified system.

The competent authority is entitled to check Inland ECDIS compliance of installed systems at any time.

3.2 Hardware and software changes

The navigation system provider can change software or hardware as long as Inland ECDIS compliance is maintained. Changes have to be fully documented and submitted to the competent

authority together with an explanation of how the navigation system is affected by these changes. The competent authority can require a partial or complete renewal of certification if considered necessary. The aforementioned also applies to the use of an approved Inland ECDIS with another national version of the operating system.

The following changes do not affect certification of the system and require only a notice to the competent authority:

- minor changes on third party components (e.g. operation system or library updates),
- use of equivalent or better hardware components (e.g. faster microprocessor, newer
- chip revisions, equivalent graphic card etc.),
- minor changes in source code or documentation.

4   Maintenance

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SECTION 4

**Operational and Performance Requirements,
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Appendix B

System Configurations
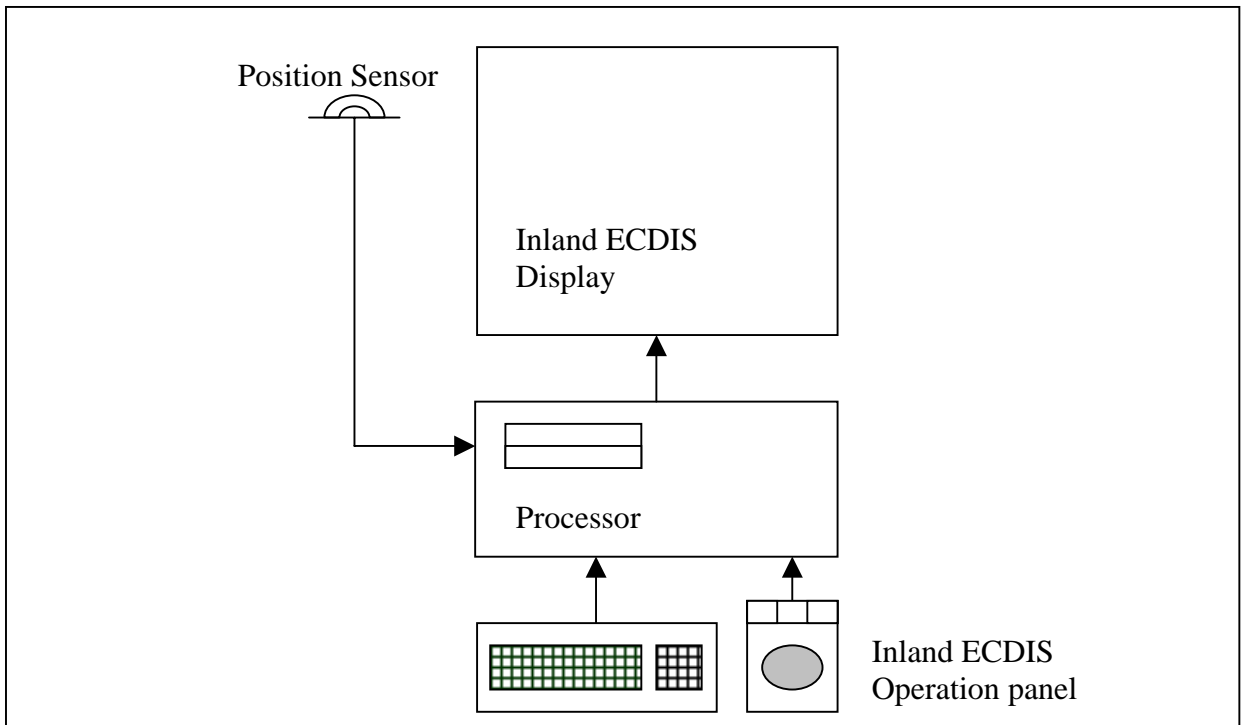
Figures

Position Sensor

Inland ECDIS
Display

Processor

Inland ECDIS
Operation panel

Fig. 1: Inland ECDIS equipment, self-sufficient system without connection to radar

Position Sensor

Radar Sensor

Display
Inland ECDIS
with overlaid
radar picture

Radar
Display

ECDIS-Processor

Radar-Processor

Inland ECDIS Operation Panel

Radar Operation Panel
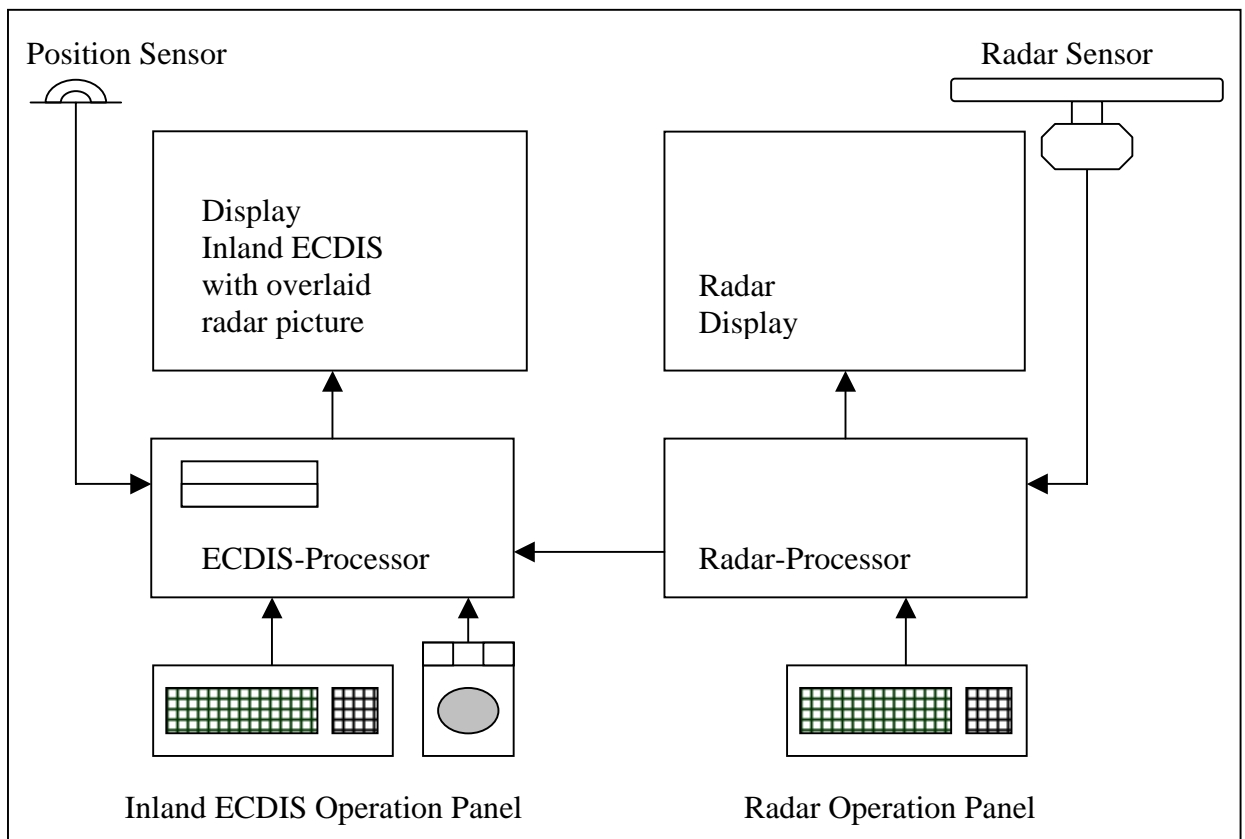
Fig. 2: Inland ECDIS equipment, self-sufficient system with connection to radar

Position Sensor

Radar Sensor

Display

Inland ECDIS with overlaid Radar Picture

Switch

Radar Picture

ECDIS-Processor

Radar-Processor

Inland ECDIS Operation Panel

Radar Operation Panel
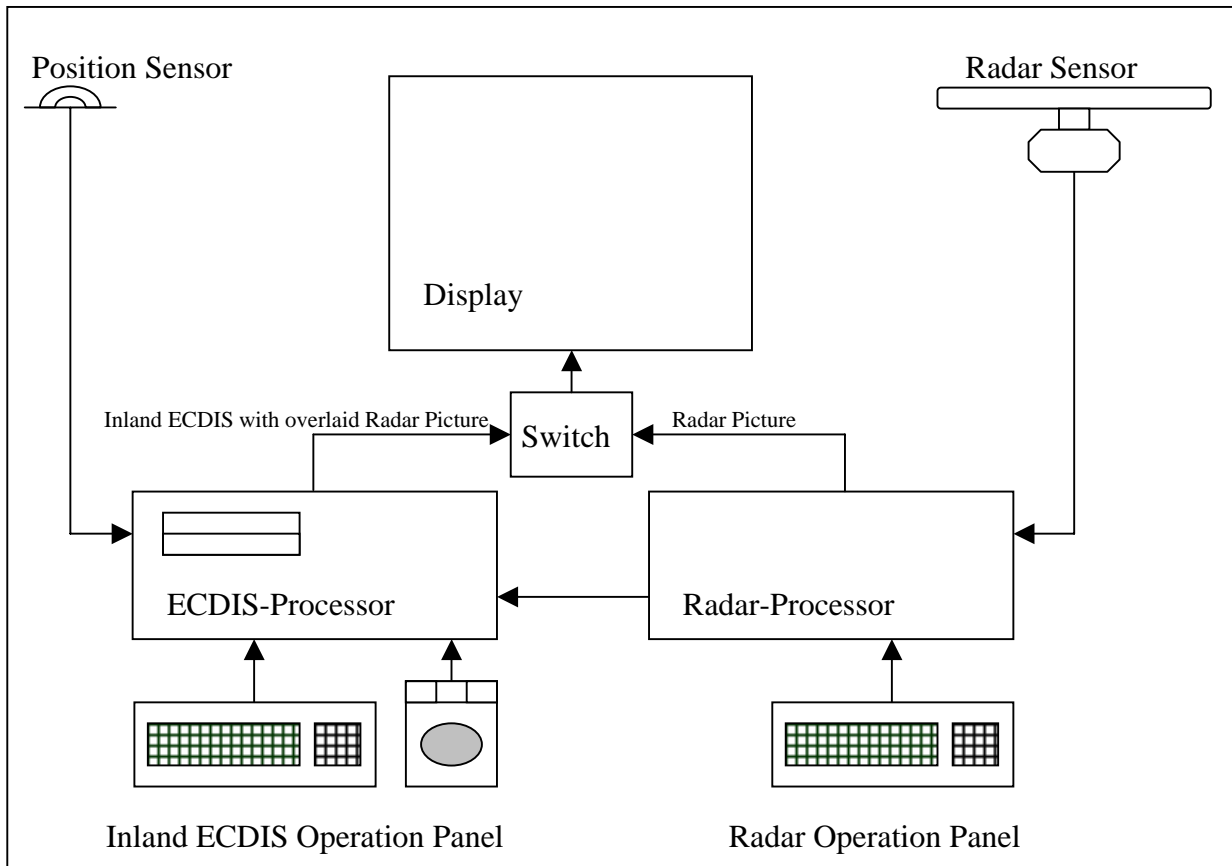
Fig. 3: Inland ECDIS equipment with connection to radar and shared monitor

Position Sensor

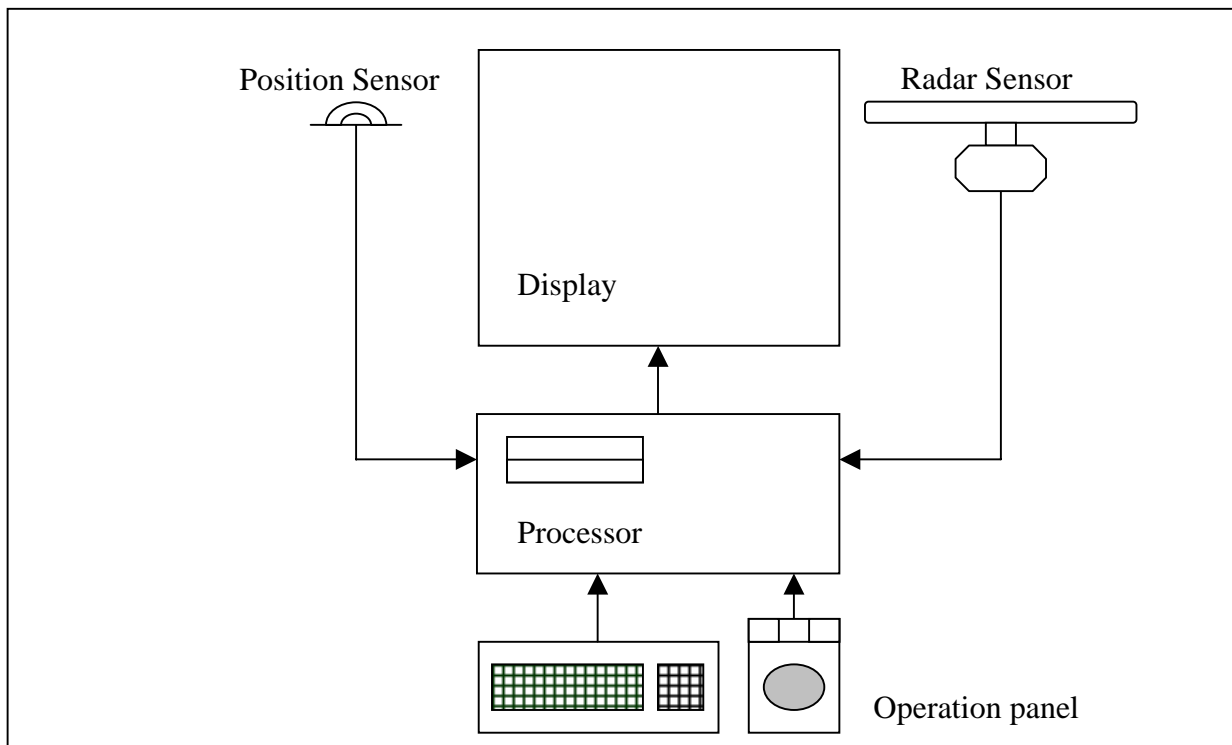Radar Sensor

Display

Processor

Operation panel

Fig. 4: Navigational radar equipment with integrated Inland ECDIS functionality

SECTION 5

GLOSSARY OF TERMS

Sources

1   IMO Resolution A.817(19)

2   IHO S-52 (especially Appendix 3 "Glossary of ECDIS-related Terms")

3   IHO S-57 (especially Part 1 "General Introduction", clause 5 "Definitions")

4   Inland ECDIS Standard, Edition 2.0

    4.1   Section 1: Performance Standard for Inland ECDIS

    4.2   Section 2: Data Standard for Inland ENCs

    4.3   Section 2a: Codes for Producers and Waterways

    4.4   Section 3: Presentation Standard for Inland ECDIS

    4.5   Section 4: Operational and Performance Requirements, Methods of Testing and Required Tests Results including its appendices A and B

5   IENC Register

6   IEHG Product Specification for Inland ENCs

7   IEHG Inland ENC Feature Catalogue

8   IEC Guideline 1174

9   CCNR Radar Regulations

10   CCNR RIS Guidelines 2004

Remark:

Definitions of the features and attributes can be derived from

- the tables of IHO S-57, Appendix A "Object Catalogue", and
- the Feature Catalogue for Inland ENCs at http://ienc.openecdis.org.

Term or Abbreviation	Definition	Source
Acronym	6-character-code of the feature/of the attribute	3
AIS	Automatic Identification System: An automatic communication and identification system intended to improve the safety of navigation by assisting in the efficient operation of vessel traffic services (VTS), ship reporting, ship-to-ship and ship-to-shore operations.	2
All information density	All information density (all display) means the maximum amount of SENC information. Here, in addition to the standard display, also all other objects are displayed, individually on demand.	4.1
Attribute	A defined characteristic of an entity (e.g. the category of a light, the sector limits, the light characteristics etc.).	3
Attribute copied	S-57/S-100 attributes (with their complete list of attribute values) which were extended according to the requirements of Inland ECDIS. All new attributes have the same name like their source, but written in small case letters.	7
CCNR	Central Commission for Navigation on the Rhine; international commission based on the "Convention of Mannheim". Current Member States are Belgium, France, Germany, The Netherlands and Switzerland. The most important and permanent objectives of CCNR are: • Prosperity of inland navigation on the Rhine and in Europe • Maintenance of the high level of safety in inland navigation and its surroundings	
Cell (chart cell)	A cell is a geographical area containing Inland ENC data.	3
CIE colour calibration	Procedure to confirm that the colour specified in IHO S-52 is correctly reproduced on the ECDIS display.	2
Collection feature	Type of feature containing information about the relationships between other features.	3
Compilation scale	The scale with which the chart information meets the IHO requirements for chart accuracy. It is established by the producing Hydrographic office and encoded in the ENC.	6
Datum	A set of parameters specifying the reference surface or the reference coordinate system used for geodetic control in the calculation of coordinates of points on the earth. Commonly datums are defined as horizontal and vertical datums separately. For the practical use of the datum it is necessary to have one or more well distinctive points with coordinates given in that datum.	2
Datum, horizontal	A set of parameters specifying the reference for horizontal geodetic control, commonly the dimensions and the location of a reference ellipsoid. (The horizontal datum must be WGS 84.)	6

Term or Abbreviation	Definition	Source
Datum, vertical	A surface to which elevations and/or depths (soundings and tide heights) are referred. For elevations commonly a level (equipotential) surface, approximately the mean sea level is used, for depths in many cases low water.	6
Differential GPS (DGPS)	A form of GPS in which the reliability and accuracy are enhanced by broadcasting a time-varying correction message from a GPS monitoring receiver (differential mode) at a known position on shore. The corrections are fed automatically into the GPS receiver onboard and used to compute an improved position.	4
Display base	Minimum information density; means the minimum amount of SENC information that is presented and which cannot be reduced by the operator, consisting of information that is required at all times in all geographic areas and under all circumstances.	1
Display scale	The ratio between a distance on the display and a distance on the ground, normalised and expressed as a ratio, e.g. 1:10 000.	2
EBL	Electronic Bearing Line	4.5
ECDIS	Electronic Chart Display and Information System; A navigation information system which can be accepted as complying with the up-to-date chart required by regulation V/20 of the 1974 SOLAS Convention, by displaying selected information from a system electronic navigational chart (SENC) with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required display additional navigation-related information. The performance requirements for ECDIS are defined in the Performance Standard for ECDIS developed by IMO/IHO/IEHG (Inland ENC Harmonization Group).	1
Edge	A one-dimensional spatial object, located by two or more coordinate pairs (or two connected nodes) and optional interpolation parameters.	3
Electronic chart	Very broad term to describe the data, the software, and the electronic system, capable of displaying chart information. An electronic chart may or may not be equivalent to the paper chart required by SOLAS.	2
ENC	Electronic Navigational Chart; The data base, standardized as to content, structure and format, issued for use with ECDIS on the authority of government authorized hydrographic offices. The ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions) which may be considered necessary for safe navigation.	1
ENC cell	The geographic division of ENC data for distributing purposes.	8

Term or Abbreviation	Definition	Source
Enumeration	A specific quality or quantity assigned to an attribute (e.g. "leading light", the limiting angles, the code specifying the light's colour – see attribute).	7
Exchange format	A specification for the structure and organization of data to facilitate exchange between computer systems.	2
Exchange set	Set of files representing a complete, single purpose (i.e. product specific) data transfer. For example, the ENC product specification defines an exchange set which contains one catalogue file and at least one data set file.	2
Feature	An identifiable set of information. A feature may have attributes and may be related to other features. A digital representation of all or a part of an entity by its characteristics (attributes), its geometry, and (optionally) its relationships to other features (e.g., the digital description of a light sector specifying, amongst others, sector limits, the colour of the light, the visibility range, etc., and a link to a light tower, if any).	2
Feature catalogue	The comprehensive list of currently identified features, attributes and enumerations which are allowed for the use in Inland ENCs.	7
Feature copied	S-57 features (with their complete set of attributes) which were extended according to the requirements of Inland ECDIS. All new features have the same name like their source, but are written in small case letters.	7
Feature Data Dictionary	A feature data dictionary specifies independent sets of features and attributes that may be used to describe geographic information in a particular context. A feature data dictionary may be used to develop a feature catalogue.	
File	An identified set of S-57 records collected together for a specific purpose. The file content and structure must be defined by a product specification.	2
Geo Feature	Type of feature containing the descriptive characteristics of a real world entity.	2
Geometric Primitive	One of three basic geometric units of representation: point, line and area.	2
Heading	The direction in which the longitudinal axis of a craft is pointed, usually expressed as an angular distance from north clockwise through 360 degrees (true, magnetic or compass).	2
Head-up display	The information shown on the display (radar or ECDIS) is directed so that the vessel's heading is always pointing upward. This orientation corresponds to the visual view from the bridge in direction of the ship's heading. This orientation may require frequent rotations of the display contents. Changing the ship's course, or yawing of the vessel may render this unstabilized orientation mode unreadable.	2

Term or Abbreviation	Definition	Source
IEC	International Electrotechnical Commission: An international (non-governmental) organization which produces world standards for electrical and electronical engineering with the objective of facilitating international trade.	2
IHO	International Hydrographic Organization: Coordinates the activities of national hydrographic offices; promotes standards and provides advice to developing countries in the fields of hydrographic surveying and production of nautical charts and publications.	2
IHO registry	A "registry" is the entire information system (or location) in which a collection of registers is located. In the case of the future S-57 (the so-called S-100) IHO will host a registry that will provide a facility to store various registers of hydrographic -related information. This will include feature data dictionaries, metadata and code lists (e.g. sounding datums). There will be registers for Hydrographic Information, Dynamic Ice Coverage, Additional Military Layers (AMLs), and Inland ENCs. Other types of information that do not fit into these categories can be included in the Open ECDIS Forum (OEF) register. For each register there is an organization that will be responsible for its content and management.	
(IHO-) S-52	Specifications for chart content and display aspects of ECDIS.	2
(IHO-) S-52 App. 1	Guidance on updating the Electronic Navigational Chart	2
(IHO-) S-52 App. 2	Colour and symbols specifications for ECDIS.	2
(IHO-) S-57	IHO Transfer standard for digital hydrographic data.	3
(IHO-) S-57 App. A	IHO Object Catalogue.	3
(IHO-) S-57 App. B	ENC Product Specifications.	3
(IHO-) S-62	ENC Producer Codes	
IMO	International Maritime Organization: Formerly called IMCO, the IMO is the specialized agency of the United Nations responsible for maritime safety, efficiency of navigation and prevention of marine pollution from ships.	2
Information Mode	means the use of the Inland ECDIS for information purposes only without overlaid radar image.	4.1

Term or Abbreviation	Definition	Source
Inland AIS	AIS for the use in inland navigation and interoperable with (maritime) AIS – technically enabled by amendments and extensions to the (maritime) AIS	
Inland ECDIS	An Electronic Chart Display and Information System for inland navigation, displaying selected information from a Inland System Electronic Navigational Chart (Inland SENC) and optionally, information from other navigation sensors.	4.1
Inland ENC (IENC)	Inland Electronic Navigational Chart: The database, standardised as to content, structure and format, issued for use with Inland ECDIS. The Inland ENC complies to the IHO standards S-57, S 62 and S-52, enhanced by the additions and clarifications of this standard for Inland ECDIS. The Inland ENC contains all essential chart information and may also contain supplementary information that may be considered as helpful for navigation.	4.1
Inland ENC register	Register within the registry of IHO dedicated for Inland ENC – related entries.	
Inland SENC	Inland System Electronic Navigational Chart: A database resulting from the transformation of the Inland ENC by Inland ECDIS for appropriate use, updates to the Inland ENC by appropriate means and other data added by the mariner. It is this database that is actually accessed by the Inland ECDIS for the display generation and other navigational functions. The Inland SENC may also contain information from other sources.	4.1
INT 1	International chart 1: Specification of symbols, abbreviations and terms to be used in the International Chart Series of IHO. (Provides the chart user with a key to symbols, abbreviations and terms used on charts compiled in accordance with the "Chart Specifications of the IHO"). Contains description entries for features and attributes. Can be seen as the reference to the legend of paper charts.	2
Integrated display	means a head-up, relative-motion picture consisting of the Inland SENC overlaid with the radar-image with matching scale, offset and orientation.	4.1
Look-up table	A table giving symbology instructions to link SENC objects to point, line or area symbolisation and providing display priority, radar priority, IMO category and optional viewing group.	2
M-4	Gives chart specifications of the IHO for compiling nautical charts, together with agreed symbols and abbreviations adopted for general use by Member States. Provides also regulations for INT Charts. Contains description entries for features and attributes.	3
Meta object	A feature which contains information about other features.	2

Term or Abbreviation	Definition	Source
Navigation Mode	means the use of the Inland ECDIS for conning the vessel with overlaid radar image.	4.1
North-up display	Information shown on the display (radar or ECDIS) with the north direction upward.	2
Other navigational information	Navigational Information not contained in the SENC, that may be displayed by an ECDIS, such a radar information.	2
Overscale	Displaying data at a larger scale than it was compiled for.	2
Own-ship	The term which identifies the vessel upon which an ECDIS is operating.	2
Own ship's safety contour	The contour related to the own ship selected by the mariner from the contours provided for in the SENC, to be used by ECDIS to distinguish on the display between the safe and the unsafe water, and for generating anti-grounding alarms.	2
Performance standard for ECDIS	Standard developed under the authority of IMO to describe the minimum performance requirements for navigational devices and other fittings required by the SOLAS Convention. Adopted by IMO 23 November 1995 as Assembly resolution and published as Annex to IMO Resolution A19/Res 817 (15 December 1995).	2
Pick report (feature report)	The result of querying a displayed point-symbol, line or area for further information from the data base which is not represented by the symbol.	2
Presentation library for ECDIS	A set of mostly digital specifications, composed of symbol libraries, colour schemes, look-up tables and rules, linking every feature and attribute of the SENC to the appropriate presentation of the ECDIS display. Published by IHO as Appendix 2 of its Special Publication No. 52 (S-52).	2
Product specification	A defined subset of the entire specification combined with rules, tailored to the intended usage of the transfer data. (The ENC Product specification specifies the content, structure and other mandatory aspects of an ENC.)	2
(Radar) range	Distance from the radar antenna. For inland navigation the radar range has to be sequential switchable according to the CCNR Radar Regulations.	9
Relative motion display	A relative motion display shows the chart information, and radar targets, moving relative to the vessel position fixed on the screen.	2
Route planning	An ECDIS function in which the area is displayed which is needed to study the intended route, to select the intended track, and to mark the track, its way points and navigational notes.	1

Term or Abbreviation	Definition	Source
SCAMIN	The minimum scale at which the feature may be used e.g. for ECDIS presentation.	3
SENC	System Electronic Navigational Chart: A data base resulting from the transformation of the ENC by ECDIS for appropriate use, updates to the ENC by appropriate means and other data added by the mariner. It is this data base that is actually accessed by the ECDIS for the display generation and other navigational functions. The SENC may also contain information from other sources.	2
Spatial object	An object which contains locational information about real world entities.	2
Standard display	Standard Information Density means the default amount of SENC information that shall be visible when the chart is first displayed on ECDIS first.	4.1
Vessel Tracking and Tracing	The function of maintaining status information of the vessel and – if needed – combined with information on cargo and consignments [tracking] and the retrieving of information concerning the whereabouts of the vessel and – if needed – combined with information on cargo, consignments and equipment [tracing].	10
True motion display	A display in which the own vessel and each radar target moves with its own true motion, while the position of all charted information remains fixed.	2
User-defined settings	Means the possibility to use and store a profile of display and operation controls-settings.	4.1
VRM	Variable Range Marker.	4.5
WGS 84	WORLD GEODETIC SYSTEM: The geodetic basis for the "Navigational Satellite Timing and Ranging - Global Positioning System" (NAVSTAR-GPS), which enables the surveying of the earth and its entities and was developed by the United States Department of Defense. This global geodetic reference system is recommended by IHO for hydrographic and cartographic use.	6

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