

Maritime navigation and radiocommunication equipment and systems — Electronic chart display and information system (ECDIS) — Operational and performance requirements, methods of testing and required test results

The European Standard EN 61174:2001 has the status of a
British Standard

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National foreword

This British Standard is the official English language version of EN 61174:2001. It is identical with IEC 61174:2001. It supersedes BS EN 61174:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee EPL/80, Maritime navigation and radiocommunication equipment and systems, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
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**Maritime navigation and radiocommunication equipment and systems -
Electronic chart display and information system (ECDIS) -
Operational and performance requirements,
methods of testing and required test results
(IEC 61174:2001)**

Matériels et systèmes de navigation
et de radiocommunications maritimes -
Systèmes de visualisation des cartes
électroniques et d'information (ECDIS) -
Exigences d'exploitation
et de fonctionnement, méthodes d'essai
et résultats d'essai exigés
(CEI 61174:2001)

Navigations- und
Funkkommunikationsgeräte
und -systeme für die Seeschifffahrt -
Elektronisches Kartendarstellungs-
und Informationssystem (ECDIS) -
Betriebs- und Leistungsanforderungen,
Prüfverfahren und geforderte
Prüfergebnisse
(IEC 61174:2001)

This European Standard was approved by CENELEC on 2001-12-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 80/308/FDIS, future edition 2 of IEC 61174, prepared by IEC TC 80, Maritime navigation and radiocommunication equipment and systems, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61174 on 2001-12-01.

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Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A, B, C, D, E, F, G, H, I, J and ZA are normative.
Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61174:2001 was approved by CENELEC as a European Standard without any modification.

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INTRODUCTION

For this second edition of this International Standard, the maintenance team completed the following tasks:

- a) developed minimum operational and performance requirements for the RCDS mode of operation in accordance with appendix 7 of the IMO performance standards as amended by IMO resolution MSC.86, importing much of the text from appendix 7 to produce an unambiguous and user-friendly annex H to this standard;
- b) developed separate tests for back-up arrangements as defined by appendix 6 of the IMO performance standards (see annex G);
- c) clarified the colour tolerance requirements and created allowances for the separate testing of monitors;
- d) performed an extensive review of the standard to ensure proper referencing and language throughout.

Technical committee 80 recognizes that there is further work to be accomplished in this standard, and a future revision is anticipated within 12 to 18 months, to incorporate some critical hydrographic considerations including the RNC test data set, several S-57 definitions and tests and harmonisation of the navigation related symbols.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS –

Electronic chart display and information system (ECDIS) – Operational and performance requirements, methods of testing and required test results

1 Scope

This International Standard specifies the performance requirements, methods of testing and required test results of equipment conforming to performance standards not inferior to those adopted by the IMO in resolution A.817 as amended by annex 5 to IMO resolution MSC.64 and annex 4 to IMO resolution MSC.86.

This standard is based upon the performance standards of IMO resolution A.817, and is also associated with IMO resolution A.694 and IEC 60945. Reference is made, where appropriate, to IMO resolution A.817, and all subclauses whose wording is identical to that in the resolution are printed in italics.

In association with the above IMO resolution A.817, are the International Hydrographic Organization (IHO) special publications S-52, S-57 and S-61. This standard has included extracts from the above publications where they are applicable to this equipment. Where reference is made, all subclauses whose wording is identical to that in the publications, are printed in italics.

The requirements of this standard are not intended to prevent the use of new techniques in equipment and systems, provided the facilities offered are not inferior to those stated.

2 Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60872-1: *Maritime navigation and radiocommunication equipment and systems – Radar plotting aids – Part 1: Automatic radar plotting aids (ARPA) – Methods of testing and required test results*

IEC 60945: *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61162 (all parts), *Maritime navigation and radiocommunication equipment and systems – Digital interfaces*

ISO 9000 (all parts), *Quality management and quality assurance standards*

IMO Convention for safety of life at sea (SOLAS) 1997 (as amended)

IMO A.424:1979, *Performance standards for gyro-compasses*

IMO A.694:1991, *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO A.817:1995, *Performance standards for electronic chart display and information systems (ECDIS)*

IMO A.821:1995, *Performance standards for gyro-compasses for high-speed craft*

IMO A.823:1995, *Performance standards for automatic radar plotting aids (ARPAs)*

IMO A.824:1995, *Performance standards for devices to indicate speed and distance*

IMO MSC.64(67):1996, Annex 4 – *Performance standards for radar equipment*

IMO MSC.64(67):1996, Annex 5 – *Amendment to IMO A.817*

IMO MSC.86(70):1998, Annex 4 – *Amendments to IMO A.817*

IHO S-52:1996, *Specifications for chart content and display aspects of ECDIS*

IHO S-52, appendix 1:1996, *Guidance on updating the electronic navigational chart*

IHO S-52, appendix 2:1997 (as amended), *Colour and symbol specifications for ECDIS*

IHO S-52, appendix 3:1997, *Glossary of ECDIS-related terms*

IHO S-52, appendix 4: *Test data set for use with IEC 61174*

IHO S-57:1996 (as amended), *Transfer standard for digital hydrographic data*

IHO S-61:1999, *Product specification for raster navigational charts (RNC)*

3 Definitions and abbreviations

Definitions of ECDIS related terms pertaining to IMO performance standards for ECDIS are listed in 4.2. A glossary of ECDIS related terms is included in S-52, appendix 3.

For the purpose of this International Standard the following definitions and abbreviations apply.

3.1 Definitions

3.1.1

CIE colour calibration

procedure to confirm that the colour specified in S-52, appendix 2 is correctly reproduced on the ECDIS display

3.1.2

common reference system

sensor input data, providing identical and obligatory reference pertaining to position, course, heading, bearing, speed, velocity, etc. and horizontal datum to different subsystems within an integrated navigation system

3.1.3

compilation scale

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

3.1.4

corrupted data

ENC data produced according to the S-57 ENC product specification, but altered or modified during production, transmission, or retrieval

3.1.5

degrade

reduce the quantity or quality of information content

3.1.6

display redraw time

interval from when the display starts to change until the new display is complete

3.1.7

display regeneration time

interval from operator action until the consequent redraw is complete

3.1.8

display scale

ratio between a distance on the display and a distance on the ground, normalized and expressed as, for example, 1:10 000

3.1.9

ENC cell

geographic division of ENC data for distributing purposes. For further information, refer to the ENC product specification in S-57

3.1.10

ENC data

data conforming to 4.2.2

3.1.11

ENC test data set

standardized data set supplied on behalf of the IHO that is necessary to accomplish IEC testing requirements for ECDIS. This data set is encoded according to the S-57 ENC product specification and contains update information based on S-52, appendix 1. The specific requirements are listed in annex F

3.1.12

non-ENC data

data not conforming to 4.2.2

3.1.13

overscale

display of the chart information at a display scale larger than the compilation scale. Overscaling may arise from deliberate overscaling by the mariner, or from automatic overscaling by ECDIS in compiling a display when the data included is at various scales

3.1.14

presentation library

implementation of the display specifications in S-52, appendix 2 "Colour and Symbol Specifications for ECDIS", by de-coding and symbolizing the SENC. It contains:

- a) the ECDIS symbol library, including the IEC navigation symbols;
- b) the ECDIS colour tables for day, dusk, and night viewing;
- c) look-up tables, linking SENC objects to the appropriate colour and symbology;
- d) conditional symbology procedures for:
 - cases where symbolizing depends on circumstances, such as the mariner's choice of safety contour;
 - cases where symbolizing is too complex to be defined in a direct look-up table;
- e) description of symbology instructions;
- f) mariner's navigation objects, specified in the same format as chart objects for convenience of processing in ECDIS;
- g) supplementary features, for example ECDIS chart 1 colour differentiation test diagrams and colour calibration software.

The presentation library is available in hard-copy or in digital form. The symbols shall be replicated in size and shape, using any convenient format. The colour tables shall be reproduced within the tolerances given in S-52, appendix 2/5.2.3. The remaining items may be implemented in any convenient form which produces the same results as the presentation library.

3.1.15

single operator action

single operation shall be achieved by activating a hardkey or softkey, including any necessary cursor movement

3.1.16

RNC data

data conforming to H.2.2

3.1.17

RNC test data set

standardized data set supplied on behalf of the IHO that is necessary to accomplish IEC testing requirements for RCDS mode of operation. This data set is encoded according to the S-61 RNC product specification. Test RNCs are specified by the HO providing the RNC service or on whose behalf the RNC service is provided.

3.2 Abbreviations

AIS	Automatic identification system
ARPA	Automatic radar plotting aid
ATA	Automatic tracking aid
CIE	Comité International de l'Eclairage
EBL	Electronic bearing line
ECDIS	Electronic chart display and information system
ENC	Electronic navigational chart
EPA	Electronic plotting aid
EPFS	Electronic position-fixing system
EUT	Equipment under test
GMDSS	Global maritime distress and safety system
HO	Hydrographic office
IEC	International Electrotechnical Commission
IHO	International Hydrographic Organization
IMO	International Maritime Organization
RCDS	Raster chart display system
RNC	Raster navigational chart
SENC	System electronic navigational chart
SOLAS	Safety of life at sea
SRNC	System raster navigational chart
VRM	Variable range marker

4 Minimum operational and performance requirements

4.1 Introduction

NOTE In the following subclauses of clause 4, the text in *italics* is from the corresponding paragraph of the annex to IMO resolution A.817. For example, 4.1.1 is paragraph 1.1 from the annex of A.817.

4.1.1 *The primary function of the ECDIS is to contribute to safe navigation.*

4.1.2 *ECDIS with adequate back-up arrangements may be accepted as complying with the up-to-date charts required by regulation V/20 of the 1974 SOLAS Convention.*

4.1.3 *In addition to the general requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and the requirements for electronic navigational aids contained in IMO resolution A.694 (IEC 60945), ECDIS shall meet the requirements of IMO resolution A.817.*

4.1.4 *ECDIS shall be capable of displaying all chart information necessary for safe and efficient navigation originated by, and distributed on the authority of, government authorized hydrographic offices.*

4.1.5 *ECDIS shall facilitate simple and reliable updating of the electronic navigational chart.*

4.1.6 *Use of ECDIS shall reduce the navigational workload as compared to use of the paper chart. It shall enable the mariner to execute in a convenient and timely manner all route planning, route monitoring and positioning currently performed on paper charts. It shall be capable of continuously plotting the ship's position.*

4.1.7 *ECDIS shall have at least the same reliability and availability of presentation as the paper chart published by government authorized hydrographic offices.*

4.1.8 *ECDIS shall provide appropriate alarms or indications with respect to the information displayed or malfunction of the equipment. (See annex D.)*

4.1.9 *When the relevant chart information is not available in the appropriate form, some ECDIS equipment may operate in the Raster Chart Display System (RCDS) mode as defined in annex H. Unless otherwise specified in annex H, the RCDS mode of operation shall conform to performance standards not inferior to those set out in IMO resolution A.817.*

4.2 ECDIS definitions

For the purpose of this standard:

4.2.1 *Electronic chart display and information system (ECDIS) means a navigation information system which with adequate backup arrangements can be accepted as complying with the up-to-date 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 by displaying additional navigation-related information.*

The reference geodetic datum is WGS-84.

4.2.2 *Electronic navigational chart (ENC) means the database, 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.*

The content, structure and format of the ENC are specified in S-57, including the associated ENC product specification.

4.2.3 *System electronic navigational chart (SENC) means a database 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 database that is actually accessed by ECDIS for the display generation and other navigational functions, and is the equivalent of an up-to-date paper chart. The SENC may also contain information from other sources.*

4.2.4 *Standard display means the SENC information that shall be shown when a chart is first displayed on ECDIS. The level of the information it provides for route planning or route monitoring may be modified by the mariner according to the mariner's needs.*

4.2.5 *Display base means the level of SENC information which cannot be removed from the display, consisting of information which is required at all times in all geographic areas and all circumstances. It is not intended to be sufficient for safe navigation.*

4.2.6 *Further information on ECDIS definitions may be found in S-52, appendix 3.*

4.3 Display of SENC information

4.3.1 *ECDIS shall be capable of displaying all SENC information. (See 6.5.1 and 6.8.2 to 6.8.5.)*

4.3.2 *SENC information available for display during route planning and route monitoring shall be subdivided into three categories, display base, standard display and all other information. (See annex A.) (See 6.8.1 to 6.8.3.)*

4.3.3 *ECDIS shall present the standard display at any time by a single operator action. (See 6.8.2.)*

4.3.4 *When a chart is first displayed on ECDIS, it shall provide the standard display at the largest scale available in the SENC for the displayed area. (See 6.8.1.)*

This is only applicable when the first chart is displayed subsequent to power up. The scale of an ENC is indicated by its compilation scale.

4.3.5 *It shall be easy to add or remove information from the ECDIS display. It shall not be possible to remove information contained in the display base. (See 6.8.2.)*

The addition or removal of information shall be limited to categories of information, for example prohibited and restricted areas, spot soundings; not individual items, for example, an individual area or an individual sounding. (See annex A, clauses 2 and 3.)

4.3.6 *It shall be possible for the mariner to select a safety contour from the depth contours provided by the SENC. ECDIS shall give the safety contour more emphasis than other contours on the display. (See 6.8.8.)*

4.3.7 *It shall be possible for the mariner to select a safety depth. ECDIS shall emphasize soundings equal to or less than the safety depth whenever spot soundings are selected for display. (See 6.8.9.)*

4.3.8 *The ENC and all updates to it shall be displayed without any degradation of their information content. (See 6.8.)*

Degradation shall be understood as degradation in information quantity as well as quality with respect to a standard test chart provided by government authorized hydrographic offices.

4.3.9 *ECDIS shall provide a method of ensuring that the ENC and all updates to it have been correctly loaded into the SENC. (See 6.8.15.2.)*

4.3.10 *The ENC data and updates to it shall be clearly distinguishable from other displayed information, such as, for example, that listed in annex B. (See 6.8.5 and 6.8.15.2.)*

Adherence to the IHO colours and symbols satisfies this requirement.

4.4 Provision and updating of chart information

(See S-52, appendix 1.)

4.4.1 *The chart information to be used in ECDIS shall be the latest edition of information originated by a government-authorized hydrographic office, and conform to IHO standards. (See 6.5.)*

In order to identify the date and origin of the ENC in use, the ECDIS shall include a graphical index of ENC data available, presented upon the mariner's request and providing access to the edition and date of each cell. (See S-52 6.3(c).)

A new edition of an ENC will supersede a previous ENC and its integrated updates issued by a government authorized hydrographic office.

4.4.2 *The contents of the SENC shall be adequate and up to date for the intended voyage, as required by regulation V/20 of the 1974 SOLAS Convention. (See 6.5.)*

4.4.3 *It shall not be possible to alter the contents of the ENC.*

4.4.4 *Updates shall be stored separately from the ENC. (See 6.8.15.2.)*

Separate storage of updates may utilize the same data storage area.

4.4.5 *ECDIS shall be capable of accepting official updates to the ENC data provided in conformity with IHO standards. These updates shall be automatically applied to the SENC. By whatever means updates are received, the implementation procedure shall not interfere with the display in use.*

The contents of an update assume that all earlier updates have been applied to the SENC. A new edition of an ENC shall supersede a previous ENC and its updates.

4.4.6 *ECDIS shall also be capable of accepting updates to the ENC data entered manually with simple means for verification prior to the final acceptance of the data. They shall be distinguishable on the display from ENC information and its official updates and not affect display legibility. (See 6.8.5 and 6.8.16.)*

4.4.7 *ECDIS shall keep a record of updates including time of application to the SENC (See 6.8.15.3.)*

The record shall include updates for each ENC until it is superseded by a new edition.

4.4.8 *ECDIS shall allow the mariner to display updates so that the mariner may review their contents and ascertain that they have been included in the SENC. (See 6.8.15.2.)*

4.5 Scale

ECDIS shall provide an indication if: (See 6.8.6.)

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

4.6 Display of other navigational information

4.6.1 *Radar information or other navigational information may be added to the ECDIS display. However, it shall not degrade the SENC information, and shall be clearly distinguishable from the SENC information. (See 6.8.3, 6.8.4 and 6.8.13.)*

4.6.2 *ECDIS and added navigational information shall use a common reference system. If this is not the case, an indication shall be provided. (See 6.8.12 g.)*

Such advice shall be included in the manufacturer's installation handbook.

4.6.3 Radar and plotting information

4.6.3.1 *Transferred radar information may contain both the radar image and ARPA or ATA or EPA information. (See 6.2, 6.8.13.)*

Where plotting information is added, it shall be indicated to the operator whether the vectors are relative or true, and if true whether they are sea or ground stabilized.

4.6.3.2 *If the radar image is added to the ECDIS display, the chart and the radar image shall match in scale and in orientation. (See 6.8.13.)*

Additionally the ECDIS and radar image shall match in projection.

4.6.3.3 *The radar image and the position from the position sensor shall both be adjusted automatically for antenna offset from the conning position. (See 6.8.13.)*

4.6.3.4 *It shall be possible to adjust the displayed position of the ship manually so that the radar image matches the SENC display. (See 6.8.13.)*

If an offset is applied, it shall be clearly indicated. The details of the offset shall be readily available.

4.6.3.5 *It shall be possible to remove the radar or plotting information by single operator action. (See 6.8.13.)*

4.7 Display mode and generation of the neighbouring area

4.7.1 *It shall always be possible to display the SENC in a 'north-up' orientation. Other orientations are permitted. (See 6.8.7.)*

4.7.2 *ECDIS shall provide for true motion mode. Other modes are permitted. (See 6.8.7.)*

4.7.3 *When true motion mode is in use, reset and generation of the neighbouring area shall take place automatically at a distance from the border of the display determined by the mariner. (See 6.8.7.)*

4.7.4 *It shall be possible to manually change the chart area and the position of own ship relative to the edge of the display. (See 6.8.7.)*

4.8 Colours and symbols

4.8.1 *IHO recommended colours and symbols shall be used to represent SENC information. (See S-52, appendix 2.) (See 6.7.1.)*

4.8.2 *The colours and symbols other than those mentioned in 4.8.1 shall be those used to describe the navigational elements and parameters listed in annex B and published in annex E. (See 6.7.1.)*

4.8.3 *SENC information, when displayed at the scale specified in the ENC, shall use the specified size of symbols, figures and letters. (See S-52, appendix 2.) (See 6.7.1.)*

4.8.4 *ECDIS shall allow the mariner to select whether own ship is displayed in true scale or as a symbol. (See 6.7.1.)*

4.9 Display requirements

4.9.1 *ECDIS shall be capable of displaying information for: (See 6.9.2 and 6.9.3.)*

- .1 route planning and supplementary navigation tasks;*
- .2 route monitoring.*

4.9.2 *The effective size of the chart presentation for route monitoring shall be at least 270 mm by 270 mm. (See 6.7.5.)*

4.9.3 *The display shall be capable of complying with the colour and resolution recommendations of IHO. (See S-52, appendix 2.) (See 6.7.3 and 6.7.4.)*

4.9.4 *The method of presentation shall ensure that the displayed information is clearly visible to more than one observer in the conditions of light normally experienced on bridge of the ship by day and by night. (See 6.7.5.)*

4.10 Route planning, monitoring and voyage recording

4.10.1 *It shall be possible to carry out route planning and route monitoring in a simple and reliable manner. (See 6.9.2.)*

4.10.2 *ECDIS shall be designed following ergonomic principles for user-friendly operation. (See 6.9.1.)*

4.10.3 *The largest scale data available in the SENC for the area given shall always be used by the ECDIS for all alarms or indications of crossing the ship's safety contour and of entering a prohibited area, and for alarms and indications according to annex D. (See 6.9.3.)*

4.10.4 Route planning

4.10.4.1 *It shall be possible to carry out route planning including both straight and curved segments. (See 6.9.2.)*

4.10.4.2 *It shall be possible to adjust a planned route by, for example: (See 6.9.2.)*

- .1 adding waypoints to a route;*
- .2 deleting waypoints from a route;*
- .3 changing the position of a waypoint;*
- .4 changing the order of the waypoints in the route.*

4.10.4.3 *It shall be possible to plan an alternate route in addition to the selected route. The selected route shall be clearly distinguishable from the other routes. (See 6.7.1h) and 6.9.2.)*

4.10.4.4 *An indication is required if the mariner plans a route across an own ship's safety contour. (See 6.9.2.)*

4.10.4.5 *An indication is required if the mariner plans a route across the boundary of a prohibited area or of a geographic area for which special conditions exist. (See annex C.) (See 6.9.2.)*

4.10.4.6 *It shall be possible for the mariner to specify a limit of deviation from the planned route at which activation of an automatic offtrack alarm shall occur. (See 6.9.2.)*

4.10.5 Route monitoring

4.10.5.1 *For route monitoring the selected route and own ship's position shall appear whenever the display covers that area. (See 6.9.3.)*

4.10.5.2 *It shall be possible to display a sea area that does not have the ship on the display (e.g. for look ahead, route planning), while route monitoring. If this is done on the display used for route monitoring, the automatic route monitoring functions (e.g. updating ship's position, and providing alarms and indications) shall be continuous. It shall be possible to return to the route monitoring display covering own ship's position immediately by single operator action. (See 6.9.3.)*

4.10.5.3 *ECDIS shall give an alarm if the ship, within a specified time set by the mariner, is going to cross the safety contour. (See 6.9.3.)*

4.10.5.4 *ECDIS shall give an alarm or indication, as selected by the mariner, if the ship, within a specified time set by the mariner, is going to cross the boundary of a prohibited area or of a geographic area for which special conditions exist. (See annex C.) (See 6.9.3.)*

4.10.5.5 *An alarm shall be given when the specified limit for deviation from the planned route is exceeded. (See 6.9.3.)*

Route monitoring will only provide an automatic alarm if the mariner has entered the appropriate data in 4.10.4.6.

4.10.5.6 *The ship's position shall be derived from a continuous positioning system of an accuracy consistent with the requirements of safe navigation. Whenever possible, a second independent positioning method of a different type shall be provided; ECDIS shall be capable of identifying discrepancies between the two systems. (See 6.8.12.)*

The ECDIS shall have means to display the position from at least two positioning methods, to identify which method is being used, and provide a means for the operator to select the method he wants to use. Secondary positioning methods could include dead reckoning.

4.10.5.7 *ECDIS shall provide an alarm when the input from the position-fixing system is lost. ECDIS shall also repeat, but only as an indication, any alarm or indication passed to it from a position-fixing system. (See 6.8.12.)*

4.10.5.8 *An alarm shall be given by ECDIS if the ship, within a specified time or distance set by the mariner, is going to reach a critical point on the planned route. (See 6.9.3.)*

ECDIS shall permit the mariner to define critical points and the time or distance at which an alarm shall be given. The words "to reach a critical point" shall be considered passing abeam of the critical point on the planned route.

4.10.5.9 *The positioning system and the SENC shall be on the same geodetic datum. ECDIS shall give an alarm if this is not the case. (See 6.8.12.)*

4.10.5.10 *It shall be possible to display an alternate route in addition to the selected route. The selected route shall be clearly distinguishable from the other routes. During the voyage, it shall be possible for the mariner to modify the selected route or select an alternate route. (See 6.9.3.)*

4.10.5.11 *It shall be possible to display:*

- .1 time-labels along ship's track manually on demand and automatically at intervals selected between 1 and 120 minutes (see 6.9.3.); and*
- .2 an adequate number of: points, free movable electronic bearing lines (EBL), variable range markers (VRM), fixed range markers and other symbols required for navigation purposes and specified in annex B. (See 6.8.11.)*

An "adequate number" of EBL and VRM implies at least one of each.

4.10.5.12 *It shall be possible to enter the geographic coordinates of any position and then display that position on demand. It shall also be possible to select any point (feature, symbol or position) on the display and read its geographic co-ordinates on demand. (See 6.8.10.)*

4.10.5.13 *It shall be possible to adjust the ship's geographic position manually. This manual adjustment shall be noted alpha-numerically on the screen, maintained until altered by the mariner, and automatically recorded. (See 6.8.12 and 6.9.4.)*

4.10.6 Voyage recording

4.10.6.1 *ECDIS shall store and be able to reproduce certain minimum elements required to reconstruct the navigation and verify the official database used during the previous 12 hours. The following data shall be recorded at one minute intervals: (See 6.9.4.)*

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

4.10.6.2 *In addition, ECDIS shall record the complete track for the entire voyage, with time marks at intervals not exceeding 4 hours. (See 6.9.5.)*

For the purposes of logging, the entire voyage is defined as a maximum period of three months.

4.10.6.3 *It shall not be possible to manipulate or change the recorded information. (See 6.9.4.)*

4.10.6.4 *ECDIS shall have a capability to preserve the record of the previous 12 hours and of the voyage track. (See 6.9.5.)*

4.11 Accuracy

4.11.1 *The accuracy of all calculations performed by ECDIS shall be independent of the characteristics of the output device and shall be consistent with the SENC accuracy. (See 6.6.)*

The output device includes ECDIS display, stored memory, and/or printout.

4.11.2 *Bearings and distances drawn on the display, or those measured between features already drawn on the display, shall have an accuracy consistent with the resolution of the display but no more than that afforded by the compilation scale of the SENC. (See 6.6.)*

4.12 Connections with other equipment (Interfaces)

(See IEC 61162 series.)

4.12.1 *ECDIS shall not degrade the performance of any equipment providing sensor inputs. Nor shall the connection of optional equipment degrade the performance of ECDIS below this standard. (See 6.2.)*

4.12.2 *ECDIS shall be connected to systems providing continuous position fixing, heading and speed information. (See 6.2.)*

4.13 Performance tests, malfunction alarms and indications

4.13.1 *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 test shall display information to indicate which module is at fault. (See 6.8.17a) and b).)*

On board tests of major functions include the integrity of sensor input. If there is any detectable reason why the information presented to the operator is invalid, adequate and clear warnings shall be given to the operator. This clarification is consistent with annex 4 to IMO resolution MSC.64.

4.13.2 *ECDIS shall provide suitable alarm or indication of system malfunction. (See 6.8.17c).)*

4.14 Back-up arrangements

Adequate independent back-up arrangements shall be provided to ensure safe navigation in case of an ECDIS failure: (See annex G.)

- .1 Facilities enabling a safe take-over of the ECDIS functions shall be provided in order to ensure that an ECDIS failure does not result in a critical situation.*
- .2 A back-up arrangement shall be provided facilitating means for safe navigation of the remaining part of the voyage in case of an ECDIS failure.*

4.15 Power supply

4.15.1 *It shall be possible to operate ECDIS and all equipment necessary for its normal functioning when supplied by an emergency source of electrical power in accordance with the appropriate requirements of regulation II/1 of the 1974 SOLAS convention.*

4.15.2 *Changing from one source of power supply to another, or any interruption of the supply for a period of up to 45 s, shall not require the equipment to be re-initialized manually. (See 6.9.6.)*

The equipment is not required to remain operational during this interruption of the power supply.

5 Requirements contained in IHO special publications

5.1 Content and structure of chart data

The chart data shall be delivered using the IHO transfer standard for digital hydrographic data (S-57). (S-52/3.1(a).)

Any ECDIS shall be capable of accepting and converting official HO data (ENC) to the internal storage structure of the individual ECDIS (system ENC or SENC). Such data includes both that in the ENC and that delivered in digital format to update the ENC. (S-52/ 3.3(b).) (See 6.8.15.1.)

The transfer standard, is designed for the distribution of digital chart data. It is recognized that it is not the most efficient means of storing, manipulating or preparing data for display. Each manufacturer of ECDIS systems may design his own storage formats or data structure to allow its system to meet the performance requirements stated in S-52. The resulting database is called the system ENC (SENC). (S-52/3.3(a).)

The following restrictions also apply:

- .1 The precision of HO supplied data shall be maintained, e.g. HO data provided in degrees and decimal degrees, when converted to manufacturer specific formats and structures and used in calculations, shall also be maintained to that accuracy. (S-52/3.4(b)(1).) (See 6.6.)*
- .2 Should the manufacturer use point reduction or smoothing operations in order to compress the chart information in the SENC, the resultant image of the chart displayed at ENC scale shall not differ from the ENC image by more than the display resolution. (S-52/3.4(b)(2).) (See 6.6.)*
- .3 HO data will be supplied in a cell structure. (See S-52/3.6.) If this cell structure is modified, it is the ECDIS manufacturer's responsibility to maintain cell dependent characteristics. (S-52/3.4(b)(3).) (See 6.5 and 6.8.15.1.)*

5.2 Priority of chart display

Layers are required to establish the priority of data on the display. The general rule for the priority between different categories of information is given below: (S-52/5.3(a).) (See 6.8.3 and 6.8.4.)

- .1 ECDIS visual alarms/indications (e.g. caution, overscale);*
- .2 HO-data: points/lines and areas plus official updates;*
- .3 Notices to mariners, manual input and radio navigational warnings;*

- .4 HO-caution (ENC cautions);
- .5 HO-colour-fill area data;
- .6 HO's on demand data;
- .7 radar information;
- .8 mariners data: points/lines and areas;
- .9 manufacturer's data: points/lines and areas;
- .10 mariners colour-fill area data.

NOTE 1 This list is not intended to indicate a drawing sequence, but to specify that the information content of category $n + 1$ must not obscure the information content of category n or any higher category (i.e. $n - 1$, etc.). (S-52/5.3(b)(1).) (See S-52, appendix 2/2.3.2 a.)

NOTE 2 Category .7 shall have a radar off switch to facilitate its removal. In order to meet the requirements of 4.6.3.4 to adjust ship's position, the ECDIS may incorporate the capability of changing the radar priority of the presentation library. Operation of this feature shall be clearly indicated. (S-52/5.3(b)(2).) (See S-52, appendix 2/2.3.2 b.) (See 6.8.13.)

5.3 Display of chart information

5.3.1 Scale and navigation purpose

If data from different compilation scales appears on the display, the boundary between different scales shall be clearly indicated. (S-52/6.3(a).) (See 6.8.6.)

When the display cannot be completely covered with ENC data for the selected navigational purpose, the remaining part of the display shall be filled with data based on a more general navigational purpose (if available). (S-52/6.3(b).) (See 6.8.6.)

A graphical index of the navigational purpose of available data shall be shown on demand. (S-52/6.3(c).) (See 6.8.6.)

Data shown on the display shall always be of the same display scale. If a compilation scale boundary is shown on the display, the information shown in the overscale area shall not be relied upon at the scale of the display. The overscale area shall be identified as specified in S-52, appendix 2. (Note that this overscale identification only applies to automatic area scaling of parts of the display; it does not apply to overscaling of the entire display commanded by the mariner.) (S-52/3.5(d).)

The manufacturer shall give the navigator the ability to use intermediate display scales, or zoom in between scales. (S-52/6.3(e).) (See 6.8.6.)

A scale bar shall be provided as part of the display base for navigating on a large compilation scale (1:80 000 and larger). (S-52/6.3(g).) (See S-52, appendix 2/ 3.2.3.9(a).) (See 6.8.6.)

For chart displays at a compilation scale smaller than 1:80 000, a latitude bar shall be shown on the border of the standard display. (S-52/6.3(g).) (See S-52, appendix 2 /3.2.3.9 (b).) (See 6.8.6.)

5.3.2 Text

The text on the ECDIS shall be readable from 1 metre. Sans serif, non-italic fonts shall be employed. The computer "Ø" shall not be used. (S-52, appendix 2/(3.1.5).) (See S-52, appendix 2/3.4.1 and IEC 60945.) (See 6.7.1.)

Similar fonts may be used as long as clarity is not reduced.

5.3.3 Units and legend

Units to be used on ECDIS displays: (S-52/6.4(a))

.1	Position	latitude and longitude in degrees, minutes and decimal minutes;
.2	Depth	metres and decimetres;
.3	Height	metres;
.4	Distance	nautical miles and decimal nautical miles, or metres;
.5	Speed	knots and decimal knots.
.6	Time	hours, minutes and seconds;
.7	Direction	degrees and tenths of degrees.

Units used shall be indicated in the display legend. There shall be no ambiguity about the units in use at a particular time. (S-52/6.4(b).) (See 6.7.2.)

A standard legend of general information relating to the area displayed, applicable to the ship's position, shall be shown on a graphic or text display. This legend shall contain as a minimum: (S-52/6.5.) (See 6.7.2.)

- .1 units for depth;
- .2 units for height;
- .3 scale of display;
- .4 data quality indicator;
- .5 sounding/vertical datum;
- .6 horizontal datum;
- .7 the value of the safety depth if used;
- .8 the value of the safety contour;
- .9 magnetic variation;
- .10 date and number of last update affecting the chart cells currently in use;
- .11 edition number and date of issue of the ENC;
- .12 chart projection.

All of the listed general information must be available for simultaneous display. It is not necessary to accomplish this using a single "standard legend" window.

5.4 Display functions

5.4.1 Object information

It shall be possible to call up all the information associated with an object by cursor enquiry on its symbol. This shall extend to areas (restricted area, depth area, etc.) and to "no symbol" areas (territorial seas, etc.) and meta areas (information about the area such as compilation scale, etc.). The search for area information shall extend only to the cell boundaries enclosing the cursor. (S-52, appendix 2/3.1.9.) (See 6.8.10.)

By identifying any object (point, line or area) with a cursor on the chart display, the object description and all available attributes shall be displayed in text in common language terms. (S-52/3.1(d).) (See 6.8.10.)

Text shall not appear automatically whenever the object it is associated with appears on the display. It shall always be possible to remove text independently of the object. (S-52, appendix 2/2.3.3(c).) (See 6.8.10.)

5.4.2 Navigational information

If the ECDIS offers a ship-centred display mode, the manufacturer shall avoid overwriting between the ship symbol and a centred symbol for an area which wholly encloses the display (for example the traffic direction arrow (TSSLPT) in a very large traffic lane such as Dover Strait). (S-52, appendix 2/3.1.2.1.6(d).) (See 6.8.7.)

This can be accomplished by moving the "centred" symbol. When the "centred" symbol is visible beneath the ship symbol, movement is not required.

5.4.3 Safety contour

If the mariner does not specify a safety contour, this shall default to 30 m. If the safety contour specified by the mariner is not in the SENC, the safety contour shown shall default to the next deeper contour. (S-52/3.4(c) and S-52, appendix 2/3.2.2(1).) (See 6.8.8.)

If the safety contour in use becomes unavailable due to a change in source data, the safety contour shall default to the next deeper contour. In each of the above cases, the mariner shall be informed. (S-52/3.4(c) and S-52, appendix 2/3.2.2(1).) (See 6.9.2 and 6.9.3.)

At all times, the safety contour shall be the one specified by the mariner or the next deeper contour if the specified one is not available. At a minimum the mariner shall be informed by emphasizing the new safety contour.

5.4.4 Navigational calculations

The system shall be capable of performing at least the following calculations: (S-52/7.1(a).) (See 6.6.)

- .1 *geographic co-ordinates to display co-ordinates and vice versa;*
- .2 *transformation between local datum and WGS-84; (See S-52/6.1(c).)*
- .3 *true distance and azimuth between two geographic positions;*
- .4 *geographic position from known position and distance/azimuth;*
- .5 *projection calculations such as true distance, rhumb line, convergence and great circle.*

The accuracy of these calculations shall be such that there shall be no visible distortion on the display between the following: (S-52/7.1(b).) (See 6.6.)

- .1 *rhumb line and chart data;*
- .2 *great circle and chart data.*

5.5 Supplementary display functions

5.5.1 Additional mariner's information

The mariner shall be provided with the capability of adding at least the following symbols, lines and areas to the SENC, and shall be able to revise or delete them: (S-52, appendix 2/2.3.1(b).) (See 6.8.5.)

- .1 *the caution (!) or information (i) symbol used to call up a note on the text display by cursor picking; (See S-52, appendix 2/3.2.3(6).)*
- .2 *simple lines and areas with or without colour fill, set up for cursor picking to give explanatory note in the text display;*
- .3 *any of the symbols in the presentation library;*
- .4 *text notes.*

In addition to the presentation library, other symbols may be used, using colours in accordance with S-52, appendix 2/2.3.1(b).

5.5.2 Additional non-HO information

Additional information from non-HO sources, may be displayed provided this does not degrade the display of ENC data. This additional information shall be distinguished from the ENC data. (S-52/7.2(f).) (See S-52, appendix 2.) (See 6.5.2 and 6.8.5.)

If the area covered by the ECDIS display includes waters for which no HO ENC at a scale appropriate for navigation exists, the areas representing those waters shall carry an indication to the mariner to refer to the paper chart. (S-52/3.4(a).) (See 6.5.2 and S-52, appendix 2.)

An area with no chart data of any kind shall be marked with the “no data” symbology defined in the presentation library. (See S-52, appendix 2/3.2.3(14).) (See 6.5.2.)

If an area with no ENC data (see 4.2.2) is covered by non-ENC data, the area shall be marked by the “non-ENC area” symbology defined in the presentation library. (See S-52, appendix 2/3.2.3(13a) and (13b).) (See 6.5.2.)

Should an “unknown object” occur in the SENC which is not adequately defined or for which no symbol exists, its presence shall be indicated on the display by a magenta “?” with the IMO category “Standard Display”. (S-52, appendix 2/3.1.3.) (See 6.5.1.)

5.5.3 Tidal adjustment

Depth information shall only be displayed as it has been provided in the ENC and not adjusted by tidal height. (S-52/7.2(g).) (See 6.8.5.)

5.6 Use of the presentation library

The library version number is included in the presentation library, and it shall be possible to display it on the ECDIS. (S-52, appendix 2/1.2.3) (See 6.5.1.)

The presentation library includes an ECDIS chart 1 showing both simplified and full chart symbols and their explanations. The ECDIS shall provide linking by cursor interrogation between the symbols and the explanations. (S-52, appendix 2/3.1.4.) (See 6.5.1.)

This is valid for both the IHO presentation library and the one provided by a manufacturer.

The presentation library contains colour differentiation test diagrams to enable the mariner to detect the stage at which the display can no longer be used to discriminate important features by colour. These diagrams, one for each colour table, are coded in S57 format. The ECDIS shall allow the selection and display of these test diagrams. The diagrams shall be used to check the discriminability of colours within all of the tables except day-bright. (S-52, appendix 2/5.2.5.) (See 6.7.3.)

5.7 Display characteristics

Information shall be displayed in the ECDIS on one or more physical screens, which may be divided into more than one display. Information may be displayed automatically, on demand or as a result of hand-entry. In addition to the IMO performance standards the following rules apply: (S-52/7.2)

The units for depth shall always be on the same screen as the chart display. (S-52/7.2(a).) (See 6.8.2.)

The following information shall be visible on demand on the same screen as the chart display is visual or on an additional graphic or text display: (S-52/7.2(b).) (See 6.8.2.)

- .1 positional data and time;*
- .2 legend;*
- .3 object description and associated attributes (result of "cursor query");*
- .4 textual information from SENC;*
- .5 list of abbreviations (from INT-1);*
- .6 result from navigational computations;*
- .7 record of ENC-updates;*
- .8 list of categories which are removed from standard display;*
- .9 symbol library. (See S-52, appendix 2)*

Navigators notes shall be visible as a result of a hand-entry on the same screen as the chart display or on an additional graphic or text display. (S-52/7.2(c).) (See 6.8.5.)

5.8 Performance requirements

5.8.1 Redraw

The ECDIS shall:

Redraw during route monitoring to follow the ship's progress, including scale changes due to change in the scale of the chart information, shall take less than 5 seconds. Demands by the mariner that cannot be predicted by the ECDIS, such as draw at a different scale or in a different area may take more than 5 seconds. In the latter case: (S-52/8(a))

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

If there is a delay in preparing (re-generating) data for display (e.g. due to a request for scale change or look ahead to another area) the ECDIS shall inform the mariner. The previous display shall be maintained and updated, until the new display is ready for re-draw. (S-52 appendix 2/2.2.3.) (See 6.9.3.)

5.8.2 Resolution

Minimum lines per mm (L) given by $L = 864/s$, where s is the smaller dimension of the chart display area (e.g. for the minimum chart area, $s = 270$ mm and the resolution is $L = 3,20$ lines per mm, giving a "picture unit" size of 0,312 mm). (S-52/8(c).) (See 6.7.4.)

The minimum sizes for all symbols shall be as shown in the presentation library. (S-52, appendix 2/3.1.5.) (See 6.7.1.)

In addition, the symbols shall always be drawn with at least the same number of pixels as are required to draw the symbol at the size defined in the presentation library for the minimum resolution and minimum chart display area (270 mm × 270 mm). (S-52, appendix 2/3.1.5.) (See 6.7.1.)

5.8.3 Number of colours

Colours: 64 (S-52/8.(c).) (See 6.7.3.)

5.8.4 Brightness and contrast

The brightness and contrast controls shall have a provision to permit returning to the calibrated setting. The ECDIS manual shall carry a warning that use of the brightness control may inhibit visibility of information at night. (S-52, appendix 2/4.1.4.) (See 6.7.3.)

The colour tables are provided in the presentation library, all of which shall be available. (S-52, appendix 2/4.1.5) (See 6.7.3.)

Colour tolerance values:

- .1 *the discrimination difference between any two colours displayed shall be not less than 10 ΔE^* units;* (S-52, appendix 2/5.2.3.1.)
- .2 *the difference between the colour displayed and the CIE colour defined in the specification shall be not greater than 16 ΔC^* units. If a monitor is independently tested, then the difference shall be not greater than 8 ΔC^* units;* (S-52, appendix 2/5.2.3.1.)
- .3 *the luminance of the colour displayed shall be within 20 % of its specified value. Black is a special case and the luminance of it shall be not greater than 0,52 cd/m² for DAY_BRIGHT.* (S-52, appendix 2/5.2.3.1.) (See 6.7.3.)

For the bright-sun colour table, restricted to colour pairs of tabular ΔE^* greater than 20. (S-52, appendix 2/5.2.3.2.)

If an optical filter is used with colour table night-filtered, it shall be removable, and of the value 0,9 ND. (S-52, appendix 2/4.1.2) (See S-52, appendix 2/4.1.5.)

5.9 Ergonomic requirements

The ECDIS shall provide the mariner with the option of using either the traditional paper chart symbols or the new simplified symbols as best fits his purpose. (S-52, appendix 2/3.2.1(2).) (See 6.7.1.)

The north arrow shall always be shown at the top left corner of the chart display, just clear of the scale bar or the latitude scale. (S-52, appendix 2/3.2.3(10).) (See 6.8.7.)

Any windows containing text, diagrams, etc. superimposed on the route monitoring display shall be temporary. (S-52, appendix 2/3.4.2.) (See 6.7.5.)

Temporary for this application means that the window can be removed or moved from the chart display area.

It shall be possible to re-locate such windows in a less important part of the display, such as on land, or behind the own ship symbol. (S-52, appendix 2/3.4.2) (See 6.7.5.)

A mariner's information panel on the same screen as the route monitoring display shall use only the "user interface" colours from the presentation library colour tables. (S-52, appendix 2/3.4.3.) (See 6.7.5.)

A mariner's information panel may use clearly visible colours deviating from the presentation library which do not detract from the chart display in any of the five mandatory colour tables. (See S-52, appendix 2/4.1.5.)

5.10 Update of chart information

5.10.1 General

Test requirements are addressed to individual update sets or cumulative updates (collection of sequential individual update sets). A third alternative update method is the “compilation update” set, which contains all current changes from the edition date of the ENC, and does not involve or rely on any previously issued update.

It shall be possible to carry out updating operations in all ECDIS modes, for example route planning, route monitoring, etc.

The detailed method of updating is described in the ENC product specification in S-57. If, in the following clauses, there are conflicts between the requirements of S-52, appendix 1 and the ENC product specification, the requirements of the latter shall be used.

5.10.1.1 Integration of updates

Updates shall be clearly distinguishable on the display. Once accepted, integrated updates shall be indistinguishable from ENC data. (S-52, appendix 1/3.4.1(c).) (See 6.8.15.2.)

Non-integrated updates (e.g. those entered manually) shall be distinguishable as described in S-52, appendix 2/2.3.4.

Official HO updates shall be distinguished from local ones. (S-52/4(a).) (See 6.8.15.2.)

5.10.1.2 Recall for display

It shall be possible on demand to review a previously installed update. (S-52, appendix 1/3.4.1(e).) (See 6.8.15.2 and 6.8.16.)

5.10.1.3 Log file

ECDIS shall keep a record of updates, including time of application and identification parameters described in S-52, appendix 1/3.2(i), through a log file. The log file shall contain, for each update applied to or rejected by the SENC, the following information: (S-52, appendix 1/3.4.1(h).) (See 6.8.15.3)

- .1 date and time of application/rejection;*
- .2 complete and unique identification number of update as described in the S-57 product specification;*
- .3 any anomalies encountered during application;*
- .4 type of application: manual/automatic.*

An example of “anomalies” could be error messages or load warnings.

5.10.1.4 Update applied out of sequence

The ECDIS shall warn the user when an update is out of sequence, terminate the update and restore the SENC as it was before application of the ENC update file. (S-52, appendix 1/3.4.1(i).) (See 6.8.15.1.)

5.10.2 Manual update

5.10.2.1 Keying and symbology

The ECDIS shall enable manual entry of updates for non-integrated presentation on the display. A capacity shall exist to enable the mariner to: (S-52, appendix 1/3.4.3(a).) (See 6.8.16)

- .1 enter the update as described in S-52, appendix 2;*
- .2 ensure all update text information relevant to the new condition and to the source of the update is entered by the mariner and recorded by the system, for display on demand.*

The system shall be capable of implementing manual updates to point objects and simple line and area objects such as traffic routing schemes and restricted areas, but excluding complicated lines and areas such as contours and coastlines.

5.10.2.2 Indications and alarms

The ECDIS shall be capable of sensing indications and alarms related to non-integrated (manual) updates, just as it does for integrated ENC updates. (S-52, appendix 1/3.4.3(b).) (See 6.8.16.)

5.10.2.3 Presentation

Manual updates shall be displayed as described in S-52, appendix 2/2.3.4. (S-52, appendix 1/3.4.3.) (See 6.8.16.)

It shall be possible to remove from the display any manual update. The removed update shall be retained in the ECDIS for future review until the commencement of the next voyage, but will not be otherwise displayed. (S-52, appendix 1/3.4.3(e).) (See 6.8.16.)

Manual updates need to be retained only until a new edition of the cell is incorporated.

For the purpose of retaining the removed updates in the ECDIS for future review, the commencement of the next voyage is defined as a period of three months.

5.10.3 Semi-automatic update

The ECDIS shall be capable of receiving updates in standard IHO format by 3,5 inch high density diskette or equivalent suitable portable media and through a telephone network. (S-52, appendix 1/3.4.2(a(ii)).) (See 6.8.15.1.)

5.10.4 Reception of updates

The identification of the issuing authority of the update shall be checked for conformance with the corresponding identifier of the ENC. (S-52, appendix 1/3.4.2(b(ii)).) (See 6.8.15.1.)

If any errors are detected from the receiving device, the reception procedure shall be terminated and the ENC update flagged invalid in the record of updates. The user shall be informed of the corruption.

The ECDIS shall employ the error detection scheme defined by IHO for ENC data.

The ECDIS shall reject corrupted files and provide a warning of this action.