

標題

電子海図情報表示装置 (Electronic Chart Display and Information System (ECDIS)) の搭載について

# ClassNK

## テクニカル インフォメーション

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各位

2009年6月に開催された第86回海上安全委員会(MSC86)において、電子海図情報表示装置(ECDIS)の搭載義務に係る SOLAS 条約第V章19規則2.1.4の改訂、2.10及び2.11が追加されました。これによりバックアップ装置を含め、ECDISが段階的に導入されます。本ClassNKテクニカル・インフォメーションでは、ECDISの搭載に関する要件をお知らせいたします。

### 1. 対象船舶

国際航海に従事する次の船舶に適用されます。

- (1) 500GT以上の旅客船
- (2) 3,000GT以上のタンカー\*
- (3) 3,000GT以上、タンカー以外の新造貨物船及び10,000GT以上、タンカー以外の現存貨物船

\*「タンカー」とは、引火性の液体貨物のばら積み輸送のために建造し又は改造した貨物船を言う。

### 2. 適用日

「建造された」の定義は、SOLAS 第V章2規則1による。

#### (1) 旅客船

- (i) 2012年7月1日以降に建造された旅客船は、登録検査の日
- (ii) 2012年7月1日前に建造された旅客船は、2014年7月1日以降の最初の安全設備検査の日

#### (2) タンカー

- (i) 2012年7月1日以降に建造されたタンカーは、登録検査の日
- (ii) 2012年7月1日前に建造されたタンカーは、2015年7月1日以降の最初の安全設備検査の日

#### (3) タンカー以外の貨物船

- (i) 2013年7月1日以降に建造された10,000GT以上の貨物船は、登録検査の日
- (ii) 2014年7月1日以降に建造された3,000GT以上10,000GT未満の貨物船は、登録検査の日
- (iii) 2013年7月1日前に建造された50,000GT以上の貨物船は、2016年7月1日以降の最初の安全設備検査の日
- (iv) 2013年7月1日前に建造された20,000GT以上50,000GT未満の貨物船は、2017年7月1日以降の最初の安全設備検査の日

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#### NOTES:

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- バックナンバーは ClassNK インターネット・ホームページ(URL: [www.classnk.or.jp](http://www.classnk.or.jp))においてご覧いただけます。

- (v) 2013年7月1日前に建造された10,000GT以上20,000GT未満の貨物船は、2018年7月1日以降の最初の安全設備検査の日
- (4) 上記(1)(ii), (2)(ii), (3)(iii), (iv)及び(v)の船で、引き渡しの日が適用日より後になる場合は、登録検査の日
3. ECDISの要件
- 紙海図の代替として航海の用に供するECDISは、次によること。  
紙海図をバックアップとして備えているECDISにあっても、同様に適用されます。
- (1) ECDISの性能要件
- ECDISの性能基準に関するIMO決議MSC.232(82)が適用されます。
- (i) 公式航海用電子海図(ENC)が使われていること。
  - (ii) ENCは、適切で更新されたものであること。
  - (iii) 適切なバックアップ装置を備えること。  
バックアップ装置への切り替えが迅速に行えること。  
バックアップ装置又は紙海図をバックアップにすることができること。
  - (iv) 有効表示域は、少なくとも270mm x 270mmあること。
  - (v) 海図情報表示、航路計画、航路監視、船位表示、海図情報の提供、更新、航路記録、警報及び表示ができること。
  - (vi) 非常電源から給電されていること。
  - (vii) 電源スイッチを切るか、又は電源喪失の後にECDISの電源スイッチをいれた場合、直近に手動選択した表示設定に戻る。
  - (viii) 主電源から非常電源に切り替わった時には、手動による再設定とならないこと。
  - (ix) ジャイロコンパス、船速距離計、GPS受信機に接続されていること。
- (2) バックアップ装置の要件
- ECDISの性能基準に関する勧告の附録6(決議MSC.232(82) Appendix 6)が適用されます。
- (i) 海図情報表示、航路計画、航路監視、情報表示、海図情報の提供、更新、航路記録の機能が、主ECDISと同等であること。
  - (ii) バックアップ装置の操作は、主装置と同じであること。
  - (iii) 主ECDISから切り替えられたときに、主ECDISの切り替え前の情報が引き継がれること。
  - (iv) 供給電源は、主装置とは分離されていること。
  - (v) ジャイロコンパス、船速距離計、GPS受信機への接続ケーブルは、主装置とは分離されていること。
  - (vi) 主ECDISとバックアップECDIS間のインターフェイスのための信号線があること。
  - (vii) 機種毎に発給された型式承認書に記載されたバックアップの要件も満足していること。
4. ECDISの型式承認
- (1) 主管庁又は主管庁の承認した機関の承認を受けた型式のものであること。
  - (2) 機関が採択した性能基準を満足していること。

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- (i) 2009年1月1日以降に搭載された ECDIS は、IMO 決議 MSC.232(82)を満足するものであること。  
ただし、2009年1月1日前に搭載された ECDIS は、IMO 決議 A.817(19)、MSC.64(67) Annex 5 及び MSC.86(70) Annex 4 を満足し、最新の IHO 基準のソフトに更新され、最新の電子海図(ENC)のすべての情報が表示できるものであること。
  - (ii) 関連する IEC 規格の試験基準を満足していること。
5. 電子海図 (Electronic Navigation Charts = ENC)
- (1) 政府から認められた水路機関が発行する航海用電子海図(ENC)で、IHO 基準に一致したデータベースにより作成された海図であること。
  - (2) 船舶が就航する海域のすべてにわたる ENC を備えること。  
適切な ENC がない場合や沿岸国から沿岸の海図の要求がある場合は、ラスター海図又は紙海図を準備すること。
  - (3) ENC のすべての情報を ECDIS の画面に表示できること。
  - (4) IHO 規格の最新版ソフトウェアに更新されていない ECDIS は、海図の代替として認められない。
  - (5) ECDIS のソフトウェアの更新については、製造メーカーからの指示に従うこと。
  - (6) ENC の管理・更新は、管理会社から ISM Code に従って船に指示されること。
  - (7) 最新の ENC 情報は、IHO の web site から入手できる。
6. 装備要領
- (1) 1 台目の ECDIS の設置場所は、操舵室のカーテンより前の場所とすること。
  - (2) バックアップの ECDIS の設置場所は、操舵室内であれば特に場所は規定されていない。
  - (3) ECDIS への外部接続機器は、上記 3.(1)(ix)の性能要件で要求される機器以外に、レーダー(画像と ARPA 情報)及び AIS に接続すること。  
現存船に ECDIS を装備する場合は、できる限り接続する。  
その他の航海設備や無線設備との接続については、デジタル出力がされていれば接続してもよい。
  - (4) バックアップ装置として、型式承認書に記載された機種以外のものは認められない。  
バックアップ装置にレーダー機能があっても、V 章で要求されるレーダーを省略できない。
7. ECDIS2 台装備による紙海図省略
- (1) 2009年1月1日以降に搭載された ECDIS 及びバックアップ装置が装備されていること。
  - (2) 旗国要件があればそれに従うこと。
8. 紙海図から電子海図を使う ECDIS 導入までの準備
- (1) 2012年7月1日前に搭載されている ECDIS の場合、上記の装備要件及び型式承認された ECDIS であること。
  - (2) ECDIS に正規の ENC が使われており、更新が行われていること。
  - (3) 乗船者の資格に、ECDIS トレーニングの修了書があるか確認が行われていること。
    - (i) STCW2010 年マニラ改正が 2012 年 1 月 1 日より発効した。  
ECDIS を装備した船舶に乗船する船長・航海士には、ECDIS の IMO トレーニングコース(IMO Model course 1.27)を修了した証明書の所持及び本船搭載の ECDIS に対するトレーニング及び教育訓練が要求される。
    - (ii) ECDIS が搭載義務となるまでの間は、トレーニング証明書の所持していない船長または航海士が乗船している場合は、旗国の指示に従うこと。

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- (iii) ECDIS のトレーニングに関する旗国からの指示、及び IMO 情報などに注意すること。
- (4) ECDIS 搭載が要求されていない船舶に、紙海図の代替として ECDIS を航海に使用する場合は、旗国の指示に従うこと。
9. 2012 年 7 月 1 日前に搭載された ECDIS の取扱
- (1) ECDIS の性能要件を満足していない ECDIS を搭載している場合は、紙海図を航海用を使用すること。この場合、ECDIS は航海用としては使用できないので、古い ECDIS の換装が必要となる。
- (2) 1 台の ECDIS が性能要件を満足しているが、正規の ENC を使用していない場合は、ECDIS は航海に使用できない。正規の ENC に取り換えること。
- (3) ECDIS のトレーニングを修了した船長及び航海士が乗船していない場合は、紙海図を航海用に使用すること。
- (4) 貨物船安全設備証書のための設備の記録 (Form E) の 3. 航海設備の詳細の記載 2.1 項 海図又は電子海図情報表示装置 (ECDIS) の記載は、海図又は ECDIS のいずれかとする。"Charts and ECDIS" の記載は、Nautical charts または ECDIS のどちらか一方を "Fitted" に代えます。
- 現在 Form E2.1 項に "Charts and ECDIS" と記載がある場合は、2012 年 7 月 1 日以後の安全設備検査時に書換を弊会検査事務所に知らせてください。
10. オートパイロット (HCS) に接続して航跡制御 (TCS) をする場合の取扱
- (1) TCS を装備した場合は、弊会検査員の立会のもとで海上公試で作動を確認すること。現存船で TCS を追加装備する場合は、装備図面、試験方案を弊会材料艤装部へ提出し、承認の後、弊会から海上試験について指示します。
- (2) バックアップナビゲーターアラームの装備場所は、船長室とする。この警報を BNWAS に接続してもよい。
11. 図面承認  
適用日前の現存船にすでに搭載された ECDIS または現存船に新設する ECDIS に対する図面承認は要求されないので、搭載完了後安全設備検査を受検してください。
12. 検査  
ECDIS に関する検査は、次の項目を確認します。
- (1) 型式承認書のコピー、適合した性能要件、
- (2) 非常電源からの給電、GPS、ジャイロ、船速距離計からの信号入力、
- (3) 最新の ENC が表示でき、就航航路のすべての ENC の所持、
- (4) バックアップ装置の要件、
- (5) バックアップが、紙海図の場合は、最新の海図で改補がされたもの、並びに
- (6) 船長及び航海士が、所持している ECDIS トレーニング (Generic training & Type Specific training) の証明書。
13. その他  
IMO 情報、旗国情報、適合機種などの情報は、弊会ホームページの ECDIS ニュースでお知らせします。
- オーストラリア入港船に対する AMSA が発行した Marine Notice については、ClassNK テクニカル・インフォメーション TEC-0896 を参照してください。

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なお、本件に関してご不明な点は、以下の部署にお問い合わせください。

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添付:

1. IMO performance standards for ECDIS MSC.232(82)

**ANNEX 24**

**RESOLUTION MSC.232(82)**

**(adopted on 5 December 2006)**

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

THE MARITIME SAFETY COMMITTEE,

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

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

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

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

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

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

1. ADOPTS the Revised performance standards for electronic chart display and information systems (ECDIS), set out in the Annex to the present resolution;
2. RECOMMENDS Governments ensure that ECDIS equipment:
  - (a) if installed on or after 1 January 2009, conform to performance standards not inferior to those specified in the Annex to the present resolution; and
  - (b) if installed on or after 1 January 1996 but before 1 January 2009, conform to performance standards not inferior to those specified in the Annex to resolution A.817(19), as amended by resolutions MSC.64(67) and MSC.86(70).



## ANNEX

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

#### 1 SCOPE OF ECDIS

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

#### 2 APPLICATION OF THESE STANDARDS

- 2.1 These performance standards should apply to all ECDIS equipment carried on all ships, as follows:
  - dedicated standalone workstation.
  - a multifunction workstation as part of an INS.
- 2.2 These performance standards apply to ECDIS mode of operation, ECDIS in RCDS mode of operation as specified in appendix 7 and ECDIS backup arrangements as specified in appendix 6.

- 2.3 Requirements for structure and format of the chart data, encryption of chart data as well as the presentation of chart data are within the scope of relevant IHO standards, including those listed in appendix 1.
- 2.4 In addition to the general requirements set out in resolution A.694(17)\*, the presentation requirements set out in resolution MSC.191(79), ECDIS equipment should meet the requirements of these standards and follow the relevant guidelines on ergonomic principles adopted by the Organization<sup>1</sup>.

### 3 DEFINITIONS

For the purpose of these performance standards:

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

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\* Refer to Publication IEC 60945.

<sup>1</sup> MSC/Circ.982.



## MODULE A - DATABASE

### 4 PROVISION AND UPDATING OF CHART INFORMATION

- 4.1 The chart information to be used in ECDIS should be the latest edition, as corrected by official updates, of that issued by or on the authority of a Government, government-authorized Hydrographic Office or other relevant government institution, and conform to IHO standards<sup>2</sup>.
- 4.2 The contents of the SENC should be adequate and up-to-date for the intended voyage to comply with regulation V/27 of the 1974 SOLAS Convention as amended.
- 4.3 It should not be possible to alter the contents of the ENC or SENC information transformed from the ENC.
- 4.4 Updates should be stored separately from the ENC.
- 4.5 ECDIS should be capable of accepting official updates to the ENC data provided in conformity with IHO standards. These updates should be automatically applied to the SENC. By whatever means updates are received, the implementation procedure should not interfere with the display in use.
- 4.6 ECDIS should also be capable of accepting updates to the ENC data entered manually with simple means for verification prior to the final acceptance of the data. They should be distinguishable on the display from ENC information and its official updates and not affect display legibility.
- 4.7 ECDIS should keep and display on demand a record of updates including time of application to the SENC. This record should include updates for each ENC until it is superseded by a new edition.
- 4.8 ECDIS should allow the mariner to display updates in order to review their contents and to ascertain that they have been included in the SENC.
- 4.9 ECDIS should be capable of accepting both non-encrypted ENCs and ENCs encrypted in accordance with the IHO Data Protection Scheme<sup>3</sup>.

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2 IHO Special Publication S-52 and S-57 (see appendix 1).

3 IHO Special Publication S-63 (see appendix 1).

## **MODULE B – OPERATIONAL AND FUNCTIONAL REQUIREMENTS**

### **5 DISPLAY OF SENC INFORMATION**

- 5.1** ECDIS should be capable of displaying all SENC information. An ECDIS should be capable of accepting and converting an ENC and its updates into a SENC. The ECDIS may also be capable of accepting a SENC resulting from conversion of ENC to SENC ashore, in accordance with IHO TR 3.11<sup>4</sup>. This method of ENC supply is known as SENC delivery.
- 5.2** SENC information available for display during route planning and route monitoring should be subdivided into the following three categories, Display Base, Standard Display and All Other Information (see appendix 2).
- 5.3** ECDIS should present the Standard Display at any time by a single operator action.
- 5.4** When an ECDIS is switched on following a switch off or power failure, it should return to the most recent manually selected settings for display.
- 5.5** It should be easy to add or remove information from the ECDIS display. It should not be possible to remove information contained in the Display Base.
- 5.6** For any operator identified geographical position (e.g. by cursor picking) ECDIS should display on demand the information about the chart objects associated with such a position.
- 5.7** It should be possible to change the display scale by appropriate steps e.g. by means of either chart scale values or ranges in nautical miles.
- 5.8** It should be possible for the mariner to select a safety contour from the depth contours provided by the SENC. ECDIS should emphasize the safety contour over other contours on the display, however:
- .1 if the mariner does not specify a safety contour, this should default to 30m. If the safety contour specified by the mariner or the default 30 m contour is not in the displayed SENC, the safety contour shown should default to the next deeper contour;
  - .2 if the safety contour in use becomes unavailable due to a change in source data, the safety contour should default to the next deeper contour; and
  - .3 in each of the above cases, an indication should be provided.
- 5.9** It should be possible for the mariner to select a safety depth. ECDIS should emphasize soundings equal to or less than the safety depth whenever spot soundings are selected for display.
- 5.10** The ENC and all updates to it should be displayed without any degradation of their information content.

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<sup>4</sup> IHO Miscellaneous Publication M-3.  
Document3

- 5.11 ECDIS should provide a means to ensure that the ENC and all updates to it have been correctly loaded into the SENC.
- 5.12 The ENC data and updates to it should be clearly distinguishable from other displayed information, including those listed in appendix 3.

## **6 SCALE**

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

## **7 DISPLAY OF OTHER NAVIGATIONAL INFORMATION**

- 7.1 Radar information and/or AIS information may be transferred from systems compliant with the relevant standards of the Organization. Other navigational information may be added to the ECDIS display. However, it should not degrade the displayed SENC information and it should be clearly distinguishable from the SENC information.
- 7.2 It should be possible to remove the radar information, AIS information and other navigational information by single operator action.
- 7.3 ECDIS and added navigational information should use a common reference system. If this is not the case, an indication should be provided.
- 7.4 Radar
  - 7.4.1 Transferred radar information may contain a radar image and/or tracked target information.
  - 7.4.2 If the radar image is added to the ECDIS display, the chart and the radar image should match in scale, projection and in orientation.
  - 7.4.3 The radar image and the position from the position sensor should both be adjusted automatically for antenna offset from the conning position.

## **8 DISPLAY MODE AND GENERATION OF THE NEIGHBOURING AREA**

- 8.1 It should always be possible to display the SENC information in a "north-up" orientation. Other orientations are permitted. When such orientations are displayed, the orientation should be altered in steps large enough to avoid unstable display of the chart information.
- 8.2 ECDIS should provide for true motion mode. Other modes are permitted.
- 8.3 When true motion mode is in use, reset and generation of the chart display of the neighbouring area should take place automatically at own ship's distance from the edge of the display as determined by the mariner.

- 8.4** It should be possible to manually change the displayed chart area and the position of own ship relative to the edge of the display.
- 8.5** If the area covered by the ECDIS display includes waters for which no ENC at a scale appropriate for navigation is available, the areas representing those waters should carry an indication (see appendix 5) to the mariner to refer to the paper chart or to the RCDS mode of operation (see appendix 7).

## **9 COLOURS AND SYMBOLS**

- 9.1** IHO recommended colours and symbols should be used to represent SENC information<sup>5</sup>.
- 9.2** The colours and symbols other than those mentioned in 9.1 should comply with the applicable requirements contained in the IMO standards for navigational symbols<sup>6</sup>.
- 9.3** SENC information displayed at the scale specified in the ENC should use the specified size of symbols, figures and letters<sup>5</sup>.
- 9.4** ECDIS should allow the mariner to select whether own ship is displayed in true scale or as a symbol.

## **10 DISPLAY REQUIREMENTS**

- 10.1** ECDIS should be capable of displaying information for:
- .1 route planning and supplementary navigation tasks; and
  - .2 route monitoring.
- 10.2** The effective size of the chart presentation for route monitoring should be at least 270 mm x 270 mm.
- 10.3** The display should be capable of meeting colour and resolution recommendations of IHO<sup>5</sup>.
- 10.4** The method of presentation should ensure that the displayed information is clearly visible to more than one observer in the conditions of light normally experienced on the bridge of the ship by day and by night.
- 10.5** If information categories included in the Standard Display (See appendix 2) are removed to customize the display, this should be permanently indicated. Identification of categories which are removed from the Standard Display should be shown on demand.

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<sup>5</sup> Special Publication S-52, Appendix 2 (see appendix 1)  
Document3

## **11 ROUTE PLANNING, MONITORING AND VOYAGE RECORDING**

**11.1** It should be possible to carry out route planning and route monitoring in a simple and reliable manner.

**11.2** The largest scale data available in the SENC for the area given should always be used by the ECDIS for all alarms or indications of crossing the ship's safety contour and of entering a prohibited area, and for alarms and indications according to appendix 5.

### **11.3 Route Planning**

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

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

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

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

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

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

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

### **11.4 Route monitoring**

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

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

- 11.4.3** ECDIS should give an alarm if, within a specified time set by the mariner, own ship will cross the safety contour.
- 11.4.4** ECDIS should give an alarm or indication, as selected by the mariner, if, within a specified time set by the mariner, own ship will cross the boundary of a prohibited area or of a geographical area for which special conditions exist (see appendix 4).
- 11.4.5** An alarm should be given when the specified cross track limit for deviation from the planned route is exceeded.
- 11.4.6** An indication should be given to the mariner if, continuing on its present course and speed, over a specified time or distance set by the mariner, own ship will pass closer than a user-specified distance from a danger (e.g. obstruction, wreck, rock) that is shallower than the mariner's safety contour or an aid to navigation.
- 11.4.7** The ship's position should be derived from a continuous positioning system of an accuracy consistent with the requirements of safe navigation. Whenever possible, a second independent positioning source, preferably of a different type, should be provided. In such cases ECDIS should be capable of identifying discrepancies between the two sources.
- 11.4.8** ECDIS should provide an alarm when the input from position, heading or speed sources is lost. ECDIS should also repeat, but only as an indication, any alarm or indication passed to it from position, heading or speed sources.
- 11.4.9** An alarm should be given by ECDIS when the ship reaches a specified time or distance, set by the mariner, in advance of a critical point on the planned route.
- 11.4.10** The positioning system and the SENC should be on the same geodetic datum. ECDIS should give an alarm if this is not the case.
- 11.4.11** It should be possible to display alternative routes in addition to the selected route. The selected route should be clearly distinguishable from the other routes. During the voyage, it should be possible for the mariner to modify the selected sailing route or change to an alternative route.
- 11.4.12** It should be possible to display:
- .1 time-labels along a ship's track manually on demand and automatically at intervals selected between 1 and 120 minutes; and
  - .2 an adequate number of: points, free movable electronic bearing lines, variable and fixed range markers and other symbols required for navigation purposes and specified in appendix 3.
- 11.4.13** It should be possible to enter the geographical co-ordinates of any position and then display that position on demand. Also, it should be possible to select any point (features, symbol or position) on the display and read its geographical co-ordinates on demand.



**11.4.14** It should be possible to adjust the displayed geographic position of the ship manually. This manual adjustment should be noted alpha-numerically on the screen, maintained until altered by the mariner and automatically recorded.

**11.4.15.1** ECDIS should provide the capability to enter and plot manually obtained bearing and distance lines of position (LOP), and calculate the resulting position of own ship. It should be possible to use the resulting position as an origin for dead-reckoning.

**11.4.15.2** ECDIS should indicate discrepancies between the positions obtained by continuous positioning systems and positions obtained by manual observations.

## **11.5 Voyage recording**

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

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

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

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

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

## **12 CALCULATIONS AND ACCURACY**

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

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

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

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

### **13 PERFORMANCE TESTS, MALFUNCTIONS ALARMS AND INDICATIONS**

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

### **14 BACK-UP ARRANGEMENTS**

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

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

## **MODULE C – INTERFACING AND INTEGRATION**

### **15 CONNECTIONS WITH OTHER EQUIPMENT 7**

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

### **16 POWER SUPPLY**

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

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7 Publication IEC 61162.

## Appendix 1

### REFERENCE DOCUMENTS

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

#### INTERNATIONAL MARITIME ORGANIZATION (IMO)

Address: International Maritime Organization	Phone: +44 207 735 76 11
4 Albert Embankment	Fax: +44 207 587 32 10
London SE1 7SR	E-mail: info@imo.org
United Kingdom	Web: <a href="http://www.imo.org">http://www.imo.org</a>

#### Publications

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

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

SN.Circ/207 (1999) on Differences between RCDS and ECDIS

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

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

#### INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO)

Address: Directing Committee	Phone: +377 93 10 81 00
International Hydrographic Bureau	Fax: +377 93 10 81 40
BP 445	E-mail: info@ihb.mc
MC 98011 Monaco Cedex	Web: <a href="http://www.iho.shom.fr">http://www.iho.shom.fr</a>
Principality of Monaco	

## **Publications**

*Special Publication No. S-52, Specifications for Chart Content and Display Aspects of ECDIS*

Special Publication No. S-52 appendix 1, Guidance on Updating the Electronic Navigational Chart

Special Publication No. S-52 appendix 2, Colour and Symbol Specifications for ECDIS

Special Publication No. S-32, Hydrographic Dictionary

Special Publication No. S-57, IHO Transfer Standard for Digital Hydrographic Data

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

Special Publication No. S-63, IHO Data Protection Scheme

Miscellaneous Publication No. M-3, *Resolutions of the IHO*

## **INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)**

Address: IEC Central Office  
3 rue de Varembé  
PO Box 131  
CH-1211 Geneva 20  
Switzerland

Phone: +41 22 734 01 50

Fax: +41 22 733 38 43

## **Publications**

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

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

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

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

## Appendix 2

### SENC INFORMATION AVAILABLE FOR DISPLAY DURING ROUTE PLANNING AND ROUTE MONITORING

- 1 Display base to be permanently shown on the ECDIS display, consisting of:
  - .1 coastline (high water);
  - .2 own ship's safety contour;
  - .3 isolated underwater dangers of depths less than the safety contour which lie within the safe waters defined by the safety contour;
  - .4 isolated dangers which lie within the safe water defined by the safety contour, such as fixed structures, overhead wires, etc.;
  - .5 scale, range and north arrow;
  - .6 units of depth and height; and
  - .7 display mode.
  
- 2 Standard display consisting of:
  - .1 display base
  - .2 drying line
  - .3 buoys, beacons, other aids to navigation and fixed structures
  - .4 boundaries of fairways, channels, etc.
  - .5 visual and radar conspicuous features
  - .6 prohibited and restricted areas
  - .7 chart scale boundaries
  - .8 indication of cautionary notes
  - .9 ships' routing systems and ferry routes
  - .10 archipelagic sea lanes.
  
- 3 All other information, to be displayed individually on demand, for example:
  - .1 spot soundings
  - .2 submarine cables and pipelines
  - .3 details of all isolated dangers
  - .4 details of aids to navigation
  - .5 contents of cautionary notes
  - .6 ENC edition date
  - .7 most recent chart update number
  - .8 magnetic variation
  - .9 graticule
  - .10 place names.

### Appendix 3

#### NAVIGATIONAL ELEMENTS AND PARAMETERS

- 1 Own ship.
  - .1 Past track with time marks for primary track.
  - .2 Past track with time marks for secondary track.
- 2 Vector for course and speed made good.
- 3 Variable range marker and/or electronic bearing line.
- 4 Cursor.
- 5 Event.
  - .1 Dead reckoning position and time (DR).
  - .2 Estimated position and time (EP).
- 6 Fix and time.
- 7 Position line and time.
- 8 Transferred position line and time.
  - .1 Predicted tidal stream or current vector with effective time and strength.
  - .2 Measured tidal stream or current vector with effective time and strength.
- 9 Danger highlight.
- 10 Clearing line.
- 11 Planned course and speed to make good.
- 12 Waypoint.
- 13 Distance to run.
- 14 Planned position with date and time.
- 15 Visual limits of lights arc to show rising/dipping range.
- 16 Position and time of “wheel over”.



## **Appendix 4**

### **AREAS FOR WHICH SPECIAL CONDITIONS EXIST**

The following are the areas which ECDIS should detect and provide an alarm or indication under sections 11.3.5 and 11.4.4:

- Traffic separation zone
- Inshore traffic zone
- Restricted area
- Caution area
- Offshore production area
- Areas to be avoided
- User defined areas to be avoided
- Military practise area
- Seaplane landing area
- Submarine transit lane
- Anchorage area
- Marine farm/aquaculture
- PSSA (Particularly Sensitive Sea Area)



## Appendix 5

### ALARMS AND INDICATORS

Section	Requirements	Information
11.4.3	Alarm	Crossing safety contour
11.4.4	Alarm or Indication	Area with special conditions
11.4.5	Alarm	Deviation from route
11.4.8	Alarm	Positioning system failure
11.4.9	Alarm	Approach to critical point
11.4.10	Alarm	Different geodetic datum
13.2	Alarm or Indication	Malfunction of ECDIS
5.8.3	Indication	Default safety contour
6.1.1	Indication	Information overscale
6.1.2	Indication	Larger scale ENC available
7.3	Indication	Different reference system
8.5	Indication	No ENC available
10.5	Indication	Customized display
11.3.4	Indication	Route planning across safety contour
11.3.5	Indication	Route planning across specified area
11.4.6	Indication	Crossing a danger in route monitoring mode
13.1	Indication	System test failure

In this Performance Standard the definitions of Indicators and Alarms provided in the IMO resolution A.830(19) "Code on Alarms and Indicators, 1995" apply.

**Alarm:** An alarm or alarm system which announces by audible means, or audible and visual means, a condition requiring attention.

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

## Appendix 6

### BACK-UP REQUIREMENTS

#### 1 INTRODUCTION

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

- .1 facilities enabling a safe take-over of the ECDIS functions in order to ensure that an ECDIS failure does not result in a critical situation;
- .2 a means to provide for safe navigation for the remaining part of the voyage in case of ECDIS failure.

#### 2 PURPOSE

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

#### 3 FUNCTIONAL REQUIREMENTS

##### 3.1 Required functions and their availability

##### 3.1.1 Presentation of chart information

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

##### 3.1.2 Route planning

The back-up system should be capable of performing the route planning functions, including:

- .1 taking over of the route plan originally performed on the ECDIS;
- .2 adjusting a planned route manually or by transfer from a route planning device.

##### 3.1.3 Route monitoring

The back-up system should enable a take-over of the route monitoring originally performed by the ECDIS, and provide at least the following functions:

- .1 plotting own ship's position automatically, or manually on a chart;
- .2 taking courses, distances and bearings from the chart;
- .3 displaying the planned route;

- .4 displaying time labels along ship's track;
- .5 plotting an adequate number of points, bearing lines, range markers, etc., on the chart.

### **3.1.4 Display information**

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

### **3.1.5 Provision of chart information**

- .1 The chart information to be used in the backup arrangement should be the latest edition, as corrected by official updates, of that issued by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution, and conform to IHO standards.
- .2 It should not be possible to alter the contents of the electronic chart information.
- .3 The chart or chart data edition and issuing date should be indicated.

### **3.1.6 Updating**

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

### **3.1.7 Scale**

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

- .1 if the information is displayed at a larger scale than that contained in the database; and
- .2 if own ship's position is covered by a chart at a larger scale than that provided by the system.

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

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

### **3.1.10 Voyage recording**

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

## **3.2 Reliability and accuracy**

### **3.2.1 Reliability**

The back-up arrangements should provide reliable operation under prevailing environmental and normal operating conditions.

### **3.2.2 Accuracy**

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

## **3.3 Malfunctions, warnings, alarms and indications**

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

## **4 OPERATIONAL REQUIREMENTS**

### **4.1 Ergonomics**

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

### **4.2 Presentation of information**

If an electronic device is used:

- .1 Colours and symbols should be in accordance with the colours and symbols requirements of ECDIS.
- .2 The effective size of the chart presentation should be not less than 250 mm x 250 mm or 250 mm diameter.

## **5 POWER SUPPLY**

If an electronic device is used:

- .1 the back-up power supply should be separate from the ECDIS; and
- .2 conform to the requirements in this ECDIS performance standard.

## **6 CONNECTIONS WITH OTHER EQUIPMENT**

**6.1** If an electronic device is used, it should:

- .1 be connected to systems providing continuous position-fixing capability; and
- .2 not degrade the performance of any equipment providing sensor input.

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

## Appendix 7

### RCDS MODE OF OPERATION

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

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

- .1 apply to RCDS; or
- .2 do not apply to RCDS; or
- .3 are modified or replaced as shown in order to apply to RCDS.

Any additional requirements applicable to RCDS are also described.

#### **1 SCOPE**

**1.1** Paragraph applies to RCDS.

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

**1.3 - 1.7** Paragraphs apply to RCDS.

**1.8** RCDS should provide appropriate alarms or indications with respect to the information displayed or malfunction of the equipment (see Table 1 of this appendix).

**1.9** Refers to Appendix 7 and applies to RCDS.

#### **2 APPLICATION OF THESE STANDARDS**

**2.1 – 2.4** Paragraphs apply to RCDS.

#### **3 DEFINITIONS**

**3.1** *Raster Chart Display System* (RCDS) means a navigation information system displaying RNCs with positional information from navigation sensors to assist the mariner in route planning and route monitoring, and if required, display additional navigation-related information.

**3.2** *Raster Navigational Chart* (RNC) means a facsimile of a paper chart originated by, or distributed on the authority of, a government-authorized hydrographic office. RNC is used in these standards to mean either a single chart or a collection of charts.



- 3.3 *System Raster Navigational Chart Database (SRNC)* means a database resulting from the transformation of the RNC by the RCDS to include updates to the RNC by appropriate means.
- 3.4-3.5 Paragraphs do not apply to RCDS.
- 3.6 Paragraph applies to RCDS.
- 3.7 Appropriate Portfolio of up to date paper Charts (APC) means a suite of paper charts of a scale to show sufficient detail of topography, depths, navigational hazards, aids to navigation, charted routes, and routing measures to provide the mariner with information on the overall navigational environment. The APC should provide adequate look-ahead capability. Coastal States will provide details of the charts which meet the requirement of this portfolio, and these details are included in a worldwide database maintained by the IHO. Consideration should be given to the details contained in this database when determining the content of the APC.

## **MODULE A - DATABASE**

### **4 PROVISION AND UPDATING OF CHART INFORMATION**

- 4.1 The RNC used in RCDS should be the latest edition of that originated by, or distributed on the authority of, a government authorized hydrographic office and conform to IHO standards. RNCs not on WGS 84 or PE-90 should carry meta-data (i.e., additional data) to allow geo-referenced positional data to be displayed in the correct relationship to SRNC data.
- 4.2 The contents of the SRNC should be adequate and up-to-date for that part of the intended voyage not covered by ENC.
- 4.3 It should not be possible to alter the contents of the RNC.
- 4.4 – 4.8 All paragraphs apply to RCDS.
- 4.9 Paragraph does not apply to RCDS

## **MODULE B – OPERATIONAL AND FUNCTIONAL REQUIREMENTS**

### **5 DISPLAY OF SRNC INFORMATION**

- 5.1 RCDS should be capable of displaying all SRNC information.
- 5.2 SRNC information available for display during route planning and route monitoring should be subdivided into two categories:
- .1 the RCDS standard display consisting of RNC and its updates, including its scale, the scale at which it is displayed, its horizontal datum, and its units of depths and heights; and
  - .2 any other information such as mariner's notes.

- 5.3- 5.4** Paragraphs apply to RCDS.
- 5.5** It should be easy to add to, or remove from; the RCDS display any information additional to the RNC data, such as mariner's notes. It should not be possible to remove any information from the RNC.
- 5.6 – 5.9** Paragraphs do not apply to RCDS.
- 5.10 – 5.12** Paragraphs apply to RCDS.
- 5.13** There should always be an indication if the ECDIS equipment is operating in RCDS mode.
- 6** **SCALE**
- This section applies to RCDS.
- 7** **DISPLAY OF OTHER NAVIGATIONAL INFORMATION**
- 7.1 - 7.4** All paragraphs apply to RCDS.
- 8** **DISPLAY MODE AND GENERATION OF THE NEIGHBOURING AREA**
- 8.1** It should always be possible to display the SRNC in “chart-up” orientation. Other orientations are permitted.
- 8.2 - 8.4** All paragraphs apply to RCDS.
- 8.5** Paragraph refers to RCDS mode of operation.
- 9** **COLOURS AND SYMBOLS**
- 9.1** IHO recommended colours and symbols should be used to represent SRNC information.
- 9.2** Paragraph applies to RCDS.
- 9.3** Paragraph does not apply to RCDS.
- 9.4** Paragraph applies to RCDS.
- 10** **DISPLAY REQUIREMENTS**
- 10.1-10.2** Paragraphs apply to RCDS.
- 10.3** Paragraph does not apply to RCDS.

- 10.4** Paragraph applies to RCDS.
- 10.5** Paragraph does not apply to RCDS.
- 10.6** RCDS should be capable of displaying, simply and quickly, chart notes which are not located on the portion of the chart currently being displayed.
- 11** **ROUTE PLANNING, MONITORING AND VOYAGE RECORDING**
- 11.1** Paragraphs apply to RCDS.
- 11.2** Paragraph does not apply to RCDS.
- 11.3** **Route Planning**
- 11.3.1-11.3.3** Paragraphs apply to RCDS.
- 11.3.4-11.3.5** Paragraphs do not apply to RCDS.
- 11.3.6** Paragraph applies to RCDS.
- 11.3.7** It should be possible for the mariner to enter points, lines and areas which activate an automatic alarm. The display of these features should not degrade the SRNC information and it should be clearly distinguishable from the SRNC information.
- 11.4** **Route monitoring**
- 11.4.1** Paragraph applies to RCDS.
- 11.4.2** It should be possible to display a sea area that does not have the ship on the display (e.g. for look ahead, route planning), while route monitoring. If this is done on the display used for route monitoring, the automatic route monitoring functions in 10.4.6 and 10.4.7 should be continuous. It should be possible to return to the route monitoring display covering own ship's position immediately by single operator action.
- 11.4.3-11.4.4** Paragraphs do not apply to RCDS.
- 11.4.5** Paragraph apply to RCDS.
- 11.4.6** Paragraphs do not apply to RCDS.
- 11.4.7-11.4.9** Paragraphs apply to RCDS.
- 11.4.10** The RCDS should only accept positional data referenced to the WGS 84 or PE-90 geodetic datum. RCDS should give an alarm if the positional data is not referenced to one of these datum. If the displayed RNC cannot be referenced to the WGS 84 or PE-90 datum then a continuous indication should be provided.

**11.4.11-11.4.15** Paragraphs apply to RCDS.

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

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

**11.5 Voyage recording**

**11.5.1-11.5.4** All paragraphs apply to RCDS.

**12 CALCULATIONS AND ACCURACY**

**12.1-12.3** All paragraphs apply to RCDS.

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

**13 PERFORMANCE TESTS, MALFUNCTION ALARMS AND INDICATIONS**

**13.1-13.2** All paragraphs apply to RCDS.

**14 BACK-UP ARRANGEMENTS**

All paragraphs apply to RCDS.

**MODULE C – INTERFACING AND INTEGRATION**

**15 CONNECTIONS WITH OTHER EQUIPMENT**

**15.1-15.3** All paragraphs apply to RCDS.

**16 POWER SUPPLY**

**16.1-16.2** All paragraphs apply to RCDS.

**Table 1**

**ALARMS AND INDICATORS IN THE RCDS MODE OF OPERATION**

<b>Paragraph</b>	<b>Requirement</b>	<b>Information</b>
11.4.5	Alarm	Deviation from route
11.4.17	Alarm	Approach to mariner entered feature, e.g. area, line
11.4.8	Alarm	Position system failure
11.4.9	Alarm	Approach to critical point
11.4.10	Alarm or indication	Different geodetic datum
13.2	Alarm or indication	Malfunction of RCDS mode
5.13	Indication	ECDIS operating in the raster mode
6.1	Indication	Larger scale information available, or overscale
6.1.2	Indication	Larger scale RNC available for the area of the vessel

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

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NO