Maritime New Zealand Guidelines

MARINE GUIDANCE NOTICE ISSUE 08 – UPDATED JULY 2009

July 2009

USE OF ELECTRONIC CHARTS, ECDIS AND ENCS IN NEW ZEALAND

This guidance is for:

- New Zealand shipping companies
- International SOLAS vessels visiting New Zealand
- Classification societies in New Zealand
- Maritime New Zealand (MNZ) safety inspectors, auditors and accident investigators.

What are ECDIS and ECS, and what is the difference?

An electronic chart system is a general term for all electronic equipment that can display a vessel's position on a chart image on a screen.

There are two classes of these systems:
- **ECDIS** (Electronic Chart Display and Information Systems)
- **ECS** (Electronic Chart Systems)

ECDIS require a special type of electronic chart called **ENCs** (Electronic Navigational Charts), which are "vector charts" that have been officially authorised by the National Hydrographic Office for those chart areas. All the hardware and software for the ECDIS systems need to be designed and certified for navigational use onboard ships and must meet international performance standards to ensure they are safe and reliable.

ECS describes all the other systems that do not meet the ECDIS standard. ECS are not safe enough to meet the IMO/SOLAS chart carriage standard and cannot be used instead of paper charts on commercial ships.
These systems can use a wide range of different types of electronic charts including "raster charts". Raster charts are unofficial electronic photocopies of paper charts, scanned into a computer and given a datum position reference. They can be less accurate, not be up to date and unsafe for navigation.
RNCs (Raster Navigational Charts), however, are accurate scale copies of the officially issued and updated versions of the paper charts as authorised by the Land Information New Zealand (LINZ) Hydrographic Office.

The main difference between RNCs and ENCs

There is a fundamental difference between the two types of official electronic navigational charts: Raster Navigational Charts (RNCs) and Electronic Navigational Charts (ENCs). It comes down to how the data of the chart is stored, how the chart communicates with the system that is running it, and the ability of that system to communicate the information to the user.

ENCs have each object (each line, object, colour, area and symbol) digitally described, positioned and encoded. The fundamental difference between RNCs and ENCs is that an ENC can communicate its information through the ECDIS to the user when or before it becomes relevant to the ship's navigation.

This means that an ENC being used within an ECDIS system can warn the user before or when they are entering into an area, shipping lane, within a certain draft or within a range of a chart object.

This is highly beneficial to the navigator. Additional to the GPS position, course and speed, these ECDIS systems can incorporate and overlay images from radars, ARPA systems, AIS, gyros and the ship's speed log to provide an integrated overview of most of the information that is generally needed, through the one system. It is for this reason that ECDIS is an information system not only a display system.

RNCs by comparison are a passive replica of the paper chart; a collection of pixels with a referenced geographical position, and the system using them can only provide warnings if the information has been manually entered into the system by the user. Raster chart reference datum can vary (they are not always WGS-84) and this can introduce significant position errors between the chart and the GPS position, however, all RNCs are required to be corrected for this inaccuracy.

Can electronic charts be used instead of paper charts?

SOLAS Chapter V "Safety of Navigation" Regulation 19.2.4 accepts ECDIS as meeting the chart carriage requirements for all ships to have *"nautical charts and nautical publications to plan and display the ship's route for the intended voyage and to plot and monitor positions throughout the voyage".* SOLAS does not recognise any other electronic chart system standard other than ECDIS.

Regulation 19.2.5 goes on to require "*back-up arrangements to meet the function requirements of subparagraph .4 if this function is partly or fully fulfilled by electronic means".*

This acceptance to permit ECDIS to be used for the above functions, in place of, but backed up by, paper charts and publications, is echoed in New Zealand's Maritime Rules as detailed below.

Maritime Rules Part 25: Nautical charts and publications

New Zealand Maritime Rules Part 25 applies to all commercial ships in New Zealand coastal waters, and publishers in New Zealand of nautical charts and publications, but does not apply to –

(a) fishing vessels of less than six metres in length within two miles of the coast; or

(b) vessels of less than 12 metres in length within the enclosed area; or

(c) warships; or

(d) pleasure craft.

Maritime Rules Part 25.7(1)(c), concerning electronic nautical charts, states that any nautical chart, if it is an electronic chart, must –

(i) be part of an Electronic Chart Display and Information System that meets the requirements of Performance Standards for Electronic Chart Display and Information Systems (ECDIS) adopted by the International Maritime Organisation by Assembly Resolution A.817(19); and

(ii) have paper back-up nautical charts; and

(iii) be operated only by persons who have received training, that is acceptable to the Director, in the use of electronic charts.

Leading on from those requirements, Maritime Rules Part 25.7(2) requires that an electronic navigational chart carried to meet the requirements of Part 25 must be maintained in a fully corrected condition from updates supplied by LINZ or its approved chart retailers. The requirement that all navigational charts must be "maintained in a fully corrected condition" applies to all paper and all electronic nautical navigational charts used onboard.

"Nautical Chart", as defined by Maritime Rules Part 25, means a special-purpose map, or a specially compiled database from which such a map is derived, that is issued officially by, or on the authority of, the relevant government institution and is designed to meet the requirements of marine navigation.

Only New Zealand nautical charts authorised by LINZ comply with Maritime Rules Part 25.

ECDIS user training requirements

Maritime Rules Part 25.7(1)(c)(iii) requires that ECDIS be operated only by persons who have received training, that is acceptable to the Director of MNZ, in the use of electronic charts.

Additionally the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1995 (STCW 95) and the International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention (ISM Code) put the onus firmly on the ship owner or operator to ensure that mariners on their ships are competent to carry out the duties they are expected to perform.

If a ship is equipped with ECDIS, the ship owner or operator needs to ensure that users of such a system are properly trained in its operation, the use of electronic charts, and are familiar with the shipboard equipment before using ECDIS operationally at sea.

By the STCW 95 implementation date of 1 February 2002 all holders of New Zealand STCW 95 endorsed Certificates of Competency in the deck department were to have completed basic ECDIS training. Before a watchkeeping officer or master intends to use a compliant ECDIS as the primary means of navigation it is recommended that they complete a generic ECDIS Operators Course complying with IMO Model Course 1.27 - The Operational Use of Electronic Chart Display and Information Systems (ECDIS).

ECDIS training should be provided by the ship owner or operator under the terms of the ISM Code. Under the ISM Code, the shipping company has a responsibility to "establish procedures to ensure that new personnel and personnel transferred to new assignments related to safety and protection of the marine environment are given proper familiarisation with their duties. Instructions which are essential to be provided prior to sailing should be identified, documented and given" (section 6.3 of the ISM Code).

Correcting and updating your electronic charts

Each country with responsibilities for updating nautical charts has an organisation whose responsibility it is to carry out updates and to communicate those changes to the users of those charts. In New Zealand it is LINZ that issues "Notice to Mariners" detailing what charts have changed and what corrections are required.

All commercial mariners should be aware of the Notice to Mariners procedure for receiving, carrying out and recording the update of chart corrections to the ship's charts. This procedure is just as important and necessary for electronic nautical charts as for paper charts.

Currently RNCs issued by national hydrographic offices are electronically kept up-to-date by the contracted update services from those organisations. The UK based *Admiralty Raster Chart Service (ARCS®)* and the American *Maptech®* are examples of the provision of this type of service.

The New Zealand RNC folio, authorised by LINZ, is called *NZMariner* and is available through LINZ authorised chart retailers. *NZMariner* is updated monthly, however, many unofficial raster charts producers do not regularly update their charts. Without an official update service many of the versions of electronic charts in New Zealand may not be up-to-date or correct.

Likewise ENCs officially distributed through authorised chart retailers should be fully supported by an automatic update service for all the corrections that are required.

If you are not aware of the electronic update service for your electronic charts (and be able to demonstrate it) it is likely that your electronic charts are not being kept up-to-date and you may not comply with Maritime Rules Part 25 for the use of those charts on board.

ENC availability for New Zealand maritime chart areas

LINZ has released a significant portion of the ENCs required for New Zealand chart areas with the initial focus being on the approaches to the principal New Zealand ports and their harbour areas.

The ongoing release of ENCs by LINZ will continue until all New Zealand's areas of chart responsibility. are provided for in the ENC format. For the current list of available ENCs please refer to the LINZ website:

http://www.linz.govt.nz/hydro/charts/digital-charts/encs/index.aspx

These ENCs are available through LINZ authorised chart retailers. A list of LINZ authorised chart retailers is available and can be found on the LINZ website: www.linz.govt.nz/hydro/charts/

For any queries relating to ENCs, their production or availability please contact LINZ on 0800 665 463, or email to info@linz.govt.nz or refer to the LINZ website on www.linz.govt.nz

Updates

Updates for New Zealand ENCs are issued in line with the fortnightly electronic New Zealand Notices to Mariners booklet. ENC updates are issued for all Permanent Notices to Mariners.

For details of Temporary and Preliminary Notices to Mariners, mariners should consult the electronic fortnightly New Zealand Notices to Mariners booklet or the LINZ website at www.linz.govt.nz or subscribe online at the LINZ website to receive fortnightly Notices to Mariners via email.

The use of ECDIS in areas where ENCs have not yet been released

ENCs are an integral component part of any ECDIS. Some ECDIS systems, however, are able to use RNCs when ENCs are not yet available. It is important to note that the performance capabilities of an ECDIS system automatically downgrade to an RCDS (Raster Chart Display System) when any RNCs are used.

This means that an ECDIS system stops being able to fulfil its functionality when it does not have the information contained in the ENC vector chart.

Only electronic charts which comply with Maritime Rules Part 25.7(1)(c) may be used for the navigation of ships within New Zealand waters.

Where ENCs are officially available for those navigational areas they need to be used within the ECDIS in order to comply with Maritime Rules Part 25.7(1)(c). The first New Zealand ENCs were released by LINZ in August 2008, and since then they must be used by ships using ECDIS for navigation in these areas.

For any ECDIS conforming to IMO resolution A.817(19) being used for navigation outside areas of official ENC coverage, the system may be used as a RCDS provided the performance standard is not inferior to that set out in Annex 4 of IMO resolution MSC.86(70).

As a guide to the effect of the different amendments to resolution A.817(19), as enforced in New Zealand by Maritime Rules Part 25, please refer to the following:

- ECDIS installed on or after 1 January 2000 must conform to performance standards not inferior to those set out in resolution A.817(19), as amended, and Annex 4 to the resolution MSC.86(70) (relating to the RCDS mode of operation); and
- ECDIS installed on or after 1 January 1999 and before 1 January 2000 must conform at least to the performance standard set out in resolution A.817(19), as amended by resolution MSC.64(67), Annex 5; and
- ECDIS installed on or after 1 January 1999 must conform at least to the performance standard set out in resolution A.817(19).

Copies of IMO resolution A.817(19), MSC.86(70) and MSC.64(67) are available on request from the MNZ Rules Co-ordinator at the following email address: rules.coordinator@maritimenz.govt.nz

The navigational use of RNCs as nautical charts, within ECS or RCDS, outside of these standards does not comply with Maritime Rules Part 25.7. This rule applies to ships in all areas ("unlimited", "offshore and coastal" and "inshore and enclosed").

Important limitations of ECDIS when an ENC is not available and an RNC is used

When an ECDIS system does not have an ENC for the area being navigated, and an RNC is used in its place, it is said to be operated as a Raster Chart Display System (RCDS).

It is important to bring the mariner's attention to the following limitations which significantly reduce the functionality from the ECDIS standard which the mariner might expect from the equipment:

- Unlike within the ECDIS where the ENCs have no chart boundaries, RNCs are based on paper charts and as such have boundaries which are evident when passing from one chart to the next. This may cause confusion or distract the user at areas on or near to chart boundaries.

- RNCs will not trigger automatic alarms (eg anti-grounding). However, some alarms and indications can be generated with the manual addition, during passage planning, by the user (eg clearing lines, ship safety contour lines, isolated danger markers and danger areas). To recover some of the safety functionality of the ECDIS system and mitigate these limitations a significant amount of data set-up is required.

- Horizontal datum and chart projections may differ between raster charts. Mariners should understand how a chart's horizontal datum relates to the datum of the position fixing system in use. In some instances, this may appear as a shift in position. This difference may be most noticeable at grid intersections and during route monitoring.

- Some raster charts cannot be referenced to WGS-84. If any electronic chart cannot be referenced to a WGS-84 chart datum the ECDIS equipment should give a continuous indication of this inaccuracy in order to highlight the position error.

- The display of RNCs features cannot be simplified by the removal of data and features to suit a particular navigational circumstance or task at hand. When you zoom in or out on scale within the system the raster chart image is only magnified, it does not jump step the available information and provide clear display detail to suit the scale as with an ENC. This could affect the superimposition of radar/ARPA and overload the amount of data being displayed.

- Without selecting different scale charts the look-ahead capability may be limited. This may lead to inconvenience when determining range and bearing or the identity of distant objects.

- Raster charts are drawn in the north-up orientation and the information is written on the chart in that same orientation. When the orientation of RNC within the RCDS display is arranged in anything other than north-up the readability of chart text and symbols may be affected (eg when in course-up, route-up display modes).

- It is not possible to interrogate RNC features to gain additional information about charted objects.

- With RNC it is not possible to display a ship's safety contour or safety depth and highlight it on the display, unless these features are manually entered during route planning.

- ECDIS systems using ENCs apply prescribed colour and intensity regimes for day, dusk and night time so as to not impair the night vision of the user. Depending on the source of the RNC,

different colours may be used to show similar chart information and these may again vary within the day and night regimes from what the user is used to.

- An RNC is intended to be used at the scale of the equivalent paper chart. Excessive zooming in or zooming out can seriously degrade the displayed image or overload the display with too much unreadable data. If the RNC is displayed at a larger scale than the equivalent paper chart, the ECDIS will provide an indication.

- ECDIS can provide an indication of the quality of hydrographic data used in the ENC. When using RNCs, mariners are require to consult the source diagram or the zone of confidence diagram, if available, to gain this data.

- Lastly, when boarding a vessel the pilot needs to interface with the bridge equipment and bridge team as quickly and seamlessly as possible. The standardised nature of ECDIS greatly assists in this, however, it is important to notify the pilot when the system is in RCDS mode so that incorrect assumptions about available functionality are avoided.

Design requirements for ECDIS

The following publications, as amended, are relevant IMO, IEC and IHO documents detailing international requirements for ECDIS equipment:

- IMO Resolution A.817(19), as amended, “Performance standards for electronic chart display and information systems”.
- IMO Resolution A.830(17) Code on alarms and indicators.
- IMO Resolution A.694(17) General requirements for shipborne radio equipment forming part of the GMDSS and for electronic navigational aids.
- IEC Standard 60945 Maritime navigation and radio communication equipment and systems - General requirements - Methods of testing and required test results.
- IEC Standard 61174 Electronic chart display and information system(ECDIS), operational and performance requirements, methods of testing and required results.
- IEC Standard 61162 Maritime navigation and radio communication equipment and systems, digital interface.
- IHO S-52 Specifications for chart content and display aspects for ECDIS.
- IHO S-57 Transfer standard for digital hydrographic data.
- IHO S-61 Product Specifications for RNCs
- IHO Test data set for use with IEC 61174.

Publications may be obtained at:

- www.imo.org, IMO publications
- www.iec.ch, IEC publications
- www.iho.shom.fr, IHO publications

Further information

For more information please contact:
Maritime Services: Senior Technical Advisor (SOLAS)
Maritime New Zealand
Phone: (04) 473 0111
Fax: (04) 494 8901
Website: www.maritimenz.govt.nz