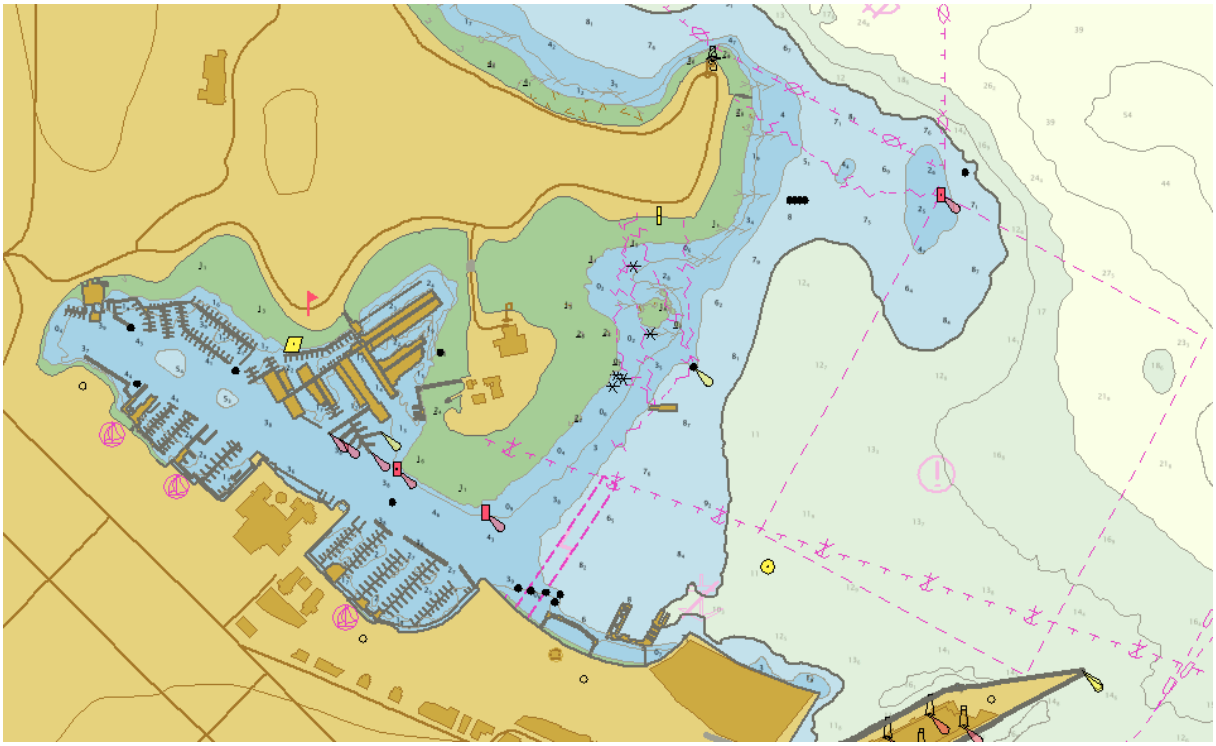
A Complete guide to ENC (Electronic Navigational Chart)



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A Complete guide to ENC (Electronic Navigational Chart) PART 1

What are official charts ?

Charts and ENCs issued by or on the authority of a Government, authorized Hydrographic Office or other relevant government institutions are official and may be used to fulfill carriage requirements (provided they are kept up to date).
All other nautical charts are by definition not official and are often referred to as private charts. These charts are not accepted as the basis for navigation under the SOLAS convention.

There are two kinds of official digital charts commonly available; Electronic Navigational Charts (ENC) and Raster Navigational Charts (RNC)

What are the IMO requirements for the carriage of nautical charts?

The requirements for carriage of nautical charts are laid down in SOLAS Chapter V.
The relevant regulations are:
- Regulation 2, defines the nautical chart
- Regulation 191, specifies the equipment to be carried on different types of ships and
- Regulation 27, specifies the requirement to keep charts and publications up-to-date.

What is an Official ENC?

Electronic Navigational Chart (ENC) means a **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.
Electronic Navigational Charts (ENC), also known as vector charts, are data sets to support all types of nautical navigation.
It complies with IHO ENC product specification that is part of the chart data transfer standard known as S-57. Any other vector chart data is unofficial and therefore does not meet the SOLAS carriage reuirement.

Attributes of an ENC

- Compiled and coded according to standards of IHO
- Referred to World Geodetic System 1984
- Regularly updated with official update information distributed digitally
- ECDIS display distinguishes between ENCs and unofficial data through the continuous display of a warning stating mariner should navigate by means of an up to date official paper chart.
- Also the boundary between ENC and unofficial data is displayed with a red hatched line.

How do I recognise an official ENC?

When you are buying:

Only authorized distributors sell official ENCs as an ENC service, which includes the delivery of update information. The distributors are authorized either directly by the originating Hydrographic Office or by a cooperation of Hydrographic Offices.

When used in an ECDIS:

ECDIS distinguishes an official ENC from unofficial data. When unofficial data is used, ECDIS informs mariners that they must navigate by means of an official up to date paper chart by a warning, which appears continuously on the screen.

If unofficial data is shown on the ECDIS display, its boundary is to be identified by a special line style. This boundary is visualized as a “one-sided” RED line with the diagonal stroke on the non-HO side of the line.

Further the mariner can use an ECDIS function to interrogate the chart display to obtain the chart details like information on originator, edition number and status of updating.

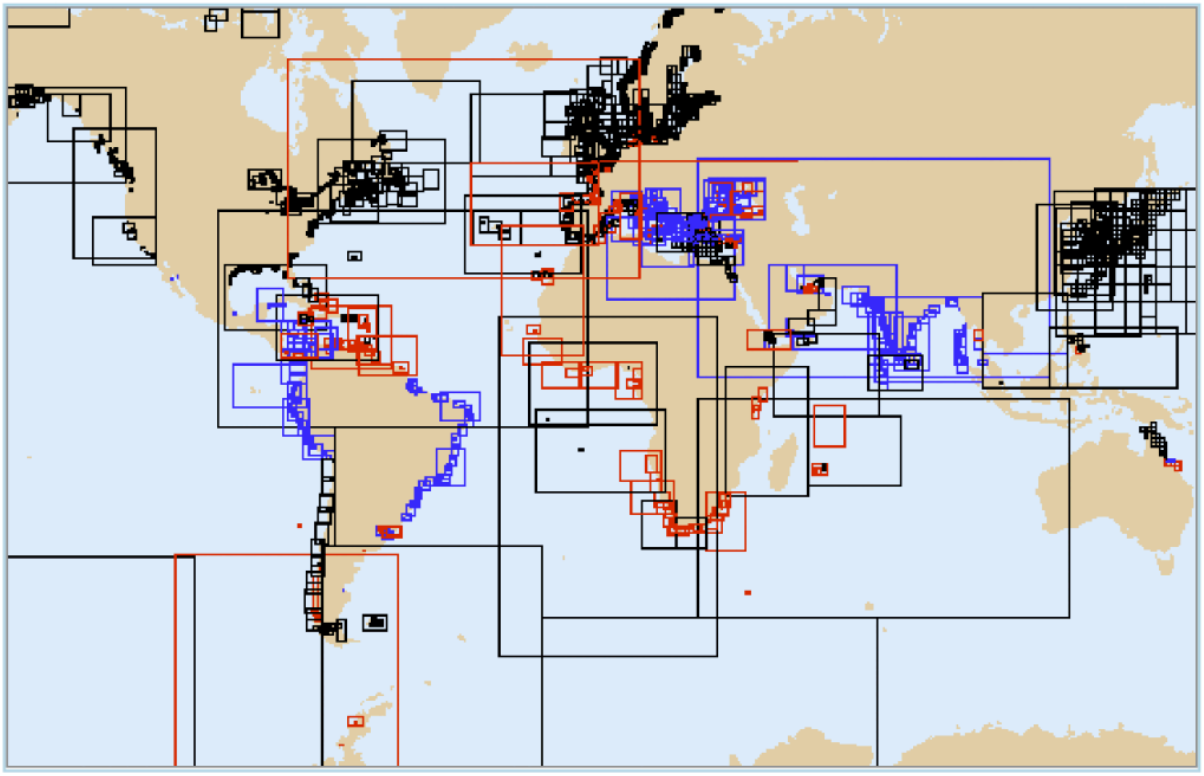
Where can I get official ENCs?

The International Hydrographic Organisation (IHO) provides an interactive web catalogue (www.iho.shom.fr) displaying the status of worldwide ENC production. This system has pointers for guiding users to ENC suppliers and distributors. A three-colour scheme is used to distinguish between degrees of accessibility.

This catalogue indicates that a considerable number of ENCs have been or are being produced by Hydrographic Offices. It also shows that only a part of the issued data has been released and made available to the market.

The illustration below shows the front page of the catalogue, which can be found at the

IHO web-site at www.iho.shom.fr, look under “ENC”



IHO standards used in ENC

S-52 – Specifications for chart content and display aspects of ECDIS

S-57 – IHO Transfer standard for Digital hyrographic data

S-58 – ENC validation checks

> Includes specifications for ENC update status, allows mariners and PSCs to confirm that ENCs installed in ECDIS are up to date.

S-62 – List of data producer codes

S-63 – IHO Data protection scheme

What is S-52?

S-52 is a standard used by ECDIS manufacturers that determines how ENC data is displayed on an ECDIS screen through symbols, line styles, colours and other visual cues. This means that what the mariner sees on the screen is displayed in the same way across all approved makes and models of ECDIS.

Presentation Library

The presentation library is an important part of this standard.

The actual appearance of an object on an ECDIS display is governed by IHO standard S-52. **Presentation Library is a large electronic document. It is directed for ECDIS manufacturers and not intended for mariners or end users.** Presentation library in particular **defines symbols used on charts including dimensions and colours**. Many aspects as to how objects are displayed are automatically governed by various user settings on ECDIS.

Latest version of presentation library is 4.0

What are the changes within Presentation Library 4.0?

As well as ensuring greater consistency in the display of ENC data across all ECDIS, the new standards deliver other benefits for the mariner.

Firstly, the latest Presentation Library addresses the number one complaint levelled at ECDIS; constant audible alarms. By providing clear guidance to ECDIS manufacturers on ENC objects that will raise an alarm, the IHO has tackled the **issue of alarm fatigue on the bridge**.

Also, information such as fairway and anchorage area names now appear on screen, with landmarks, lights and buoys viewable via a 'hover-over' function. Both initiatives reduce the time-consuming need to find information buried in a pick report.

What is S-57?

S-57 is the data format **used for the transfer of digital hydrographic data between national hydrographic offices and for its distribution to manufacturers**, mariners and other data users.

Within this standard, the S-57 ENC product specification defines how hydrographic offices will construct an Electronic Navigational Chart. By meeting these specifications hydrographic offices will ensure that all electronic charts contain all the chart information that is necessary for safe navigation.

What is S-58?

S-58 sets out validation checks that must be performed on ENCs by hydrographic offices before they are released to the mariner at sea. These checks include tests to ensure that there are no irregularities in an ENC that could cause an ECDIS to malfunction. Irregularities could include incorrectly intersecting geometry, depths plotted on land or railway tracks appearing in open water.

What is S-63?

This standard covers three important areas:

- Piracy Protection – to prevent unauthorised use of data by encrypting the ENC information.
- Selective Access – to restrict access to ENC information to only those cells that a customer has been licenced for.
- Authentication – to provide assurance that the ENC data has come from approved sources

For the mariner, this means that data which meets these standards is authenticated and comes from an official source, reducing the risk of using inaccurate data that is posed by unofficial ENCs and the risk of malware being introduced to a ship's IT systems.

How are official ENCs protected?

A majority of all official ENCs in Europe are only made available to the end users in a protected form compliant with the IHO S-63 Data Protection standard. The standard maintains the integrity in all transactions between the service provider and the end user.

The protection standard enables the end user systems to check the authenticity of the supplied information and verify that it is official ENC data. This feature can also be used to distinguish between official ENCs and unofficial vector data in the market.

How are ENCs kept up-to-date?

In order to meet carriage requirements, official charts ENCs must be kept corrected by Notices to Mariners issued by Hydrographic Offices.

Official electronic charts are kept up to date by applying regular, for example weekly, update information to the chart data via a data file. The update file may be transferred by wireless transmission, or by a suitable media e.g. CD.

The actual updating is applied automatically by the ECDIS to its chart database. This is the preferred update method.

A standard function of ECDIS is the capability of updating the ENC manually on the,screen. Objects retrieved from the Notices to Mariners and applied manually to the ENC are marked on the ENC display with an additional orange indicator.

How do I check that all updates have been applied to the official ENC?

Updates to official ENCs are sequential, and the sequence is unique to each ENC.

A standard ECDIS functionality is the verification that all updates in the sequence havebeen applied. Thus an indication will be given if an update to a specific ENC has been missed and updating is no longer possible until this missed update is added to the sequence.
Verification of the application of updates can be found in the list of updates already applied, which the ECDIS is required to keep. Should all available ENCs show the same date for the latest update, it is likely that they have not been updated regularly, and the distributor should be contacted for verification. Furthermore it is possible to use traditional sources of information, such as Notices to Mariners, to verify updates.

Compilation scale of ENC

IHO recommends that compilation scales are based on radar like ranges as given below:

48 Nm – 1:700,000 24 Nm – 1;350,000 etc

The viewing scale of a paper chart is determined and fixed by the cartographer at the chart compilation stage, so symbols are typically larger than the extent of the real-world feature they represent and do not change. The situation is different when ENCs are used in ECDIS as the Mariner can zoom in and out beyond the ENC compilation scale. Zooming in to a larger scale introduces the risk that any positional errors that may exist in the ENC data are magnified to a point where the data becomes unsafe to use – and this fact will not be immediately apparent as the ECDIS will continue to display the text and symbols at a fixed size.

ENC producers use a variety of methods to define the compilation scale of their ENC data,but for safety reasons these will always take into account the scale at which the source information was captured.
To ensure consistency, and thus contribute to improved display, most ENCs are assigned to one of the IHO's recommended standard compilation scales. These are defined within the IHO's S-65 publication, together with an example of the navigational purpose to which each ENC scale may be assigned.

Navigational purpose categories of ENC

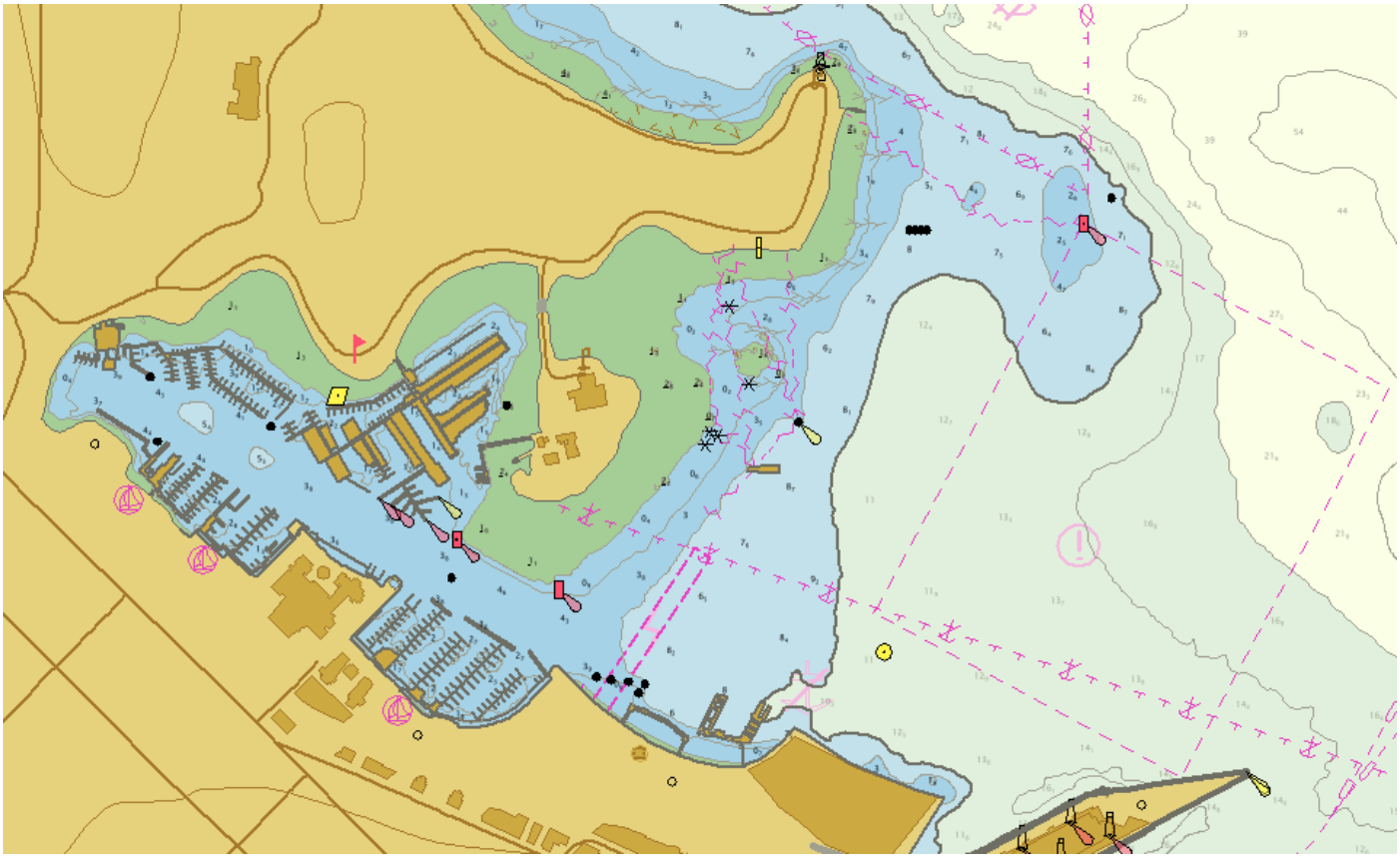
Dependent on its intended navigational purpose an ENC is assigned to one of the 6 Navigational Purposes defined in S-57:

1) Overview
2) General
3) Coastal
4) Approach
5) Harbour
6) Berthing

S-57 Edition 3.1 does not define minimum and maximum compilation scales for each Navigational Purpose. However, the following table is an example of how scale ranges may be assigned to Navigational Purposes:

Navigational Purpose Name Scale Range

1 Overview <1:1 499 999
2 General 1:350 000 – 1:1 499 999
3 Coastal 1:90 000 – 1:349 999
4 Approach 1:22 000 – 1:89 999
5 Harbour 1:4 000 – 1:21 999
6 Berthing > 1:4 000



A Complete guide to ENC (Electronic Navigational Chart) PART 2

Introduction

ENC contains all the chart information necessary for safe navigation and may contain supplementary information in addition to that contained in the paper chart (Eg Sailing Direction) which may be considered necessary for safe navigation.

ENCs are the fuel (Database) for ECDIS compiled according to strict rules detailed by the IHO The format of the ENC data is defined in IHO digital document known as S-57. S-57 is a digital document and also has a substantial appendices. S-57 is a formidable document and is not intended for the use by the mariner. ENC data is compiled into rectangular cells aligned with constant latitude and longitude i.e two parallels and two meridians. The cells boundaries are chosen by the compiling hydrographic office. The ENC cell boundaries are chosen by the compiling hydrographic office. The cells may be thought of as an digital equivalent of a navigational paper chart. It may require 3 cells to cover entire data covered in a single paper chart. The boundaries are agreed by the neighboring HOs (hydrographic organisation), working with the principle defined in WEND.

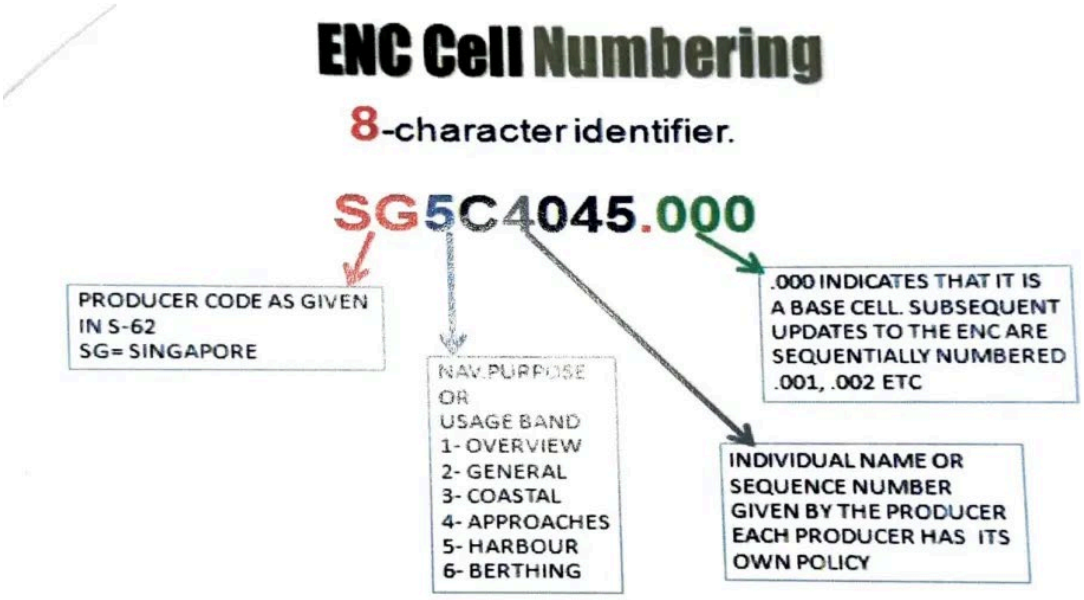
Worldwide Electronic Navigational Chart Database

WEND was setup by the IHO to define the responsibilities of HOs for the production and distribution of ENCs. The officially stated purpose of the WEND is to ensure a worldwide consistent level of high quality updated official ENCs through integrated services that support carriage requirements of SOLAS chapter V and the requirements of the IMO performance standards for ECDIS.

How are official ENCs named

Each ENC cell has an eight-character identifier. First character is an alphabet and identifies the producing nation e.g. US, GB, NL, Cl. (All countries use 2 alphabets except China which uses an alphabet and a number).
The 3rd character shows the usage band (navigational purpose category) and the remaining 5 characters identify the actual cell (various formats are used by different countries).

All unofficial charts are identified by the first character being a number or less than 8 digits in the name.



The cell boundaries are chosen by the compiling hydrographic office. The boundaries are agreed by the neighbouring Hydrographic offices.
It may require 1 to 3 cells to cover the entire data covered in a single paper chart.

The third digit in the unit does not necessarily follow any usage band criteria. For example, Canada has units with CA7 & CA8 . Inside these units there maybe cells of usage bands 1 to 6.
The last 3 characters are used as the specific identifier for that Unit. For example, SG5001 is a Singapore ENC unit in the coastal usage band. This unit has 13 SG ENCs, all of usage band 5. Units are similar to paper chart folios. Units are mainly used for licensing purposes. Some HOs distributes licenses per units. All Singapore ENCs have to be purchased as one unit of 13 ENCs. Recently another 3 SG ENCs have been added but as separate ENCs not included in the unit.

SENC (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.

An Electronic Chart Display and Information System (ECDIS) will convert the ENC and its updates into its own native System ENC (SENC) format. The SENC format is optimized by the ECDIS manufacturer for the correct and efficient display of the ENC information.
Within the ECDIS, the features and their attributes (for example position, color, shape) can be selectively displayed and queried, creating the potential to customize the chart image displayed on screen.

This not only provides ENC users with control over what level and type of detail they wish to see, but can also be linked to other on-board systems to provide additional features such as automatic warning alarms and indications.

SENC Information Available for Display during Route Planning and Route monitoring.

A. Display Base

means the chart content as listed below and which cannot be removed from the display. It is not intended to be sufficient for safe navigation. 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.

B**. Standard Display**

is the display mode intended to be used as a minimum during route planning and route monitoring.

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.

C. 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 1
10. Place names.

What to do in areas without official ENC coverage?

In 1998 the IMO recognized that it would take some years to complete the world's coverage of ENCs. As a consequence IMO ECDIS Performance Standards were amended adding is new optional mode of operation of ECDIS, the Raster Chart Display System (RCDS) model In this mode RNCs can be used in ECDIS to meet SOLAS carriage requirements for nautical charts. However, this is only allowed if approved by the Flag State.

The intention of those changes was to allow the ECDIS cooperate as far as possible on official chart data; official ENCs where they were available and official RNCs to fill in the gaps.
IMO took note of the limitations of RNCs as compared to ENC55, and the revised ECDIS Performance Standards require that the ECDIS must be used together with -an appropriate folio of up-to-date paper charts" for the areas where RCDS mode is employed.

The intention was to allow the number of paper charts carried by a vessel to be reduced where RCDS mode was employed, but only to a level compatible with safe navigation.

No definition of an "appropriate folio- was provided by IMO and consequently different Flag States developed individual interpretations.
As there is no common interpretation of the term "appropriate" – ship owners should consult their flag state as to whether RCDS mode is allowed and under what conditions.

In areas where ENCs or RNCs are not available vessels must carry all paper charts necessary for the intended voyage.

Source: https://alphacadet.in/