

	<i>HEALTH, SAFETY, ENVIRONMENT AND QUALITY MANAGEMENT SYSTEM</i> 7B.0. ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM (ECDIS) <i>NAUTICAL MANUAL</i>	Sect : 7B.0 Page : 1 of 55 Date : 7-Aug-25 Rev : 10.1 Appr : DPA
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ELECTRONIC CHART DISPLAY AND INFORMATION SYSTEM (ECDIS)

1. GENERAL

Electronic Chart Display and Information System (ECDIS) is an electronic navigation system that operates with Electronic Navigation Charts (ENC) or Raster Navigational Charts (RNC) when ENC's are not available.

All our vessels are equipped with two ECDIS and ECDIS is used as Primary means of navigation.¹

The primary function of the ECDIS is to contribute to safe navigation. The ECDIS, either with an ENC on display or operating in RCDS mode, must at all times be able to perform the following tasks:

- Show automatic and continuous plotting of the vessel's position on the display
- Generate an alarm about navigational dangers
- Show deviations from the vessel's planned route
- Generate an alarm when crossing a safety contour
- Maintain an electronic logbook of the vessel
- Display acquired ARPA targets to indicate other vessels' manoeuvres
- Display AIS targets and AIS information on the display.
- Show the latest update added, and be able to show that all updates have been correctly added. ECDIS should facilitate simple and reliable updating of the electronic navigational chart.
- Show the Standard Display through one single adjustment (key stroke) by the operator
- Allow easy movement from one item of information to another or from one chart to another
- Enable the operator to select a safety depth contour, which will be highlighted on the ECDIS
- Show that vessel's radar and ECDIS are working to the same scale when overlaid on the ECDIS screen
- Make it easy for the radar information to be added on or removed from the ENC display by the operator, and allow other sources of information to be added to the ENC with a common system of references. (If this is not done, then the ECDIS should make it apparent to the operator)
- Allow the ENC to be shown in a north-up, course-up or head-up display, and be able to switch easily between these modes
- Allow the operator at any time to switch the display from showing the vessel's present position to another image 'looking ahead' further along the planned route

¹ W 08 / 2019

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

1.1. The main features of ECDIS are:

- ENC's are displayed on an electronic screen situated in the bridge console allowing the Master and Pilot to con the vessel without having to leave the conning station to consult a chart.
- Continuous monitoring of the ship's position through input from multiple position sensors such as GPS, speed log, gyro compass etc;
- Route planning and route monitoring facilities;
- Wide variety of warning facilities, including grounding warnings and safe depth contours.
- Radar image may be superimposed on electronic charts (optional).
- Built in navigational information such as details and characteristics of lights etc.
- Chart database loaded and updated using CD ROM's.

ENC's are vector charts that conform to International Hydrographic Organization standards. They are compiled from a database of individual items (objects) of digitised chart data which can be displayed as a seamless chart. When used in an electronic navigation system, the data can then be reassembled to display either the entire chart image or a user selected combination of data. ENC's are intelligent in that systems using them can be programmed to give warning of impending danger in relation to the vessel's position and movement.

To achieve compliance with international regulations, a ship may navigate with ECDIS as the primary means of navigation if:

- Sufficient official data adequate for the intended passage is installed (ENC and RNC).
- the installed ECDIS is type approved.
- a second type approved ECDIS is installed as a backup (or there is a full paper chart backup).
- adequate generic and type specific training has taken place.
- any additional requirements laid down by Flag State are fulfilled.

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Additionally, a ship may navigate paperless if:

- a. It is utilizing ENC's to fulfil the chart requirement (i.e. official vector charts only).

Providing it is used correctly, ECDIS provides enhanced navigation, situation and spatial awareness when compared to navigating using traditional paper charts. It is a system that is capable of displaying the past, present and future position of a vessel by utilising all available sensor information. However, the techniques required to use ECDIS differ in part to those required when using paper charts and as such they must be understood if they are to replace paper charts without a loss of safety. To achieve the requirement for safe ECDIS navigation, the following must first be achieved:

- a. All officers in charge of a navigational watch are to have conducted adequate generic and type specific ECDIS training.
- b. the use of high quality and up to date chart data and maintenance of such data.
- c. the use of all available sensors and navigation aids to support accurate, safe navigation and prevent the over reliance on anyone sensor.
- d. the use of all available techniques including but not limited to visual and radar fixing to prove GPS correct.
- e. the ability to utilise an accurate Dead Reckoning (DR) and Estimated Position (EP) in the event of GPS equipment failure.
- f. the use of Safety Depth and Safety Contour values to emphasise the limits of safe water.
- g. safe configuration of ECDIS to suit the environment and conditions.

On board vessels fitted with an approved Electronic Chart Display and Information System (ECDIS) the following policy shall apply:

- a. Vector charts conforming to the International Hydrographic Office S-57 format, published by a government-authorised Hydrographic Office and referred to as Official ENC's shall be used and be considered as secondary to paper charts.
- b. The use of non-official vector format CM-93 charts shall be avoided. CM-93 vector charts do not have ENC status as defined by IMO, IHO and IEC and thus cannot be used to replace paper charts.
- c. Where Official ENC are not available, raster navigational charts (RNC's) called ARCS (from UK HO) shall be used in the Raster Chart Display System (RCDS)/ ARCS mode of the ECDIS as an alternative.

2. MANUFACTURER'S OPERATORS MANUAL

For detailed operating instructions and guidance on the use of ECDIS equipment and ENC and

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ARC's charts, reference should be made to the manufacturer's operating manual. Ensure that the User Guide and a list of Alarms and Warnings for the specific system are available on the bridge. It should be noted that system user guides are generally poor and are not a substitute for adequate training.

3. RISK OF OVER RELIANCE ON ECDIS

Watch keepers should not become tempted to rely almost exclusively on the ECDIS, without the understanding of its limitations and potential errors. Therefore, it is extremely important that the user understands and acknowledges the potential for system errors and malfunctions, including errors in display data, errors of interpretation, incorrect user set-up, improper configuration or calibration of system parameters. The accuracy of any ECDIS system will vary with sensor accuracy, chart accuracy, user settings and other system variables e.g. a GPS system selected as a primary position source may fail and revert to dead reckoning and subsequently fail to recognise that the vessel is drifting off course.

3.1. Limitations of ECDIS

The electronic chart should not be totally relied upon or lead the OOW into a false sense of comfort level. Overconfidence must not result from the fact that the ship's position is automatically shown on a chart. The OOW must be always wary as to how the system is actually performing with regards to accuracy and reliability. This requires an awareness of the deficiencies and risks of the overall system and its components. It must be recognized that the quality of the sum of the information is essentially dependent on the reliability of each component of data and technology. Similar to any system, an ECDIS is not infallible. It has the same shortcomings that exist in any technical device.

The following factors should be considered, when using ECDIS

- The limitations of ECDIS as a navigational tool;
- Potential risk of improper functioning of the system;
- System limitations, including those of its sensors;
- Knowledge of principal types of ARPA / ECDIS / AIS, their display characteristics, performance standards and the dangers of over reliance on ARPA / ECDIS / AIS;
- Hydrographic data inaccuracy; limitations of vector and raster electronic charts (ECDIS vs. RCDS and ENC vs. RNC);
- Potential risk of human errors. Emphasis should be placed on the need to keep a proper look-out and to perform periodical checking, especially of the ship's position, by independent means.

Knowledge of the limitations of the equipment and detection of misrepresentation of information is essential for the safe use of ECDIS.

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3.2. Monitoring Accuracy of GNSS Position in ECDIS²

ECDIS provides continuous real time position indication on ENC by automated electronic means such as GNSS. ECDIS also records own ship's past track: time, position, heading, and speed for past 12 hours at one minute interval and complete track for the entire voyage, with time marks at intervals not exceeding 4 hours.

In theory, position fixing is thus not required in ECDIS. However, the ECDIS position is only as good as the GNSS inputs which are themselves subject to environmental as well as deliberate interference, and the frequent verification of GNSS position by other independent means is therefore required to monitor its' accuracy. This Position Verification should be manually plotted.

3.2.1. ECDIS is provided with following methods for position-fixing:

The OOW should take Operator's Fixes using one of the following methods when possible to check the accuracy of GNSS position.

- Manual position plotting (DR/EP)
DR/EP are relevant on ocean passage, when no other means is available.
- Echo Sounder, celestial navigation
Each of these options can be used in ocean passage when available and if conditions permit. They are also methods of position verification.
- Position plotting by bearing and distance lines of position (LOP) using terrestrial objects/Navigational aids
This is especially relevant when closer to the coast, and suitable charted objects (navigation aids, terrestrial objects) are radar-conspicuous.

Manual position-fixing using the above methods can be dangerously time-consuming especially when a vessel is under pilotage in confined waters. Position verification using Radar Overlay and Parallel Indexing can in fact be quicker, more accurate, and less-distracting for the OOW from essential watchkeeping functions.

3.2.2. ECDIS has the following facilities for comparatively quick position verification in real-time:

- Radar overlay
The OOW should make full use of RIO (RADAR Information Overlay) checks, if available, as a comparison between radar and ENC will detect instantaneously if there is any error in the GNSS generated position and will also reveal any radar alignment error. This should be used when in range of the coast, and especially, in confined waters such as when under pilotage. Take care that the chart information is not obscured due to clutter.

² W 22 / 2020 (Entire section)

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If the radar overlay shows no significant error in the GNSS position, simply drop a single-push (GNSS) “Manual Fix” to record the fact that the position at that time has been verified, and this will be recorded in the ECDIS history log. This becomes a position verification which is as at least as valid as a manual terrestrial plot.

- Continuous monitoring of a vessel’s track using parallel index lines
If the radar has been correctly checked and calibrated, the index error along a radar bearing and rotational bearing error are known, an “On-track” Parallel Index line, along with “No-less than” and “No-more than” PI’s marked from fixed objects, can provide reliable positional information independent of external sources, and can be used with confidence even in restricted visibility conditions. Floating EBL’s may be used in a similar manner, although they need to be set up by the OOW at the time.
- Clearing ranges, and clearing bearings (on radar.)
These – along with passing abeam of salient points for example - will also detect instantaneously if there is any error in GNSS generated position and will also reveal any radar alignment error. Like Radar Overlay, they should be used in confined waters for easily monitoring the vessel’s position or track particularly during busy times.

3.2.3. The recommended intervals for checking the accuracy of GPS in Ocean Navigation, Coastal Navigation and Confined Water are as following:

- During ocean navigation, the interval between check fixes should not be greater than 2 hours using DR/EP fixes. Cross check GNSS position using echo sounder and celestial means if possible as and when available.
- During coastal navigation, GNSS position verification interval should not be greater than 30 minutes. Position is to be verified and recorded by lines of position (LOP) using terrestrial objects/Navigational aids.
- In confined waters, GNSS position verification interval should not be greater than 12 minutes. Position is to be verified and recorded by lines of position (LOP) using terrestrial objects/Navigational aids. GNSS position is to be further verified by observing the land marks and fixed navigational aids visually while passing abeam, same may be recorded in bell book.
- In coastal and confined waters, continuous track monitoring by parallel index and frequent position verification by the use of radar overlay. Radar overlay will show instantaneously whether GNSS generated position is correct, or the extent of any error. The position verified and recorded by Radar Overlay at mid interval between the LOP verification where possible, keeping in mind that OOW may be associated with other navigational duties especially in confined waters, which may have priority to recording the verification in ECDIS.

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4. SETTING THE TIME

Some items or parts of charts may be date dependent e.g. they become visible after a set date or they are visible only for a limited period, therefore it is important to ensure that the correct time and date is set in ECDIS. This should be checked at the change of each watch.

5. ENC ORDERING AND UPDATING.

Ordering cell permit is a four-step process which involve

- a. Creating and exporting an order list of required cell permits;
- b. Sending the request to service provider;
- c. Receiving the cell permit and
- d. Importing cell permit

The master of the vessel must ensure that when placing orders for ENC cells all the required bands of ENC cells based on navigational purpose must be ordered. ECDIS are divided into six categories depending upon the scales. These categories are:

- Band 1. Overview
- Band 2. General
- Band 3. Coastal
- Band 4. Approach
- Band 5. Harbour
- Band 6. Berthing

The vessel must not completely rely on the automatic “Route to Basket” feature provided by the service provider.

6. ECDIS SAFETY FUNCTIONS

ECDIS implements functions for setting and monitoring safe navigation parameters on vector charts. Chart objects are identified by the ECDIS as dangers to navigation by certain parameters and such parameters are referred to as Safety Parameters and are set by the operator.

Appropriate safety settings are of paramount importance to safety of navigation, at the change of watch the oncoming OOW shall verify the alarm settings before taking over the watch. Refer following figure for the safety depth and contour settings:

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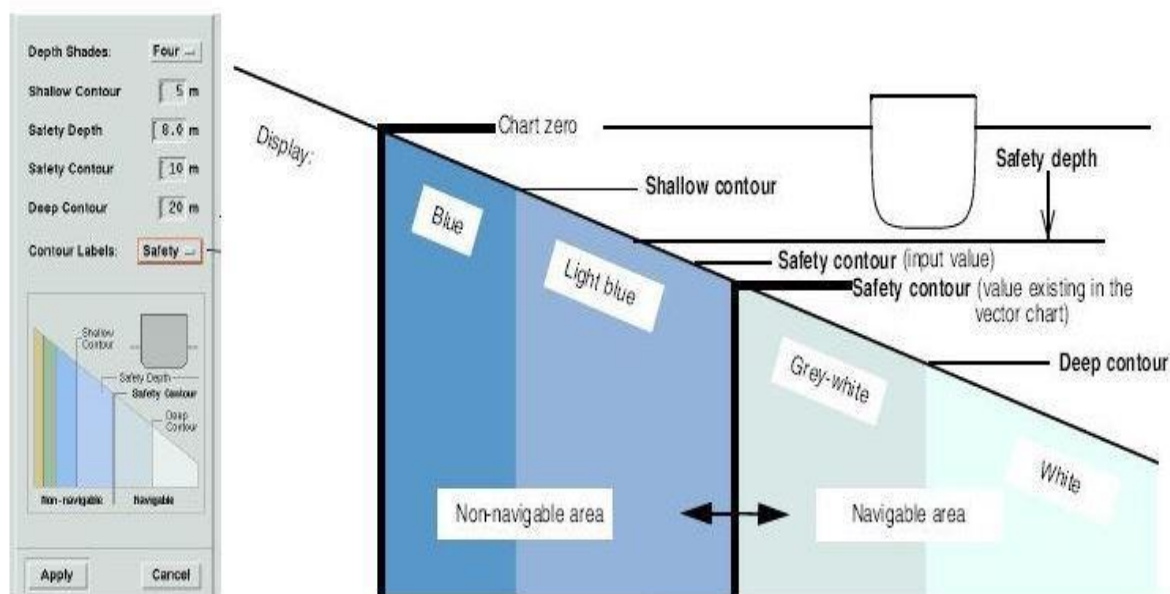


Figure 1 – Contour setting

6.1. Safety Depth

The Safety Depth is a value set by the operator that serves to detect depths that are a danger to navigation. A depth equal to or less than the Safety Depth is highlighted on the chart in bold type when the display of spot soundings is turned on (ENC's only). This alerts the user to know the depths that are insufficient for the vessel to safely pass over.

Safety depth is determined using company Form 1.3.2 as following³:

Safety Depth = Static Draft (a) + Safety (b) + Squat (c) + UKC (e) - HoT (f) + Depth Accuracy/Catzoc correction (g)

Where ECDIS doesn't accept the safety depth value in decimal, the value shall be rounded to higher whole number (e.g. 10.09m to 11m)⁴.

Safety Depth is not required to trigger any alarm or indication as per ECDIS performance standards

6.2. Setting Safety Contour

Safety Contour serves a very important function of providing an easy visual presentation of safe navigation zones with adequate water depth, and provides a datum for chart alarms. Safety Contour distinguishes between the navigable and the non-navigable water. The Safety Contour also defines the boundary of the safe water area used for the indication of

³ W 45 / 2019

⁴ W 45 / 2019

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isolated underwater dangers and isolated dangers that lie within the safe water area.⁵

The Look Ahead function or “Check Area” (Furuno) will activate an alarm if violated by the safety Contour. This is the only safe water setting that gives alarm/ advance warning to the user as per ECDIS performance standards.⁶

Determination of the Safety Depth and Safety Contour is the responsibility of the Captain, advised by the Navigator, and requires a good deal of precision, rigour and checking.⁷

The value for Safety Contour is equal to Safety Depth which is determined as follows:

Safety Depth = Static Draft (a) + Safety(b) + Squat (c)+ UKC (e)- HoT (f) + Depth Accuracy/Catzoc correction(g).⁸

Company form 1.3.2. shall be used for the purpose of calculating both Safety Depth and Safety Contour. Safety Contour value obtained in decimal after calculation shall be rounded to higher whole number (e.g. 10.14m to 11m). If the Safety Contour of exact value is not available in the ENC, the ECDIS will then display the next deeper contour as the Safety Contour. This should be confirmed by visual inspection.⁹

Once approved by the Captain, the Safety Depth and Safety Contour should be stated in the navigation plan as appropriate. The authorised Safety Depth and Safety Contour must always be known to the OOW. This information is part of the Watch Handover and is displayed on all ECDIS units using laminated Form 1.3.2.¹⁰

The selected water depth value for the Safety Contour should ensure an adequate depth of water to allow for the vessels minimum calculated under water keel clearance.

Note: Safety Contour lines are pre-set at the time of producing the chart and the number of contour lines available for display may differ for each chart. Should the value of the Safety Contour water depth as selected by the Master not be equal to a pre-set safety contour line then the next deeper contour line will be displayed e.g. if the contour lines are at 10m and 20m depths respectively and a water depth of 12m is selected then the 20m contour line will be displayed.

Because the Safety Contour lines may differ for each chart it is possible that when crossing the chart boundary, the displayed contour line on the next chart may be different e.g. a set water depth of 12m may result in a Safety Contour line of 20m on one chart and 15m on the next adjacent chart.

⁵ W 43 / 2019

⁶ W 43 / 2019

⁷ W 43 / 2019

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It is important to note that Safety Depth and Safety Contour settings are dynamic and not fixed for the entire planned route. It will have to be monitored and changed by the user as required for each leg/ section of the voyage depending on factors like UKC requirements, speed and available depth and width of water.

6.3. Shallow and Deep Contour

The Shallow and Deep Contours are not alarmable and as such are for information purposes only. However, although it does not provide an indication of a dangerous depth contour, the Deep Contour can be useful in displaying contour information that has significance on ship handling. For example, if the 50-m contour is the onset depth for squat, then the Deep Contour setting could be set accordingly to give an indication of the 50-m contour to the OOW. The Shallow and Deep Contours provide the following:

- a. Shallow contour - shades the area from the shallow contour to zero depth
- b. Deep contour - shades the area below the deep contour (above is white).

If all Contours are correctly configured, the following depth information is shaded and distinguishable from each other:

- a. Zero to shallow contour (dark blue)
- b. shallow contour to safety contour (light blue)
- c. safety contour to deep contour (light grey)
- d. greater than deep contour (white).

If Four Shades is not selected then Two Shades are used. This has the effect of displaying depth in two shades only:

- a. Zero to safety contour (blue)
- b. greater than safety contour (white).

The Two Shades setting is of benefit to the OOW when navigating using the dusk or night palette as the contrast between safe and unsafe water and ARPA and AIS targets is improved.

6.4. Recommended settings for shallow and deep contour:

- Shallow contour – Maximum draft of vessel
- Deep contour – At least twice the maximum draft of vessel and always more than safety contour

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6.5. Check Area / Watchdog Sector¹¹

The Check Area or Watchdog Sector¹² (may also be known as the Anti Grounding Cone¹³, Look Ahead, Safety Frame or other name dependent upon the manufacturer) is intended for setting the size of the area that will be used for the chart data analysis and for the generation of the Anti- grounding alarms, Area Alerts and Navigational Alarms. The trigger points for Alarms and Warnings are defined by a Check Area projected Ahead, and Around (Port, Starboard, Bow and Stern) of the vessel. The size of the Check Area will depend on the ECDIS system in use as well as the size, manoeuvrability and speed of the vessel. Once a danger has been picked up in the Check Area, it will be necessary for the vessel to avoid it and this delay and time to manoeuvre must be taken into account when setting up.

This feature does not provide alarms for ARPA and AIS targets.

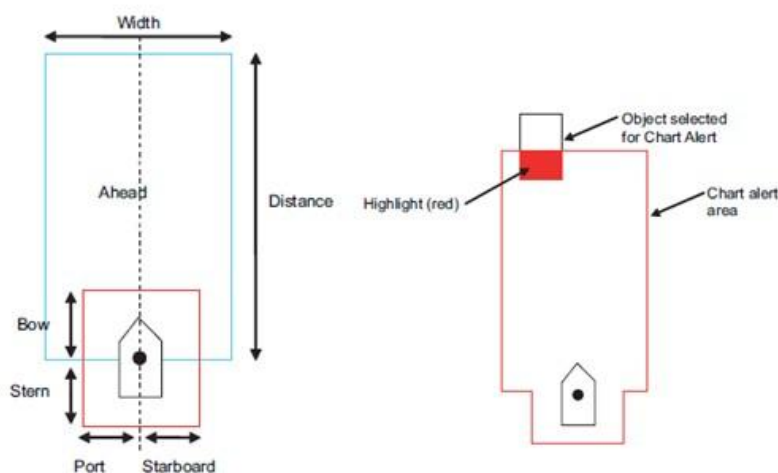
Recommended Minimum settings for Check Area/Look Ahead alarm¹⁴

Pilotage / confined waters: Ahead – 0.5 to 2 mins, Width - 75m¹⁵, Port/Stbd/bow/stern – 50m¹⁶.

Coastal waters: Ahead – 12 mins, Width 570m, Port/Stbd/bow/stern – 185 m¹⁷.

Open waters: Ahead – 30 mins, Width 1000m, Port/Stbd/bow/stern – 370 m¹⁸.

These recommendations do not alter the Captain's prerogative to modify or augment Check Area settings. The Check Area setting should be agreed when the route is presented for approval. Authorisation to modify, augment or, by exception, turn off the Check Area to best support the execution of navigation is to be recorded in the Passage Plan or Logbook.



¹¹ W 08 / 2024

¹² W 08 / 2024

¹³ W 25 / 2018

¹⁴ W 12 / 2019

¹⁵ W 12 / 2019

¹⁶ W 12 / 2019

¹⁷ W 12 / 2019

¹⁸ W 12 / 2019

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6.6. CATZOC

The purpose of the Category Zone of Confidence (CATZOC) system is similar to that of source data diagrams used on Traditional Paper charts. They enable the mariner to make informed decisions on the degree of reliance to place on the ENC when planning a passage or conducting navigation.

ENC's incorporate Category Zone of Confidence (CATZOC) which categorise data based on position accuracy, depth accuracy and sea floor coverage.

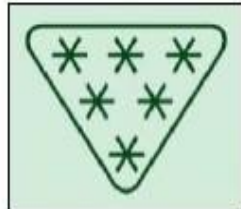
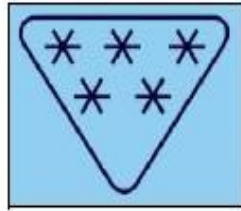
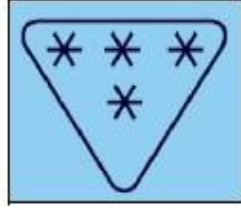
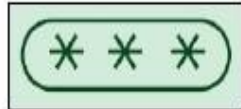
CATZOC data is encoded into six (6) categories labelled A1, A2, B, C, D and U.

ZOCs A1, A2, and B are generated from modern and future surveys with ZOCs A1 and A2 requiring a full area search.

ZOC's C and D reflect low accuracy and poor-quality data whilst ZOC U represents data which is un-assessed.

CATZOCs are only visible when the user has selected the appropriate ENC layer for display.

When displayed by the ECDIS, CATZOCs are distinguishable by the shape of the symbol and the number of asterisks contained within it. Refer to the Table below:

1	2	3		4	5	6
ZOC	Position Accuracy	Depth Accuracy		Seafloor Coverage	Typical Survey Characteristics	Symbol
A1	± 5m	=0.50 + 1% <i>d</i>		Full area search undertaken. Significant seafloor features detected and depths measured.	Controlled, systematic survey high position and depth accuracy achieved using DGPS or a minimum three high quality lines of position (LOP) and a multibeam, channel or mechanical sweep system.	
		Depth (m)	Accuracy (m)			
		10	± 0.6			
		30	± 0.8			
		100	± 1.5			
1000	±10.5					
A2	± 20m	=1.0 + 2% <i>d</i>		Full area search undertaken. Significant seafloor features detected and depths measured.	Controlled, systematic survey achieving position and depth accuracy less than ZOC A1 and using a modern survey Echosounder and a sonar or mechanical sweep system.	
		Depth (m)	Accuracy (m)			
		10	±1.2			
		30	± 1.6			
		100	± 3.0			
1000	± 21.0					
B	± 50m	=1.0 + 2% <i>d</i>		Full area search not achieved; uncharted features, hazardous to surface navigation are not expected but may exist.	Controlled, systematic survey achieving similar depth but lesser position accuracy less than ZOC A2 and using a modern survey echosounder, but no sonar or mechanical sweep system.	
		Depth (m)	Accuracy (m)			
		10	±1.2			
		30	± 1.6			
		100	± 3.0			
1000	± 21.0					
C	± 500m	=2.0 + 5% <i>d</i>		Full area search not achieved, depth anomalies may be expected.	Low accuracy survey or data collected on an opportunity basis such as soundings on passage.	
		Depth (m)	Accuracy (m)			
		10	±2.5			
		30	± 3.5			
		100	± 7.0			
1000	± 52.0					
D	Worse Than ZOC 'C'	Worse Than ZOC 'C'		Full area search not achieved, large depth anomalies may be expected.	Poor quality data or data that cannot be quality assessed due to lack of information.	
U	Unassessed - The quality of the bathymetric data has yet to be assessed.					

Unlike source data diagrams on paper charts, CATZOC's are only visible when the user has selected the appropriate ENC layer for display. During passage planning, it is essential that CATZOC's are displayed and noted for all stages of the voyage. On-board procedures for passage planning should include CATZOC's as part of the list of ENC layers to be displayed during passage planning.

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6.7. Points to consider for using CATZOC:

In relation to the above table, the OOW need to examine the usability of the ENC, an appraisal has to be carried out by the OOW to consider if the charted data fit for the use. Whenever the information given on the ENC is used, the OOW has to allow for charted depth uncertainty. During the passage planning stage itself as far possible the ENC's which has the highest data quality must be used and when using ENC's which have low data reliability, sufficient cautions to be posted to warn the OOW about the uncertainty in charted depth. When using ENC's with low data accuracy he has to be more vigilant, and carry out repeated cross checks with information available from other navigational aids and also has to consider this in the UKC calculation. Whenever possible the accuracy of the ENC's to be crossed check with information available from local agents, pilot, local authorities.

Note:

- a. Safety Depth = Draught + Squat + Safety - HoT (Height of Tide) + Depth Accuracy/Catzoc correction
- b. Hydrographic depth Accuracy (Catzoc correction) need not be calculated at berth and Channel/Harbour or where depth exceeds 30 meters. Depth accuracy correction need not be applied at berth and in channel as maximum safe draft is declared by local port regulation based on depth criteria:
 - Port Authority manages channel navigation and terminal limitations based upon a declared safe draft
 - There is clear precedent of similar sized vessels safely navigating the channel in numerous transits under similar conditions
- c. Catzoc correction/depth accuracy to be applied in UKC and Safety depth calculation in coastal and ocean waters using Form 1.3.2
- d. CATZOC correction is also to be applied in UKC calculation sheet of passage plan form 1.3.1A (Accuracy of Hydrographic Data)

6.8. Cross Track Limits / Distance¹⁹ (XTL / XTD) Setting

The cross track limits / distance (XTL /XTD) setting made for each leg during the planning stage shall be reviewed taking into account the available sea room keeping in mind that too wide XTD in confined waters may lead to alarm fatigue. In normal circumstances, XTD should be wide enough so the vessel will not leave XTD limits while navigating. The XTD for river/buoyed channel passage should be as wide as channel without including shallows or buoys inside the corridor. The XTD corridor in the open sea should be as wide as possible.²⁰

¹⁹ W 08 / 2024

²⁰ W 08 / 2024

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Safety checks are carried out of the XTD corridor during route planning. A cross track alert will trigger if vessel deviates from the planned corridor.²¹

Recommended Minimum settings for XTD values are as follows:

- Open Sea: **2.0 NM (3704 m)**²² either side of the course.
- Coastal water: **1.0 NM (1852 m)**²³ either side of the course.
- Harbour / Confined Waters: 0.1NM (185 m) on either side as much as possible.
- **Channel / TSS / Two way route: 0.06NM (110 m) on either side as much as possible but within the boundary limit**

7. CONTROLLING VISIBLE CHART AND NAVIGATION FEATURES

A subset of chart features is called the Display Base. As required by IMO, these features cannot be made invisible e.g. coastline, Safety Contour chosen by the Master, indication of isolated dangers etc.

In addition to the fixed information visible in Display Base, features such as Safety Depth, Shallow Contour, display colour palette, simplified or paper chart display of symbols, chart and navigation information, navigation features such as channel borders, way point marks etc., and pilot data can be added or removed from the chart. If all this information is added to the chart it will result in a cluttered display which may be suitable for route planning but not for monitoring on passage.

To facilitate the system loading the best scale chart, Chart Autoload and Chart Autoscale or equivalent are to be ON at all times when executing navigation. The Primary ECDIS terminal should, where possible, always be set to the best scale 1: 1).

The Master should determine what minimum features should be displayed depending on the location of the vessel and the route.

8. PRESENTATION OF DATA

Every ECDIS operator should assess the quality of information being viewed. This means ensuring settings and procedures consistently provide full relevant safety and that information is mirrored on both Bridge ECDIS terminals.

When a chart is loaded for display (either manually or automatically) the OOW must be alert to its Datum and Update status, which should be checked by interrogation. The OOW should also check

²¹ W 08 / 2024

²² W 08 / 2024

²³ W 08 / 2024

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all chart cautions, warnings and Category Zone of Confidence (ZOC) details (or Source Data Diagrams for RNC's) for charts in use. If the CATZOC is 'U' (Unassessed), then the comparable RNC should be consulted for comparison of depths and survey data noting that it may not necessarily be based on the same survey data, particularly with foreign sourced ENC's. The Captain and Navigator must be advised of any relevant hazards or cautions discovered and the necessary navigational caution exercised.

9. SELECTION OF SENSORS

As per SOLAS Chapter V ECDIS should be connected to:

- A ship's position fixing system
- A Heading Indicator and
- A Speed and Distance measuring device.

In order enhance the system and improve the safety of navigation, the company recommends following additional navigational equipment to be connected to each ECDIS:

- 2 Independent Position Fixing Systems
- Navtex (with Auto update on ECDIS),
- Echo sounder;
- Radar Overlays
- ARPA
- AIS
- Wind sensor (if available)

Position information in ECDIS is based on the Primary Position Source. A Secondary Position Source may also be displayed. A variety of Position Sources, including manual inputs, may also be input. Where possible, both the Primary and Secondary position sources should be displayed and the divergence alarm configured to alert the OOW of any significant differences between the two sources.

The OOW should always select the preferred sensor source with regard to Heading, Depth, Speed, Wind and ARPA. Any degradation of sensors should be reported to the Navigator and the most accurate secondary sensor should be selected if available.

If more than one radar is interfaced to ECDIS, then the Active Radar source may be selected by the user. Routes and Map data may be overlaid on the Radar but excessive clutter should be avoided and the Radar should never be used as a substitute for ECDIS and ECDIS should never be used as a substitute for Radar.

It is recommended that use be made of the Kalman filter that can derive a position using all

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operative position sensors. The filter knows the behaviour of different types of sensors and continuously monitors the position given by each individual sensor to determine if the sensor is reliable or not. The result of the processing is a smoothed position that is used as a final position of the ship.

The data inputs from Gyro compass, Speed log, Echo sounder and all other equipment must be periodically monitored for accuracy by verification using manual means to ensure that they are being accurately reflected on the ECDIS.

- GPS: By Visual Fixes / Radar Fixes.
- Gyro: By Transit Bearing & celestial observation
- Speed Log: Measured mile between 2 positions
- Echo Sounder: Hand Line or spot soundings on chart
- Radar: Visual Fixes

10. MAN OVERBOARD

In the case of a Man Overboard (MOB), the MOB icon or shortcut key is to be pressed on all systems. This initiates the input of a reference point in ECDIS, and a constant range and bearing from the ship is provided. If the MOB is not being tracked visually, ECDIS should be used to direct the lookout bearing, although the position of the MOB may not take into account Set and Drift (system dependent). Any time delay between the MOB entering the water and activation of the MOB marker should be established as quickly as possible. It may be possible to offset the location of the MOB marker (system dependent).

If visual contact has been lost and a significant delay in activating the ship's MOB marker has occurred, the OOW should estimate the likely position of the MOB against the Primary Vessel Track history. The position of the MOB can then be offset to this new position (system dependent).

Note that the MOB function may not provide a prediction of set and drift and as such tidal information must be known to the OOW.

11. ALARM MANAGEMENT²⁴

ECDIS chart alert settings (Furuno ECDIS) are indicated as following and bridge team is required to familiarize themselves with the maker's manual.

A: Alarm, audible and visual, mandatory

W: Warning, visual and aural alerts

²⁴ W 15 / 2019

C: Caution, visual alert only

11.1. Alert Priority:

a. Alarm

a high-priority alert. Condition requiring immediate attention and action by the bridge team, to maintain the safe navigation of the ship.

b. Warning

Conditions or situations which require immediate attention for precautionary reasons, to make the bridge team aware of conditions which are not immediately hazardous, but may become so.

c. Caution

Lowest priority of alert. Awareness of a condition which does not warrant an alarm or warning condition but still requires attention out of the ordinary consideration of the situation or of the given information.

Minimum company recommended alert settings are provided in the following Table. However, Master can set ship specific or more stringent alert:

Chart Alert Setting	Alarm	Warning	Caution	No Display (Off)
Safety Contour	X			
Areas to be avoided		X		
User Chart Danger		X		
Traffic Separation Zone			X	
Inshore Traffic Zone			X	XX
Restricted Area			X	
Caution Area			X	
Offshore Production Area			X	XX
Military Practice Area		XX	X	
Seaplane Landing Area			X	
Submarine Transit Lane			X	
Anchorage Area			X	XX
Marine Farm/Aqua Culture		XX	X	
PSSA Area			X	
Non-official ENC		X		
No Vector Chart		X		
Not Up-to-date		X		
Permit Expired		X		
UKC Limit		X		

XX – Alert may be set in one or more of the recommended fields depending upon the situation e.g. if vessel's route doesn't require to use or is not in the vicinity of an inshore traffic zone, alert may be set off. In other case if there are known military exercises or Marine Farm/Aqua Culture in the vicinity of the route, it may be prudent to set an audible alarm to

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alert the navigator that he may be headed into danger.

Broadly two types of alarm are there in ECDIS:

a. Operator configured alarm

This alarm is activated when the system detects values outside of user set limits. Safety depth and safety contour, Safety Frame/Look-ahead/Check area, Cross track distance (XTD) and other configured alarms i.e. way point alteration, Anchor watch alarm.

b. System Alarms

This type is activated when the ECDIS system detects unacceptable conditions, predominantly with the sensors integrated. Examples of system generated alarms would include loss of GPS, Gyro and Speed log. Other non-mandatory sensor feed (AIS, ARPA etc) which may have alert - alarm or caution. Refer list of alerts provided in the maker's manual.

There is no such thing as a spurious alert in ECDIS and only the OOW is permitted to acknowledge Alerts.

All ECDIS alerts shall be acknowledged and investigated. The OOW shall not rely solely on automated monitoring alerts generated by the ECDIS.

The ECDIS automatically provide warnings in following circumstances:

- a. If it malfunctions or when developing a fault
- b. If it has detected an approaching navigation problem

There are three categories of situations which can trigger alerts:

- a. Navigational hazards, alerting the operator to a potential navigational hazard during route planning or monitoring, such as the ship crossing a safety contour.
- b. Information in-put malfunction, indicating the breakdown of a sensor, such as the failure of the GPS or of the ECDIS itself.
- c. Information conflict, indicating a datum or chart miss-match, such as a changed horizontal geodetic datum or a wrong scale setting which could cause a miscalculation of distances.

Below are mandatory alarms and indicators as per IMO ECDIS Performance standards (Resolution MSC.232(82))²⁵

Crossing safety contour	Alarm
Area with special conditions	Alarm or Indication
Deviation from route	Alarm

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Positioning system failure	Alarm
Approach to critical point	Alarm
Different geodetic datum	Alarm
Malfunction of ECDIS	Alarm or Indication
Default safety contour	Indication
Information over scale	Indication
Large scale ENC available	Indication
Different reference system	Indication
No ENC available	Indication
Customized display	Indication
Route planning across safety contour	Indication
Route planning across specified area	Indication
Crossing a danger in route monitoring mode	Indication
System Test failure	Indication

a. Alarm²⁶

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

b. Indicator²⁷

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

11.2. Other than the mandatory alarms, the ECDIS may have the following alarms:

- a. Anchor watch alarm/ indication to indicate when the vessel drifts out from the set limits of swinging circle at anchorage.
- b. Wheel over positions alarm/ indication to indicate when reaching those points
- c. CPA/ TCPA alarm/ indication for targets input provided by ARPA and AIS

11.3. Areas in which Special Conditions Exist

ECDIS shall detect and provide an alarm or indication when entering:

- a. Traffic Separation zone
- b. Inshore Traffic zone
- c. Restricted area
- d. Caution area
- e. Offshore production area
- f. Areas to be avoided

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²⁷ W 15 / 2019

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- g. User defined areas to be avoided
- h. Military practice area
- i. Seaplane landing area
- j. Submarine transit lane
- k. Anchorage area
- l. Marine farm / aquaculture
- m. PSSA (Particularly Sensitive Sea Area)

12. RCDS MODE

The OOW is to be mindful that, when the system has RNC as well as ENC data installed and the operator configures the system to choose the priority of data automatically, the system will select the best scale chart and this may be an RNC. The OOW is to know the limitations of the system when in the RCDS mode of operation. The OOW is to know the criteria for which data is selected for display by the system and any limitations that may be imposed as a result of doing so.

Where possible, an ENC is to be used. However, if an appropriate scale ENC is not available, an appropriate scale RNC is to be used. **An appropriate portfolio of paper charts is to be available and up to date.**

13. USE OF ECDIS AT NIGHT

The colour palette should be configured by the OOW to suit the environmental conditions so that charted information, in particular safety critical information, is not hidden or difficult to see. This is particularly relevant when using an RNC.

14. ECDIS DISPLAY CONFIGURATION

For all its potential, ECDIS is only computer software running on a marinised PC. As a result, it suffers from all the faults and errors of any computer. The greatest single danger from ECDIS is to assume that it has been correctly configured with regard to the Route, Safety Depth, Safety Contour, Alarms and Displayed Data. A ship can ground just as easily as a consequence of improper configuration as it could from sloppy chart work on a paper chart.

Where the ECDIS in use supports it, display configurations should be saved so that the system can be set up quickly when transiting between different environments such as Confined Waters, Anchoring, Coastal Navigation and Open Ocean. This will save time when setting up the system.

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15. CHART DATUM

The earth's shape is not a perfect sphere and its shape varies from location to location. Charts drawn for a particular area may therefore contain datum information that is localised. Local datum's have evolved over time and this has resulted in scores of different data linked to different datum systems.

The use of satellite systems has involved the use of global datum and GPS uses the World Geodetic System 1984 (WGS-84) that uses a model of the complete earth. Because most paper chart surveys are old few are referenced directly to WGS-84.

ENC vector material has to conform to the S57 Standard and has to be produced by a National Hydrographic Office in the WGS-84 datum.

The ECDIS uses ENC material, produced to standards using WGS-84 datum.

Positioning devices connected to the ECDIS must work in the WGS-84 datum. IMO requires that the ECDIS must give an alarm if the datum of a positioning device is not in the WGS-84 datum – (Note: some older positioning devices do not comply with this requirement).

The difference between ARCS chart local datum and WGS-84 datum is known as WGS-84 shift. For most of the ARCS charts this is known and the ECDIS system can do the conversion automatically.

The ECDIS allows the user to change viewed datum. This selection of the datum does not change anything inside the ECDIS for navigation calculation processes or for electronic chart display processes. However, it changes the numerical values of positions displayed on the ECDIS screen into the user-chosen datum.

When using paper charts together with electronic charts, it is recommended that the same datum be used for the electronic chart as the current paper chart to avoid misalignment between ECDIS and points taken or plotted on the current paper chart.

16. HANDOVER ROUTINE

While on watch, the OOW is responsible for the operation and management of ECDIS. Therefore, a comprehensive handover of the system is essential before taking over the watch. If the off going or oncoming OOW is in any doubt about the state of the ECDIS configuration, the Navigator should be consulted immediately.

The OOW is to annotate on the ECDIS console the configuration in force, that is to say whether it is set up for Confined Waters, Coastal or Open Ocean. The oncoming OOW is to check the system setup to view any changes or errors in setup.

When taking over the watch, the OOW is to confirm the position of the ship by taking a Manual Fix.

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Wherever possible, this fix should be by means independent of the Primary Position Source such as but not limited to visual or radar and the use of RIO if available.

As a **minimum**, the following checks and actions are to be conducted with the ECDIS upon watch handover:

- a. ensure that the correct Display setting is shown
- b. ensure that the correct Route is loaded in Route Monitoring
- c. ensure that the secondary Route is loaded in Route Editor (if required)
- d. if in True Motion, check that the Look Ahead is configured correctly
- e. verify that the Safety Depth and Safety Contour settings are configured correctly
- f. ensure that the Check Area is set for the prevailing conditions
- g. ensure that XTD is applied and displayed correctly
- h. ensure that vectors are configured correctly
- i. ensure that the chart in use is on the best scale
- j. ensure that the chart is the most recently corrected ENC available from installed charts
- k. interrogate the quality of data and review all Chart Notes
- l. fix the ship's position on ECDIS and prove ECDIS correct
- m. sight the ECDIS check-off cards
- n. ensure that the ECDIS Management Card is up to date
- o. repeat the above steps at the Secondary ECDIS terminal
- p. if in RCDS mode, confirm the geodetic datum in use
- q. if in RCDS mode, view the source data diagram and review all Chart Notes
- r. if in RCDS mode, ensure that paper backup is correct.

17. GPS INPUT FAILURE

ECDIS is capable of working efficiently without GPS following a loss of signal or jamming. In the event of such a failure, the OOW must know instinctively what actions to take. As a minimum, the following is to be conducted in the event of GPS failure:

- a. read and Acknowledge the Alarm, identifying the failed sensor
- b. select the Secondary position fixing sensor
- c. if GPS is unavailable, select DR or EP mode
- d. independently fix the ship using Visual and Radar means or using ECDIS radar image overlay which should reveal any positional error by misalignment of the RIO from the

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- corresponding land feature, increase frequency of position fixing
- e. identify other equipment that may be affected by the failed sensor
- f. instigate defect rectification
- g. amend the ship's Route as necessary, increase safety margins and reduce speed
- h. call the master and inform Engine Room
- i. when the Primary Position Fixing System is restored, correlate with RIO and other means and inform the master
- j. Inform office

18. GYRO/HEADING INPUT FAILURE

Observe following:

- a. Observe magnetic compass heading, manually enter the heading into the ECDIS units
- b. Switch the ECDIS to "Head Up" mode
- c. Verify magnetic compass error
- d. Inform office

19. SPEED INPUT FAILURE

In case of speed input failure from the speed log, observe following:

- a. Change the speed source to any alternative available source. e.g. GPS
- b. Inform office

20. ECDIS FAILURE

All our vessels are equipped with 2 ECDIS. Both the ECDIS units to be operational at all times during sea passage in order if one ECDIS fails for any reason the OOW can take immediate appropriate actions using the other ECDIS. OOW shall immediately inform the Master who will inform office.²⁸

The backup ECDIS shall be fully synchronised with the primary ECDIS and the installed electronic charts checked to ensure they are updated correctly during passage planning.²⁹ The planned route and relevant Mariner's Notes shall be synchronised and displayed on the backup ECDIS³⁰

²⁸ W 15 / 2019

²⁹ W 15 / 2019

³⁰ W 15 / 2019

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including monitoring method, display settings and track related information.

Routes, permits and other relevant documentation shall be backed up and maintained on-board.

There is always a chance of ECDIS failure and the OOW must know instinctively what to do in such eventuality.

In the event of an ECDIS failure, suitable and sufficient procedures are required to ensure that the safe navigation is not compromised. Risk assessment shall be carried out to identify the principal hazards and control measures required. Emergency procedures shall be initiated in the event of a hazard occurring. For example, if the ECDIS did not produce (could not display) the next ENC chart, despite the control measures in place, then the navigating officer must initiate the company contingency plan for single ECDIS failure.³¹

As a minimum, the following is to be conducted on all systems in the event of an ECDIS failure:

- a. if a single unit failure, use the secondary ECDIS³², inform the Master, OOWs and Office and instigate defect rectification.
- b. check ECDIS to ensure that settings are correct, in particular:
 - i. Check Area/Look-ahead
 - ii. safety depth
 - iii. safety contour
 - iv. velocity vector
 - v. units
 - vi. chart priority
 - vii. chart autoloading
- c. check that the Primary and Secondary position sources are selected and working correctly
- d. confirm that the heading source is selected and working correctly confirm that RIO is operating correctly
- e. check current position
- f. verify that own vessel shape is correct and that the ship is aligned to ship's head conduct Alarm self-test.

In event of both ECDIS units malfunctioning/failure, the Company must be informed immediately and risk assessment must be carried out. Contingency plan for both ECDIS failure should be activated.³³

³¹ W 15 / 2019

³² W 15 / 2019

³³ W 15 / 2019

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The voyage should be aborted and safe anchorage or drifting area used as appropriate.³⁴

The Company will advise on further course of action, contact manufacturer and seek emergency assistance and arrange to supply the vessel with updated charts for the purpose of navigation.³⁵

21. ROUTE PLANNING PRINCIPLES

The principles and fundamentals of planning remain unchanged, i.e.:

- a. Appraisal
- b. planning (includes Route Creation and Route Checking)
- c. execution
- d. monitoring

The voyage plan should consider all elements of the passage from berth to berth including where a pilot will be embarked.

It is recommended use of the smaller scale ENC's (Bands 1 and 2 - overview & general) outlining a basic route before moving to medium scale ENC's (Band 3- coastal ENC's) bringing in more detail to refine the overall plan and edit Legs of the voyage as proximity to the safety contour decreases, then Bands 4/5/6 (approach, harbour, berthing) to prepare the pilotage details.

During the route planning processes, consideration must be given to the intended method of execution and monitoring such as Navigation Technique to cross check accuracy of GPS i.e. RIO, Parallel Index, visual reference and radar fixing. OOW must be aware of the danger of over reliance on single source of information (E.g. GPS). He should make use of RIO checks, Line of Position, cross bearing, visual bearing, etc. It is therefore essential that navigators maintain an active role and continue to manually plot positions at regular intervals to confirm the position displayed on the ECDIS is correct.

The Master must ensure that the vessel's position is fixed as often as the navigational situation requires and specified in the passage plan. Position fixing intervals may be adjusted as per the discretion of the Master depending on the location of the vessel, prevailing conditions, proximity to dangers and scale of charts in use.

21.1. Appraisal

The following information sources that must be consulted when conducting the Appraisal phase (not exhaustive), also refer Passage plan – checklist B Form 1.3.1:

³⁴ W 15 / 2019

³⁵ W 15 / 2019

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21.2. Voyage Orders

- a. Destination, location and suitability
- b. Nautical publications information - Sailing Directions/AENPs, List of Lights/ADLL, List of Radio Signals/ADRS, port guide, distance table, nautical almanac
- c. Ocean Passages, Ship's Routeing, ENC and RNC Overview, Digital Catalogue
- d. Predicted tidal and current data along the route – Tide Tables/ATT, Tidal stream atlases
- e. Chart Permits (ENCs/RNCs)
- f. Navigation Warnings, NTM, T+Ps, AIO, NAVAREAS, NAVTEX, Local Port Warnings
- g. Tides and Currents, Approved digital publications (UKHO Total Tide)
- h. CATZOCs³⁶, Under Keel Clearance, change in water density,³⁷ Safety Depth, Safety Contour, Coastal, Nav Danger Clearances, Company Procedures, Master's Discretion
- i. Weather Information – wind, swell, visibility³⁸, routeing, internet, Met Office, Specific Met Service
- j. Ship Reporting Requirements and ship routeing systems³⁹
- k. any other considerations such as Piracy, Cargo, Limiting Latitudes, MARPOL, Contingencies, abort positions, ice⁴⁰, IALA Buoyage Systems, ECDIS Licence expiry, Chart Permit expiry.
- l. Vessel traffic patterns and areas of expected high traffic density⁴¹
- m. Applicable local regulations, including VTS, tug escort or assist services, and pilot requirements etc.⁴²
- n. Vessel operations which require additional sea room, such as ballast exchange or pilot embarkation⁴³

After gathering and assessment of the information, the data identified as relevant to the voyage is loaded into the ECDIS to allow the plan to be calculated against the most up-to-date information.⁴⁴

³⁶ W 15 / 2019

³⁷ W 15 / 2019

³⁸ W 15 / 2019

³⁹ W 15 / 2019

⁴⁰ W 15 / 2019

⁴¹ W 15 / 2019

⁴² W 15 / 2019

⁴³ W 15 / 2019

⁴⁴ W 15 / 2019

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21.3. Planning

The following are considerations when conducting the Planning phase (not exhaustive):

- a. Use all the information from the appraisal to create the safest appropriate route and navigation plan
- b. during the route planning processes, consideration must be given to the intended method of execution and monitoring, such as:
 - i. chart availability, ENC's and RNC's at appropriate scales, appropriate folio of paper charts for RCDS mode, Licensing and Risk Assessment
 - ii. WGS 84 Datum coverage
 - iii. GPS denial or inaccuracy
 - iv. relative Navigation Techniques to cross-check accuracy of GPS such as RIO, Parallel Indices, Visual aids to navigation⁴⁵, Visual and Radar Fixing, Astronomical observation.

21.4. Route Creation

The following are notes on creating a route using ECDIS to assist with fast, efficient and safe planning (not exhaustive):

- a. create a 'blank canvas' by unloading old routes, notes and user charts⁴⁶
- b. configure screen display as required⁴⁷
- c. set display to 'large' or 'planning' format at a scale that allows you to view the start and end locations, prior to detailed routing
- d. use an ENC or RNC dependent upon availability⁴⁸
- e. enable route creation⁴⁹
- f. name the route appropriately⁵⁰
- g. begin with waypoint plotting in the general area of the start and end of the route.
- h. the Route defaults to Rhumb Line. Change the line properties to Great Circle if required
- i. set Safety Depth and Safety Contour values noting that these values may change throughout your voyage

⁴⁵ W 15 / 2019

⁴⁶ W 15 / 2019

⁴⁷ W 15 / 2019

⁴⁸ W 15 / 2019

⁴⁹ W 15 / 2019

⁵⁰ W 15 / 2019

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- j. zoom in to a more appropriate scale such as best scale⁵¹ to modify the start and finish waypoints, and 'name' waypoints to account for TSS etc, alternating between chart formats as required for quality control. It will be necessary to activate appropriate layers for this purpose
- k. check CATZOCs or Source Data Diagrams and amend the route or highlight as necessary
- l. where ENC overlap, check the route on each ENC⁵²
- m. ensure that you have adequate XTD/channel limits/corridor and safety margins (if available)⁵³ for the various legs of your route to take into account the availability of navigable water, expected traffic, likely deviations⁵⁴ and collision avoidance
- n. check the Turn Radius settings and ensure that the computed turn calculations are realistic
- o. complete the route and ensure all schedule information is correct
- p. save the Route and prepare it for the Master's approval⁵⁵.

21.5. Route Checking and approval

- a. It is critical to note that the Route Check function will only detect certain danger to navigation parameters that have been detected within the XTD of the planned route. Moreover, they will only be detected on ENCs. That is to say that the system will not detect dangers on RNCs unless a Manual Correction with a Danger Attribute associated with it has been detected within the XTD. The Route Check is therefore not an infallible safety check and it will be necessary to check the entire route at compilation⁵⁶ scale as a final safety check.
- b. Routes should be routinely checked as follows:
 - i. During and on completion of Route Planning
 - ii. alter a Route has been modified
 - iii. after any charts used by a Route have been updated
 - iv. during the Master's approval of the Route.
- c. The Route is checked automatically for presence of the following groups of dangers to navigation within the zone limited by the XTD (the parameters that the ECDIS uses to identify hazards and dangers must be known by the operator): Safety depth, safety contour, isolated dangers to navigation, saved and loaded objects with danger attribute associated in user charts/mariner added objects/mariners

⁵¹ W 15 / 2019

⁵² W 15 / 2019

⁵³ W 15 / 2019

⁵⁴ W 15 / 2019

⁵⁵ W 15 / 2019

⁵⁶ W 15 / 2019

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notes/additional information⁵⁷

- d. The following are considerations when conducting the Route Checking phase (not exhaustive):
- i. Select ENC as the chart priority, select custom display and configure the display so that all navigation dangers may be viewed
 - ii. ensure that all area alert are configured appropriately
 - iii. ensure that you have adequate XTD/channel limit/corridor and safety margins (if available) for each leg of your route to take into account the availability of navigable water, expected traffic, likely deviations and collision avoidance⁵⁸
 - iv. use the route check function to automatically check the route
 - v. examine each alarm/warning/caution for safety individually and edit the Route as necessary⁵⁹
 - vi. Do not rely solely on automated checks, in addition to the automatic check, a careful visual check should be conducted of the entire planned route at compilation scale with viewing groups set to “ALL”, across all legs to confirm the route and XTD are clear of potential hazards⁶⁰
 - vii. add relevant user charts and notes⁶¹
 - viii. double-check distance, ETD, ETA and Tidal Constraints
 - ix. save the Route
 - x. The voyage plan should, if possible, then be independently checked by another deck officer.⁶²
 - xi. The master must then review the voyage plan and authorize it after satisfied with the voyage plan.⁶³
 - xii. record approval in passage plan⁶⁴
 - xiii. The authorized voyage plan must be loaded and synchronized into all ECDIS units.⁶⁵
 - xiv. The voyage plan must not then be altered without formal approval and a separate review of the changed legs as a minimum.⁶⁶

⁵⁷ W 15 / 2019

⁵⁸ W 15 / 2019

⁵⁹ W 15 / 2019

⁶⁰ W 15 / 2019

⁶¹ W 15 / 2019

⁶² W 15 / 2019

⁶³ W 15 / 2019

⁶⁴ W 15 / 2019

⁶⁵ W 15 / 2019

⁶⁶ W 15 / 2019

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xv. if updates are installed prior to sailing or during the execution of the Route, ensure that the Route is checked again as updates may affect it

xvi. active the route prior to departure⁶⁷

Note that if the check does not result in any detected dangers then it is likely that an appropriate value has not been set for XTD that area alerts have not been configured. In such circumstances, set the values as required and check the Route again.

- e. Voyage notes and supplementary information to aid in the execution of the Route should be added using the user charts/mariner added objects. If there is a requirement for an alarm to sound when additional information is detected by the look-ahead/Check Area⁶⁸ during monitoring of the Route, then a danger attribute must be associated with the object. To ensure that inserted data is positioned correctly, the operator must ensure that data is inserted on the same scale chart that the operator will be using to monitor the route. User chart/mariner added object files that are relevant to the active route should be saved with an appropriate filename and linked to the route.
- f. Examples of the type of supplementary information that may be applicable are as follows:
 - i. Planned changes to Safety Depth, Safety Contours, Deep and Shallow Contour values
 - ii. ships routeing and reporting systems with instructions
 - iii. changes in IALA maritime buoyage
 - iv. weather concerns and measures to be taken (Safe Care of Cargoes and Personnel)
 - v. information relevant to international regulations, codes and guidelines (e.g. MARPOL)
 - vi. abort points and contingencies
 - vii. pilotage obligations with Reporting Points, rendezvous (including Marine declarations of health and requirements of the international health regulations)
 - viii. applications of the International Safety Management (ISM) Code
 - ix. areas of special interest or concern such as piracy measures to be taken during Day or Night.

21.6. Execution – Final adjustments prior to departure⁶⁹

⁶⁷ W 15 / 2019

⁶⁸ W 15 / 2019

⁶⁹ W 15 / 2019

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The following are considerations when conducting the Execution phase (not exhaustive):

- a. When ETD is confirmed, actual ETA at each waypoint can now be determined⁷⁰
- b. ETA at each point allows tidal predictions⁷¹
- c. latest AIO, navigation warnings and NTMS applied⁷²
- d. safety settings reconfirmed⁷³
- e. final route checks before activating passage plan⁷⁴
- f. conduct final pre-sailing checks⁷⁵

OOW should be aware of the changing conditions as the voyage is executed. Such changes may have implications on the safety of navigation. For example, local conditions affecting position sensor (GPS) integrity may require alternative position fixing methods to be employed and greater safety tolerances to be applied.⁷⁶

21.7. Monitoring⁷⁷

The following (not exhaustive) is to be conducted during monitoring phase in addition to ECDIS periodic checks using checklist Nab B18:

- a. Display the most relevant panel for execution such as route monitoring
- b. Ensure appropriate configuration of safety alarms (look-ahead, safety depth, safety contour, areas etc.)
- c. Follow the route and know the XTD in case of deviation
- d. Manually review the passage plan ahead to check for any voyage notes or dangers for the duration of the watch
- e. Check weather forecast and any effect on the plan
- f. Monitor NAVTEX and navigation warnings, plotting relevant information manually as required (if not done automatically) and checking the route as necessary to see if affected
- g. At all times, be aware of the nearest danger to navigation
- h. Monitor the status of all sensors and their accuracy
- i. Determine the accuracy of the primary positioning fixing system (GPS) by using all available means including the use of visual references, RIO, Parallel Indices, Visual and Radar Fixes and Astronomical observation as applicable

⁷⁰ W 15 / 2019

⁷¹ W 15 / 2019

⁷² W 15 / 2019

⁷³ W 15 / 2019

⁷⁴ W 15 / 2019

⁷⁵ W 15 / 2019

⁷⁶ W 15 / 2019

⁷⁷ W 15 / 2019

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- j. Check waypoint ETAs
- k. Frequently cross-check against all other Navigation Aids
- l. Always be vigilant to any hazards or danger not previously identified in the passage plan. It may be necessary to dynamically adapt the passage plan and anomalies should be reported to the Master immediately.

22. ECDIS MONITORING WITH PILOT ON BOARD

The Pilot should be considered an addition to the Bridge Team and should be fully integrated into the Watch. Each member of the Bridge Team should be clear as to the role of the Pilot and their continued responsibility to the Master. Whilst the Pilot may have had some ECDIS training (and might even carry a Portable Pilotage Unit) it should not be assumed that they will be familiar with the particular ECDIS model fitted to the vessel.

A Master/Pilot exchange must take place prior to pilotage. The vessel must provide information in the Pilot Card about the ECDIS and advise the Pilot on:

- a. The ECDIS type, make and model
- b. The ENC's and updates available and applied to the ECDIS for the Port and approaches
- c. Local Warnings held on board
- d. Backup procedures in use
- e. Any non-standard configuration settings of the ECDIS

The delegated Deck Officer must make any necessary amendments to the Voyage Plan following the Master/Pilot exchange and agree these with the Master and Pilot

Once the Pilot has completed the briefing with the Master as described above and any differences between the Pilot's plan and the safe water identified on ECDIS (within the Voyage Plan settings) resolved. There should be no part of the Pilot's plan that takes the vessel outside of the safety settings calculated and documented in the Voyage Plan. Where it does, there should be a careful investigation of the parameters and agreement reached. Changes in predicted conditions of tide and wind should be factored into the revised Voyage Plan and reviewed effectively before the next stage of the Voyage Plan is executed.

It should be accepted that the Pilot may not have experience of the particular ECDIS in use but the role of the Bridge Team is to provide the pilot with the view that they require. The Bridge Team may not have experience of the port, but planning should have ensured that the Limits of safe water are adequate and correct for the conditions and time of the entry/exit and allow the Pilot to manage the safe movement of the vessel.

By monitoring the passage against the agreed plan, any actions which may result in the vessel entering unsafe water can be brought to the attention of the Bridge Team.

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23. CROSSING A SAFETY CONTOUR⁷⁸

The ability of an ECDIS system to highlight a given Safety Contour based on a set Safety Depth is one of the great advantages of the system. In essence, the system displays clearly in bold the contour beyond which you do not wish to proceed. Furthermore, if you have activated your Check Area the system will alarm when in contact with the Safety Contour, thereby giving prior warning of the proximity of danger. However, the lack of contour data currently available within ENC's means the operator is not able to fully harmonise the Safety Contour with the Safety Depth. If the Safety Contour value is set to 13 m, for example, the system will automatically highlight the next available contour, which is normally the 15 or 20 m contour.

Due to this constraint it is likely that at points within the Voyage Plan the vessel will need to navigate in waters inside the Safety Contour. There are two methods provided in NP232, Section 12.13. Company has adopted method 1 and same has been explained here.⁷⁹

23.1. Configuring the ECDIS to Cross the Safety Contour:⁸⁰

Leave the Safety Contour as displayed and make a visual assessment of the chart as to the amount of actual safe water available. Ensure that suitable display settings are enabled so that all possible dangers are shown. The entered safety depth will indicate all soundings which are equal to or less than safety depth in black text, this will assist in visualizing the actual safe water. All soundings greater than the safety depth will appear as grey text. Safety Depth calculated for this leg of the passage should be updated to a given date/time and predicted height of tide.

The advantage of this procedure for deciding the safety contour and safety draft are clear, simple and remains always the same irrespective of the situation.

The hazards associated with this method are:

- The automated route check will display a warning for crossing the Safety Contour but possibly no further indication if the route is planned into waters shallower than the entered Safety Contour.
- Similarly, during monitoring of the voyage, the look ahead frame / check area will activate an audible alarm when it encounters the Safety Contour and possibly not activate any further alarms once the vessel moves into the water that is shallower than the Safety Contour entered.
- A danger may be missed during the visual inspection of the ENC with no electronic warnings or alarms to warn the user.

⁷⁸ W 36 / 2017

⁷⁹ W 25 / 2018

⁸⁰ W 25 / 2018 (Entire Section)

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- As the Safety Contour alarm will be activated but disregarded, a culture of “Safety Contour doesn’t matter” may develop and lead to the Safety Contour indication during planning, or alarm during monitoring, being dismissed as not important at any time.
- Image may not be clear in dusk and night time setting

23.2. Procedure for crossing the Safety Contour:⁸¹

- Ensure safety depth is entered correctly into ECDIS
- Select Safety Contour in ECDIS and select viewing groups for soundings, seabed features and contours to be displayed. Ensure all obstructions and potential hazards are displayed (safest is to use Display = “ALL”)
- Review area within the Safety Contour to identify areas greater than safety depth to determine that planned leg remains in safe water
- Manually draw (mark-up) No-Go Areas with the User Chart tool using a line/area/circle demarcating the safe and unsafe areas, and marking the latter as Danger. Select the User Chart danger alarm in the Chart Alert window for the manually drawn No Go Areas (and save) so that any approach to this area alarm is activated.⁸²
- Add Mariner’s Note to show area that may be crossed at appropriate height of tide with time and date for planned crossing⁸³
- Run route check to confirm that Safety Contour crossing is identified and note in Voyage Plan for review and approval by the Master⁸⁴

It should be noted that on Furuno 3000 series ECDIS, with latest software and presentation library, objects with a depth less than the safe contour will be highlighted with a generic isolated danger symbol.⁸⁵

If no ENC is available, it is recommended that a Limiting Danger Line (LDL) be drawn on RNCs in both Open Ocean and Coastal waters if required by the proximity of hazards to the navigation track. If an LDL is to be utilised on the Route, it is to be planned, briefed and authorised when the Route is presented to the Captain. The value of the LDL is to be detailed in the Passage Plan / Logbook or clearly displayed on the ECDIS console.

23.3. Predictor

The Predictor function, may be used when deemed necessary. The Predictor can be

⁸¹ W 36 / 2017

⁸² W 25 / 2018

⁸³ W 36 / 2017

⁸⁴ W 36 / 2017

⁸⁵ W 36 / 2017

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described as the ownship projected ahead in Time. When the Predictor function is activated, a copy of the ownship contour is displayed. Normally it can be configured to a set distance or time ahead of the vessel. The prediction is normally based upon the Heading, Log, COG, SOG and the Rate of Turn, although this is dependent upon the ECDIS in use. It is of use for gauging time and distance to dangers and obstructions, and to gauge the effectiveness of turns. However, it is only a guide and does not replace the need to verify progress of turns by visual means.

23.4. TT/AIS

Targets that are being tracked by an AIS transponder can also be displayed on the ECDIS display. To show or hide AIS targets, select the [TT/AIS] page from the [Overlay/NAV tools] box. Select DISP FILT / DISP ALL to show targets within the filter/range set.⁸⁶

24. ANCHOR WATCH PLANNING

When planning anchorages, the distance between the anchor and the Pelorus (stem to standard distance) should be used to establish the position of the Pelorus at the moment of Letting Go. This Let Go position is therefore also the final Waypoint of the anchorage leg. When at anchor, the Anchor Watch settings should be used to display the position of the anchor and provide an alarmable drag circle whereupon the system will alarm if the ship leaves the circle. When at anchor, the GPS position of the vessel can be checked using RIO, if available, and any other means of fixing LOPs in the proximity of the coast.

25. NAVTEX (SOLAS IV/7.1.4)

NAVTEX is a vital source of safety information and as such should be monitored closely by the OOW. NAVTEX information should be plotted in ECDIS where relevant to the safety of navigation using the appropriate function. Where NAVTEX has been integrated with ECDIS, on receipt of a NAVTEX message it is recommended that the OOW conducts the following:

- a. Highlight the location and coordinates that the message relates to
- b. plot the coordinates as required
- c. allocate a Danger attribute if necessary
- d. assess the effect on the route, informing the Navigator as required
- e. indicate that the message has been read and the location examined
- f. protect the message as required to prevent deletion.

The Navigator is to ensure that, where NAVTEX is integrated in ECDIS, the following have been configured correctly:

⁸⁶ W 25 / 2018

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- a. Station identifiers (relevant to current and future requirements)
- b. subject identifiers (relevant to current and future requirements)
- c. outdated information is deleted appropriately
- d. NAVTEX data is selected for display
- e. area alerts are configured with regard to NAVTEX information.

26. CHART ACCURACY

When Route Planning and compiling the navigation plan, the Chart Information Panel should be checked to confirm the chart's age, Datum and Update status. It is recommended that all chart cautions, warnings and other details also be investigated. In the case of RNCs, this should include the Source Data Diagram. If in doubt as to the quality of the ENC source data, the equivalent RNC should be consulted if available for comparison. However, it should be noted that it does not automatically follow that the ENC uses the same Source Data as the RNC equivalent, particularly with foreign sourced ENCs. Any relevant hazards or cautions should be noted and briefed to the Captain when the plan is presented.

27. COPYING AND SAVING INFORMATION

One of the many benefits of ECDIS is that, once a Route has been prepared, it can be saved and used again or uploaded and used in another system. In the case of multiple systems connected by LAN, data such as Routes, Additional Information and Manual Corrections should be transferred between systems in order to keep all systems in an identical state.

Transfer of voyage specific data between ships by any media should be avoided. This practice will inevitably lead to complacency in the planning of Routes and may result in the activation of a Route that has not been planned in accordance with these procedures or uses data not specific to the ship. Activating such a Route may ultimately place the ship in danger.

28. CHART UPDATING

28.1. Licenses and Permits

Separate ENC and RNC Licences are produced by the relevant government authorised Hydrographic Office to limit access to those charts that users are authorised to operate. The Licence is system specific for each ECDIS (or ECDIS ship-fit) and the Licence number is also used to order additional charts for that system.

RNCs and encrypted ENCs require a chart specific Permit to be used in the system. Each chart Permit is associated with the Licence for a particular system. The Permit can be

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provided on a CD or by email and is updated to reflect changes in Permit permissions or when new charts and new editions of charts are published. Only the most recent Permits should be installed on the system.

The system of Licence and Permit means that the user may be able to carry more ENC's and RNC's than they have Permits. Additional Permits can be gained to allow the user to activate inactive ENC's and RNC's. This system therefore should provide a more cost-effective service and effective means of activating necessary charts in case of diversion, emergency or a change of destination. The Navigator is to ensure that all operators know the process by which additional charts are activated.

The Navigator is to ensure that Permit updates arrive in a timely manner and on the required media. Expiry dates of Licences and Permits are to be documented and renewals undertaken in a timely manner.

28.2. Updating Charts

NTMs are produced in DVD format on a weekly basis for both ENC's and RNC's. These Updates include Temporary and Preliminary (T&P) notices for RNC's only and are cumulative. Therefore, only the most recent Update is required if several arrive after a mail backlog. The Updates will only be effective if the appropriate Licences, Permits and the relevant charts have been installed on each ECDIS. When updating ECDIS, it must be remembered that the Permits for ENC's and RNC's must be updated prior to inserting the update disc and conducting the Update.

As the Updating process can be lengthy, it is recommended that it be conducted while the ship is alongside. It must be noted that, if updating while under way, there are implications for safety such as:

- a. Some systems only permit updating to take place if safety monitoring is turned off
- b. updating utilises capacity of the computer and therefore is diverting from its primary task
- c. all extant Routes will need to be re-checked following an Update.

Therefore, a Risk Assessment should be conducted prior to updating while under way. However, if it is deemed safe to do so, it is recommended that the ECDIS is updated one at a time to ensure the OOW retains an operational system. Once the Update is complete, the Navigator should ensure that the updated ECDIS is performing correctly with the new data prior to conducting the update on the next ECDIS or synchronising across the LAN. To aid with the Risk Assessment process, the Navigator should record approximately how long it takes to update all systems.

Once all ECDIS have been updated, a Spot Check should be conducted of a random selection of charts in both ENC and RNC formats to check that Corrections, New Editions and New Charts have updated correctly on all systems. Furthermore, all extant Routes are to be checked to ensure that they remain navigationally safe. This is also to include a

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manual 1:1 check of the entire Route in accordance with Route Checking procedures in section 18.4.

The Navigating Officer (Second Officer) is responsible for ensuring that all ECDIS are updated correctly and that all operators know the process by which the systems are updated. Under the guidance of the Navigator, all operators are to conduct routine Spot Checks.

The Navigating Officer (Second Officer) is responsible for safeguarding the latest Update disc, Permit file, Licence file and the last set of ENC and RNC Base discs.

28.3. ENC/AVCS Correction

For common updates (e.g. Notice to Mariner) the Company subscribes to Passage Manager/Voyager that sends updates directly to the ship using Vsat/FBB Inmarsat or ship's email. This subscription also includes the AIO (Admiralty information overlay). Weekly updates can also be directly downloaded from UKHO website via the internet and apply the same to the ECDIS system. In case the vessel is unable to receive the updates automatically via the internet, the same is send via ships email as attachments. It is Navigating officer (Second Officer) to download and install updates into ECDIS and to record the corrections in the NP 133C.

The updates are also published weekly by Admiralty in DVD format and are delivered to ships by Automatic Outfit Management Service (Update consists of series of Base and correction, AIO and ARCS DVD) which are to be loaded in ECDIS and contains new charts and corrections. Relevant electronic charts are to be updated as soon as received for safety of navigation.

Even though all charts are installed into the ECDIS System, all missing charts or newly acquired cells are to be updated using the latest Base DVD before applying any future updates.

Only the Latest Base DVD's, Update DVD's, AIO DVD's to be available on the bridge.

It is necessary to activate the charts before they are available for use on ECDIS (unless it was already done during previous voyages). Digital Chart Licenses are obtained for different licensing periods (3 months, 6 months, 12 months) and it is recommended that the same is selected according with expected routes, when such information is available.

In order to get the licenses of all required charts necessary for the voyage which is to be performed, the Master or the Navigating Officer (Second Officer) should request for the ENC license/permit from the service provider and load the licenses/permits into the ECDIS system to enable their usage. Manufacturer's instructions must be referred to for more details on chart installation, loading of permits/licenses and updating of ENC's. The request for ENC license and permits must be done before the commencement of the voyage.

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28.4. Admiralty Information Overlay (AIO)

The Admiralty Information Overlay is a digital dataset that is designed to be displayed over ENC's in ECDIS and other chart display systems to provide additional information to the navigator. The AIO contains all Admiralty Temporary & Preliminary Notices to Mariners (T&P NMs) and provides additional preliminary information that is specific to ENC's, such as reported navigational hazards that have been incorporated on paper charts but have not yet been included in ENC's. The AIO gives seafarers an easy way to view the information they need, in addition to the standard chart, to navigate safely and compliantly. The Overlay makes passage planning simpler and safer by clearly showing where important Temporary or Preliminary changes may impact a voyage. It also gives seafarers the same consistent picture of the maritime environment on their ECDIS as they have always had with the Admiralty paper chart.

The AIO includes all Admiralty T&P NMs in force worldwide and additional information that relates specifically to ENC's, published as ENC Preliminary NMs (EPNMs). EPNMs are displayed in the same way as T&P NMs, as a simple red polygon (usually rectangular) with red hatched fill which indicates the area affected by the NM. When the Overlay is added to the AVCS license the Overlay permit will be added to the Chart Permit files issued for all ECDIS registered on the license. The Overlay is designed to be displayed on top of a standard ECDIS chart display and can be switched on and off without changing the underlying chart. Only those features relevant to the chart in use are displayed. As the user zooms in or out, the ECDIS will automatically select charts of a suitable scale and the Overlay features relevant to the selected charts will be displayed. For example, a Temporary NM that applies only to a large scale chart will not be displayed when smaller scale charts of the same area are being used. The full text of the NM can be viewed in the ECDIS Pick Report against the Information attribute.

Not all ENC producers include Temporary and Preliminary (T&P) Notices to Mariners (NMs) in their ENC's. The table that lists the confirmed status of T&P NMs in the ENC's is to be consulted. Areas for which T&P NMs are not included in the ENC by the ENC producer, T&P are to be manually annotated.

The information contained in the overlay is important navigation information that should be used when planning a voyage and may be referred to when navigating.

The OOW shall not entirely rely on AIO as they may not be updated. Applicable T&P notices should be verified against weekly eNTM and plotted manually if required.

28.5. Navigational Warnings

Navigational warnings transmitted by satellite (EGC) and Navtex receiver are by nature more short term and urgent than T&P notices. NAVTEX warnings may be displayed automatically if the NAVTEX is integrated into the ECDIS system.

Navigating Officer should obtain consolidated list of Navigational Warnings of the voyage

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area in force while planning the passage.

Weekly notices to mariner (Section 3) published by UKHO issues Nav warning for Nav area-1.

OOW should select Nav areas in SAT-C /Navtex as per vessels route and receive print out of all the in-force warnings. Weekly list of in-force warnings is also received thorough SATC/EGC.

Navigation warnings received from all the sources (Navarea, Coastal and Local) during the watch are to be checked immediately by the OOW upon receipt.

The Master is to be advised immediately of any Navigational Warnings which are within 50 miles of vessels track (either side)

In case the Nav warning affects the passage for example firing exercise area, then the route is to be changed in consultation with master & passage plan amended.

Specific details of a critical navigational warning should be plotted and made alarmable by using the look-ahead feature in order to highlight the navigational hazard for the OOW.

28.6. Automatic Update

Where Navtex receiver is interfaced with ECDIS for navigational warnings, the envelope type of symbol is displayed to depict the navigational warning on the screen.

All Navigation warnings which are in force and which are within 50 miles of the vessels track (either side) shall be checked if they are available in ENCS.

Navigational warning received from EGC/NAVTEX which are within 20 miles on either side of vessels track shall also be plotted manually on ENCS.

For example, if there is a dangerous wreck in a position as per Navtex message within 20 miles of vessels track, it also has to be plotted manually.

In case of any unexpected deviation in passage plan, Navigational warnings shall be reviewed and replotted.

28.7. Manual Update

Where Navtex is not interfaced with ECDIS, Relevant Navigational warning which are within 20 miles on either side of vessels track shall be plotted manually.

All Navigation warnings received from EGC/NAVTEX which are in force and which are between 20 to 50 miles of the vessels track (either side) need not be plotted but must be recorded in a section in the Passage plan as checked and verified.

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For example, if there is a dangerous wreck in a position as per Navtex message within 20 miles of vessels track, it has to be plotted manually.

In case of any unexpected deviation in passage plan, Navigational warnings shall be reviewed and replotted.

Ship staff shall not sign and mark the Navigational Warning printout “out of route” the without checking the position.

28.8. Log Keeping for Nav Warnings / Navtex Warnings

Similar to management on paper charts, OOW should check all the warning printouts from SAT-C, NAVTEX, etc. If the warning is relevant to the passage and plotted / noted, the ENC no. should be mentioned on the print out and kept for record with OOW’s signature.

28.9. Marine Information Objects (MIO) / User Charts

They are separate supplementary information displayed in conjunction with the overall System ENC and are not contained within nor are they an integral part of an ENC. They are similar in concept to adding radar and AIS information to an ECDIS display. Examples are Tides/Water levels, Ice coverage, Meteorological, Oceanographic, Marine Habitats, Environmental Protection, Archaeological, Vessel Traffic Services (VTS), and Aids to Navigation Status etc. Navigators using ECDIS should be aware of the ability to plot new dangers, navigational warnings etc. electronically on ENCs through the use of the MIO capability.

28.10. Manual Corrections

ECDIS allows the operator to create and display additional S-52 objects as Manual Corrections on the chart, in the same way that annotations would be made on a paper chart for in force Navigation Warnings, T&Ps, etc. Manual Corrections may be applied to both ENCs and RNCs and may be interrogated, edited, moved, deleted and copied to disc as appropriate. However, on most systems, Manual Corrections are not removed following an update. Therefore, the Navigator is to ensure that a log is kept of all Manual Corrections input into ECDIS so that information no longer valid can be deleted. The Navigator is to ensure that all operators understand the process of logging Manual Corrections.

28.11. Deleting Charts

Great care must be taken by operators not to delete relevant data from the system, in particular chart data. To ensure the integrity of the chart portfolio, only the Navigator has authority to delete charts from the system.

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29. VIRUS PROTECTION

ECDIS do not have virus protection and are therefore prone to attack. An infected ECDIS could lead to catastrophic failure of the system. To prevent a harmful virus infecting ECDIS, it is crucial that there is a procedure for the use of USB and CD media that is inserted into ECDIS. It is recommended that use of USB is restricted to a single USB that is only used within the LAN. USB sticks and CDs should be virus checked prior to inserting into ECDIS. The Navigator is to ensure that a robust system exists and that all operators are briefed accordingly.

29.1. Software Updates

ECDIS operators must ensure that their software, further to charts data, always conform to the latest version available. Instruction to get current installed software version, are specific for each different ECDIS model and are available into manufacturer instructions. Availability of latest software version will be notified when published by office to the ship and shore service will be organized to update the system if deemed necessary. See also section 30.0 below.

The Navigator is to ensure that any software updates, including updates to the S-52 Presentation Library, provided by the manufacturer are installed, tested on all ECDIS and recorded.

30. ADMINISTRATION AND RECORDS

30.1. ECDIS Data Recording

ECDIS automatically records voyage data during use, the settings for which should be configured as required to provide as comprehensive a picture as possible of the past track of the ship. The playback mode should not be operated on ECDIS whilst the vessel is underway, as it may affect or stop the monitoring function. If absolutely essential to playback to check on some alleged mishap, it should be done on the ECDIS not being used for Monitoring purposes.

The Navigator should back up Log data for archive purposes on a monthly basis and radar data on a weekly basis. The Logs are to be copied to CD, clearly and sequentially labelled and kept on board until called for.

In the event of a navigational incident developing, ECDIS Screenshots should be taken if possible. This activity should not be permitted to distract or prejudice action necessary to deal correctly with the incident. In the event of a navigational incident, the relevant Playback files should be immediately backed up.

If for any reason it was not possible to get a Screenshot during an incident, then immediately following any incident or near miss, a Screenshot should be saved to disc from all Bridge

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terminals. This is to assist in any subsequent investigation or enquiry and to enable the investigating team to observe how each terminal was configured, and therefore what each user was seeing at the time.

30.2. Backup Procedure

The Navigator is responsible for backing up Routes, Additional Information, Manual Corrections, Logbook and other relevant ECDIS data so as to de-clutter the hard drive of the ECDIS and also to serve as a readily available record in the event of ECDIS failure, loss of data or inadvertent deletion of data.

30.3. Records

The introduction of ECDIS, its carriage and training requirements has brought with it requirements to provide evidence of compliance, particularly for Port State Control. It is likely that the following documentation will be required to be retained on board for inspection:

- a. Type approved documentation stating ECDIS complies with IMO performance standards
- b. type approved documentation stating ECDIS backup complies with IMO performance standards
- c. generic ECDIS training certification, as per Flag State requirements
- d. type specific training certification under the terms of the ISM Code and the ship's relevant Flag State (method of training/approval to be determined by relevant Flag State)
- e. ENC and RNC data used for the intended voyage are from the latest official editions
- f. ECDIS is being updated properly and a system for updating electronic charts is in place from an official electronic chart supplier

Onboard safety management system has been updated to incorporate ECDIS training and familiarisation requirements, including ECDIS maintenance procedures.

All deck officers are to have undertaken a Flag State approved Generic ECDIS course (40 hours course) in accordance with the IMO 1.27 model and type Specific ECDIS training in order to be familiar with equipment in use on Company vessels. Furthermore, ECDIS On Board Familiarization Checklist has to be completed by all watch keeping officers. This familiarisation will include the backup system, sensor configuration and integration and current operational status of the ECDIS.

Company requires that Masters and Officers approach the use of ECDIS with the appropriate mind-set. The main component of the ECDIS mind-set is the ability to appreciate the strengths and weaknesses of using an ECDIS-based system for navigation through:

- a. Recognizing that the system could fail (either fully or partially) at any time and knowing how to identify the difference;

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- b. Ensuring that the backup and contingency arrangements are always efficiently involved in the on-going navigation process;
- c. Recognizing that anomalies within the ECDIS software and/or the digital chart can exist;
- d. Being aware of the need to ensure that the ECDIS software is kept up to date;
- e. Being able to adapt to the changes in display detail when adjusting display scale;
- f. Regularly planning the chart display ahead of the vessel, using the largest scale data available;
- g. Non-standardized user interface;
- h. Specifying safety settings and ensure the same is displayed correctly;
- i. Ensure that the Display (ENC Layers) is setup appropriately;
- j. Correlating position derived from GPS with other navigational aids. (e.g. radar overlay) and periodically fixing the vessel's position by visual bearing and radar range;
- k. Prudent use of automatic route-checking functions without over reliance.
- l. The Company requires that Master and Officers undergo ECDIS drills at least quarterly involving deck officers and duty engineer.

The Navigator is responsible for keeping the following manual records up to date:

- a. Record of updates installed on all systems
- b. record of manual corrections
- c. record of chart spot checks on all systems
- d. chart correction Log for the appropriate paper chart folio
- e. receipt and installation of any new Licences or Permits
- f. receipt and loading of any New Charts.

31. USE OF ECDIS ON PASSAGE

ECDIS is an excellent tool to assist with navigation, but it is just an aid to navigation and not a solution in itself. Always remember that it is the navigation aid feeding ECDIS that is providing a position and that ECDIS is simply the means of plotting it. Such an advance in technology does not remove the responsibility vested in the OOW to correlate and confirm the ship's position using all available means and by cross-checking one method against another. A seaman's eye remains critical to the safe navigation of the ship.

The OOW should be constantly critical of the information provided by ECDIS, comparing it against other sources of information and the picture they are seeing out of the window. OOW should use

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ECDIS wisely to enhance situational awareness by using it in conjunction with keeping a proper lookout. The OOW is to quality control all sensor inputs to ECDIS, remembering the old adage that if you 'put rubbish in, you get rubbish out.

The OOW shall know at all times the primary position source that is fixing ECDIS and correlate positional information whether visual, radar or from other electronic navigation aids, particularly when making landfall.

The OOW is never to discard visual position information, particularly when it does not tie in with positional information displayed on ECDIS as GPS (including DGPS) can fail, be jammed and may be prone to drift. If unsure of the ship's position, **the OOW is to call the Master immediately and alter course towards safe waters or even stop the ship**, then re-fix.

The use of traditional navigational techniques, such as Clearing Bearings and Clearing Ranges to indicate safe water, remains valid as a standard tool for the OOW and an additional check for safety and redundancy against ECDIS failure or GPS denial. If available, RIO should be used by the OOW to facilitate check fixes when in radar range of the coast. Operator fixes should be input using what visual and radar points are available to cross-check GPS as required. When out of sight and radar range of land, the GPS derived position should be confirmed at the first opportunity; celestial LOPs can be used when navigating deep sea.

The Safety Depth and Check Area values should be set as discussed above. Any changes to these settings, such as for operating close to the coast, should be discussed with the Navigator, and then authorised by the Captain. Changes must be recorded in the Passage Plan / Logbook. The system is not infallible and in no way relieves the OOW of his duty to check the chart ahead of him for navigational dangers.

It is essential that the OOW properly configures the system in accordance with the recommendations contained herein, being mindful that too much information is as dangerous as too little.

Careful attention is to be paid to the state of both bridge ECDIS terminals at watch handovers, with particular attention paid to configuration of the display.

Alarms and Warnings are to be read and understood prior to being acknowledged by the OOW. The OOW is to know where to find details of an acknowledged Alarm or Warning if required. There is no such thing as a spurious alarm in ECDIS and only the OOW is permitted to acknowledge Alarms and Warnings.

With regard to ECDIS, the Captain should be called in the following circumstances; these circumstances should be included in the Master's Standing Orders as well:

- when ECDIS configuration changes are complete on all systems (i.e. transition to Pilotage, Coastal, Open Ocean, etc.)
- failure of any of the Bridge ECDIS units
- when a change to Safety Depth, Safety Contour or Check Area settings is requested.

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- d. When there is any large discrepancy between visual position fixes and ECDIS displayed position.

When in RCDS Mode, the OOW is to be mindful of the limitations imposed when using an RNC. The OOW is to ensure that a manually derived danger line is drawn at all times on an RNC.

Where doubt or discrepancy exists, it should be reported to the Master.

To facilitate the loading of the best scale chart, Chart Autoload and Chart Autoscale are always to be ON. Where both ENC and RNC data are installed, consideration must be given to Chart Priority in order to ensure that the best scale chart of the required format is selected. This is because an RNC may be selected by the system even when an appropriate ENC exists because it is a better scale.

31.1. Auto Track Control

Auto Track Control should not be used when navigating in confined or restricted waters.

Warning: In automatic Track Control mode, the observed position is controlled, not the real ship.

31.2. Parallel Indexing

The ECDIS system is fitted with a parallel index line system. It is strongly recommended that this function is regularly used when navigating in coastal, confined or restricted waters.

32. ECDIS CHART 1 AND IHO PRESENTATION LIBRARY EDITION 4.0⁸⁷

Changes to the IHO S-52 Presentation Library introduced in edition 4.0 have invalidated the tests contained in IHO ECDIS Data Presentation and Performance Checks which were specifically designed and developed for ECDIS using the IHO S-52 Presentation Library edition 3.4 or earlier.

ECDIS users can check that their systems are capable of displaying the new symbols introduced in the IHO S-52 Presentation Library edition 4.0 by opening the ECDIS Chart 1 datasets. ECDIS Chart 1, which includes a legend of symbols used in ENC's, should be installed on all type approved ECDIS.

The new symbols introduced in IHO Presentation Library edition 4.0 are provided in the document available at website:

https://www.iho.int/mtg_docs/com_wg/ENCWG/MISC/IHOPreslibChart1final.pdf

⁸⁷ W 49 / 2017 (Entire Section 32)

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Viewing ECDIS Chart 1, “Information about chart display (A, B)” within the ECDIS will only display the new symbols if the IHO Presentation Library edition 4.0 is installed.

This is the IHO recommended method for checking that the ECDIS system can display the new symbols correctly. The performance check (against ECDIS Chart 1) has been successfully carried out after the software upgrade should be recorded at appropriate page of NP 133C.

The Declaration of Conformity Certificate available digitally in the ECDIS itself by accessing the Manual in reference to system ability to display presentation library edition 4.0 is to be filed in NP 133C.

33. MAINTENANCE OF ECDIS SOFTWARE AND FIRMWARE

Refer chapter 7.0 Navigation Equipment/section 24⁸⁸

34. RASTER CHART DISPLAY SYSTEMS (RCDS)

Raster Chart Display System (RCDS) is an electronic navigation system similar to ECDIS but without the full functionality of ECDIS. RCDS can only operate on Raster Navigational Charts (RNC). For detailed operating instructions and guidance on the use of RCDS, reference should be made to the manufacturer’s detailed operating instructions.

RNC’s are called ARCS charts by the UK Hydrographic Office and are digital reproductions of British Admiralty (BA) paper charts. They retain the same standards of accuracy, reliability and clarity as paper charts.

ARCS charts can only be used with up-to-date paper charts. It is considered as a secondary navigation system and does not replace paper charts.

35. DIFFERENCES BETWEEN RCDS AND ECDIS

Unlike ECDIS where there are no chart boundaries, RCDS is a chart based system similar to a portfolio of paper charts;

Raster navigational chart (RNC) data, itself, will not trigger automatic alarms (e.g. anti-grounding). However, some alarms can be generated by RCDS from user-inserted information. These can include:

- a. Clearing lines
- b. Ship safety contour lines

⁸⁸ W 05 / 2022

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c. Isolated dangers

d. Danger areas

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

Chart features cannot be simplified or removed to suit a particular navigational circumstance or task to hand. This could affect the superimposition of radar/ARPA;

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

Orientation of the RCDS display to other than chart-up, may affect the readability of chart text and symbols;

It may not be possible to interrogate RNC features to gain additional information about charted objects;

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;

Depending on the source of the RNC, different colours may be used to show similar chart information. There may also be differences in colours used during day and night time;

An RNC should be displayed at the scale of the paper chart. Excessive zooming in or zooming out can seriously degrade RCDS capability, for example, by degrading the legibility of the chart image.

36. POWER SUPPLY

It should be possible to operate ECDIS and all equipment's necessary for its normal functioning when supplied by an emergency source of electrical power and the change 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. All navigating officers should be familiar with the power sources available for each ECDIS units including normal and emergency supplies.

37. DISPLAY

There are three levels of information that can be displayed on an ECDIS screen:

37.1. The Base Display

is the basic display provided by the SENC and is required for all charts. It is the basic data

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that cannot be altered by the operator. The Display Base contains information on coastlines, safety contours, danger indications, traffic routing, scale, range, orientation and display mode, as well as units of depth and height. The Display Base is not intended to provide enough information for safe navigation just by itself.

37.2. The Standard Display

which is also a pre-arranged chart display, but which can be modified by the operator, and which is automatically shown when the ECDIS is first switched on. It contains the Display Base, plus boundaries of channels etc., conspicuous features, restricted areas, chart scale boundaries and cautionary notes. The operator can modify the amount of information displayed for the purposes of route planning and navigational monitoring. The operator decides what level of information is displayed during any particular situation or task. However, when working with these other levels of information display, an operator must immediately be able to return to the Standard Display with just one single key stroke or action of the controls.

37.3. The 'All Other Information' Levels

After the first two main levels of chart displays mentioned above, extra layers of information known as 'All Other Information' can be called upon the ECDIS and added to the Standard Display, when required by the operator. These may show spot soundings, undersea cables and pipelines, ferry routes, lines of magnetic variation, the chart graticule, place names, extra details of Marine Operation – Navigation aids, hazards and notes. It is suggested to use "OTHER" as display category at all times in order to display all potential navigational hazards. Watch keeping Officers should verify that all compulsory information (base + standard) are selected.

37.4. SCAMIN (Scale Minimum)

SCAMIN is an optional attribute by the chart producer (defined by IHO S57) that can be used to label ENC chart features to be suppressed above a certain display scale. The main function of SCAMIN is to de-clutter the chart display, enabling the user to focus on the most useful navigational information for the display scale in use. SCAMIN may affect the display as it removes certain information from the display if best scale chart is not being used i.e. safety critical information may be removed from the display. A buoy that has the IENC Encoding Guide's recommended SCAMIN setting of 22,000 will only be shown on the display if the selected display scale is greater than 1: 22,000 (Larger scale). The system auto-filter means that unless navigating on the best scale chart, OOW will not see all the information available for display. Therefore, when zooming out the system will automatically deselect certain features from display such as Soundings, Lights and Topographical detail. The only way to ensure that the display is not affected by SCAMIN is to always ensure that the chart is being used on the best scale When in use, this feature should provide "SCAMIN filter" warning to the users.

Navigators should always check the passage plans at "compilation scale" before use and

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during route monitoring. Zoom in/out function should only be used for short periods of time. If possible SCAMIN settings to be kept 'off' during the passage planning stage.

37.5. Symbols & Information display

Reference shall be made to Admiralty guide to ENC Symbols used in ECDIS (NP 5012) when using the ECDIS. Watch keepers should be aware of the use of traditional and simplified symbols in ECDIS.

Where possible only Traditional Symbols are to be utilised. The ECDIS Chart 1 is intended to familiarize the mariner with the colour and symbol coding used by the ECDIS. It is part of the S-52 Presentation Library and is distributed as graphics and tables within the paper specification and also as digital ENC.000 files. Users must understand that ECDIS provides a dynamic presentation where all the data loaded by the user is present but different settings determine which individual features are portrayed and how they are symbolized.

37.6. Compilation Scale

Compilation scale is the scale of the ENC at which the chart data was compiled based on the nature of the source data. It's the Scale at which the chart information meets the IHO requirements for chart accuracy.

Navigators must exercise extreme caution when using the scale or zoom facility of the electronic charts. It is possible to zoom-in to a scale larger than that used in the compilation of the data which could create a false impression about the reliability of the charted information. Consequently, it could give a false impression of safe waters around the vessel. Also, some features may be not displayed because of the SCAMIN (Scale Minimum) attribute of ENC objects.

38. ECDIS SYNCHRONIZATION AND DATA BACKUP⁸⁹

Company recommends following actions with regard to synchronization of ECDIS and keeping data backup:

- Passage planning and updating – Keep ECDIS in synchronized mode
- Updating ENC permits / base DVD - Keep ECDIS in synchronized mode
- Deleting any information – Keep ECDIS isolated and delete information from each ECDIS separately so that if accidentally any important data is deleted, same will not be lost from second ECDIS
- At sea during navigation – Keep isolated
- A complete backup of all settings, routes, user maps, etc. to be conducted at least once a

⁸⁹ W 49 / 2017 (Entire Section)

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month. Backup to be saved on either bridge PC or master's laptop.

- Current passage plan data to be backed up as soon as passage plan completed. Backup to be saved on bridge PC in case of ECDIS failure.
- During repair of a faulty ECDIS – keep both the ECDIS unsynchronized until the ECDIS is fully repaired and operational. If in doubt, contact office/technician before synchronizing both ECDIS.⁹⁰

⁹⁰ W 28 / 2023