Paper for Consideration by TSMAD and DIPWG

Short Review of the S-101 Portrayal Documentation

Submitted by:	S-101 Work Item Leader and DIPWG chair
Executive Summary:	This paper will review the work that has been done on the S-101 portrayal documentation. This paper will mainly focus on the business rule annex for S-101
Related Documents:	S-101 Main Product Specification
Related Projects:	N/A

Introduction / Background

While work is progressing on S-101, one of the major items that had to be put on hold is the review of S-52 for inclusion into S-101. It should be noted that much of the existing items that are contained within S-52 will be housed in the portrayal catalogue. However, there are items regarding guidance and implementation that are found in s-52 and are still required for an S-100 based ECDIS.

In 2011, the Chair of DIPWG drafted a first cut of the relevant items that would still need to be included in s-101. In March 2012, the S-101 work item leader further refined this to include items that were specifically mentioned in IEC 61174 and would have to be retained. It should be noted that the concept needs to be retained, but the methodology used by S-101 would require a change to the IEC 61174 test.

It should be noted that this paper is only focusing on the business rule annex for Portrayal and not on the main section in S-101, as that will be developed once the S-100 portrayal model is approved.

Analysis/Discussion

In order to progress the S-101 portrayal business rule annex to a state where TSMAD/DIPWG members can make formal comments, the following questions need to be answered. Once a consensus has been reached at the meeting, the revised S-101 product specification will be released for another round of comments and will include the portrayal business rules.

Please refer to the attached annex for the accompanying text for these questions:

Question 1: Clause 9.1.1 – Does S-101 need to make reference to the ECDIS "Display Generator" concept?

Question 2: Clause 9.6.4 and Clause 9.11.3 – Display calibration and verification/ Colour Tables - Can this be removed from S-101?

NOTE: IEC 61174 contains the same information and IEC 61174 can remove the reference to S-52.

Question 3: Clause 9.6.5.1 – Use of Controls – Can S-101 remove reference to CRT and just keep LCD references? If yes, all references to CRT will be removed from the annex.

NOTE: This clause was retained due to an IEC 61174 reference that this needs to be in a manual and S-52 was the document that states that the ECDIS manual "should carry a warning that careless use of the display controls may adversely affect the visibility of information on the display."

Question 4: Clause 9.8.6 Viewing groups – There is a clause that manufactures may use the viewing group scheme or not – should this remain optional?

NOTE: Most of the viewing group information will be in the Portrayal catalogue

Question 5: Clause 9.8.9 – Scale-dependent features – Can this clause be combined with the Data loading and Unloading business rules?

NOTE: This will need to be updated to reflect the new display scale ranges

Question 6: Clause 9.9.2 – ENC scale and Graphical Index – Can this be moved to the Data Loading and Unloading Business rules?

NOTE: The Graphical Index would have to remain here

Question 7: Clause 9.10.2 (4) – IEC Mariner's Navigational Elements – Can this be removed as it is covered in IEC 62288?

NOTE: If agreed, then it will be removed from the entire document

Question 8: Clause 9.11.4 - Other special symbols – National Language Display – it is currently optional. Should we make it mandatory that it should be displayed in the Pick Report?

NOTE: TSMAD has come up with a way to make display of names easier.

Question 9: Clause 9.11.9.2 – Light Description Text Strings – Is this necessary, as it is already covered in the CSP or in the Portrayal Catalogue?

Question 10: Clause 9.11.13 – Colour Test Diagram – Does this belong in S-101?

NOTE: It is for CRT's and IEC 61174 references this clause, however, maybe this should be just located in IEC 61174?

Question 11: Clause 9.11.14 and 9.11.14.1 – Using the Colour test diagram – Does this belong in S-101? Or should it be part of S-64 and the associated test instruction manual.

NOTE: If this is a test for mariners, I'm not sure they will read S-52 for the test procedures.

Question 12: Clause 9.14- The colour scheme – Is it useful to have this in S-101, even though the values are in the Portrayal Register?

Question 13: Clause 9.14.3 – Colour Tables - Is it useful to have this in S-101, even though the values are in the Portrayal Register?

Question 14: Clause 9.14.4 – Alphabetical list of Colour Tokens - Is it useful to have this in S-101, even though the values are in the Portrayal Register?

In addition to the above questions, TSMAD has developed a new complex attribute to assist in the display of names. Currently, the business rules have been added to the portrayal annex. The reasoning is that when the mariner turns on OBJNAM they end up with the full name, when in reality they only want to see the short name. In using a complex attribute, the data will be able to carry a Boolean display name that indicates that this would be name to appear on the screen and all other names should be available via pick report.

Display of Names

In S-101 Names are modelled as a complex attribute. As part of this model there is a new attribute categoryOfName. When the user turns text on, then the name that has display name encoded must be the name that is displayed on the screen.

EXAMPLE: A light is encoded with the full name as a long name: Micklefirth lighted beacon "9", it is also encoded with a short name: "9". The display name is toggled for the short name; therefore the ECDIS must only display "9" when text is turned on. The long name must be visible in the pick report.
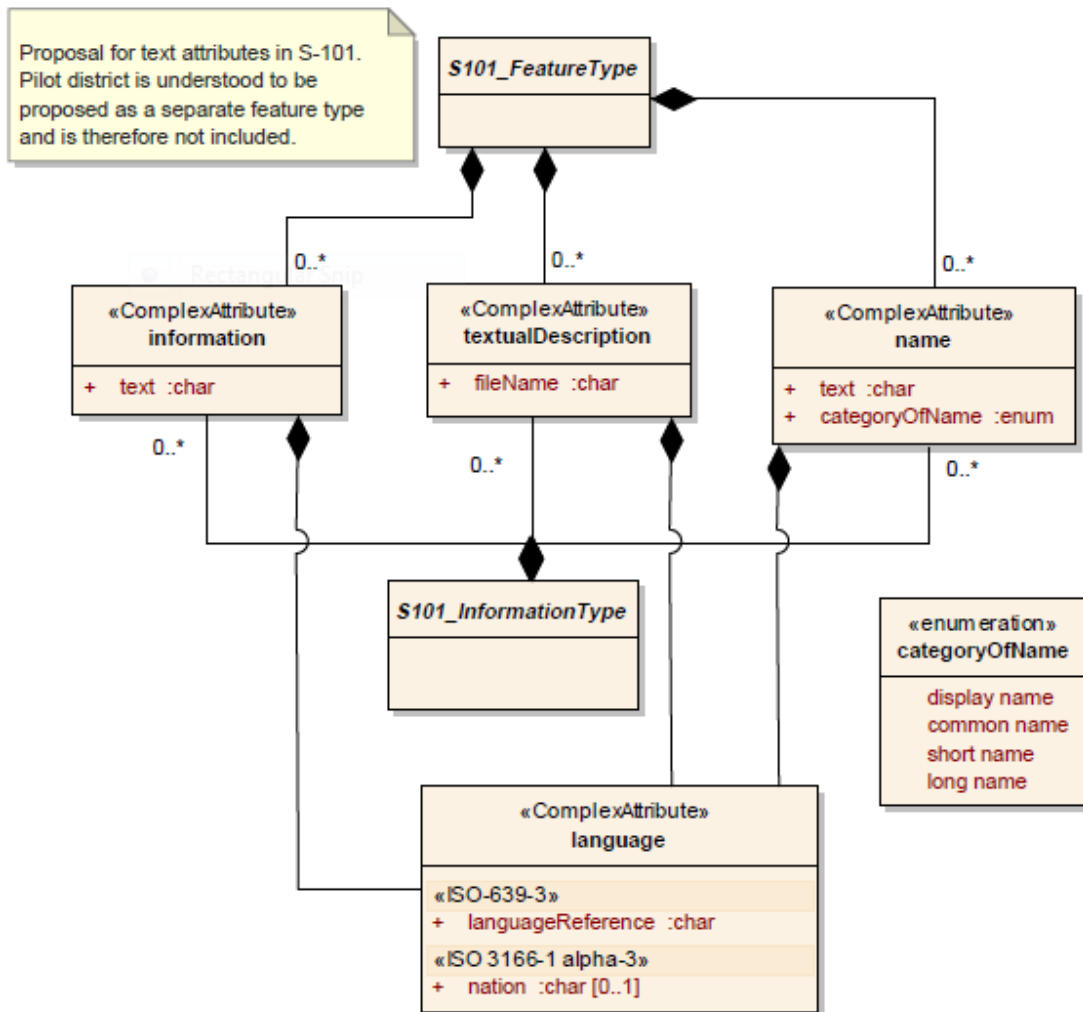
Recommendations
TSMAD and DIPWG provide answers to the questions raised in this paper. Then the S-101 work item leader will update the business rule annex and send it out for review and comment to a small sub working group to further refine the annex.

Action Required of DIPWG and TSMAD
The DIPWG and TSMAD is invited to:

a.   discuss the questions posed in this paper

b.   note the new concept of display name

c.   agree to a sub-wg to finalize this annex for full review and comment by both DIPWG and TSMAD.

9   Portrayal

9.1   Introduction

This section contains additional guidance for the implementation of portrayal within an S-101 enabled ECDIS. While much of the existing S-52 presentation library is now housed in the portrayal catalogue, this clause contains subsets of S-52 – *Specifications for Chart Content and Display Aspects of ECDIS*, which are still required for ECDIS to conform to the IMO Performance Specification and IEC 61174.

9.1.1   ECDIS "Display Generator" Concept <<Annex A.2 >>

The elements of S-101 portrayal are handled by an ECDIS Display Generator that is designed by each manufacturer, following the specifications outlined in S-101. The S-101 Portrayal Catalogue provides the link between the feature characteristics according to S-101 and the actual presentation on the ECDIS screen.

NOTE: The Display Generator is not provided in S-101. This must be developed by the manufacturer.

Figure 1 shows how the various portrayal elements can be linked together in order to display an S-101 feature from the SENC. The individual elements (symbols, symbol display rules, etc.) are provided in the portrayal register and are collected together in the portrayal catalogue, which is a machine readable file to allow for an enhanced change mechanism for new versions of the feature and portrayal catalogues.

NOTE: Section 9.6.6.1, "Date-dependant features," which discusses the display of features depending on date in attributes, such as DATSTA, DATEND, PERSTA and PEREND. The requirement to display date-dependent information outside the date at which it is active (for route planning etc.) means that the date-filter in the first diamond of figure 1 will be deliberately by-passed on request by the mariner. When this option is in use, the mariner must be reminded that the information on the display may not be correct for the actual, current, date and time.   The **maximumDisplayScale** and **minimumDisplayScale** set for each **DataCoverage** feature and the value of the SCAMIN attribute also affects the display of certain features.

Comment [N1]: The concept behind date dependent features is the same. However, in S-101 it is modelled as a complex attribute dateRange.

Get Object from SENC — Object definition through attribute values & spatial elements.

Is date within range DATSTA-DATEND PERSTA-PEREND ? — NO / YES

Get Symbology Instruction ← **Instruction from Look-Up Table** — Symbology Instructions, conditional symbology, priority, radar flag, category and viewing group.

Conditional Symbology? — NO / YES

Generate Instruction from Symbology Procedure ← **Procedure Library** — Procedures to perform conditional symbology which may change priority, radar flag, category and viewing group.

Is displayscale greater than SCAMIN — NO / YES

Generate Entry to Display List from Symbology Instructions ← **Mariner Options Selection** — Eg. safety contour, colour scheme, text on/off.

More Objects? — YES / NO

Symbol Library → **Perform Display List Commands** ← **Colour Tables** — Simplified and full chart symbols, linestyles and patterns.
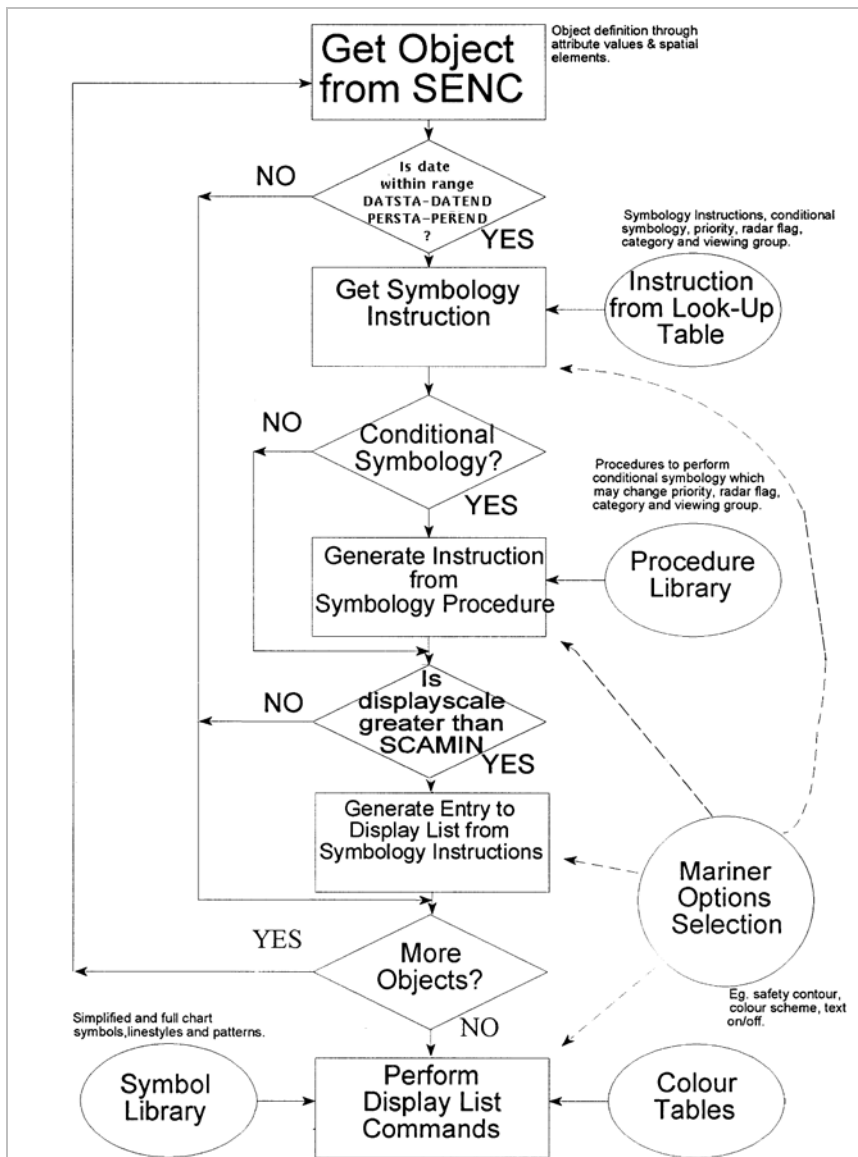
Fig. 1 - Display generator concept

After all features have been examined by the programmed loop, the display list is filled with graphic commands. The commands are then performed by the ECDIS, which in turn loads symbols from the symbol library and gets the colour values from the colour tables. This method to generate an ECDIS display gives the mariner control over the contents and the appearance of the presentation:

- If the mariner selects another safety contour, the display list is renewed in the programmed loop and the depth areas distinguishing shades are changed by a symbology procedure which is called to generate symbology instructions for the feature class DEPARE (depth area);

- or symbology instructions which refer to the plain-boundaries or symbolized-boundaries areas, and lines by switching to another portrayal rule based on the mariner's preference

- or the generation of the display list is influenced by a filter suppressing text commands;

- or the colour values for the day time are replaced with the values for the night time by selecting another colour table.

NOTE: The ECDIS should not initiate any change of state automatically or by linkage, e.g., it should not automatically select "lights" because the mariner selects the night colour table. All changes to the composition of the display should be initiated by the mariner.

9.2 Tidal Adjustment <<1.2(f)>>

Depth information should only be displayed as it has been provided in the ENC and not adjusted by tidal height. If the ECDIS has integrated the use of a S-10X tidal product specification, it may display the adjusted tide as an italicized offset to the sounding in the ENC.

9.3 Physical Display << MAIN 5.1 >>

Portrayal requirements for the main graphic display are:

- Size: minimum effective size of the area for chart display: 270 x 270 mm.

- Resolution: minimum lines per mm (L) given by L=864/s, where s is the smaller dimension of the chart display area. (e.g. for the minimum chart area, s=270 mm and the resolution L=3.20 lines per mm, giving a "picture unit" size of 0.312 mm)

- Number of Colours: 64

Information should be displayed in the ECDIS on one or more physical screens, which may be divided into more than one chart display. Information may be displayed automatically, on demand or as a result of mariners' selection.

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

- the mariner should be informed;

- the display should continue route monitoring until the new information is ready to draw within 5 seconds.

The specifications above permit a chart display whose minimum resolution (lines/mm) may vary depending on the size of the display. To maintain a clearly readable chart display under this flexibility requires the following constraints to ensure that enough "picture units" (pixels) are always used to draw small features and symbols clearly:

- Chart features: Chart features should never be drawn with fewer "picture units" (i.e., lines, pixels, dot-pitch intervals) than when drawn on a 270 x 270 mm chart area at SENC scale.

- Symbols: For clear representation, symbols require a minimum number of picture units, depending on their complexity. A simple chart symbol should extend about 12 pixels (that is at least 3.5mm for an IHO standard screen.) See section 9.4 for details on the size of symbols.

9.4 Units << MAIN 2.3.1f >>

There must be no ambiguity about the units in use at a particular time. The units listed below must be indicated in the display legend:

1) Position: latitude and longitude in degrees, minutes and decimal minutes.

2) Depth: metres and decimetres.

3) Height: metres.

4) Distance: nautical miles and decimal miles, or metres.

5) Speed: knots and decimal knots.

9.5 Size of lines symbols and text; fonts <<3.1.5>>

Lines and symbols and text should be large enough that they can be easily interpreted at the operational viewing distance. This will be about 70 cm for route planning, but experience to date indicates that the viewing distance for important features during route monitoring may be several metres.

The minimum sizes for all symbols should be as shown in the Portrayal Catalogue.

In addition, the symbols should always be drawn with at least the same number of pixels as are required to draw the symbol at the size defined in the portrayal catalogue for the minimum resolution and minimum chart display area (270x270 mm).

When the display scale is enlarged by zooming in, it should be possible to hold symbol size constant. The same applies to text. Symbol and text size should never be decreased when zooming out.

The text on the ECDIS should be readable from 1 metre.* Sans serif, non-italic fonts should be used. The computer ø should not be used.

9.6 Colours << Adapted from MAIN 4.2 & MAIN 4.1 & MAIN 4.2.6 & ANNEX A 3.1 >>

The design of both colours and symbols ensures that important chart and navigation features remain clearly visible under the extremes of bright sun and dark night viewing. Note that these colour specifications apply to both the operational chart display (for route planning and route monitoring), and also to any text on the same screen as the chart display.

9.6.1 Colour Tables

Three colour tables have been carefully designed by perception specialists to give the maximum clarity and contrast between features on the display under all light conditions on the bridge. The ECDIS must enable mariners to switch among all three colour tables specified (day, night and dusk).

DAY – The Day Colour Table uses a white background as a result of a comparative test outdoors in bright sunlight which showed that a display background of maximum luminance gives the best contrast achievable under near-washout conditions. This conclusion has been confirmed by subsequent sea experience.

DUSK – The Dusk Colour Table is a black background table, which may also be used by day as a mariner's option.

NIGHT – At night the light emitted by the display must be strictly limited to avoid impairing night vision. In case the luminance needs to be further reduced, the Night Colour Table may be augmented by a luminance-reducing neutral density filter which should have 8 times attenuation, designated (logarithmically) "0.9 ND". (This is a manufacturer's option).

The colours are specified in CIE (Commission Internationale de l'Eclairage) xy chromaticity coordinates and luminance L. CIE colour coordinates are used because any other colour specification, such as RGB, is specific to a particular monitor and so cannot be specified either in relative or in absolute terms.

The colour tables and other detailed information about the assignment of colours is provided in the Portrayal Register.

9.6.2   Colour Tokens

A look-up table assigns all feature/attribute combinations of features from the SENC to one of 64 "colour tokens". Each colour usage is represented by a token that is a five-letter code. Each colour token corresponds to a colour definition given in CIE coordinates in one of a set of colour tables for different bridge lighting conditions (day, dusk and night). A few tokens apply to only one feature, but most include a group of similar features. For example, traffic lanes, traffic direction arrows, prohibited areas and other such features share the "trfcd" for "traffic control dominant (conspicuous)" colour token. Each token is assigned colour coordinates for each table in the Hydro Portrayal Register.

9.6.3   Transparency

Transparent area colour fill is used so that the background colours, lines and symbols show through an area shade (e.g. depth shades and contours should show through a traffic separation zone) and to reduce the prominence of a large symbol (e.g. too prominent a centred anchorage area symbol would cause clutter on the display). Any method used by the ECDIS manufacturer to obtain various degrees of transparency is acceptable.

9.6.4   Display calibration and Verification <<4.2.3>>

The ECDIS display should be calibrated initially in order to transform the CIE colour table coordinates to screen coordinates. The main components of the ECDIS display are the monitor and the image generator. Both the monitor and the image generator used to drive the ECDIS display can be calibrated together as a colour generating unit. Another alternative is to calibrate separately both the monitor and image generator. This process is described for CRT screens in Annex B1, and software for processing calibration and converting CIE colour coordinates to RGB, with worked examples, is included in the Presentation Library.

The ECDIS display calibration should be verified for type approval of all monitors as described in section X.X.X, using a combination of instrumental testing for the bright sun colour table and subjective visual checking for the dusk and night colour tables.

The procedure of calibrating all three colour tables by the current method used for CRTs, together with remote control of the calibration settings, should be used also for LCDs.

The visual checking is done by viewing all but the bright sun colour table on a multi-purpose Colour Differentiation Test Diagram carried in clause X.X.X. The test diagram is also intended for use by the mariner for checking display performance and adjusting the controls as described below.

9.6.5 Colour Control, contrast and brightness controls <<4.2.4>>

9.6.5.1 Use of Controls <<4.2.4.2>>

Colour tables are provided for day, dusk and night. The mariner should be provided with the control to make fine adjustments between these tables; the calibration position should be marked as a reference for this.

For a CRT type of monitor the brightness control should be preset, i.e. used only when essential, with provision to return to the calibrated setting.

LCD and other monitor technologies have a variety of controls. The general principle is that all available controls should have a provision to return to the calibrated settings and that only appropriate controls should be made available for the mariner.

The ECDIS manual should carry a warning that careless use of the display controls may adversely affect the visibility of information on the display.

9.7 Abbreviations << ANNEX A, 7.1.3.2 & ANNEX A 13.4 >>

The abbreviations used on the ECDIS display are listed below. The meaning of each of these abbreviations must be readily accessible to the mariner. Note that a few abbreviations, such as "DW" for deep water route and "IT" for inshore traffic zone, are used as symbols; The meaning of these abbreviations must be readily accessible to the mariner as well.

9.7.1 "TE" text command abbreviations

The abbreviations in the table below are used with the "TE" command word.

Prefixes		Suffixes		'C' Format Command		
bn	= beacon (INT1)	kn	= knots (INT1)	%	=	instruction follows
by	= buoy	deg	= degrees	%s	=	text string
clr	= overhead clearance			%d	=	integer number
clr cl	= clearance closed			%n.mlf	=	floating point number with n characters (including the decimal), m of which come after the decimal point
clr op	= clearance open					
sf clr	= safe clearance					
No	= number (INT1)					
Plt	= pilot					
Prod	= offshore production (INT1)					
LtV	= light vessel					
Varn	= magnetic variation					
ch	= communication channel					
NMT	= not more than "CLEARING BEARING"					
NLT	= not less than "CLEARING BEARING"					

9.7.2 Light Description Abbreviations

The following abbreviations are used to display light characteristics in ECDIS.

Al	alternating	Dir	directional
~~Al~~	~~group alternating~~	Aero	aeronautical
AlF Fl	alternating fixed and flashing		
AlFl	alternating flash	W	White
AlLFl	alternating long-flash	R	Red
AlOc Fl	alternating occulting/flashing	G	Green
AlOc	alternating occulting	Y	Yellow
F	fixed		
FFl	fixed and flashing	occas	occasional
Fl	flashing	temp	temporary
Fl+LFl	flash/long-flash	priv	private
FLFl	fixed/long-flash	exting	extinguished
IQ	interrupted quick-flashing		
Iso	isophased	m	metres
IUQ	interrupted ultra quick-flashing	M	nautical miles
IVQ	interrupted very quick-flashing		
LFl	long-flashing		
Mo	morse		
Oc	occulting		
Q	quick-flashing		
Q+LFl	quick-flash plus long-flash		
UQ	ultra quick-flashing		
UQ+LFl	ultra quick-flash plus long-flash		
VQ	very quick-flashing		
VQ+LFl	very quick-flash plus long-flash		

9.7.3 Nature of seabed abbreviations ('TX')

The abbreviations in the table below may be used for values of NATSUR - nature of seabed.

NATSUR 1	mud	M		NATSUR 8	cobbles	Cb
NATSUR 2	clay	Cy		NATSUR 9	rock	R
NATSUR 3	silt	Si		NATSUR 11	lava	R
NATSUR 4	sand	S		NATSUR 14	coral	Co
NATSUR 5	stones	St		NATSUR 17	shells	Sh
NATSUR 6	gravel	G		NATSUR 18	boulder	R
NATSUR 7	pebbles	P				

To write out on the display "Mud Sand Gravel", for example, causes more clutter than writing " M S G". ECDIS manufacturers are encouraged to use the abbreviations both on the chart display and when providing cursor-pick information.

9.8 Organization of Display << NEW INTRODUCTORY INFORMATION>>

There are several ways that information is organized in ECDIS. They are:

- Display Categories

- Display Priority

- Viewing Groups

Comment [N7]:

Comment [N7]: This may change depending on what the mariner would like to see. Either way it should either be one or the other.

Display Categories and Viewing Groups are used to assist the mariner in selecting features to display or filter out of the ECDIS. Display Priorities are not used for selecting features, but to specify which features may obscure or "overprint" features of less importance when they are displayed together. These and other means of organizing the data displayed are described below.

9.8.1   IMO Display Categories << MAIN 2.3.3a >> <<ANNEX A, 8.3.4.3>>

The IMO "display categories" are as follows:

- **Standard Display** information is the part of the SENC that should be presented when the ECDIS display is first switched on or at any time by a single operator action (see IMO Performance Standards).

- **Display Base** is that part of the Standard Display which should be permanently retained on the display (see IMO Performance Standards).

- **Other Information** includes all SENC information that is not in the Standard Display, to be displayed on demand by the mariner.

The IMO "Standard Display" is the display mode intended to be used as a minimum during route planning and route monitoring (IMO PS). It contains a list of features that the mariner may either add further features to, or remove features (except Display Base) from, in deciding what is to be displayed.

NOTE: As soon as any feature on this list is removed from the display, or any feature not on this list is added to the display, the display no longer shows the IMO "Standard Display".

The IMO "Display Base" is that part of the Standard Display that must never be removed and is not intended to be sufficient for safe navigation. It is a list of basic features which the IMO consider are required at all times, in all geographic areas and under all circumstances.

NOTE: The IMO does not intend the Display Base to be sufficient for safe navigation on its own; therefore it should not be a display option to "Show Display Base" without any additions.

The IMO category "Other Information" contains every feature in the SENC which is not classed as "Standard Display".

The mariner should be able to remove information selectively from "Standard Display", except that they cannot remove any feature of the "Display Base". In addition, they should be able to add selectively to the Standard Display any items of the "Other" category.

The IMO category is part of the ruleset in the S-101 portrayal catalogue and assigns the IMO category in detail to every feature in the SENC, including Mariner's Navigational Features. The mariner may override the category for mariner's features, but not for chart features.

9.8.2   Mariners Features Display Categories

The own-ship symbol and planned route are always required on the route monitoring display by IMO PS 10.5.1, and so must the Display base. All other mariners' navigational features, which are listed in the portrayal catalogue under "Non-standard classes", are initially assigned in the ruleset to a default "Mariners' Standard" or "Mariners' Other" category. However the mariner should have the option of changing the category of any non-standard feature class (except for Display base), to suit his operational needs.

The following key words in **field 6 of symbology look-up tables** are used to assign the look-up table entries to display categories:

Category	Description

DISPLAY BASE	*assigns the feature to the Display Base*
STANDARD	*assigns the feature to the Standard Display*
OTHER	*assigns the feature to Other Information*
MARINERS STANDARD	*assigns the feature to Standard Display, or whichever category the mariner assigns them to*
MARINERS OTHER	

9.8.3 Display Priority & Display Category in Conditional Symbology Procedures << ANNEX A, 8.3.4.5 >>

A **conditional symbology procedure (CSP)** is called from the look-up tables. Thus, the symbolization that is generated by the procedure has the display priority, OVERRADAR classification and display category which is given in field 4, 5 & 6 of the look-up table entry from which the procedure was called.

A conditional symbology procedure can assign the symbolization to another display category, put it on top of radar or give it a different display priority if necessary. Thus it 'overwrites' the default assignments given in the look-up table e.g. if a depth contour is identical with the safety contour the depth contour is assigned to the DISPLAYBASE category (see symbology procedure diagram 'DEPCNT03', section 12).

The default assignments from the look-up tables are valid if there is no explicit assignment for display category, display priority or OVERRADAR made within the **CSP.**

9.8.4 Priority Layers << MAIN 2.3.2 >>

The IMO PS divides SENC information into three categories that determine what data is to be on the display: Display Base (always present on the display); Standard Display (the default display); and Other Information (displayed on demand). (IMO PS section 3 and Appendix 2). (See section 2.3.3a).

There are 10 priority layers for the drawing sequence of the data on the display:

1) ECDIS visual alarms/indications (e.g. caution, overscale)
2) HO-data: points/lines and areas, plus official updates
3) NtMs, manual input and Radio Navigational Warnings
4) HO-caution (ENC cautions)
5) HO-colour-fill area data
6) HO's on demand data
7) Radar information
8) Mariners data: points/lines and areas
9) Manufacturer's data: points/lines and areas
10) Mariners colour-fill area data

This list is not intended to indicate a drawing sequence, but to specify that the information content of category n+1 must not obscure the information content of category n, or any higher category (i.e. n-1 etc.).

Category (7) should have a radar off switch to facilitate its removal.

The rulesets and conditional procedures of the portrayal catalogue assign a category, and a display priority (drawing sequence), to every feature (feature class-attribute combination) in the ENC.

> **Comment [CAH9]:** This section will have to be modified, based on the final portrayal mod

> **Comment [N10]:** IEC 61174 ref 2.3.2a

<< ANNEX A 8.3.4.1 >>

Each symbolization instruction from a look-up table line has a display priority given in field 4. The display priority can be of a value between '0' and '9', where '9' identifies the highest priority. The display priority applies irrespective of whether a feature is a point, line or area. If the display priority is equal among features, line features must be drawn on top of area features whereas point features have to be drawn on top of both. If the display priority is still equal among features of the same type of geometry (area, line or point) the given sequence in the data structure of the SENC, or some other neutral criterion, should be used for an arbitrary decision as to which feature is drawn on top. Text should be drawn last (except for ownship etc.), in priority 8.

The display priority should be used to ensure that features that overlap each other are drawn in the right sequence. Thus, a feature with a higher priority should be drawn after (on top of) an feature with a lower display priority. However, if two line features, or two area boundaries, or a line and an area boundary, are located at the same position and share the same extent (their coordinates are identical), then the line symbolization with the higher display priority must suppress the line symbolization of the other feature (line or area). Therefore only the line symbolization of the feature (line or area) of the higher display priority is drawn.

This suppression only applies between line features, which include area boundaries. The rule for centred symbols, area patterns and point symbols is that all symbols should be drawn, with the highest priority feature being drawn last independent of whether it is a point, line or area.

The only exception to this rule for suppressing overlapping lines. The manual chart correction lines LC(CHCRIDnn) and LC(CHCRDELn) should coexist with the underlying line. Both LC(CHCRIDnn) or LC(CHCRDELn) and the underlying line should be drawn.

Overdrawing may be essential, for example in that case of buoy, its name, and its light flare. These are given offsets in the symbol library to avoid overwriting.

The following gives a general indication of how priorities are allocated. Within each group priorities are adjusted to meet specific cases:

Specific Case	Priority Layer
No data filled area patter	0
S-101 Skin of the Earth Feature	1
Superimposed areas (e.g. CANALS)	2,3
Restricted area	5
Traffic areas	5
Land features	4,5
Water features	3,4,5,6
Coastline features	5,6,7
Routeing lines	5,6,7
Symbols for lines and areas	4,5,6
Hazards (bridge, safety contour)	8
Mariners VRM and EBL	9

Own Ship	9

9.8.5 Radar << MAIN 2.3.1d and MAIN 2.3.2.b >>

The radar image may be displayed by an opaque overlay or a transparent overlay, using colour tokens RADHI and RADLO.

The priority of HO chart data over radar is carried out by the single action "remove radar" control (IMO PS 7.2). When present, the radar data always writes over the opaque colour fills. Chart line and point features should normally write over the radar image, with some exceptions, as described in the "over-radar" field of the Presentation Library look-up table. But in order to meet the requirements of IMO PS 11.4.14 to adjust the ship's position, the ECDIS may incorporate the capability of changing the radar priority of the Presentation Library. Operation of this feature should be clearly indicated.

<< ANNEX A< 8.3.4.2 >>

Field 5 of the look-up table lines contains the OVERRADAR flag. It classifies whether features are shown on top of the raw radar picture. Two different values can occur in this field:

  'O' which puts the feature's presentation over radar; and

  'S' which means that presentation is suppressed by radar

Thus, OVERRADAR is similar to a display layer that assigns features to the information shown on top of the raw radar picture. As a fail-safe, features are automatically OVERRADAR if field 5 of a look-up table line is empty.

9.8.6 Viewing Groups

The mariner should have effective control over which features appear on the display (subject to the over-riding requirements of IMO category), as required by the IMO ECDIS Performance Standard section 3.5.

The viewing groups suggested in **table XX** are intended as a framework on which the ECDIS manufacturer can base his own method of providing this capability.

Viewing groups are 'on' or 'off' switches for use by the mariner to control the information appearing on the display. An item in the viewing group table may be a chart feature; a mariners' or other time-variable feature; a special symbol such as the "depth less than safety contour" pattern; or a non-ENC feature such as the shallow water pattern. 'Symbol viewing groups' allow auxiliary symbols such as contour labels, the 'low accuracy' symbol, etc., to be switched on or off without affecting the primary symbolisation of the feature.

Items in the viewing group tables are arranged in numbered groups (e.g. group 26230 consisting of the items pipeline area and cable area) which in turn are arranged in sets (e.g. set 26000 consisting of cautionary areas). The groups are arranged by IMO Category, in the sequence of INT 1 for the paper chart. Mariners are generally familiar with INT 1.

Manufacturers may use the viewing group scheme or not, as they prefer. If it is not used, then in some cases a single item, such as soundings (33010) should probably be selectable. In other cases several groups from different sets may be combined. However groups from different IMO categories should not be combined.

Although the viewing groups reflect the IMO category, the authority for category is the classification in field 6 of the portrayal catalogue ruleset.

Comment [CAH11]: This section will have to be modified, based on the final portrayal mod

Comment [CAH12]: This section will have to be modified, based on the final portrayal mod The overradar flag will also be defined in the Main Section 9.

Comment [CAH13]: This section will have to be modified, based on the final portrayal mod Viewing Groups will also be defined in the Ma Section 9.

Comment [J14]: This is an optional thing. Should it remain optional in S-101

Comment [J15]: Amend when model is finalized

DISPLAY BASE	STANDARD DISPLAY	OTHER INFORMATION
00000-09999 reserved for administrative purposes		
10000 reserved *40000 reserved*	20000 reserved *50000 reserved*	30000 reserved *60000 reserved*
11000 A,B information about the chart display *41000 tools*	21000 A,B 51000 tool	31000 A,B *61000 tools*
12000 C, D, E, F land features *42000 own ship, planned route*	22000 C, D, E, F *52000 own ship etc*	32000 C, D, E, F *62000 own ship etc*
13000 H, I depths & currents *43000 mariners' features*	23000 H,I *53000 mariners' features*	33000 H,I *63000 mariners' features*
14000 J,K,L obstructions, pipelines *44000 other vessels*	24000 J,K,L *54000 other vessels*	34000 J,K,L *64000 other vessels*
15000 M traffic,routes *45000 manufacturers' features*	25000 M *55000 manufacturers' features*	35000 M *65000 mfrs' features*
16000 N special areas 46000 mariners' assignments	26000 N 56000 mariners' assignments	36000 N 66000 mariners' assgnts
17000 P,Q,R,S buoys, beacons, lights, radar 47000 reserved for mariners' information	27000 P,Q,R,S 57000 reserved	37000 P,Q,R,S

		67000 reserved
18000 T,U services & small craft facilities 48000 reserved for mariners' information	28000 T,U 58000 reserved	38000 T,U 68000 reserved
19000-19999 reserved 49000-49999 reserved	29000-29999 reserved 59000-59999 reserved	39000-39999 reserved 69000-69999 reserved
70000-99999 reserved for future use.		

Notes:

1. These viewing groups reflect the display category, but they do not set it. Display Category is set by field 6 of the look-up table.

2. Gaps between sets and groups are left deliberately to allow for future expansion. "na" means that a particular set or group is not yet assigned (not "populated").

9.8.7 Text Groupings <<MAIN 2.3.3c >>

The ECDIS manufacturer should provide the mariner with control over the selection and display of text on the route monitoring display.

Text should not appear automatically whenever the feature it is associated with appears on the display. It should always be possible to remove text independently of the feature. The IMO Display Category for text is "other".

As a guide to adding and removing text from the display, S-101 distinguishes between "Important text" and "Other text", and provides suggested groupings for text display in Table X.

<< APPENDIX A 7.1.3.1 >>

9.8.7.1 Display of Text

The display of text should be controlled independently of the display of the feature it applies to. The mariner should have full control over the display of text. All text is in the IMO Category "Other Information".

Text is in colour black, to give best readability under all light conditions.

Text should only be displayed when the feature it applies to is displayed.

Text should always have display priority 8, to ensure it is readable, independent of the feature it applies to.

As a guide to organizing the display of text, the last two digits of the SHOWTEXT instruction give a text classification that distinguishes between "Important" and "Other" text, and gives further suggested text groupings. The manufacturer should provide at least the capability to select "Important Text" and/or "Other Text", and he may provide further text groupings if he so wishes.

The text groupings are:

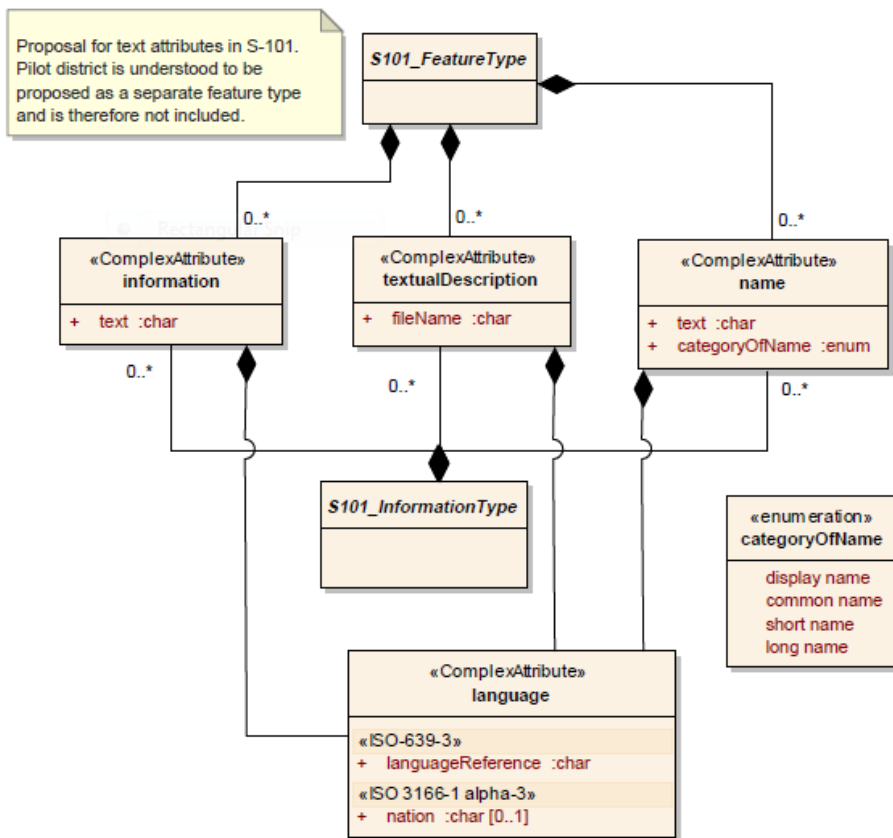00-10   reserved for future assignment by IHO.

10   Important Text
11   vertical clearance of bridges, overhead cable, pipe or conveyor (BRIDGE, CBLOHD, PIPOHD, CONVYR, VERCSA, VERCLR, VERCCL, VERCOP), bearing of navline, recommended route, deep water route centreline line, recommended track (NAVLNE, RCRTCL, DWRTCL, RECTRC, ORIENT), name and communications channel of radio calling-in point (RDOCAL, OBJNAM, COMCHA).

20   Other text
21   names for position reporting:
      name or number (OBJNAM) of buoys (BOYxxx), beacons(BCNxxx), daymarks (DAYMAR), light vessel, light float (LITVES, LITFLT), offshore platform (OFSPLF)
22   na (not allocated)
23   light description string
24   note on chart data (INFORM) or nautical publication (TXTDSC)
25   nature of seabed (NATSUR of SBDARE)
26   geographic names (OBJNAM of SEAARE, LNDRGN etc.)
27   value of: magnetic variation (VALMAG of MAGVAR); swept depth (DRVAL1 of SWPARE)
28   height of islet or land feature
29   berth number (OBJNAM of BERTHS, ACHBRT)
30   na
*31   national language text (NOBJNM, NINFOM, NTXTDS)

32-49 reserved for IHO

50-69 mariners' text, including planned speed etc.

70-79 manufacturer's text

80-99 future requirements (AIS etc.)

*   National text is a supplementary option for ECDIS. If used, the style should be similar to that of the Presentation Library.

9.8.7.2   Display of Names

In S-101 Names are modelled as a complex attribute. As part of this model there is a new attribute categoryOfName. When the user turns text on, then the name that has display name encoded must be the name that is displayed on the screen.

EXAMPLE: A light is encoded with the full name as a long name: Micklefirth lighted beacon "9", it is also encoded with a short name: "9". The display name is toggled for the short name; therefore the ECDIS must only display "9" when text is turned on. The long name must be visible in the pick report.

Proposal for text attributes in S-101. Pilot district is understood to be proposed as a separate feature type and is therefore not included.

S101_FeatureType

«ComplexAttribute»
information

+ text :char

«ComplexAttribute»
textualDescription

+ fileName :char

«ComplexAttribute»
name

+ text :char
+ categoryOfName :enum

S101_InformationType

«enumeration»
categoryOfName

display name
common name
short name
long name

«ComplexAttribute»
language

«ISO-639-3»
+ languageReference :char

«ISO 3166-1 alpha-3»
+ nation :char [0..1]

9.8.8 Display of features depending on date or display scale <<ANNEX 8.4 >>

9.8.8.1 Date-dependant features

Some features, such as seasonal buoys, are only to be displayed over a certain period (PERSTA to PEREND). Other features, such as a traffic separation scheme, may have a date on which they are introduced (DATSTA) or discontinued (DATEND). Any feature with one of the above attributes should not normally be displayed outside its effective dates (see figure 1).

However to provide for effective route planning; for look-ahead during route monitoring; or for other purposes, the ECDIS should allow the mariner to view chart data for any required date and time for the purpose of reviewing pre-planned changes in chart data. The ECDIS manufacturer may provide this either:

By allowing the mariner to select a date for displaying all chart features active at that date and time,

 OR

By allowing the mariner to display all features in the ENC, irrespective of the current date. Information on the date and time window for which features of interest are in existence should then be available by cursor-pick report through viewing the date-dependent attributes.

When this option is in use, the mariner must be reminded that the information on the display may not be correct for the actual, current, date and time.

9.8.9 Scale-dependant features

Some features (such as intermediate depth contours) may carry the attribute SCAMIN to specify the smallest display scale at which they should be drawn. At display scales smaller than SCAMIN the feature should not be drawn, in order to avoid clutter. For example, a feature with a SCAMIN value of 50,000, indicating a scale of 1/50,000, should not be drawn on an ECDIS display of 1/60,000.

9.9   Display Components << Provide short new introductory information here >>

9.9.1   Legend <<ANNEX A 8.6.3 >> <<2.3.1g>>

A standard legend containing at least the following elements should be available for display. It may either be on the same screen as the ECDIS chart display, or on a separate screen.

The following table indicates which ENC data elements must be used. Values, other than those defined in the data set record, should reflect the situation at the own ship's position:

1. units for depth	DUNI subfield of the DSPM field.
2. units for height	HUNI subfield of the DSPM field.
Note on 1., 2. – units for depth and height: although the ENC Product Specification of S-57 does not allow any other than metric depths and heights, these two elements may be stated for the information of unfamiliar users.	
3. scale of display	Selected by user. (The default display scale is defined by the CSCL subfield of the DSPM field or CSCALE attribute value of the M_CSCL feature.)
4. data quality indicator	a. CATZOC attribute of the M_QUAL feature for bathymetric data.
	b. POSACC attribute of the M_ACCY feature (if available) for non-bathymetric data.
Note: due to the way quality is encoded in the ENC, both values (a and b) must be used.	
5. sounding/vertical datum	SDAT and VDAT subfields of the DSPM field or the VERDAT attribute of the M_SDAT feature and M_VDAT feature.
	(VERDAT attributes of individual features must not be used for the legend.)
6. horizontal datum	HDAT subfield of the DSPM field.
7. value of safety depth	Selected by user. Default is 30 metres.
8. value of safety contour	Selected by user. Default is 30 metres.
Note: if the mariner selected a contour that is not available in the ENC and the ECDIS displays a default contour, both the contour selected and the contour displayed should be quoted.	
9. magnetic variation	VALMAG, RYRMGV and VALACM of the MAGVAR feature. Item must be displayed as VALMAG RYRMGV (VALACM) e.g., 4°15W 1990 (8'E).
10. date and number of latest update affecting chart cells currently in use.	ISDT and UPDN subfields of the DSID field of the last update cell update file (ER data set) applied.
11. edition number and date of the ENC.	EDTN and UADT subfields of the DSID field of the last EN data issue of current ENC issue of the ENC set.

Comment [N18]: This is covered elsewhere S-101. Should this be moved to the appropria section

Comment [N19]: This needs to be checked against the S-101 8211

12. chart projection	Projection used for the ECDIS display (e.g., oblique azimuthal).

The list above is the minimum that should be available, but the complete list need not always be shown. Individual items might be picked by the mariner for display for a period; examples are magnetic variation, data quality for depths (M_QUAL, CATZOC) etc.

9.9.2   ENC Scale & Graphical Index << MAIN 3.1.7 >>

1) ENC scale. The compilation scale of the ENC is the scale at which the ENC was designed to be displayed. It may not be the same as the scale of the source data. As required by IMO Performance Standards, section 6.1.1, an overscale indication should be shown whenever the mariner selects a display scale that is larger than the compilation scale. See Presentation Library, Part I, section 12.2.2 DATCVR for details.

2.) Automatic overscale at a scale boundary. Where ENCs of different navigational purpose overlap, the ECDIS display of the overlap area should show two "chart compilation scale boundaries", at the beginning and end of the overlap. Beyond one boundary the part of the display taken from the smaller scale ENC will often be grossly overscale. (See section 3.2.3 8(b))

Only the major changes in compilation scale resulting from a change in "navigational purpose" should be shown as scale boundaries on the display. Small changes in compilation scale within a navigational purpose should not be shown.

The Presentation Library, Part I, section 12.2.2 DATCVR, specifies how the scale boundaries and the overscale area should be symbolised.

When the display cannot be completely covered with ENC data for the selected navigational purpose, the remaining part of the display should be filled with data based on a more general navigational purpose (if available).

3.) Graphical Index of ENCs by Navigational Purpose. Without cursor enquiry of the chart area it will not always be clear what compilation scale applies to a given part of a mixed source display. S-52 requires a graphical index of the navigational purpose of the data to clarify the situation. This is also needed for route planning.

4.) Limit of HO data. The end of HO chart data on this graphical index defines the limit of HO ENC coverage. Details are given in the Presentation Library, Part 1, section 12.2.2 DATCVR.

9.9.3   Display Orientation << MAIN 3.1.6 >> << 7.2.3 >>

It should always be possible to display the chart north-up (IMO PS section 8.1), but other orientations are allowed.

Symbols and text should always be drawn screen-up, no matter what the orientation of the screen may be. Symbols which include "rotate" in the symbology instruction (e.g., light flares) should be rotated with respect to the top of the screen. However, symbols that are oriented according to an S-57 attribute such as ORIENT should be oriented with respect to true north. Symbols with no rotation should always be drawn upright with respect to the screen.

- Symbols with a rotation instruction should be rotated with respect to the top of the screen.
- Symbols rotated by means of the six-character code of an S-57 attribute such as ORIENT should be rotated with respect to true north.
- Symbols should be rotated about their pivot point. Rotation angle is in degrees clockwise from 0 to 360. The default value is 0 degrees.

Comment [N20]: IEC 61174 ref
This section will change and it is also covered elsewhere in S-101.

Comment [CAH21]: This CSP is to be replaced with logic encoded in XML.

Comment [CAH22]: This CSP is to be replaced with logic encoded in XML.

Comment [CAH23]: This CSP is to be replaced with logic encoded in XML.

If the display is oriented course-up, the orientation should not be altered too frequently, in order to avoid jitter from frequent rewriting of chart information.

The north arrow is always required on the display, as part of the IMO Performance Standards Display Base.

9.10   Types of ECDIS Symbols << Main, 3.2 & 3.3 >>

9.10.1 Adaption of Traditional Paper Chart Symbols

<< Adapted from Main, 3.3.1 >> << Special Conditions >>

Most of the symbols in IHO INT 1, *Symbols, Abbreviations, Terms used on Charts* have been adapted for use in ECDIS. The ECDIS Chart 1, which is divided into lettered sections in the same way that INT 1 is, provides a quick reference for the symbols.

For light sectors, the mariner shall be able, upon request to the ECDIS, be capable of identifying the colour of the sectors affecting the ship, even if the lights involved are off the display.

9.10.2 ECDIS only symbols << Adapted from Main, 3.2 >>

There are four types' symbols that are only found on ECDIS, which are described below.

1) Special ECDIS chart symbols to identify unsafe depths, such as the safety contour, safety depth, isolated dangers etc.

2) Symbolized area boundary linestyles.

On a large scale display, the boundary lines of areas can become confusing; symbolised area boundaries identify the type of area and also indicate on which side of the boundary line the area lies.

The ECDIS should provide mariners with the option of using either the symbolized or the plain area boundary linestyles, as best fits their purpose. The symbol tables of the Presentation Library are organised to facilitate these options.

3) New chart symbols, such as north arrow, scale boundary, depth area less than safety contour, etc., which are needed to explain the more flexible, electronic display based, presentation of ECDIS.

4) IEC Mariner's Navigational Elements developed by IEC for IMO, which include the important planned route and own ship symbols. The authority for these features is IEC Standard 61174 and IEC 62288, and they are included in the Presentation Library for convenient reference by agreement with the IEC. They are described by features and attributes in the same manner as chart features so that only one symbolising routine is required (see Part II of the Presentation Library).

9.10.3 Special ECDIS Symbols to Identify Unsafe Depths << Adapted from Main, 3.2.2 >>

The ECDIS highlights in new ways four features that are important for safe navigation. These are the safety contour, depth shades, the safety depth and isolated dangers:

1) The own-ship safety contour, selected by the mariner from among the contours in the SENC, is double-coded by a thick line and a prominent change in depth shade.

If the safety contour selected by the mariner is not available in the SENC, the ECDIS shall default to next deeper contour and inform the mariner. If, when the ship moves onto a new chart, the safety contour previously in use is no longer available, the ECDIS shall select the next deeper contour available, and inform the mariner.

If the mariner does not select a safety contour, the value should default to 30 m.

2) Depth zone shades, defined by the safety contour and selected shallow and deep contours and the drying line.

The safety contour defines two depth zone shades and the drying line a third:

deep water:	deeper than the safety contour (colour token DEPDW),
shallow water:	shallower than the safety contour (colour token DEPVS),
intertidal area:	area exposed at low water (colour token DEPIT).

These are the only three depth shades that can be clearly distinguished on the night display, and they can only be distinguished by contrast, when seen on the display together. If, at night, the entire display consists of shallow water, the mariner will not be able to recognise this dangerous situation. Therefore, a "depth less than safety contour" pattern is provided to reinforce the depth shade. It is optional for the manufacturer to provide this feature, but its inclusion is strongly recommended as a safety feature.

The mariner should be given the option of whether to use this pattern, by night or by day (although it is not strictly necessary by day when the shallow water can be clearly identified by the difference in depth shade). This mariner's option is built into conditional symbology procedure "SEABEDnn". See Presentation Library , sections 8.5.7 and 12.2.18.

Comment [CAH28]: This CSP is to be replaced with logic encoded in XML.

It is recommended that the ECDIS should also allow the mariner the option of selecting a deep contour and a shallow contour from among the contours in the SENC, thus establishing the following five depth zones:

deep water:	deeper than the deep contour (colour token DEPDW),
medium-deep water:	depths between the deep contour and the safety contour (DEPMD),
medium-shallow:	depths between the safety contour and the shallow contour (DEPMS),
very shallow water:	depths between the shallow contour and zero metre contour (DEPVS)
drying foreshore:	intertidal area (DEPIT)

The following depth zones may be used as default values:

deep water:	deeper than 30 m (deep draught vessels)
medium deep:	own-ship safety contour to 30 m
medium shallow:	2 m to the own-ship safety contour
very shallow:	0 to 2 m (defines waters accessible to small craft)

intertidal:	exposed at low water

3)   The own-ship safety depth is intended as an aid when no appropriate safety contour is available in the SENC. Soundings equal to or less than the safety depth selected by the mariner are made more conspicuous than deeper soundings. A separate set of sounding figures is provided in the Hydro Portrayal Register.

4)   Isolated dangers (small shoals, rocks, wrecks, obstructions) of depth less than the safety contour, and also lying within the 'safe' water defined by the safety contour, are highlighted by a special symbol. Because the mariner may sometimes have to navigate in water shallower than a default safety contour, the mariner may also select to show isolated dangers in the 'unsafe' water between the displayed safety contour and the zero metre contour.

These procedures are found in the portrayal catalogue

9.10.4 Symbolised and Plain Area Boundary Linestyles. << Main, 3.1.1 >>

9.10.4.1   Mariner's options for linestyles << MAIN 3.1.1 >>

The mariner shall be able to optionally select to display symbolised area boundary linestyles, which are more useful for large scale displays, or plain linestyles, which are recommended for small scale displays, where symbolised lines would cause clutter. Two look-up tables are provided, to display either symbolised or plain area boundary linestyles.

<< Adapted from MAIN, 3.2.3 >>

New chart symbols required by the difference in purpose between ECDIS and the paper chart, as well as the difference between paper and electronic presentation, are described below.

9.10.5 Unique ECDIS Symbols << Adapted from Main, 3.2.3(2) – (21) >>

Comment [N29]: IEC 61174 ref

1)   General symbol for isolated underwater danger.

The conspicuous magenta "screw head" symbol is applied automatically to rocks, wrecks, small shoals, etc., of depth equal to or less than the own-ship safety contour and which are in deeper water than the safety contour. Optionally, the mariner may extend displaying isolated dangers to shallow waters between the safety contour and the zero metre contour, in case he is forced by circumstances to navigate in such waters.

2)   The dredged area is shown by a grey dotted area fill pattern.

3)   Radar conspicuous coastline.

This includes cliffs and abrupt coastlines that can be expected to return a strong radar echo consistently from the same part of the feature. The magenta highlight line is only used if the coastline is identified as "radar conspicuous" in the ENC.

4) Prohibitions, cautions and information notes are symbolized with small symbols for point application and with large centred symbols for areas, as illustrated in screens (AB), (JKL) and (MN) of the ECDIS Chart 1. Multiple symbols are used when necessary to convey more than one restriction.

Regulated areas are divided for symbolization into Cautionary Areas (including the existing caution area) and Information Areas. (See Table 4 of this document).

Point cautions and notes entered by the mariner and the manufacturer are distinguished by the colours orange and yellow respectively.

5) Unknown feature.

    A magenta "?" marks the position of a feature which cannot be identified or for which there is no entry in the Presentation Library look-up table.

6a) Scale boundary.

    This shows where the compilation scale of the chart data available changes. The ECDIS should warn the mariner of upcoming chart scale change. Only the major changes in compilation scale resulting from a change in "navigational purpose" should be shown. Small changes in compilation scale within a navigational purpose should not be shown. See Presentation Library, Part I, section 12.2.2 DATCVR for details.

6b) Overscale area at scale boundary.

    All the chart data on the display must be shown at the same scale. In order to avoid leaving part of the display blank, the chart display may extend beyond the edge of a relatively large scale ENC to include information from an adjoining smaller scale ENC, which may be from a different "navigational purpose". The smaller scale data will normally be enlarged to match the larger scale ENC, and in this case the "overscale area" symbol should be used to identify any part of the chart display shown at more than twice the compilation scale. See Presentation Library, Part I, section 12.2.2 DATCVR for details.

NOTE: This symbol applies only to the automatic overscaling performed by the ECDIS in matching ENCs at different compilation scales. It should not be applied to an overscale display deliberately requested by the mariner, which should trigger the overscale indication required by IMO Performance Standard section 6.1.1.

6d) Change of horizontal (geodetic) datum.

    The use of non-WGS 84 ENC data does not comply with IHO S-101, and the boundary at which the local geodetic datum changes is not symbolized by the Presentation Library.

    The ENC may include information on the relation between the local geodetic datum and WGS 84 (M_HDAT, HORDAT), but this is intended for use in converting local data to WGS 84 for use in the SENC, should the need arise.

7) Scale bar or latitude scale.

    The IMO PS requires an indication of scale and range as part of the Display Base. The display scale decides which should be used:

    (a) for optimum scales larger than 1/80,000: always display the 1 mile scale bar provided in the Presentation Library

    (b) for optimum scales at 1/80,000 or smaller: always display the 10 mile latitude scale provided in the Presentation Library.

    The scale bar or latitude scale should always be drawn vertically at the left side of the chart display, just clear of the border of the display.

    The mariner should be able to remove any labels on the scales to avoid clutter.

    Optimum scale is defined as one twelve values in Clause 3 of S-101. These values have been aligned to the standard RADAR ranges.

8) North arrow.

The IMO PS requires a north arrow as part of the Display Base. The north arrow should always be shown at the top left corner of the chart display, just clear of the scale bar or latitude scale.

9) Manual chart correction.

Small orange identifiers are used to distinguish hand-entered chart corrections, which are subject to human error, from corrections entered automatically by electronic means. The original chart feature should not be removed or altered. (See 2.3.4 for details).

10) Ramark, Racon.

This is introduced to distinguish beacons that will appear on the radar display from other radio-beacons.

11) Data from non-HO sources

The non-HO data boundary LC(NONHODAT) serves to separate ENC data from non-HO chart information.

12) No data areas.

The first action of the ECDIS display re-draw should be to cover the entire screen with the NODTA area colour fill and the AP(NODATA03) area pattern. These will remain to identify any area not subsequently covered by chart information as a no data area.

13) Identifying pattern for depth areas less than the safety contour.

14a)   Identifying pattern for traffic junctions, crossings and roundabouts.

A pattern of diagonal magenta lines is used to identify the areas of a traffic separation scheme which are traffic junctions, crossings or roundabouts, or precautionary areas.

14b)   Traffic routeing and regulated areas in general.

New centred symbols are provided in the Portrayal Catalogue, to avoid the clutter caused by a pattern of symbols in these often critical waters.

15) Glacier or ice shelf.

A random pattern of short lines symbolising "candled" ice is provided to indicate a glacier or area of shore-fast ice.

16) Daymark.

The daymark symbols are designed so that they can be over-written on a beacon which is highlighted by a daymark.

17) Paper chart symbols for an opening bridge and a radar reflector on an overhead cable have been revised to fit any orientation of the bridge or cable - see ECDIS Chart 1.

18) A one-sided linestyle is provided for use on large-scale displays to indicate the side of an area boundary on which the area lies, when only a part of the boundary can be seen on the display.

19) Meta-data (information about the chart data), such as chart data confidence areas.

The "zones of confidence " in the chart data (section 3.1.8) are symbolised by a system of stars. Other meta-data items, including compilation scale, IALA "A" or "B" buoyage, etc, are left to cursor picking.

20) Special identifiers.

   In addition to the manual chart correction identifier of para. (11) above, identifiers are provided for low accuracy chart data and for ENC features which have additional information for cursor picking under the "INFORM" attribute. The latter may cause clutter, and should only be displayed temporarily. Identifiers are shown on screen (AB) of the ECDIS Chart 1.

21) IEC symbols.

   By agreement with the IEC, symbols for the "Navigational Elements and Parameters" of the IMO PS Appendix 3, and also symbols being developed by IMO for AIS vessel reports, are included in the Presentation Library. These are on the last diagram of the ECDIS Chart 1.

9.10.6 Mariner's Features << Adapted from Main, 2.3.1a >>

IMO PS section 1.5 requires that ECDIS distinguish between chart data and additional data from users (mariners) and manufacturers. The following colour and symbol usage for mariners and manufacturers data is designed to implement this while ensuring the display remains clear and uncluttered.

Clause X.X.X of this annex describes "Mariner's Navigational Features" for route planning and route monitoring chartwork, and for adding mariner's and manufacturer's information to the SENC. The descriptions are in the same format as chart features, in order to avoid the ECDIS having to deal with two differently coded types of data. The colours, symbols, categories and display procedures that apply to all these features are included in the portrayal cataloguer, along with the procedures for chart features.

Mariners may alter the IMO categories for Mariner's Features (but not for chart features).

NOTE: IMO PS 11.4.1 requires that own ship and selected planned route should always appear, and should therefore remain in Display Base.

NOTE: Mariner's Features should be kept independent of chart data in the SENC, and that mariners' information does not need to be split into datasets.

In referring to Mariner's Features it is important to distinguish between:

"Add/Enter", "Revise" or "Delete" mariner's or manufacturer's information; this refers to the contents of the SENC, and:

"Display" or "Remove" the information; this refers to the ECDIS display.

9.11 The Portrayal Display

9.11.1 Introduction << MAIN 3.1.3 >>

All symbols are specified in the Hydro Portrayal Register.

Some feature classes do not have a symbol (e.g. territorial sea). Such "no symbol" features may be picked up by cursor interrogation of the area.

Should an "unknown feature" occur in the SENC which is not adequately defined or for which no symbol exists, its presence should be indicated on the display by a magenta"?" SY(QUESMRK1) with the IMO category "Standard Display".

Some features are symbolised differently depending on circumstances (for example the symbol for a contour depends on whether it is the safety contour.) The Presentation Library includes conditional symbology procedure diagrams for features whose symbols cannot be supplied by a fixed look-up table. Some of these procedures are unavoidably complex, and they should be evaluated carefully.

9.11.2 Symbols << ANNEX 1.1 >>

The symbols of the Hydro Portrayal Register may be replicated in size and shape, using any convenient format. The colour tables may be reproduced within the tolerances given in the portrayal catalogue. The remaining items may be implemented in any convenient form which produces the same results as the Presentation Library.

It is also required that the ECDIS be able to read in the set of symbols, colour tables, and other items in the portrayal catalogue. This is to ensure that if new features and symbols are required they can be updated via the S-101 feature and portrayal catalogue so that the mariner may receive the updated catalogues in an expedient manner.

9.11.2.1   Minor Symbol Deviations <<Adapted from Main 1.4.6>>

Minor deviations by ECDIS manufactures in the implementation of the symbols specified in this document and the Portrayal Register are permitted to allow for innovation and responsiveness to ECDIS users. However, only minor changes are allowed and all symbols must be easily recognizable as the respective symbol in the Portrayal Register. The following criteria shall be used to determine whether any symbolization on an ECDIS that is different from the symbolization in Portrayal Register is still compliant. The symbolization used should:

   1.) be the same in general shape and size as the IHO version;

   2.) be clear and sharp so that there is no uncertainty over meaning;

   3.) be close enough to the IHO version to avoid ambiguity in meaning between that model and any other model of ECDIS;

   4.) use only the colours as specified in S-100;

   5.) comply with the various considerations of scientific design described in S-100;

   6.) comply with the priority of prominence on the display in proportion to importance to safety of navigation which as provided in the Portrayal Register, and

   7.) avoid any increase in clutter.

9.11.3 Colour Tables <<5.2.3.1>>

> **Comment [N36]:** IEC 61174 ref

Tolerances. The tolerances quoted below apply only to the process of converting CIE colour coordinates to RGB values, and so should be evaluated shortly after the ECDIS leaves the manufacturer's plant.

Considerable operational experience will be needed before it will be possible to state colour maintenance tolerances for ECDIS onboard ship.

The colour tables developed have been selected to ensure maximum colour discrimination between features. Colour discrimination depends on both the colour difference and the luminance difference between two colours. Colour science (as represented by the C.I.E. colour convention) has defined colour difference units ΔE^* and ΔC^*. ΔE^* is a measure of the overall discrimination (including both colour and luminance differences). ΔC^* is a measure of the discrimination in colour alone, excluding luminance differences.

Note: "Δ" represents the Greek letter "Delta", although it may appear differently on some computers.

The tolerances for the conversion of the colour tables from the CIE colours defined in these specifications to the actual RGB values for the ECDIS CRT are defined in three terms:

1. Overall discrimination between actual colours within the converted table : ΔE*. This is to ensure that all the colours within the RGB table remain discriminably separate, ie. that the relative colour distinctions have been maintained.

2. Colour discrimination differences between the defined and the actual values : ΔC*. This is to ensure that the actual RGB colours resulting from the conversion remain reasonably close to the CIE colours defined in the specifications, i.e. that the blues stay blue and the greens stay green.

3. Luminance differences between the defined values and the actual values : L. This is to ensure that the luminance remains the same within acceptable limits.

NOTE: The CIE L*u*v* human perception colour model, which is the source of the tolerances described above, has not yet been evaluated at the low luminances of the night colour table, at which the less colour-sensitive rods of the eye take over from the daytime cones. Consequently these tolerances should not be applied to the night table, and for type-approval purposes they are restricted to the bright sun table.

Colour tolerance values:

1. The discrimination difference between any two colours displayed (except those with a tabular ΔE* less than 20 - see list in Annex B 4.5) should be not less than 10 ΔE* units.

2. The difference between the colour displayed and the CIE colour defined in these specifications should be not greater than 16 ΔC* units. If a monitor is independently tested then the difference shall be not greater than 8 ΔC* units.

3. The luminance of the colour displayed should be within 20% of its specified value. Black is a special case and the luminance of it shall be not greater than 0.52 cd/m² for bright sun colour table.

9.11.4 Other Special Symbols

1.) Additional information Indicator (INFORM01) << ANNEX A 8.6.1 >>

HOs may apply the INFORM attribute to any feature to carry information that cannot be coded in S-101 format, such as a warning for a traffic junction, an abstract from a nautical publication, a pictorial representation of an feature, etc. There are a total of five similar universal attributes:

- INFORM

- NINFOM (INFORM text in national language) *

- TXTDSC

- NTXTDS (TXTDSC text in national language)

- PICREP (Pictorial representation)

To identify features with such additional information, the ECDIS should, on mariner's command, identify all features having any such attribute populated by means of SY(INFORM01). The mariner should then be able to access the information by cursor-pick.

The pivot point of SY(INFORM01) should be placed at the position of a point feature, at the midpoint of a line feature, or at the centre of an area feature. SY(INFORM01) is intended as a temporary overlay. Its display priority is 8, overradar, category other, viewing group 31030.

The ECDIS manufacturers should provide appropriate solutions that enable PICREP and other files to be displayed without affecting night vision. (Note: this applies as of September 2001 – particular technical standards may be applied at a later date if found necessary).

2.) 'Cautionary' and 'Information' Areas << MAIN Table 4 >>

The cautionary area / information area distinction is reflected in the IMO PS Appendix 4 "Areas for which special conditions exist". It is the basis for symbolising those areas which do not have a specific symbol with either a "(!)" for a cautionary area or a "[i]" for an information area:

Information areas - Standard Display:

    anchorage area (ACHARE)
    anchor berth (ACHBRT)

    dumping ground (DMPGRD)

    fishing ground (FSHGRD)
    pipeline area (PIPARE)
    cable area (CBLARE)

    cargo transhipment area (CTSARE)
    incineration area (ICNARE)

    specially protected areas – sanctuaries, etc. (RESARE CATREA 4, 5, 6, 7,10, 18, 20, 22, 23, 27, 28)
    no wake area (RESARE CATREA 24)

Cautionary Areas:

Routeing areas - Standard Display:

    Traffic separation zone (TSEZNE)
    Traffic routeing scheme crossing or roundabout (TSSCRS, TSSRON)
    Traffic routeing scheme precautionary area (PRCARE)
    Two-way traffic route (TWRTPT)
    Traffic separation scheme lane (TSSLPT)
    Deepwater route (DWRTPT)
    Recommended traffic lane (RCTLPT)
    Inshore traffic zone (ISTZNE)

Other cautionary areas - Standard Display:

    fairway (FAIRWY)
    area to be avoided (RESTRN 14)
    entry prohibited/restricted (RESTRN 7, 8)
    anchoring prohibited/restricted (RESTRN 1,2)
    fishing/trawling prohibited/restricted (RESTRN 3, 4, 5, 6)
    caution area (CTNARE)
    waiting area (RESARE CATREA 19)
    swinging area (RESARE CATREA 25)
    ferry area (FERYRT)
    navigation aid safety zone (RESARE CATREA 12)
    offshore production area (OFSPRD)
    offshore safety zone (RESARE CATREA 1)
    minefield (RESARE CATREA 14)
    submarine transit lane (SUBTLN)
    military practise area (MIPARE)
    military area (RESARE CATREA 9)

Comment [CAH38]: Does DIPWG want to make (the optional) display of National Language a mandatory capability of ECDIS? Can DIPWG do this on its own or should IMO be specifying this?

degaussing area (RESARE CATREA 8)
seaplane landing area (SPLARE)

3.) Display of updates (manual and automatic)

4.) Chart Data Quality Indicator << MAIN 3.1.8 >>

A bathymetric data quality indicator by zones of confidence (M_QUAL CATZOC) will cover the entire area of depth data or bathymetry for the ENC. The table of "CATZOC" values giving the meaning of each zone of confidence should be readily available to the mariner.

9.11.5 Displaying of Manual and Automatic Updates <<Annex 8.7>>

For guidance on updating the ENC, see Appendix 1. This section deals with how updates should be displayed. It is keyed to the relevant sections of the IMO PS.

> IMO PS 4.5   Automatic and semi-automatic updates: these should be displayed in the same manner as ENC information, using standard colours and symbols.

> IMO PS 4.8   The mariner should be able to display updates for review as follows:

> For automatic updates: the manufacturer should provide a means of distinguishing these from each other. One method suggested is to identify automatic updates temporarily in the same manner as manual updates. The temporary switch-on/switch-off of the identifiers would distinguish automatic from manual updates.

> For manual updates: Display all SENC information and should be distinguishable from each other.

9.11.5.1 Manual Updates <<Annex 8.7.1>> <<2.3.4>>

Manual updates of ENC information should be displayed using the same symbology as ENC information and should be distinguished from ENC information as follows:

9.11.5.2 Added feature: <<Annex 8.7.1.1>>

Point feature: superimpose SY(CHCRIDnn)*

Line feature: overwrite with line LC(CHCRIDnn)*

Area feature: overwrite area boundary with line LC(CHCRIDnn) and superimpose SY(CHCRIDnn) on any centred symbol.

9.11.5.3 Deleted feature: <<Annex 8.7.1.2>

The feature should remain on the display and should be marked as follows:

Point feature: Superimpose SY(CHCRDELn)*

Line feature: Overwrite with line LC(CHCRDELn)* (do not remove the original line)

Area feature: Overwrite area boundary with line LC(CHCRDELn) and superimpose SY(CHCRDELn) on any centred symbol.

*SY(CHCRIDnn) means the current version of symbol CHCRID, i.e., CHCRID01 in 1997. CHCRID and CHCRDEL symbols have the category and viewing group of the feature they are attached to, display priority "8", radar priority "O".

Note that the line symbols LC(CHCRIDnn) and LC(CHCRDELn) should not suppress the underlying line (see section 8.3.4.1).

9.11.5.4 Moved feature: <<Annex 8.7.1.3>>

As for deleted feature, followed by added feature.

9.11.5.5 Modified feature: <<Annex 8.7.1.4>>

a) If the only modification is an addition (e.g., an existing buoy has a retro-reflector added with no other change): superimpose SY(CHCRIDnn) or LC(CHCRIDnn)

b) If the only modification is a deletion of a part (e.g., an existing buoy has a fog signal removed, or an area has a «fishing prohibited» restriction removed), then this creates both a change and a deletion and both should be symbolized:

Point: superimpose SY(CHCRIDnn) and SY(CHCRDELn)

Line: overwrite with LC(CHCRIDnn) and LC(CHCRDELn)

Area: overwrite the boundary with LC(CHCRIDnn) and LC(CHCRDELn) and also superimpose SY(CHCRIDnn) and SY(CHCRDELn) on any centred symbol.

c) If the modification is an addition and a deletion then it is handled as in 9.4.4.4 b above.

A deleted feature must appear on the display only when its IMO category and viewing group are displayed.

S-52 Appendix 1 requires that a manually updated feature must be capable of the same performance in feature selection, response to cursor-picking, etc., as an ENC feature. In addition, it must provide updating information (identification and source of update, when and by whom entered, etc.) on cursor picking.

9.11.5.6 Identifying automatic chart corrections on mariners demand <<Annex 8.7.1.5>>

The ECDIS manufacturer must provide a means of identifying automatic chart corrections to the SENC on demand by the mariner.

9.11.6 Displaying added chart information <<Annex 8.7 & Main 2.3.1>>

9.11.6.1 Non-HO (non-ENC) Chart Information <<Annex 8.7.2>>

If the manufacturer should add non-HO (non- ENC) chart information to the SENC it should be symbolised in the same way as HO chart information and distinguished from HO chart information as described for the various cases below:

(i) Limited non-HO data is added to existing HO data to augment the chart information. Each feature should be marked by the special identifiers described in the Presentation Library, section 8.7.2.

(ii) An area of non-HO data is located in waters for which HO chart data exists; it is superimposed on the HO data. In some cases the non-HO data may be more appropriate for the intended purpose, for example it may be more detailed.

In this situation it is at the mariner's discretion whether to use the HO or the non-HO data.

If the mariner selects the non-HO data, the boundary of this data should be identified on the ECDIS display by the line LC(NONHODAT) and the warning "Unofficial data displayed; refer to official RNC or paper chart" should be displayed.

Note that the LC(NONHODAT) is a "one-sided line", and the boundary of the area of non-HO data must be drawn according to S-57 rules to ensure that the diagonal stroke of the line is on the non-HO data side of the line. More details are given in PresLib section 12 conditional symbology procedure DATCVR section 2.1.

(iii) An area of non-HO data is located wholly outside the area covered by HO data (although it may share a boundary with the HO data) but is shown on the same display as HO data. The non-HO data should be bounded by the line LC(NONHODAT) and the warning "Unofficial data displayed; refer to official RNC or paper chart." should be displayed.

(iv) The entire display contains nothing but non-HO data. The warning "No official data available; refer to official RNC or paper chart." should be displayed. In this case, special identifiers need not be used."

9.11.6.2 Distinguishing between HO and non-HO data <<Annex 8.7.2>>

Non-HO data added to existing HO ENC data by mariners or manufacturers to augment the chart information must be distinguished from the HO-ENC information as follows: <<Annex 8.7.2.1>>

Point feature: superimpose SY(CHCRIDnn)

Line feature: overwrite with line LC(CHCRIDnn)

Area feature: overwrite area boundary with line LC(CHCRIDnn) and superimpose SY(CHCRIDnn) on any centred symbol.

Distinguishing non-HO data from manually updated chart information, which uses the same identifiers, must be enabled through cursor picking.

9.11.6.3 Manufacturer's Information on the route monitoring display <<Main 2.3.1.c >>

> **Comment [N43]:** IEC 61174 ref

In addition to the requirements of 9.10.2 above, the following is also required for manufacturer added chart and non-chart data.

9.11.6.4 Updating and removing Non-HO chart information <<Annex 8.7.2.2 & 8.7.2.3>>

Non-HO chart information may be updated by any systematic procedure. A record of updates must be maintained. The mariner must be able to remove all non-HO chart information if the need should arise.

9.11.6.5 Added non-chart information <Main 2.3.1.c.1 >>

All non-chart information added to the SENC by the manufacturer must use the following symbols, lines and areas:

The circled (!) caution symbol SY(CHINFO11), or boxed [i] information symbol SY(CHINFO10), used to call up a note on the alphanumeric display by cursor picking,simple lines, or areas without colour fill, set up for cursor picking to give an explanatory note in the alphanumeric display (colour fill must not be used).

Non-chart information entered by the manufacturer must be distinguished by the colour yellow (colour token ADINF). It must not overwrite HO ENC information.

9.11.6.6 Added chart information << Main 2.3.1.c.2>>

All non-HO (non-ENC) chart information added to the SENC by the manufacturer must be symbolised in the same way as HO chart information and distinguished from HO chart information as described for the various cases below:

1.) An area of non-HO data is located in waters for which HO chart data exists; it is superimposed on the HO data. In some cases the non-HO data may be more appropriate for the intended purpose, for example it may be more detailed.

In this situation it is at the mariner's discretion whether to use the HO or the non-HO data.

If the mariner selects the non-HO data, the boundary of this data should be identified on the ECDIS display by the line LC(NONHODAT) and the warning "Unofficial data displayed; refer to official RNC or paper chart" should be displayed.

NOTE: The LC(NONHODAT) is a "one-sided line", and the boundary of the area of non-HO data must be drawn according to **S-101** rules to ensure that the diagonal stroke of the line is on the non-HO data side of the line.

2.) An area of non-HO data is located wholly outside the area covered by HO data (although it may share a boundary with the HO data) but is shown on the same display as HO data. The non-HO data should be bounded by the line LC(NONHODAT) and the warning "Unofficial data displayed; refer to official RNC or paper chart." should be displayed.

3) The entire display contains nothing but non-HO data. The warning "No official data available; refer to official RNC or paper chart." should be displayed. In this case, special identifiers need not be used."

9.11.7 Mariner's Navigational Features << MAIN 2.3.1a >>

The Portrayal Catalogue describes "Mariner's Navigational Features" for route planning and route monitoring chartwork, and for adding mariner's and manufacturer's information to the SENC. The descriptions are in the same format as chart features, in order to avoid the ECDIS having to deal with two differently coded types of data.

Mariners may alter the IMO categories for Mariner's Features (but not for chart features). Note, however, that IMO PS 11.4.1 requires that own ship and selected planned route should always appear, and should therefore remain in Display Base.

NOTE: Mariner's Features should be kept independent of chart data in the SENC, and that mariners' information does not need to be split into cells.

In referring to Mariner's Features it is important to distinguish between:

"Add/Enter", "Revise" or "Delete" mariner's or manufacturer's information; this refers to the contents of the SENC, and:

"Display" or "Remove" the information; this refers to the ECDIS display.

9.11.8 Mariner's Information on the route monitoring display << MAIN 2.3.1b >>

In addition to the ability to enter manual chart corrections and to carry out route planning and route monitoring chartwork, the mariner must be provided with the capability of adding at least the following symbols, lines and areas to the SENC, and should be able to revise or delete them:

1. the caution "(!)" or information "[i]" symbol **section 3.2.3 (6b), (6c),** used to call up a note on the text display by cursor picking,

2. simple lines and areas with or without colour fill, set up for cursor picking to give an explanatory note in the text display,

3. any of the chart symbols in the S-101 Symbol Catalogue,

4. text notes.

Non-ENC chart information added by the mariner should be in normal chart colours.

Other information added by the mariner should be distinguished by the colour orange (colour token NINFO) except for colour fill, which should use transparent yellow (colour token ADINF). (Transparent orange tends to look magenta in colour over blue backgrounds).

Mariner's information should not overwrite ENC information.

9.11.9 Text

9.11.9.1   Text as part of the route monitoring display << MAIN 3.4.1 >>

Text information should be used on the route monitoring display only when unavoidable, since it has to be written large to be readable and so causes clutter.

Soundings are treated by the Presentation Library as symbols to ensure they are legible and correctly located.

9.11.9.2   Light description text strings << ANNEX A 8.6.4 >>

The mariner may need to label all lights with a description in order to identify those he can see. A mariner-optional light description text-string is provided for this purpose, as a required sub-procedure of conditional symbology procedure LIGHTS (see 'C' program LITDSN on this CD).

Comment [J47]: Included a display of text earlier in this annex. Should it really go hear a note to refer to the above.

9.11.9.3   Text windows, explanatory diagrams etc. superimposed on the route monitoring display << MAIN 3.4.2 >>

Comment [N48]: IEC 61174 ref

The 270 mm by 270 mm minimum area of chart presentation for route monitoring should normally be used for chart and navigation information alone.

Any windows containing text, diagrams, etc., superimposed on the route monitoring display should be temporary, and should not obscure important chart or navigational information. Such windows should use only the "User Interface" colours from the Portrayal Catalogue. It should be possible for the mariner to re-locate a window in a less important part of the display, such as on land, or behind the ship.

9.11.9.4   Separate text panel on the same screen as the route monitoring display <<MAIN 3.4.3 >>

Comment [N49]: IEC 61174 ref

A Mariner's Information Panel, consisting mainly of text (alphanumerics), might include:

*   ECDIS alarms and indications, e.g." crossing safety contour",

*   navigation information, e.g. time, position, course to make good, etc.,

*   chart information, e.g. contour selected for own-ship safety contour,

*   supplementary chart information, e.g. tide tables, sailing directions,

- interface dialogue, e.g. "change to night colour table".

- etc.

The text panel should be outside the 270 by 270 mm minimum area designated for the route monitoring chart display by the IMO PS. The colours, symbols and luminance of this user interface panel should not degrade the SENC information on the chart display.

At night it is essential that any interface panel or other information added by the manufacturer to the screen carrying the chart display should never generate more light than the chart display itself. Great care is taken to reduce the light emitted by the chart in order to preserve the mariners night vision, and it is dangerous to ship safety if added non-chart information defeats that purpose.

It is particularly important to limit the information shown using the conspicuous colour token "UINFD", which is reserved for important information. Even a small panel of text in this colour can produce more light on the bridge than the entire route monitoring chart display.

9.11.9.5 Text shown on a separate auxiliary screen

A separate screen may be provided for text display, either instead of or in addition to a panel on the main screen used for the route monitoring display. The presentation on this auxiliary screen need not follow these specifications in detail, but should conform in general, to avoid confusion, and should meet the same bridge lighting constraints.

All information displays should be designed in accordance with ergonomic principles.

9.11.10   Pick Reports <<MAIN 2.3.1e and ANNEX A 8.8.1 >> <<3.1.2>>

Comment [J50]: IEC 61174 ref

<< This section will be augmented with ideas from Richard Coombes' Grand Unified Theory of Pick

Comment [N51]: IEC 61174 ref

It should be possible to call up any of the information associated with an object by cursor enquiry on its symbol. This should extend to areas (restricted area, depth area, etc.) and to "no symbol" areas (territorial seas, etc.) and meta-areas (information about the area such as compilation scale, etc.). The search for area information needs to extend only to the cell boundaries enclosing the position of the cursor.

9.11.11   IMO Presentation Instructions Not Handled by Look-up Tables <<ANNEX A, 8.5 >>

In some cases the Presentation Library does not provide a symbology instruction in the look-up tables or flow chart of a conditional symbology procedure that specifies how to present a specific feature on the ECDIS screen. The reason is, that such a feature cannot be clearly identified as an S-57 feature class or it appears to be illogical to include it to the mariners' navigational feature classes (see Part II for further details and definitions of the mariners' navigational feature classes).

Therefore, the following presentation instructions are in free text in order to assist the manufacturer to set up a satisfactory and comprehensive ECDIS display. The manufacturer can achieve a correct presentation by handling these cases in his software individually. All symbols, line styles or fill pattern mentioned in the text are in the portrayal catalogue.

9.11.11.1 Detecting the Safety Contour

IMO Performance Standards for ECDIS requires that "ECDIS should give an alarm if the ship, within a specified time set by the mariner, is going to cross the safety contour".

The ENC may not contain any contours round small isolated dangers. However conditional symbology procedure UDWHAZ identifies all rocks, wrecks and obstructions that require a safety contour, and the output of this procedure through calling procedures OBSTRN and WRECKS may be used in

generating alarms. One feature, LNDARE as a point (islet) or line (isthmus) is not covered by procedure UDWHAZ; it should be added to the safety contour detection process as a separate item..

9.11.11.2 Scalebar and latitude scale:

For optimum scales larger than 1/80,000 (e.g. a scale of 1/50,000) draw symbol 'SCALEB10' on the left side of the chart display (so that the mariner knows where to look for it), bottom justified and about 3mm in from the border of the display. Make sure the symbol is properly sized by your software to represent 1 nautical mile (1852 m) at the scale of the display. For display scales of 1/80,000 or smaller (e.g. 1/250,000) use symbol 'SCALEB11', similarly located, and scaled to represent 10 miles at the scale of the display. For both symbols the display priority is 9, over radar, category display base, viewing group 11030.

9.11.11.3 North arrow:

Use symbol 'NORTHAR1' to indicate true north. Place it in the top left corner of the chart display, inside the scalebar. Rotate the symbol to true north if the display is other than north up, and make sure it is clear of the scalebar even if the latter extends the full height of the display. Display priority is 9; over radar; category display base, viewing group 11040.

9.11.11.4 Graticule:

If the ECDIS shows a graticule (IMO PS) the lines should be one unit wide, CHBLK.

9.11.11.5 Display mode:

The ECDIS manufacturer should provide the indication of display mode required in the display base by IMO PS.

9.11.11.6 Night-time shallow water indicator:

If the entire water area on the display is of less depth than the safety contour, it will not be possible to detect this problem at night due to the small differences between the depth area shades. A faint lattice pattern DIAMOND1 is provided to distinguish shallow water at night (see conditional symbology procedure SEABEDnn). Display priority is 3, suppressed by radar, IMO category is standard and viewing group is 23010. This is not a required feature, but it is recommended that it be made available. The mariner should be given the option of whether they wishe to use the pattern (see section 12.2.18 conditional symbology procedure "SEABED", last question).

9.11.12   ECDIS Chart 1

<<ANNEX A 3.6 >>

<< MAIN 3.1.4 >>

ECDIS chart 1,is a graphical index of ECDIS symbols, symbolized lines, and area boundary linestyles used in the display of ENCs. It is intended to familiarize the mariner with the colour and symbol coding used by the ECDIS. The symbols are grouped according to INT1, but are numbered with a look-up sheet. A digital version of ECDIS Chart 1 is part of the ENC test data set; the manufacturer should provide linking by cursor interrogation between the symbols and the explanations given in the symbol library.

The ECDIS Chart 1 is intended for use off-line and in route planning. It is not needed during route monitoring, when the mariner can use cursor enquiry to find the meaning of symbols.

9.11.13   Colour Test Diagram

<< Is this test procedure in IEC 61174 or somewhere else? >>

<<ANNEX A 3.6 >><< MAIN 5.2.3.3 >>

A Colour Differentiation Test diagram is included to enable the mariner to verify the ability of his ECDIS display screen to distinguish between differently colour-coded areas, lines and point symbols.

The colour generating capability of any type of display screen will deteriorate with age and the Colour Differentiation Test diagram is provided to enable the mariner to verify that his display screen still retains the colour differentiation capability needed to distinguish between the various colour-coded areas, lines and point symbols of the ECDIS display.

The diagram will not be true to colour unless it is projected on a calibrated monitor and is generated using the colour tables of the portrayal catalogue.

Two methods of providing the diagram are:

a) Use the S-57 format file labelled "C1WOO" containing the Colour Differentiation Test Diagram, which is included on the Presentation Library distribution CD. This file should be drawn so that the extent of the imaginary chart data covers the entire ECDIS display. Because the file uses pseudo-S57 cartographic objects it must be displayed using the special look-up provided for the digital ECDIS Chart 1.

b) Use the graphics file illustrated in section 15.4 as a model. Based on this model reproduce the same pattern of rectangles and lines on the screen, but present them in the correct colours using the colour tokens given immediately below and the colour tables of section 13.1.

The diagram consists of twenty numbered squares extending over the whole of a 350x270 mm (approx) screen. Each square is coloured with one of the four main background area shades (such as shallow water blue, DEPVS), and each carries a two-pixel wide diagonal line in one of the important line or symbol foreground colours (such as planned route red, PLRTE). These are arranged as follows:

Four main background colours:

DEPVS (shallow water blue)	squares 3, 5, 11, 15, 18, 20.
DEPDW (deep water, white or black)	squares 1, 7, 8, 10, 13, 19.
LANDA (land colour)	squares 6, 14, 17.
NODTA (no data shade: radar, navigation safety lines and chartwork should be visible on the no-data part of a display)	squares 2, 4, 9, 12, 16.

Six important foreground colours:

DEPSC (safety contour grey)	squares 3, 10, 17.
NINFO (orange, mariner's information)	squares 5, 8, 14, 16.
ADINF (yellow, manufacturer's information)	squares 12, 15, 19.
TRFCD (magenta, traffic lanes and area boundaries)	squares 1, 9, 11.
RADLO (the lower luminance radar green)	
RESBL (blue, provisionally reserved for traffic info from	squares 4, 6, 13, 18.
transponder, VTS etc.)	squares 2, 7, 20.

Although originally designed for use on CRTs, this test should be extended to LCD and other screens.

9.11.14   Using the diagram

The Colour Test should be applied on the day and dusk colour tables.
Before the Colour Test diagram is used, the black-adjust symbol SY(BLKADJ) should be brought up on the screen and the contrast and brightness controls (or equivalent controls for an LCD) should be adjusted as follows:

First, set contrast to a maximum, brightness to a minimum. Look at the black-adjust symbol. Then either:

2A. If the centre square is not visible, turn up the brightness until it just appears.

OR:

2B. If the centre square is clearly visible (with contrast at maximum, brightness at minimum), turn the contrast down until the inner square disappears, then turn contrast back up until the inner square is just visible again.

(If the above adjustment is not successful, select a more appropriate colour table and repeat this procedure).

The "black level" is then correctly set. If a brighter display is required use the contrast control, but preferably do not adjust the controls unless lighting conditions on the bridge change.

The test consists of being able to distinguish the background colours and to pick out the like foreground colours, ie to say that squares 3, 5, 11, 15, 18 and 20 all have a shallow water blue background, and that squares 3, 10 and 17 have a grey line.

9.11.14.1 Test using Colour Differentiation Test Diagram.

The dusk and night tables should be checked subjectively by means of the colour differentiation test diagram, which is provided as an S-101 file as part of the ENC test dataset, as follows:

1.) The person carrying out the test should have passed the Isihara colour blindness test, or other test used to qualify bridge watchkeepers, and should adapt to night viewing for 10 minutes before checking the night display;

2.) The controls should be set to their calibrated settings;

3.) While the display is off, adjust the ambient light reflected from white paper positioned on the display screen to the following values:

Colour table   Light level

Day   200 cd/sq m

Dusk   10 cd/sq m

Night   darkness (the ECDIS display is the predominant light source)

Preferably use natural daylight for the day table.

4.) Under each of the above conditions, display the appropriate colour differentiation test diagram described in section 5.2.5 for the colour tables. Select each table in turn and ensure that:

- each foreground diagonal line is clearly distinguished from its background;

- the foreground lines representing yellow, orange, magenta (purple), green, blue and grey may be clearly identified

9.12 General Colour Assignment for ECDIS Features <<Main 5.2.5 – Tbl 1>>

- **black/white   (black by day / white by night)** is used for critical navigation features which need highlighting by contrast against their background to give them adequate prominence.

EXAMPLE: own-ship symbol, dangerous soundings less than the safety depth, buoys, conspicuous features on land etc. It is also used for text, which is less clear in any other colour.

- **white/black   (white by day / black by night)** as a background area shade is used for deep, safe, water.

- **magenta**   is used to highlight critically important features such as isolated dangers, traffic routes, anchorages; and for restricted areas, submarine cables, gas pipelines etc. It is also used for aids to navigation and services such as daymarks, racons, and pilot stations.

- **grey**   is used for many features which are black on the paper chart. It is used with thick lines for critical physical features such as bridges and overhead cables, and with thin lines for important but less critical physical features such as non-dangerous soundings, sandwaves, overfalls, water pipelines and fish farms. It is similarly used for chart features such as fairways, harbour areas, tidal information and for information about the chart such as quality of chart data, overscale areas, etc.

- grey   as a background area shade is used with a prominent pattern for no-data areas.

- **blue**   as a background area shade is used to distinguish depth zones.

- **blue**   as foreground colour for AIS and VTS information; also reserved for future requirements.

- **green**   is used for the radar image and synthetics, and for buoy and lights colours.

- **blue-green**   is used for transferred ARPA.

- **yellow-green ('moss-green')** as a background area shade is used for the intertidal area between high and low waterlines,

- **yellow** is used as the manufacturer's colour; for the mariner's transparent colour fill; and for buoy and lights colours.

- **red** is used for the important planned route, for the mariner's danger highlight, and for buoy and lights colours.

- **orange** is the mariner's colour, for notes, chartwork, chart corrections. The scale bar, north arrow, and mariner's navigation features such as EBLs and VRMs are also orange.

- **brown** as a background area shade is used for the land, and dark brown is used for features on land and in the intertidal area that do not have any strong significance for navigation.

9.13 Description of the colour coding system << ANNEX A 4. >>

The colours of the Presentation Library for ECDIS are named with a five character code that reflects their usage, e.g., CHMGD for "chart magenta, dominant". These names are called "colour tokens". The colour tokens are used by symbology instructions, symbols, line & fill styles and to enter the colour tables where the colours are identified by CIE-coordinates. The colours are designed to meet different conditions of illumination on the bridge.

The colour tokens are organized in a colour scheme that groups the tokens in colour sections. Each colour section contains a set of colour tokens that serves a special purpose, e.g., to provide colours for the chart content. Note that the number of tokens is currently limited to 64.

9.14 The Colour Scheme << ANNEX A 4.1 >>

This section explains the structure of the colour scheme and the usage of the colour tokens. Note that the colour values themselves are listed in the colour tables of section 13.

General Uses

Token		Colour	Usage
TRNSP-		transparent	(invisible pixels)
NODTA	-	grey	(areas without chart data)
CURSR	-	orange	(cursor colour,VRM,EBL)

Colour Section I / Chart Contents (31 uses)

Token		Colour, day/night Usage	
CHBLK	-	black/grey	(general)
CHGRD	-	grey, dominant	(general)
CHGRF	-	grey, faint	(general)
CHRED	-	red	(general)
CHGRN	-	green	(general)
CHYLW	-	yellow	(general)
CHMGD	-	magenta, dominant	(general)
CHMGF	-	magenta, faint	(general)
CHBRN	-	brown	(general)
CHWHT	-	white	(general)
OUTLW	-	black	(symbol outline on sea area background)
OUTLL	-	pale/dark brown	(symbol outline on land area background)
LITRD	-	red	(red lights)
LITGN	-	green	(green lights)
LITYW	-	yellow	(white/yellow/orange/amber lights)
ISDNG	-	magenta	(isolated danger)
DNGHL	-	red	(danger highlight)
TRFCD	-	magenta, dominant	(traffic control features)
TRFCF	-	magenta, faint	(traffic control features)
LANDA	-	brown	(Land areas)
LANDF	-	brown	(Landforms, land features)
CSTLN	-	black/grey	(Coastline, shoreline constructions)
SNDG1	-	grey	(deep soundings > safety depth)
SNDG2	-	black/white	(shallow soundings <= safety depth)
DEPSC	-	grey	(safety contour)
DEPCN	-	grey	(depth contours)
DEPDW	-	white/black	(deeper than selected deep contour)
DEPMD	-	pale/dark blue	(safety contour to selected deep contour)
DEPMS	-	light/medium blue	(shallow contour to selected safety contour)
DEPVS	-	medium/light blue	(zero meter contour to shallow contour)
DEPIT	-	yellow-green	(high water line to zero meter contour)

Colour Section II / Radar Image Overlay (3 uses)

Token		Colour	Usage
RADHI	-	green	(high intensity echo or single int. echo)
RADLO	-	green	(low intensity echo & target trail)
ARPAT	-	green, dashed	(ARPA, target symbols & infos)

Radar Overlay

The radar image overlay can be generated by using either one intensity or a range of intensities of the radar colour. The colour for high echo intensity (RADHI) should be used in case you show only one intensity. If you prefer to show more than one echo intensity or fading target trails, the corresponding colour intensities should be interpolated between the colour for high echo intensity (RADHI) and the colour for low echo intensity (RADLO). A separate colour token is used for ARPA targets and information tagged on them (ARPAT).

Transparent Radar

Optionally, the manufacturer may vary the radar green overlay by making it transparent. As described in section 7.4.2, there are two ways of doing this:

1) Use "pixel swap" transparency, as described in detail in section 7.4.2.

2) by mixing the fill and underlaying colour at each pixel to give a continuous transparency change from 0% to 100%. This must be done in such a way that no appearance of colour or shape change occurs in any SENC feature on the display, at any intermediate transparency value. The underlying SENC information must remain distinguishable, except when the overlay colour approaches 100%, in which case Colour & Symbol Specifications 2.3.2 (b) applies and an indication is required.

Colour Section III / Mariners' & Navigation Information (3 uses)

Token		Colour	Usage
SCLBR	-	orange	(scalebar)
CHCOR	-	orange	(chart corrections)
NINFO	-	orange	(Navigators Notes)
ADINF	-	yellow	(mariners' transparent area fill and manufacturers' points and lines)

This section provides colours for mariners' notes and navigation info. SCLBR is used to generate the scalebar. Hand entered chart corrections are marked by the colour CHCOR. Mariners' notes of any form (Symbols, Text) are generated using the colour NINFO.

Colour Section IV / Reserved for Special Requirements (7 uses)

Token		Colour	Usage
RESBL	-	blue	(AIS features and symbols)
RESGR	-	grey	(reserved for line features & screened areas)
BKAJ1	-	black	(black level test symbol background)
BKAJ2	-	grey	(black level test symbol foreground)
RES01	-	grey	(reserved for future use)
RES02	-	grey	(reserved for future use)
RES03	-	grey	(reserved for future use)

The colours of this section were originally reserved for future requirements. Some have since been assigned as indicted above.

Colour Section V / Ship symbol & Planned Route (5 uses)

Token		Colour,day/night	Usage
SHIPS	-	black/white	(own ship, Co&SpMG vector)
PSTRK	-	black/white	(Past Track)
SYTRK	-	grey	(Secondary Track)
PLRTE	-	red	(planned route & notations)
APLRT	-	orange	(alternate planned route)

This section groups colours that apply to the ship symbol and features associated to it. Own ship symbol, course over ground and speed over ground vector are shown in the colour SHIPS. The past track of the main position sensor and a secondary position sensor is shown in PSTRK and SYTRK. The planned route uses the colour PLRTE as well as the symbol set for the planned route elements (waypoints, etc.). The alternate route is shown in APLRT.

Colour Section VI / User Interface (11 uses)

Token	Colour,day/night	Usage
UIBCK -	white/black	(background user interface components)
UIBDR -	grey, dominant	(user interface border components)
UIAFD -	medium/light blue	(dominant fill colour)
UIAFF -	brown	(faint fill colour)
UINFD -	black/white	(dominant textual information)
UINFF -	grey	(faint textual information)
UINFR -	red	(textual information)
UINFG -	green	(textual information)
UINFO -	orange	(textual information)
UINFB -	blue	(textual information)
UINFM -	magenta	(textual information)

Note: These colours are to be used whenever a user interface is on the same screen as the chart display.

This section is composed of eleven colour tokens to be used in coding information in the user interface area. The foreground and background colours have been selected with the intent of ensuring the visibility and legibility of information in this area and, at the same time, not distracting the mariner while viewing the chart. Thus, UIBCK is white in the light background colour sets and black in the dark background colour sets. This helps ensure the visibility of information in bright sunlight and helps maintain the mariner's dark adaptation at night. At the same time, it keeps average luminance in the two areas consistent. Large differences in brightness between the chart and the user interface area could be distracting to the mariner when viewing the chart. For the same reason, the amount of information in the user interface area should be keep to a minimum and excessive differences in luminance between the foreground and background should be avoided. Thus, UINFD should be used for limited important text information only.

To ensure legibility, alphanumerics should be between 24 and 30 minutes of arc at the viewer's eye. The use of the UINFR (red) and UINFB (blue) tokens should be avoided for large amounts of text especially under low ambient illumination. The use of colours that vary widely across the spectrum can be fatiguing because of the need to constantly refocus when switching between them. In addition, the eye is less sensitive to red in low ambient illumination. In general, the use of several different colours, several different fonts, and excessive highlighting should be avoided because these practices can interfere with human processing of information.

The user interface area should have a border, especially at night to delineate it from the chart area. The use of a solid line, 3 pixels wide, in UIBOR is recommended. Note that the selection of colours for the user interface area and the guidelines given above are likely to change as experience accumulates.

9.14.1 General Uses

The colours of this section are in use in combination with every section of the whole colour scheme:

- **TRNSP** - This means a 100% "transparent" colour. This is not a "real" colour since it is invisible. Every pixel on the screen, which has the colour value 0 shows up as 100% transparent. In case the pixel was already painted with another (visible, e.g., black) colour this colour is not overwritten by the transparent colour. In case the pixel was cleared before or not yet painted the "background" colour shows up (see **NODTA**).

- **NODTA** - This abbreviation stands for "No Data". This colour shows up on every pixel on the screen, which is neither covered by chart features nor covered by other elements of the ECDIS display (e.g., radar overlay, user interface). Thus, it can also be called the "empty background colour" (see **TRNSP**).

- **CURSR** - In most graphic systems the cursor is treated as an item that can be handled completely independent from the graphic of the chart area. Therefore the cursor was given its own colour and it is kept separately from the other sections of the colour scheme. The cursor colour is also used by variable range marker (VRM), electronic bearing line (EBL), parallel indexing lines and other tools to perform absolute and relative measurements in the chart.

9.14.2 Colour Section I / Chart Contents

The colours in this section are designed for chart display. The selection of the colours is a compromise between minimum bitplane consumption (5 bits) and flexibility for future changes in the colour composition. Some colours can be used in general, others are reserved for specific types of feature purposes.

- **CHBLK, CHGRD, CHGRF, CHRED, CHGRN, CHYLW, CHMGD, CHMGF, CHBRN, CHWHT** - This selection of colours is used in general to design symbols and chart line features as well as fill styles. They are not used in cases where other colours are available for a special usage.

- **OUTLW, OUTLL** - These colours are used to outline symbols depending on which background they are normally shown (water/land).

- **LITRD, LITGN, LITYW** - Light symbols have their own colours to give the opportunity to influence their colour luminance individually. Yellow (**LITYW**) is used for white, yellow, orange and amber lights because it might be difficult to distinguish these colours from each other on a badly calibrated monitor. It also follows the tradition to show up white lights with a yellow flare or coloured arc.

- **ISDNG** - Since the isolated danger symbol forms one of the most important items on the ECDIS screen, it was given a separate colour.

- **DNGHL** - This colour is used for symbology that highlights mariner selected dangers. The mariner decides during route planning which features are highlighted by this colour.

- **TRFCD, TRFCF** - Traffic separation schemes are complex chart features. The navigator is confronted with important elements of the schemes and with less important elements as well. **TRFCD** is used to distinguish important traffic routeing features.

- **LANDA** - This colour is used for land areas in general.

- **LANDF** - Landforms and land features are given a contrasting brown.

- **CSTLN** - The coastline is a very important feature of the chart. If a radar image is combined with the chart picture it is required that coastline elements clearly show up on top of the green radar picture (see also **RADHI/RADLO**). To have full control over this combination under all conditions (day/night) a separate colour is reserved for coastline features.

- **SNDG1** - This colour is used for soundings that are deeper than the selected safety depth ("safe" soundings).

- **SNDG2** - This colour is used for soundings that are shallower than or equal to the selected safety depth ("unsafe" soundings).

- **DEPSC** - This colour is reserved for the selected safety contour.

- **DEPCN** - All depth contours other than the safety contour should use this colour.

- **DEPDW, DEPMD, DEPMS, DEPVS, DEPIT** - These are depth shades. The depth zones are:

- **DEPDW:** areas deeper than the mariner-selected deep contour;

- **DEPMD:** areas between deep contour and the mariner-selected safety contour;

- **DEPMS:** areas between safety contour and the mariner-selected shallow water contour;

- **DEPVS:** areas between shallow water contour and the low water line (zero meter contour);

- **DEPIT:** areas between zero meter contour and coastline (intertidal).

For route monitoring it may be desirable to distinguish only two water shades, plus **DEPIT**: deeper than own-ship's safety contour and shallower than safety contour. In that case **DEPDW** and **DEPVS** should be used. At night it may be difficult to distinguish between **DEPMD** and **DEPDW**.

9.14.3 Colour Tables << ANNEX A, 13.1 >>

The following colour tables have been designed for different conditions of ambient illumination on the bridge. There are 63 colours in these tables. With the addition of the transparent colour (TRNSP) there are 64 colour tokens.

DAY Colour Table

Token	Colour	X	Y	Luminance
NODTA	grey	0.2800	0.3100	40.000
CURSR	orange	0.5000	0.4000	32.000
CHBLK	black	0.2800	0.3100	0.000
CHGRD	grey	0.2800	0.3100	10.000
CHGRF	grey	0.2800	0.3100	25.000
CHRED	red	0.4800	0.3000	25.000
CHGRN	green	0.3100	0.5600	60.000
CHYLW	yellow	0.4100	0.4900	70.000
CHMGD	magenta	0.3000	0.1700	20.000
CHMGF	magenta	0.2800	0.2400	48.000
CHBRN	brown	0.3900	0.4300	30.000
CHWHT	white	0.2800	0.3100	80.000
SCLBR	orange	0.5000	0.4000	32.000
CHCOR	orange	0.5000	0.4000	32.000
LITRD	red	0.4800	0.3000	25.000
LITGN	green	0.3100	0.5600	60.000
LITYW	yellow	0.4100	0.4900	70.000
ISDNG	magenta	0.3000	0.1700	20.000
DNGHL	red	0.4800	0.3000	25.000
TRFCD	magenta	0.3000	0.1700	20.000
TRFCF	magenta	0.2800	0.2400	48.000
LANDA	brown	0.3500	0.3900	50.000
LANDF	brown	0.4500	0.4200	15.000
CSTLN	grey	0.2800	0.3100	10.000
SNDG1	grey	0.2800	0.3100	25.000
SNDG2	black	0.2800	0.3100	0.000
DEPSC	grey	0.2800	0.3100	10.000
DEPCN	grey	0.2800	0.3100	25.000
DEPDW	white	0.2800	0.3100	80.000
DEPMD	pale_blue	0.2600	0.2900	65.000
DEPMS	light_blue	0.2300	0.2500	55.000
DEPVS	medium_blue	0.2100	0.2200	45.000

Token	Colour	X	Y	Luminance
DEPIT	yellow-green	0.2600	0.3600	35.000
RADHI	green	0.3100	0.5600	60.000
RADLO	green	0.3100	0.5600	20.000
ARPAT	blue-green	0.2600	0.4200	30.000
NINFO	orange	0.5000	0.4000	32.000
RESBL	blue	0.1800	0.1500	22.000
ADINF	yellow	0.4100	0.4900	35.000
RESGR	grey	0.2800	0.3100	25.000
SHIPS	black	0.2800	0.3100	0.000
PSTRK	black	0.2800	0.3100	0.000
SYTRK	grey	0.2800	0.3100	25.000
PLRTE	red	0.5800	0.3500	18.000
APLRT	orange	0.5000	0.4000	32.000
UINFD	black	0.2800	0.3100	0.000
UINFF	grey	0.2800	0.3100	10.000
UIBCK	white	0.2800	0.3100	80.000
UIAFD	medium_blue	0.2100	0.2200	45.000
UINFR	red	0.4800	0.3000	25.000
UINFG	green	0.3100	0.5600	60.000
UINFO	orange	0.5000	0.4000	32.000
UINFB	blue	0.1800	0.1500	22.000
UINFM	magenta	0.3000	0.1700	20.000
UIBDR	grey	0.2800	0.3100	10.000
UIAFF	brown	0.3500	0.3900	50.000
OUTLW	black	0.2800	0.3100	0.000
OUTLL	brown	0.4500	0.4200	15.000
RES01	grey	0.2800	0.3100	25.000
RES02	grey	0.2800	0.3100	25.000
RES03	grey	0.2800	0.3100	25.000
BKAJ1	grey	0.2800	0.3100	0.600
BKAJ2	grey	0.2800	0.3100	1.600

DUSK Colour Table

Token	Colour	X	Y	Luminance
NODTA	grey	0.2800	0.3100	7.000
CURSR	orange	0.5000	0.4000	10.000
CHBLK	grey	0.2800	0.3100	20.000
CHGRD	grey	0.2800	0.3100	20.000
CHGRF	grey	0.2800	0.3100	10.000
CHRED	red	0.4800	0.3000	10.000
CHGRN	green	0.3100	0.5600	20.000
CHYLW	yellow	0.4100	0.4900	24.000
CHMGD	magenta	0.2800	0.2400	18.000
CHMGF	magenta	0.3000	0.1700	7.000
CHBRN	brown	0.3900	0.4300	8.000
CHWHT	white	0.2800	0.3100	36.000
SCLBR	orange	0.5000	0.4000	10.000
CHCOR	orange	0.5000	0.4000	10.000
LITRD	red	0.4800	0.3000	10.000
LITGN	green	0.3100	0.5600	20.000
LITYW	yellow	0.4100	0.4900	24.000
ISDNG	magenta	0.2800	0.2400	18.000
DNGHL	red	0.4800	0.3000	10.000
TRFCD	magenta	0.2800	0.2400	18.000
TRFCF	magenta	0.3000	0.1700	7.000
LANDA	brown	0.3500	0.3900	5.000
LANDF	brown	0.4500	0.4200	12.000
CSTLN	grey	0.2800	0.3100	20.000

SNDG1	grey	0.2800	0.3100	10.000
SNDG2	white	0.2800	0.3100	36.000
DEPSC	grey	0.2800	0.3100	20.000
DEPCN	grey	0.2800	0.3100	10.000
DEPDW	black	0.2800	0.3100	0.000
DEPMD	dark_blue	0.2500	0.2900	1.000
DEPMS	medium_blue	0.2300	0.2500	3.000
DEPVS	light_blue	0.2100	0.2200	5.000
DEPIT	yellow-green	0.2600	0.3600	6.000
RADHI	green	0.3100	0.5600	20.000
RADLO	green	0.3100	0.5600	7.000
ARPAT	green	0.2600	0.4200	17.000
NINFO	orange	0.5000	0.4000	10.000
RESBL	blue	0.1800	0.1500	10.000
ADINF	yellow	0.4100	0.4900	12.000
RESGR	grey	0.2800	0.3100	20.000
SHIPS	white	0.2800	0.3100	36.000
PSTRK	white	0.2800	0.3100	36.000
SYTRK	grey	0.2800	0.3100	10.000
PLRTE	red	0.5800	0.3500	8.000
APLRT	orange	0.5000	0.4000	10.000
UINFD	white	0.2800	0.3100	36.000
UINFF	grey	0.2800	0.3100	20.000
UIBCK	black	0.2800	0.3100	0.000
UIAFD	light_blue	0.2100	0.2200	5.000
UINFR	red	0.4800	0.3000	10.000
UINFG	green	0.3100	0.5600	20.000
UINFO	orange	0.5000	0.4000	10.000
UINFB	blue	0.1800	0.1500	10.000
UINFM	magenta	0.2800	0.2400	18.000
UIBDR	grey	0.2800	0.3100	20.000
UIAFF	brown	0.4500	0.4200	12.000
OUTLW	black	0.2800	0.3100	0.000
OUTLL	brown	0.3500	0.3900	5.000
RES01	grey	0.2800	0.3100	10.000
RES02	grey	0.2800	0.3100	10.000
RES03	grey	0.2800	0.3100	10.000
BKAJ1	black	0.2800	0.3100	0.000
BKAJ2	grey	0.2800	0.3100	0.720

NIGHT Colour Table

Token	Colour	X	Y	Luminance
NODTA	grey	0.2800	0.3100	1.200
CURSR	orange	0.5000	0.4000	1.250
CHBLK	grey	0.2800	0.3100	2.500
CHGRD	grey	0.2800	0.3100	2.500
CHGRF	grey	0.2800	0.3100	1.250
CHRED	red	0.4800	0.3000	1.250
CHGRN	green	0.3100	0.5600	2.500
CHYLW	yellow	0.4100	0.4900	3.000
CHMGD	magenta	0.3000	0.1700	2.000
CHMGF	magenta	0.3000	0.1700	2.000
CHBRN	brown	0.3900	0.4300	1.300
CHWHT	white	0.2800	0.3100	5.000

SCLBR	orange	0.5000	0.4000	1.250
CHCOR	orange	0.5000	0.4000	1.250
LITRD	red	0.4800	0.3000	1.250
LITGN	green	0.3100	0.5600	2.500
LITYW	yellow	0.4100	0.4900	3.000
ISDNG	magenta	0.3000	0.1700	2.000
DNGHL	red	0.4800	0.3000	1.250
TRFCD	magenta	0.3000	0.1700	2.000
TRFCF	magenta	0.3000	0.1700	2.000
LANDA	brown	0.3500	0.3900	0.800
LANDF	brown	0.4500	0.4200	1.600
CSTLN	grey	0.2800	0.3100	2.500
SNDG1	grey	0.2800	0.3100	1.250
SNDG2	white	0.2800	0.3100	5.000
DEPSC	grey	0.2800	0.3100	2.500
DEPCN	grey	0.2800	0.3100	1.250
DEPDW	black	0.2800	0.3100	0.000
DEPMD	dark_blue	0.2500	0.2900	0.200
DEPMS	medium-blue	0.2300	0.2500	0.400
DEPVS	light-blue	0.2100	0.2200	0.800
DEPIT	yellow-green	0.2600	0.3600	1.200
RADHI	green	0.3100	0.5600	2.500
RADLO	green	0.3100	0.5600	0.800
ARPAT	blue-green	0.2600	0.4200	1.750
NINFO	orange	0.5000	0.4000	1.250
RESBL	blue	0.1800	0.1500	1.250
ADINF	yellow	0.4100	0.4900	1.500
RESGR	grey	0.2800	0.3100	1.250
SHIPS	white	0.2800	0.3100	5.000
PSTRK	white	0.2800	0.3100	5.000
SYTRK	grey	0.2800	0.3100	1.250
PLRTE	red	0.5800	0.3500	0.900
APLRT	orange	0.5000	0.4000	1.250
UINFD	white	0.2800	0.3100	5.000
UINFF	grey	0.2800	0.3100	2.500
UIBCK	black	0.2800	0.3100	0.000
UIAFD	light-blue	0.2100	0.2200	0.800
UINFR	red	0.4800	0.3000	1.250
UINFG	green	0.3100	0.5600	2.500
UINFO	orange	0.5000	0.4000	1.250
UINFB	blue	0.1800	0.1500	1.250
UINFM	magenta	0.3000	0.1700	2.000
UIBDR	grey	0.2800	0.3100	2.500
UIAFF	brown	0.4500	0.4200	3.200
OUTLW	black	0.2800	0.3100	0.000
OUTLL	brown	0.3500	0.3900	0.800
RES01	grey	0.2800	0.3100	1.250
RES02	grey	0.2800	0.3100	1.250
RES03	grey	0.2800	0.3100	1.250
BKAJ1	black	0.2800	0.3100	0.000
BKAJ2	grey	0.2800	0.3100	0.100

9.14.4 Alphabetical List of Colour Tokens << MAIN, 5.2.5, Tbl 3 >>

Token	Colour (day/night)	Use
ADINF	yellow	mariner's and manufacturer's added information
APLRT	orange	alternate planned route.
ARPAT	blue-green	ARPA target and vector.
BKAJ1	black	black colour of black-adjust symbol

BKAJ2	grey	dark grey colour of black-adjust symbol
CHBLK	black/white	general.
CHWHT	white/white	general.
CHGRD	grey, conspic	general.
CHGRF	grey, faint	general.
CHBRN	brown	built-up land areas, etc.
CHGRN	green	general, including buoys.
CHRED	red	general, including buoys.
CHYLW	yellow	general, including buoys.
CHMGD	magenta, conspic	dangers, important magenta chart features.
CHMGF	magenta, faint	less important magenta chart features.
CHCOR	orange	manual chart corrections made by the mariner.
CSTLN	grey, conspic	coastline (high water line), including wharf and dock faces.
CURSR	orange	cursor, also mariner's EBLs and VRMs.
DEPDW	white/black	area fill colour for deep water, depth greater than the deep contour selected by the mariner.
DEPMD	blue	area fill for medium-deep water, deeper than the Safety Contour.
DEPMS	blue	area fill for medium-shallow water, less than the Safety Contour.
DEPVS	blue	area fill for very shallow water, less than the shallow contour.
DEPIT	yellow-green	area fill for the intertidal zone between the drying line and the high water line.
DEPSC	grey, conspic	own-ship's Safety Contour, selected by the mariner.
DEPCN	grey	other depth contours
DNGHL	red	danger highlight symbol, applied by the mariner.
ISDNG	magenta, conspic	isolated danger, selected automatically by ECDIS depending on the Safety Contour selected by the mariner.
LANDA	brown	area fill for land that is not built-over.
LANDF	brown, conspic	contrasting brown for land features (buildings, dykes etc.)
LITRD	red	light flares and sectors.
LITGN	green	light flares and sectors.
LITYW	yellow	light flares and sectors.
NINFO	orange	navigator's information added to the chart by the mariner.
NODTA	grey	area for which there is no chart information.
OUTLW	black	outline colour to clarify overwritten symbols on water areas.
OUTLL	brown	outline colour to clarify overwritten symbols on land areas.
PLRTE	red, conspic	own-ship's planned route.
PSTRK	black/white	own-ship's past track from primary positioning system.
RADHI	green, conspic	high luminance radar colour for high echo intensity.
RADLO	green, faint	low luminance radar colour for low echo intensity.
RESBL	blue	symbol, line or text colour reserved for AIS and VTS
RESGR	grey	symbol, line or text colour reserved for future applications
RES01	grey	symbol, line or text colour reserved for future applications
RES02	grey	symbol, line or text colour reserved for future applications
RES03	grey	symbol, line or text colour reserved for future applications
SCLBR	orange, white	1 mile vertical bar to give general impression of display scale.
SNDG1	grey	soundings deeper than the mariner-selected Safety Depth.
SNDG2	black/white	dangerous soundings, equal to or less than the Safety Depth.
SHIPS	black/white	own-ship symbol or scaled shape, with velocity vectors.
SYTRK	grey	own-ship's past track from secondary positioning system.
TRFCD	magenta, conspic	important traffic routeing features.
TRFCF	magenta	less important routeing features.
TRNSP	transparent	used in "transparent" area fills ,(e.g. traffic separation zones), to let the background colour show through, say, 75% of the pixels.
UIBCK	white/black	user interface background.
UIBDR	grey	border to separate user interface from ECDIS chart display.
UIAFD	blue	area fill for use on user interface, water colour.
UIAFF	brown	area fill for use on user interface, land colour.
UINFD	grey, conspic	conspic colour for limited amount of important text.
UINFF	grey	normal colour for user interface text.
UINFB	blue	colour for symbols, lines and text on the user interface

UINFG	green	colour for symbols, lines and text on the user interface
UINFR	red	colour for symbols, lines and text on the user interface
UINFM	magenta	colour for symbols, lines and text on the user interface
UINFO	orange	colour for symbols, lines and text on the user interface

NOTES

1. There are 63 colours, plus TRNSP (which is not a colour), making 64 colour tokens.

2. Suffix "D" indicates "dominant", important, hence prominent (e.g. "TRFCD");

    Suffix "F" indicates "faint", less important (e.g. "TRFCF").

    Suffix "1" indicates non-dangerous, e.g. "SNDG1" is deeper than the Safety Depth;

    Suffix "2" indicates dangerous, e.g. "SNDG2" is equal to or less than the Safety Depth.

3. There are nine opaque area fills, listed below:

    | CHBRN | built-up areas |
    | DEPDW | deep water |
    | DEPIT | intertidal area |
    | DEPMD | medium deep water |
    | DEPMS | medium shallow |
    | DEPVS | very shallow |
    | LANDA | land in general |
    | NODTA | no chart data |
    | UIBCK | user interface – background |

These are the background colours for all other ECDIS information. These are deliberately made light by day to give maximum contrast for foreground colours in bright sun, and dark by night to avoid a large luminant area which would compromise night vision.

4. Note that the user interface background, UIBCK, and the deep water area fill, DEPDW, are the same colour.