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Information Paper

New Paper-Chart and ECDIS Chart 1

<b>Submitted by:</b>	United States
<b>Executive Summary</b>	The United States has produced the first chart 1 to show both paper chart (INT1 and U.S. national symbols) and ECDIS (S-52) symbols side-by-side in a single reference document for mariners.
<b>Related Documents:</b>	INT1, "Symbols, Abbreviations and Terms used on Charts" S-52, "Specifications for Chart Content and Display Aspects of ECDIS" <a href="#">U.S. Chart No. 1</a> , "Symbols, Abbreviations and Terms used on Paper and Electronic Navigational Charts"
<b>Related Projects</b>	None

### Background

Since the early days of ECDIS, there has been a desire to have a simple, easily accessible ECDIS/ENC symbology reference for mariners. S-52 provides an "ECDIS Chart 1," which is required to be displayable in ECDIS. However, it is difficult to use either the paper version in S-52 (which mariners would rarely have a copy of) or the digital version in ECDIS. Although the "ECDIS Chart 1" groups symbols into familiar INT1 lettered categories (such as K for rocks, wrecks, etc.) it does not associate any of the ECDIS symbols with the commonly known traditional paper chart symbols that most mariners could easily identify and thus relate to the ECDIS symbol.

In May of 2013, the U.S. National Oceanographic and Atmospheric Administration (NOAA) released Edition 12 of the U.S. Chart No. 1. It is the first chart 1 to show both paper chart (INT1) symbols side-by-side with the corresponding ECDIS (S-52) symbols (an idea proposed at least as far back as 2008 at the last Colours and Symbols Maintenance Working Group meeting in Cape Town and probably much earlier).

The new Chart No. 1 may be downloaded at <http://www.nauticalcharts.noaa.gov/mcd/chart1/ChartNo1.pdf> for free. Paper copies may also be ordered from one of NOAA's four publishing partners listed at <http://www.nauticalcharts.noaa.gov/mcd/chartno1.htm>.

### Analysis / Discussion

Over a period of two years, NOAA analyzed the S-52 specifications, symbolization look-up tables and procedures; ECDIS displays; recent editions of the three official INT1s; as well as U.S. national charting specifications to develop a mapping between INT1 paper chart symbols and the S-52 symbols specified for displaying ENC data in ECDIS. The figure below shows a sample of the document. INT1 symbols are on the left, national symbols in the center and ECDIS symbols on the right.

### K Rocks, Wrecks, Obstructions, Aquaculture

No.	INT	Description	NOAA	NGA	Other NGA	ECDIS
13		Underwater rock of unknown depth, dangerous to surface navigation				 
14.1		Underwater rock of known depth; inside the corresponding depth area	12 Rk	27 Rk 21 R		 
14.2		Underwater rock of known depth; outside the corresponding depth area, dangerous to surface navigation				
15		Underwater rock of known depth, not dangerous to surface navigation		35 Rk	35 <sub>R</sub> +(35)	 

Note that there is a many-to-many correspondence between many of the INT1 and ECDIS symbols. The variation in the portrayal of some objects in ECDIS also had to be accounted for, such as the display of the magenta "screw head" isolated danger symbol for rocks shoaler than the safety contour value set by the mariner in each ECDIS.

Special ECDIS specific content has been added Edition 12 to explain unique aspects of the portrayal of ENC data in ECDIS. Topics include:

- Isolated Danger Symbol
- Pick Reports
- Day, Dusk and Night Color Palettes
- Conspicuous and Non-Conspicuous Features
- ECDIS Portrayal of Depths
- Routing Measures in ECDIS
- Simplified and Traditional "Paper Chart" Symbols

Examples of a few of these are provided in Annex A.

#### Thanks and Sharing of Document Files

Members of DIPWG (especially Australia) and the CSPCWG INT1 Sub-Working Group provided helpful critiques of early drafts of the combined paper chart and ECDIS symbology chart 1

The InDesign files and graphics used to create the document have been provided to each of the three INT1 Sub-Working Group members. The U.S. can provide additional copies of the InDesign files and graphics to any country wishing to incorporate ECDIS symbology into their own chart 1. Please send requests to [USChart1@noaa.gov](mailto:USChart1@noaa.gov).

#### **Conclusions and Recommended Actions**

The new U.S. Chart No.1 will be a valuable resource for ECDIS users and could provide the foundation for other chart 1 producers who wish to incorporate ECDIS symbology into their own chart 1 documents.

Expanding the role of the CSPCWG INT1 Sub-Working Group or forming a similar ECDIS Chart 1 Sub-Working Group to continually improve and standardize the presentation of ECDIS symbology in INT1s and other national chart 1s could be useful.

#### **Action Required of HSSC**

The HSSC is invited to:

- a. **note** the report and
- b. **consider** expanding the role of the CSPCWG INT1 Sub-Working Group or establishing an ECDIS Chart 1 consultative body within an appropriate working group to improve and standardize the presentation of ECDIS symbology within national chart 1 documents.

## Examples of ECDIS Specific Content - Annex A



### New in Edition 12: ECDIS Symbols and Other ECDIS Information

Symbology for displaying Electronic Navigational Charts (ENCs) on an Electronic Chart Display and Information System (ECDIS) has been added to U.S. Chart No. 1. See the Preface and Introduction sections for more details.

In addition to the ECDIS symbols shown in the traditional lettered sections of U.S. Chart No. 1, there are now several special pages devoted exclusively to providing important details about ECDIS. These pages are distinguished by the ECDIS icon, as shown in the top left corner of this page. The ECDIS pages are also listed in the table of contents in italic type.

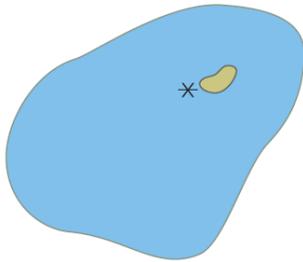


One major difference in the use of paper charts and ENCs is the ability of ECDIS to display the same feature differently depending on user settings and other conditions, such as a ship's draft. An important example is that ECDIS displays wrecks, rocks and other obstructions with their traditional "paper-chart" symbols if they are at or deeper than the depth of the safety contour set for the ship. Dangers that are shoaler are portrayed with the unique ECDIS "isolated danger" symbol shown at left. (See the ECDIS Portrayal of Depths page for more information about the ECDIS safety contour.)



Another advantage that ECDIS provides over paper charts is enabling users to obtain more information about a feature through a "cursor pick." Some feature attribute values that can be obtained by cursor pick are noted throughout U.S. Chart No. 1. This is especially true if a particular value, such as height, vertical clearance or the like is included in the INT symbol description. The cursor pick icon, shown at left, is used to indicate when a reference to a cursor pick is made.

There are many other attribute values that users may obtain through a cursor pick that are not specifically noted. These include, but are not limited to, the purpose, seasonality, periodicity, status, color, height, type of structure and the visual or radar conspicuousness of features; shape, color or color pattern of buoys; characteristics of lights; category of obstructions and wrecks; radar wave length, radio frequency, communication channel and call signs; the presence of AIS transmitted signals; information regarding pilotage services and many more.



No man is an island and no single reference document stands on its own. U.S. Chart No. 1 is a handy guide for ECDIS users, but it is no substitute for mandated ECDIS training.

The ECDIS user and developer communities are invited to help improve the presentation of ECDIS symbology and information in U.S. Chart No. 1. We want to know what you think works well, which parts are a little rocky, and what additional information you would like to have included in the next edition of U.S. Chart No. 1.

Please send any recommendations or corrections to:

USChart1@noaa.gov

or

National Ocean Service, NOAA (N/CS2)  
Attention: U.S. Chart No. 1  
1315 East West Highway  
Silver Spring, MD 20912-3282

### Day, Dusk and Night Color Palettes



ECDIS allows the mariner to change the color palette that is used to display an ENC. Three different color tables have been designed to provide the maximum clarity and contrast between features on the display under three different lighting conditions on the bridge, namely Day, Dusk and Night.

Each symbol is rendered in a different color appropriate for the lighting condition that the color table is meant for. This design provides maximum contrast for the display on a sunny day, as well as preserving night vision on a dimly lit bridge in the evening. This allows the mariner to look back and forth between the chart on the ECDIS display and out to sea through the bridge window without the mariner's eyes needing to readjust to a difference in light intensity.

- The Day Color Table, meant to be used in bright sunlight, uses a white background for deep water and looks the most like a traditional paper chart.
- The Dusk Color Table uses a black background for deep water and colors are subdued, but slightly brighter than those used in the Night Color Table.
- The Night Color Table, meant to be used in the darkest conditions, uses a black background for deep water and muted color shades for other features.

The images on the right show each of the three color palettes.

The symbols shown in the remainder of this document use the day color palette.

DAY



DUSK



NIGHT



## ECDIS Portrayal of Depths



ECDIS depth related symbols closely resemble their paper chart counterparts; however, ECDIS provides valuable additional information to mariners that paper charts cannot.

### Soundings

ECDIS enables mariners to set their own-ship "safety depth." If no depth is set, ECDIS sets the value to 30m. Soundings equal to or shallower than the safety depth are shown in black; deeper soundings are displayed in a less conspicuous gray. Fractional values are shown with subscript numbers of the same size.

### Depth Contours & Depth Areas

Depth contours in ECDIS are portrayed with a thin gray line. Each pair of adjacent depth contours is used to create depth area features. These are used by ECDIS to tint different depth levels and to initiate alarms when a ship is headed into unsafe water.

### Depth Contour Labels



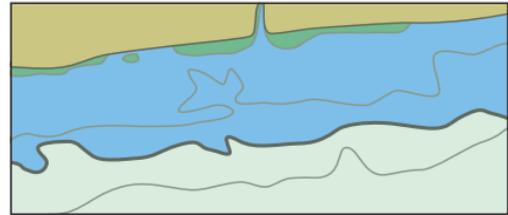
ECDIS depth contour labels are not centered and oriented along iso-lines as they appear on paper charts. They are displayed upright and may appear either on or next to the contour lines that they describe. The labels are black and the same size as soundings, but the labels have a light "halo" to set them apart. The graphic to the left shows depth labels and soundings both deeper and shallower than the safety depth. Note that depths on NOAA paper charts and ENCs are usually compiled in fathoms and feet. Because ECDIS displays depths in meters, soundings and contour lines often show fractional meter values. The "own-ship safety contour" (described below) is always displayed, but mariners may choose to have all other depth contours turned off.

### Safety Contour

ECDIS uses a "safety contour" value to show an extra thick line for the depth contour that separates "safe water" from shoaler areas. If the mariner does not set an own-ship safety contour value, ECDIS sets the value to 30m. If the ENC being displayed does not have a contour line equal to the safety contour depth value set by the mariner, then ECDIS sets the next deeper contour as the safety contour. Depending on the contour intervals used on individual ENCs, ECDIS may set different safety contours as a ship transits from one ENC to another. ECDIS will initiate an alarm if the ship's future track will cross the safety contour within a specified time set by the mariner.

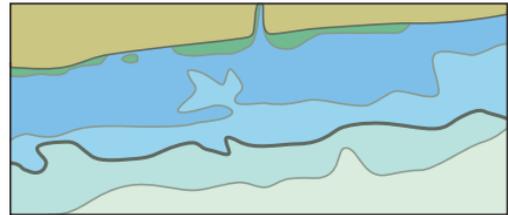
### Two or Four Tints for Shading Depth Areas

ECDIS tints all depth areas beyond the (green tinted) foreshore in either one of two or one of four shades of blue. This is similar to the convention used for paper charts, but the depths used to change from one tint to another are based on the safety contour and thus "customized" for each ship. If the mariner chooses two shades to be displayed, water deeper than the safety contour is shown in an off-white color, water shallower than the safety contour is tinted blue.



Portrayal of Depth Areas with 2 Color Settings

Some ECDIS enable mariners to define two additional depth areas for medium-deep water and medium-shallow water by setting a "deep contour" value and a "shallow contour" value. If this option is used, the safety contour is displayed between the medium deep and medium shallow contours.



Portrayal of Depth Areas with 4 Color Setting



Some ECDIS also provide the mariner with the option of displaying a cross-hatch "shallow water" pattern over all depth areas shallower than the safety contour.



## Simplified and Traditional "Paper Chart" Symbols

ECDIS can be set to display aids to navigation with either traditional "paper chart" or simplified symbols. The two symbol sets are shown below. Some ECDIS color fill the paper chart buoy shapes, but this is not required by IHO ECDIS portrayal specifications.

### Floating Marks

Paper Chart	Simplified	Simplified Symbol Name
		Cardinal buoy, north
		Cardinal buoy, east
		Cardinal buoy, south
		Cardinal buoy, west
		Default symbol for buoy (used when no defining attributes have been encoded in the ENC)
		Isolated danger buoy
		Conical lateral buoy, green
		Conical lateral buoy, red
		Can shape lateral buoy, green
		Can shape lateral buoy, red
		Installation buoy and mooring buoy
		Safe water buoy
		Special purpose buoy, spherical or barrel shaped, or default symbol for special purpose buoy
		Special purpose TSS buoy marking the starboard side of the traffic lane
		Special purpose TSS buoy marking the port side of the traffic lane
		Special purpose ice buoy or spar or pillar shaped buoy
		Super-buoy ODAS & LANBY
		Light float
		Light vessel

### Fixed Marks

Paper Chart	Simplified	Simplified Symbol Name
		Cardinal beacon, north
		Cardinal beacon, east
		Cardinal beacon, south
		Cardinal beacon, west
		Default symbol for a beacon (used when no defining attributes have been encoded in the ENC)
		Isolated danger beacon
		Major lateral beacon, red
		Major lateral beacon, green
		Minor lateral beacon, green
		Major safe water beacon
		Minor safe water beacon
		Major special purpose beacon
		Minor special purpose beacon

\* Paper chart symbols display various buoy or beacon shape symbols in conjunction with the topmark. Simplified portrayal only displays the topmark.

\*\* Several different paper chart symbols correspond to this simplified symbol.

### Day Marks

Paper Chart	Simplified	Simplified Symbol Name
		Square or rectangular daymark
		Triangular daymark, point up
		Triangular daymark, point down
		Retro reflector