U.S. Department of Homeland Security

United States Coast Guard

Commandant
United States Coast Guard

2703 Martin Luther King Jr Ave, SE,
STOP 7418
Washington, DC 20593-7501
Staff Symbol: CG-NAV-2
Phone: (202) 372-1565
Fax: (202) 475-4173
Email: cgnav@uscg.mil

COMDTCHANGENOTE 16700.4
NVIC 01-16
May 21, 2020

COMMANDANT CHANGE NOTICE 16700.4

Subj: CH-2 TO USE OF ELECTRONIC CHARTS AND PUBLICATIONS IN LIEU OF PAPER CHARTS, MAPS AND PUBLICATIONS, NVIC 01-16, COMDTPUB 16700.4

Ref: (a) Title 33, Code of Federal Regulations, Parts 83, 161, and 164
(b) Title 46, Code of Federal Regulations, various parts
(c) International Convention for Safety of Life at Sea, 1974, and its Protocol of 1988: articles, annexes and certificates, (SOLAS) Chapter V, Regulation 27

1. PURPOSE. This Commandant Change Notice publishes a change to *Use of Electronic Charts and Publications in Lieu of Paper Charts, Maps and Publications*, Navigation and Vessel Inspection Circular number 01-16, 16700.4.

2. ACTION. Officers in Charge, Marine Inspection (OCMI) should bring this Notice to the attention of marine inspectors and the maritime industry within their zones of responsibility. Internet release authorized.

3. DIRECTIVES AFFECTED. With the addition of this Commandant Change Notice, *Use of Electronic Charts and Publications in lieu of Paper Charts, Maps and Publications*, NVIC 01-16 Ch-1, COMDTPUB P16700.4 is updated.

4. DISCLAIMER. This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is intended to provide operational guidance for Coast Guard personnel and is not intended to nor does it impose legally binding requirements on any party outside the Coast Guard. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other Federal and state regulators, in applying statutory and regulatory requirements. This Circular prescribes no new requirements for the maritime industry. As such, vessel owners and operators may continue using official paper charts and publications in accordance with References (a) and

DISTRIBUTION – SDL No. 170

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B	X	X	X																							
C													X	X	X										X	
D				X							X	X						X								
E					X		X		X					X				X					X			
F																										
G																										
H					X																					

(b) until the relevant regulations therein are amended.

5. MAJOR CHANGES. In response to recommendations from the Navigation Safety Advisory Council and the public, the Coast Guard updated its policy on electronic carriage of the Inland Navigation Rules and electronic publications in general. This Ch-2 to NVIC 01-16 revises the NVIC, Enclosure (1) and Enclosure (2) to allow electronic editions of the Inland Navigation Rules and Vessel Traffic Service Rules so long as operators are able to display ready reference current electronic editions on their electronic device without internet connectivity by a producing a previously downloaded copy. It also provides a path for mariners to access certain required publications which are not required to be ready reference via web services. Enclosure (2) is further updated to highlight which publications are required by existing regulations to be ready reference and removes the requirement for independent back-ups. Finally, Ch-2 makes non-substantive clarifying changes throughout the NVIC and enclosures.

6. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS.

   a. The development of this instruction and the general policies contained within it have been thoroughly reviewed by the originating office in conjunction with the Office of Environmental Management, Commandant (CG-47). This instruction is categorically excluded under current Department of Homeland Security (DHS) categorical exclusion (CATEX) A3 from further environmental analysis in accordance with the Coast Guard Environmental Planning Policy, COMDTINST 5090.1 and the Environmental Planning (EP) Implementing Procedures (IP).

   b. This instruction will not have any of the following: significant cumulative impacts on the human environment; substantial controversy or substantial change to existing environmental conditions; or inconsistencies with any Federal, State, or local laws or administrative determinations relating to the environment. All future specific actions resulting from the general policy in this instruction must be individually evaluated for compliance with the National Environmental Policy Act (NEPA) and Environmental Effects Abroad of Major Federal Actions, Executive Order 12114, Department of Homeland Security (DHS) NEPA policy, Coast Guard Environmental Planning policy, and compliance with all other applicable environmental mandates.

7. DISTRIBUTION. No paper distribution will be made of the Circular. An electronic version will be located on the following Commandant web site: http://www.dco.uscg.mil/Our-Organization/NVIC/

8. PROCEDURE. If maintaining a paper library, remove NVIC 01-16 (CH-1) and Enclosures (1) and (2), and replace them with the updated NVIC 01-16 (CH-2) including updated Enclosures (1) and (2).

9. RECORDS MANAGEMENT CONSIDERATIONS. This Circular has been thoroughly reviewed during the directives clearance process, and it has been determined there are no further records scheduling requirements, in accordance with Federal Records Act, 44 U.S.C. Chapter 31, NARA requirements, and Information and Life Cycle Management Manual,

COMDTINST M5212.12 (series). This policy does not have any significant or substantial change to existing records management requirements.

10. FORMS/REPORTS. None.

11. REQUEST FOR CHANGES. Submit recommended changes or questions regarding this guidance to Coast Guard Headquarters, Office of Navigation Systems (CG-NAV-2), using the contact information provided in the above letterhead.

R. V. TIMME
Rear Admiral, U.S. Coast Guard
Assistant Commandant for Prevention Policy

U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

2703 Martin Luther King Jr Ave, SE,
STOP 7418
Washington, DC 20593-7501
Staff Symbol: CG-NAV-2
Phone: (202) 372-1565
Fax: (202) 475-4173
Email: cgnav@uscg.mil

COMDTPUB P16700.4
NVIC 01-16
May 21, 2020

NAVIGATION AND VESSEL INSPECTION CIRCULAR NO. 01-16

Subj: CH-2 TO USE OF ELECTRONIC CHARTS AND PUBLICATIONS IN LIEU OF PAPER CHARTS, MAPS AND PUBLICATIONS

Ref: (a) Title 33, Code of Federal Regulations, Parts 83, 161, and 164
(b) Title 46, Code of Federal Regulations, various parts
(c) International Convention for Safety of Life at Sea, 1974, and its Protocol of 1988: articles, annexes and certificates, (SOLAS) Chapter V, Regulation 27

1. PURPOSE. This Circular provides guidance to Coast Guard marine inspectors and U.S. vessel owners and operators regarding electronic navigation information, equipment and practices. It announces what the Coast Guard considers equivalent to chart and publication carriage and certain navigation functions required by titles 33 and 46 of the Code of Federal Regulations (CFR) as well as publication requirements in the International Convention for Safety of Life at Sea (SOLAS) Chapter V, Regulation 27.

2. ACTION.

   a. Officers in Charge, Marine Inspection (OCMI), vessel owners and operators, or their representatives, are encouraged to use the guidelines detailed herein. Area Commanders, District Commanders, Sector Commanders and OCMIs are encouraged to apprise industry representatives of this Circular and apply its provisions appropriately.

   b. Authorized Classification Societies and Coast Guard marine inspectors should refer to Enclosures (1) and (2) when conducting inspections on vessels subject to the chart and publication carriage requirements in References (a), (b), and publication requirements in Reference (c).[1] The use of this guidance will assist marine inspectors and vessel owner

[1] The relevant subchapters of title 46 are subchapter C (§§ 24.15-1, 26.03-4, and 28.225), subchapter D (§§ 30.15-1 and 35.20-1), subchapter H (§§ 70.15-1 and 78.05-5), subchapter I (§§ 90.15-1 and 97.05-5), subchapter I–A

DISTRIBUTION – SDL No. 170

	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A																										
B	X	X	X																							
C													X	X	X										X	
D				X							X	X						X								
E					X		X		X					X				X					X			
F																										
G																										
H					X																					

and operators to identify safe equipment and practices regarding electronic navigation. Internet release authorized.

3. DIRECTIVES AFFECTED. *Use of Electronic Charts and Publications in Lieu of Paper Charts, Maps and Publications*, NVIC 01-16 Ch-1, COMDTPUB P16700.4 is updated by this Circular.

4. BACKGROUND.

In 1966, the Coast Guard mandated "charts" carriage on certain commercial vessels (31 FR 15264 at 15269, December 6, 1966). At that time, the only charts available to meet the requirements were paper charts. In 1977, the Coast Guard recognized four entities through which mariners could obtain paper charts: National Oceanic and Atmospheric Administration (NOAA), United States Army Corps of Engineers (USACE), a river authority and foreign governments (42 FR 5956, January 31, 1977). Since then, some of these entities have developed and distributed chart data sets in support of electronic navigation.

In order to standardize electronic charting data, in 2006, the International Maritime Organization (IMO) defined an Electronic Navigational Chart (ENC).[2] The International Hydrographic Organization (IHO) further narrowed this definition[3] and created standards and specifications relevant to an ENC.[4] They also recognized the display manufacturer's role in ENC distribution by acknowledging and defining the transformation of the entire ENC contents and updates accessed by the display system (referred to as a System Electronic Navigational Chart).[5] To address the features unique to the inland environment, the Inland ENC Harmonization Group (IEHG) developed an Inland ENC standard.[6]

In 2002, NOAA announced that their "Electronic navigation chart" met the Safety of Life at Sea definition of a "nautical chart" (67 FR 39695, June 10, 2002). They then renamed this product through rulemaking to "NOAA Electronic Navigational Charts" (NOAA ENC®) (70 FR 52906, September 6, 2005). Similarly, in 2001, USACE began production of "Inland Electronic Navigation Charts" (IENC). During this time, foreign governments also began producing ENCs. Because these products meet the IHO's ENC definition and the relevant

(§§ 108.105 and 109.565), subchapter K (§§ 114.540 and 121.420), subchapter L (§§ 125.170 and 130.330), subchapter M (§ 140.705), subchapter T (§§ 175.540 and 184.420), and subchapter U (§§ 188.15-1 and 196.05-5).

[2] IMO Maritime Safety Committee Resolution MSC.232(82) – "the database…standardized… issued…by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution, and conform to the International Hydrographic Organization's (IHO) standards."

[3] IHO S-32 Hydrographic Dictionary – see "electronic navigational chart": http://hd.iho.int/en/index.php/electronic_navigational_chart.

[4] See Standards & Publications on IHO website at: https://www.iho.int (IHO S-52 – Specifications for Chart Content and Display Aspects of ECDIS; IHO S-57 – IHO Transfer Standard for Digital Hydrographic Data; IHO S-58 – ENC Validation Checks; IHO S-63 – IHO Data Protection Scheme; IHO S-64 – IHO Test Data Sets for ECDIS; IHO S-65 – ENCs: Production, Maintenance and Distribution Guidance; IHO S-101- Electronic Navigational Chart Product Specification; IHO S-401- Inland Electronic Navigational Chart Product Specification).

[5] IHO S-32 Hydrographic Dictionary – "system electronic navigational chart" – is a database, in the manufacturer's internal ECDIS [display system] format, resulting from the loss-less transformation of the entire ENC contents and updates. This database is accessed by ECDIS [the display system] for the display generation and other navigational functions and is the equivalent to an up-to-date paper chart.

[6] IEHG Inland ECDIS Standard (series).

standards and specifications, the Coast Guard is announcing that the display of NOAA ENCs ®, USACE IENCs, and ENCs issued by a river authority or by the authority of a foreign government meets the chart carriage requirements in titles 33 and 46 of the CFR.

In 2002, the Coast Guard accepted electronic chart display and information systems (ECDIS) as meeting the "nautical chart regulation in 33 CFR 164.33(a)(1), because the ECDIS meets the same navigational safety concerns as do paper nautical charts" (67 FR 53382, August 15, 2002 as amended by 69 FR 42192, July 14, 2004). Since 2002, charting system manufacturers have developed other systems, in addition to ECDIS, that can display ENC data. In light of this, the Coast Guard recognizes that an ECDIS is not the only way to display ENC data. ENC data and display use have improved such that the Coast Guard now considers that ENCs provide substantially more information and therefore may enhance navigational safety beyond that of paper nautical charts, and thus may reduce the potential for marine accidents.

For decades, NOAA produced paper nautical charts using lithographic printing presses. The government process not only ensured accuracy of the data, but also the durability of the ink and paper. In 2013, NOAA stopped printing paper charts, instead turning to a commercial "print-on-demand" paper chart service. Even though NOAA no longer prints charts, commercial chart providers still have to prove the durability of their products through a stress test (water tolerance, ultraviolet ray resistance and permanence during repeated handling, writing, and erasing). Likewise, an electronic charting system should meet a commensurate environmental standard. Therefore, vessels whose intended voyage is outside the territorial sea baseline[7] must display ENCs on a system that meets more stringent environmental standards as discussed in this NVIC.

Title 33 part 164 requires that some vessels fix their position[8] and other vessels fix and plot their position.[9] When navigating on paper charts, by the time the person directing the movement of the vessel was informed of the vessel's position, the vessel had advanced beyond that position. Thus, the information represented a past reality. When integrated with position information, properly displayed ENCs can provide real-time vessel location and predicted future movement. The Coast Guard recognizes the benefit of real-time positioning data conveyed on an ENC, and that it can provide greater situational awareness than what could be achieved using paper charts. Therefore, Coast Guard considers position information integrated into a displayed ENC equivalent to the fixing and plotting requirements in 33 CFR part 164.

Likewise, the International Convention for the Safety of Life at Sea and title 33 parts 83, 161, and 164 and various sections of title 46 (see footnote one) of the CFR require that some vessels carry certain navigation publications.[10] In 2010, Coast Guard announced policy

[7] 33 CFR 2.20.
[8] 33 CFR 164.11 and 164.78 – Self-propelled vessels 1600 or more gross tons and towing vessels 12 meters or more in length.
[9] 33 CFR 164.11 - Self-propelled vessels 1600 or more gross tons.
[10] These publications include: U.S. Coast Pilot, Sailing Directions, Coast Guard Light List, List of Lights, tide tables, tidal current and river current tables, Notice to Mariners, Local Notice to Mariners, Notices to Navigation Interests, Inland Navigation Rules and Vessel Traffic Service Rules.

accepting some electronic publications in lieu of paper publications.[11] Other publications were still required in hard copy because the relevant institution placed additional availability requirements (such as during emergencies or tactical situations). In 2016, the Navigation Safety Advisory Council (NAVSAC) recommended that Coast Guard update its policy on carriage of the Inland Navigation Rules.[12] In 2017, the public requested the same.[13] Recognizing the usability and advantages in cost and space of electronic publications over paper, the Coast Guard is expanding the list of publications allowed to be carried in their equivalent electronic format in lieu of paper to include the Inland Navigation Rules and Vessel Traffic Service Rules.

The Coast Guard is now allowing current electronic editions of the Inland Navigation Rules and Vessel Traffic Service Rules to meet the equivalent carriage requirement to that of current paper copies, provided their respective files are downloaded so as not to require internet connectivity to access them when needed. The Inland Navigation Rules and Vessel Traffic Service Rules are unique among nautical publications required for carriage in that they must be "ready reference." "Inland Rule 1(g)," 33 CFR 83.01(g), requires operators of self-propelled vessels 12 meters or more in length to carry and maintain for ready reference a copy of the Inland Navigation Rules. Section 161.4 of 33 CFR requires that each VTS User shall carry on board and maintain for ready reference a copy of Vessel Traffic Service Rules. Considering new advancements in technology, the Coast Guard now considers most electronic devices to be capable of meeting the "ready reference" time frame by which a ready-reference paper version on board a vessel would be available. To be eligible for the equivalency available under this NVIC, mariners must be able to display ready-reference current electronic editions of the Inland Navigation Rules and Vessel Traffic Service Rules on their electronic device without internet connectivity by a producing a previously downloaded copy.

The Coast Guard sees no significant safety barriers preventing vessels from accessing voyage planning navigational information via the internet on an as-needed basis, versus keeping a publication or extract onboard. Navigation publications primarily used for voyage planning purposes have always been a principal source of information. Mariners research books of tide tables, current tables and local notices to mariners to glean the relevant information for a particular transit. Although such publications have historically been required to be kept onboard a vessel, the Coast Guard has formally recognized that a mariner engaged in voyage planning might not need an entire publication at all times.[14] Additionally, NOAA and the Coast Guard are delivering marine safety information in an updated format, which is now graphical and geographically selectable. Furthermore, the Coast Guard recognizes that the maritime industry has made substantial investments to ensure vessels maintain internet connectivity, even while underway. To encourage the use of electronic voyage planning products, the Coast Guard is allowing vessels to meet the publication requirements of 33 CFR part 164 and reference (b) via internet access.

[11] CG-543 Policy Letter 10-05 canceled and replaced by Navigation and Vessel Inspection Circular 01-16
[12] NAVSAC resolution 16-03.
[13] Comment received to proposed rule: "Evaluation of Existing Coast Guard Regulations, Guidance Documents, Interpretive Documents, and Collections of Information (82 FR 26632)."
[14] 33 CFR part 164 and title 46 allow for an "applicable currently corrected extract."

5. DISCLAIMER. This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is intended to provide operational guidance for Coast Guard personnel and is not intended to nor does it impose legally binding requirements on any party outside the Coast Guard. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other Federal and state regulators, in applying statutory and regulatory requirements. This Circular prescribes no new requirements for the maritime industry. As such, vessel owners and operators may continue using official paper charts and publications in accordance with References (a) and (b) until the relevant regulations therein are amended.

6. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS.

   a. The development of this instruction and the general policies contained within it have been thoroughly reviewed by the originating office in conjunction with the Office of Environmental Management, Commandant (CG-47). This instruction is categorically excluded under current Department of Homeland Security (DHS) categorical exclusion (CATEX) A3 from further environmental analysis in accordance with the Coast Guard Environmental Planning Policy, COMDTINST 5090.1 and the Environmental Planning (EP) Implementing Procedures (IP).

   b. This instruction will not have any of the following: significant cumulative impacts on the human environment; substantial controversy or substantial change to existing environmental conditions; or inconsistencies with any Federal, State, or local laws or administrative determinations relating to the environment. All future specific actions resulting from the general policies in this instruction must be individually evaluated for compliance with the National Environmental Policy Act (NEPA) and Environmental Effects Abroad of Major Federal Actions, Executive Order 12114, Department of Homeland Security (DHS) NEPA policy, Coast Guard Environmental Planning policy, and compliance with all other applicable environmental mandates.

7. DISTRIBUTION. No paper distribution will be made of the Circular. An electronic version will be located on the following Commandant web sites; Internet: https://www.dco.uscg.mil/Our-Organization/NVIC/, and CGPortal: https://cgportal2.uscg.mil/library/directives/SitePages/Home.aspx.

8. RECORDS MANAGEMENT CONSIDERATIONS. This Circular has been thoroughly reviewed during the directives clearance process, and it has been determined there are no further records scheduling requirements, in accordance with Federal Records Act, 44 U.S.C. Chapter 31, NARA requirements, and Information and Life Cycle Management Manual, COMDTINST M5212.12 (series). This policy does not have any significant or substantial change to existing records management requirements.

9. FORMS/REPORTS. None.

10. REQUEST FOR CHANGES. Submit recommended changes or questions regarding this guidance to Coast Guard Headquarters, Office of Navigation Systems (CG-NAV-2), using the contact information provided in the above letterhead.

R. V. TIMME
Rear Admiral, U.S. Coast Guard
Assistant Commandant for Prevention Policy

Encl: (1) Equivalency determination for "Marine Charts," "Charts," or "Maps;" "Publications;" and navigation functions
(2) Guidelines for inspecting and using electronic charts and publications

EQUIVALENCY DETERMINATION FOR "MARINE CHARTS," "CHARTS," OR "MAPS;" "PUBLICATIONS;" AND NAVIGATION FUNCTIONS

This guidance applies to U.S. vessels subject to U.S. chart (or map), publication and electronic position fixing device carriage requirements who choose the voluntary equivalency announced in this Circular. Vessels may continue to comply with carriage requirements using official paper charts, maps, publications and electronic position fixing devices as required by titles 33 and 46 of the CFR. This guidance provides a chart equivalency only for domestic requirements and does not provide a chart equivalency for requirements contained in the International Convention for the Safety of Life at Sea, 1974 (SOLAS) or for the purposes of SOLAS certificates. It does, however, provide navigation publication equivalency for all U.S. vessels to meet domestic publication requirements.

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. Mariners are responsible to safely navigate and follow applicable regulatory requirements. To be eligible for the electronic charts and publications equivalency available under this NVIC, mariners must meet the following requirements:

A. Electronic Navigational Charts.

1. For the purposes of this policy, "marine charts," "charts," or "maps" as required by titles 33 and 46 of the CFR, can be data that conforms to the International Hydrographic Organization's definition of an Electronic Navigational Chart (ENC), issued by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution. Furthermore, "marine charts," "charts," or "maps" can be data that conforms to the Inland ENC Harmonization Group (IEHG) standard (e.g. Inland Electronic Navigational Chart [IENC]) and meets the issuing criteria detailed above. ENC and IENC are henceforward referred to, generically, as ENC for the ease of reading.

2. ENCs must be of the area to be transited, displayed in a large enough scale, and portray enough detail to make safe navigation of the area possible. The ENC, and all updates to it, must be displayed without any degradation of their information content according to the relevant chart content and display standard, as specified by the issuing authority.[1] ENCs used shall be the latest version reasonably available, including the latest update. All downloaded ENC data intended for portrayal must be displayable.[2] New features provided by the relevant charting authority must be displayable within 1 year of adoption. Upon demand, the display system shall indicate the issuing authority, cell name, edition, and

[1] For ENCs the relevant standard is IHO S-52 – Specifications for Chart Content and Display Aspects of ECDIS. For IENCs the relevant standard is IHO S-52 and IEHG Inland ECDIS Standard (series). Where content display standards are not specified, manufactures are still responsible to portray the features.
[2] Manufacturers can ensure their systems display all data by testing their product to the appropriate test set(s). IHO S-64 – IHO Test Data Sets for ECDIS and/or the USACE IENC Standard Exchange Set (series).

associated update(s) of an ENC.[3]

B. ENC Display. ENCs must be displayed on a system sufficient for the intended voyage.

1. If any part of the vessel's intended voyage is seaward of the territorial sea baseline (as defined by 33 CFR 2.20), then the display system must be tested against and meet the International Electrotechnical Committee's Maritime Navigation and Radiocommunication Equipment and Systems Standard (IEC 60945) or be a Radio Technical Commission for Maritime Services Electronic Chart System.

2. Vessels that operate solely inside the territorial sea baseline may display ENCs on a system of their choice so long as it displays the ENC in a large enough scale and portrays enough detail to make safe navigation of the area possible.

C. Navigation Functions. Position information that is integrated into an ENC display is equivalent to the fixing and plotting requirements in title 33 of the CFR.

1. Position updates must be real-time (delivered less than every 2 seconds), sound (8 - 20 meter accuracy) and a minimum resolution of 0.001 minutes.[4]

2. Devices dependent on cellular connection are not acceptable.

D. Electronic Publications and Rules. "Publications," as required by the International Convention for the Safety of Life at Sea Chapter V Regulation 27 and title 33 sections 83.01, 161.4, 164.33, and 164.72 and title 46 of the CFR, can be kept in electronic format so long as the information is provided by the originating agency, is the latest version, including the latest update reasonably available. Additionally, the Inland Navigation Rules and applicable Vessel Traffic Service Rules must be available for "ready reference."[5] This equivalency does not apply to publications with a "hard-copy" requirement.[6]

[3] NOAA charts can be checked at: https://nauticalcharts.noaa.gov/charts/noaa-enc.html. USACE charts at: http://ienccloud.us/.
[4] Description derived from the Federal Radionavigation Plan (most recent edition), IMO Resolution MSC.112(73) and IEC 61108-1. Position information may not come from cellular tower triangulations.
[5] For the purposes of this policy, "ready reference" means able to display ready reference, current electronic editions of the Inland Navigation Rules and Vessel Traffic Service Rules on their electronic device without internet connectivity by a producing a previously downloaded copy.
[6] IMO Maritime Safety Committee and Marine Environment Protection Committee MSC-MEPC.2/Circ.2 – IMO requirements on carriage of publications on-board ships.

GUIDELINES FOR INSPECTING AND USING ELECTRONIC CHARTS AND PUBLICATIONS

This guidance applies to U.S. vessels subject to U.S. chart (or map) publication and electronic position fixing device carriage requirements who choose the voluntary equivalency announced in this Circular. Vessels may continue to comply with carriage requirements using official paper charts, maps, publications and electronic position fixing devices as required by titles 33 and 46 of the Code of Federal Regulations (CFR). This guidance provides a chart equivalency only for domestic requirements and does not provide a chart equivalency for requirements contained in the International Convention for the Safety of Life at Sea, 1974 (SOLAS) or for the purposes of SOLAS certificates. However, it does provide navigation publication equivalency for all U.S. vessels.

A. Electronic Navigational Charts. As detailed in Enclosure (1) of this Circular, "marine charts," "charts," or "maps" as required by titles 33 and 46 of the CFR, can be a displayed Electronic Navigational Chart (ENC) or Inland Electronic Navigational Chart (IENC) issued by or on the authority of a Government, authorized Hydrographic Office or other relevant government institution.[1]

1. Marine inspectors can determine whether or not a chart is an ENC by the same means used to validate the authenticity of a paper chart (e.g. issuing authority, edition, latest update, and visual inspection). For familiarization, National Oceanic and Atmospheric Administration (NOAA) NOAA ENCs ® and U. S. Army Corps of Engineers (USACE) IENCs can be viewed online.[2] However, as a caution, the chart viewers may not portray all features using the full presentation library. Viewing NOAA and USACE ENCs on the agency's provided viewer should be used to guide a general sense of an authentic ENC, not an exact portrayal.

2. Like official paper charts, ENCs have edition numbers and are updated as necessary. ENC updates may be called various names such as "revisions." When a current edition is combined with its associated revisions, they make a complete, updated ENC database. Issuance of a new edition supersedes all previous editions and associated revisions. Mariners should produce evidence that ENCs are the latest reasonably available edition and revision. Marine inspectors should familiarize themselves with NOAA and USACE's latest ENC editions and revisions prior to commencing inspections.

B. ENC Display. An ENC cannot be equivalent to a paper chart unless the information can be viewed. ENCs on a portable storage device without a display system are insufficient. The Coast Guard considers a reliable display, sufficient for the voyage, necessary for safe navigation.

[1] ENC and IENC are henceforward referred to generically as ENC for ease of reading.
[2] Currently, NOAA ENCs can be viewed at https://nauticalcharts.noaa.gov/charts/noaa-enc.html. USACE ENCs can be viewed at http://ienccloud.us/. These links may change as NOAA and USACE update their ENC processes.

1. As outlined in Enclosure (1), the ENC data intended for portrayal must be displayable. The purpose of this is to ensure that the system has the ability to show all the features provided by the issuing authority. Display system manufacturers should provide means for the user to ascertain that their ENC and display system meets the latest standards. Display system manufacturers are encouraged to inform their customers when changes have occurred and develop appropriate procedures for updating. Display system manufacturers are the usual entity for conducting tests on data set(s) to ensure the ENC data are displayable.

2. Marine inspectors can determine whether or not a display system (e.g. Electronic Chart Display and Information System [ECDIS]) can display all features by reviewing the system type-approval documentation or a manufacturer's declaration of conformity, which clearly states that the display system was tested against the appropriate test data set(s). Display systems should be tested prior to market release and re-tested after new chart features are adopted by the charting authority. Systems that fail to display features, including new features within 1 year of adoption, will no longer meet the chart equivalency.

3. Since the ENC is being displayed on a computer, marine inspectors should determine if the display system itself is being maintained and up-to-date with manufacturer's specifications. Many display systems will present a single screen with easily accessible "dashboard" information (e.g. chart information and status, notices to mariners applied and date, list of standards the system conforms to, last software update, and system check indicating if the hardware meets the minimum performance requirements of the software).

4. One way to ensure display systems are operating correctly, displaying all relevant features and continuing to be an equivalent to paper charts is for manufacturers and users to maintain communication through the display system's service life. Users are encouraged to be aware of the latest information and updates available from their ENC authority and display system manufacturer. As an added layer of confidence for ECDIS users, vessel owners and operators can validate their system using a check data set.[3] Likewise, manufactures are encouraged to track their display units and the software/hardware versions in use. When updates are available, manufacturers should contact their users in order to encourage them to update their systems.

5. Manufacturers should provide certainty to users as to the authenticity of updates.

6. While the Coast Guard does not mandate a specific screen size, marine inspectors should consider whether or not the size shows enough detail in a large enough scale to make safe navigation possible. Those that fail to do so should be declared not equivalent.

[3] Check data set and instructions are available at: https://iho.int/en/enc-data-protection

7. As outlined in Enclosure (1), vessels that transit outside the territorial sea baseline[4] must display ENCs on a system appropriate for the environment. Currently, we are aware of one standard that sufficiently tests equipment to the likely conditions: International Electrotechnical Committee's Maritime Navigation and Radiocommunication Equipment and Systems Standard (IEC 60945). Additionally, we are aware of three display systems that meet both the ENC requirements and hardware requirements required by Enclosure (1). They are an ECDIS,[5] a Chart Radar,[6] and a Radio Technical Commission for Maritime Services (RTCM) Electronic Chart System (ECS).[7]

    a. For those areas where the territorial sea baseline is not depicted on charts (e.g. Great Lakes, Puget Sound and others), Officers in Charge of Marine Inspections (OCMIs) should define a line for the purposes of this policy. OCMIs should compare the area in question to similar bodies of water where territorial sea baselines are defined. As a guiding principle, waters outside the baseline have greater environmental risks and/or there are limited visual aids to navigation.

    b. OCMI's who establish lines of applicability should make that determination known to respective vessel owners and/or operators. Vessel owners and/or operators should coordinate with their OCMIs to understand the expected requirements prior to making capital investments in charting systems.

    c. Marine inspectors should expect chart display systems that meet IEC 60945 to be type-approved (e.g. ECDIS or chart radar) or be shown a manufacturer's declaration of conformity which clearly states that the device meets the RTCM's ECS standard.

8. IEC 60945 is the internationally recognized equipment standard for maritime navigation systems. IEC 60945 tested chart displays give users confidence in the system's durability in the maritime environment and compatibility with other bridge equipment. However, the Coast Guard recognizes that equipment tested to this standard may not be necessary for safe operations inside the territorial sea baseline. This does not diminish the fact that displays subjected to testing are a proven way to ensure durability and compatibility.

C. Incorporated Information. An ENC display system is most functional for navigational safety when used as a collection point of navigational information. The Coast Guard recommends interfacing installed navigation sensors to decrease operator distraction and enhance safety.

[4] 33 CFR 2.20.
[5] IEC 61174 (series).
[6] Chart Radar that meets the IEC 60936-3 (series).
[7] Radio Technical Commission for Maritime Services Standard 10900 series for Electronic Chart Systems.

1. Type-approved electronic position-fixing devices (EPFD)[8] provide the best position information. Vessels that are not required to carry a type-approved EPFD, but desire to take advantage of the equivalency announced in Enclosure (1) must use a device that can, at a minimum, meet the requirements outlined therein.

2. Marine inspectors should ensure position sensor data comes from a type-approved EPFD, a type-approved Automatic Identification System or a position sensor covered by a manufacturer's declaration of conformity which clearly states that the device's data meets requirements contained in Enclosure (1).

3. Vessel operators should be aware of the significant limitations associated with use of non-type-approved EPFDs. Some devices will not alarm when position data is lost or an updated position has not been calculated within a set reoccurrence. Others will not alarm when the suitability of the constellation in view of the receiver is questionable. Still others will not autonomously monitor the integrity of the position information. These devices will not notify the user when the device fails to provide availability, or acquire and track sufficient satellites.

D. Back-up Arrangement.

1. The Coast Guard recommends vessel owners and operators address procedures for a loss of charts, display systems and/or publications in a Safety Management System (SMS). The Coast Guard further encourages an independent back-up arrangement when using ENCs.

2. Such arrangement could be a secondary system that meets the equivalency or a full folio of currently corrected paper charts. If the back-up arrangement is an additional ENC display, then mariners should consider interfacing it with the same navigation equipment as the primary system. The goal would be to provide a seamless transition of navigation information in the event of a failure.

3. If a vessel chooses to use an SMS, marine inspectors should verify that loss procedures are addressed in it. Further, marine inspectors should check for evidence of successful implementation of those procedures. Marine inspectors should work with Third Party Organizations to address SMS procedures or implementation deficiencies.

E. Training. The Coast Guard considers the principles of marine navigation fundamentally unchanged even when enhancing such practices with electronic tools. However, there are critical navigation and system functions that mariners should understand prior to navigating with ENCs. The International Maritime Organization

[8] Such as a Coast Guard type-approved Global Positioning System (GPS) or Global Orbiting Navigation Satellite Systems (GLONASS), see 33 CRF 164.41.

developed a Model Course that trains mariners in the effective use of these tools.[9] Marine inspectors should review documentation as outlined below.

1. Marine inspectors and mariners are reminded that in order to use an ECDIS while in charge of a navigational watch, when serving on a vessel to which the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers, 1978, as amended (STCW) applies, they must possess an appropriate STCW endorsement without an ECDIS limitation.

2. The Coast Guard has reviewed an RTCM class 'A' ECS and considers it to function similarly to an ECDIS. Therefore, those in charge of a navigational watch using an RTCM 'A' ECS are encouraged to possess either a successful completion certificate from a Coast Guard approved ECDIS course or the appropriate STCW endorsement without an ECDIS limitation.

3. For all other ENC display systems, as an alternative to an approved ECDIS course, several training topics from the Model Course could be applied. The most germane topics include, but are not limited to—

    a. Display System Performance Standards
    b. ENC Data
    c. Sensors
    d. Basic navigation functions
    e. Specific functions for route planning and monitoring (as fitted):
        i. Data updating;
        ii. Presentation and display and errors;
        iii. Display and function of other navigational information;
        iv. Errors in displayed data;
        v. Errors in interpretation;
        vi. Status indications, indicators and alarms; and
        vii. Understanding the risk of over-reliance on ENCs and display systems.

4. Mariners are reminded to complete the required familiarization training with installed equipment prior to use in accordance with 46 CFR15.405.

F. Electronic Publications and Rules. Navigation publications and rules required by 33 CFR 83.01, 161.4, 164.33, and 164.72, title 46 of the CFR (various sections) and SOLAS Chapter V Regulation 27 may be kept in electronic format. Those publications are listed in Table F-1 below.

[9] Model Course 1.27, Operational Use of Electronic Chart Display and Information Systems (ECDIS) series

Table F-1: Electronic Publication Inspection Guide

Publication / Rules	**Originator**	**Update Periodicity**	**Accessibility**
Inland Navigation Rules	USCG	No set periodicity	Ready reference.
Vessel Traffic Service Rules	USCG	No set periodicity	Ready reference.
Coast Guard Light List	USCG	Updated Weekly; Annual Edition	Accessible
Local Notice to Mariners	USCG	Updated Weekly	Accessible
U.S. Coast Pilot®	NOAA	Updated Weekly; Annual Edition	Accessible
Tide Tables	NOAA	Updated Quarterly; Annual Edition	Accessible
Tidal Current Tables	NOAA	Updated Quarterly; Annual Edition	Accessible
Notice to Mariners	NGA	Updated Weekly	Accessible
Sailing Directions	NGA	No set periodicity	Accessible
List of Lights	NGA	Updated Monthly; Annual Edition	Accessible
Notices to Navigation	USACE	Updated Weekly	Accessible
river current tables	River Authority	No set periodicity	Accessible

1. Electronic publications must be accessible and certain publications must be available for "ready reference." First, Coast Guard marine inspectors and boarding officers should ascertain how the mariner is accessing the publication (downloaded e-copy, cellular connection, wi-fi booster, satellite internet, etc.). Publications required to be "accessible," as outlined in Table F-1, which are chosen to be carried and displayed only via internet connectivty, should be available anytime. For example, a vessel whose operating area goes beyond coastal cellular coverage would not be able to rely solely on a cellular connectivity solution for equivalency under this NVIC, but would be required to demonstrate some additional form of connectivity (probably satellite based) whose coverage area supports the vessel's full operating area.[10] Next, marine inspectors should evaluate accessibility by determining whether or not bridge personel or operators have access without being detracted from normal underway duties. If these conditions can not be met, then the electronic information may not be considered "accessible." For publications stored or accessed electronically and

[10] Depending on a vessel's heading, masts or other topside obstructions may block antennas from receiving signal. Additionally, connectivity may be intermittent or unavailable for short durations of a voyage. This temporary unavailability may not interfere with voyage planning activities, but even brief periods of unavailability could result in an unacceptable delay in displaying the Inland Navigation Rules and Vessel Traffic Service Rules, that are required to be ready reference.

which must be available for ready reference, the publications must be previously downloaded to an electronic device so that internet access is not required to access it. Mariners should provide evidence that they can view information at the time of inspection or boarding and for the areas they intend to transit.

2. Marine inspectors and boarding officers should ensure operators are displaying official agency information by familiarizing themselves with the content of required publications and rules. Agency web pages are prime sources for content familiarization.[11]

G. Cyber Risk Management Considerations.

1. Cyber dependent technologies have become the backbone of vessel operation and management. Numerous systems, critical to safety and security, depend on these technologies. The increasing level of interconnectivity of electronic navigation equipment brings substantial benefits to the mariner, but also introduces new types of risk. Although highly reliable, electronic navigation systems, like other types of electronics, are subject to technical failure and malfunction. As vessels are increasingly networked, and dependent on external inputs including EPFD signals and software updates, they are also subject to cyber related failures or exploitation.

2. Risk management is fundamental to operations in the maritime industry. The increased reliance on cyber dependent systems has created a need for cyber risk management to be implemented in a holistic and widespread manner, much in the same way that mariners assess and mitigate physical risks during all aspects of vessel operations. The Coast Guard recommends that both electronic navigation equipment manufacturers and vessel operators consider their cyber risks and develop cyber risk management processes that are incorporated into the existing operational routine. The International Maritime Organization Maritime Safety Committee Circular 1526 "Interim Guidelines for Maritime Cyber Risk Management" contains recommended actions and procedures for managing cyber related risks.[12] Additionally information is also available on the Coast Guard's Homeport page under the "Cybersecurity" mission sub-section.[13]

[11] Coast Guard Navigation Center (www.navcen.uscg.gov); NOAA (https://tidesandcurrents.noaa.gov/tide_predictions.html) and (https://tidesandcurrents.noaa.gov/noaacurrents/Regions); NGA (https://msi.nga.mil/NGAPortal/MSI.portal?_nfpb=true&_pageLabel=msi_portal_page_62&pubCode=0010); and USACE (https://corpslocks.usace.army.mil/lpwb/f?p=150).

[12] The MSC.1 Cir 1526 can be found at: http://www.imo.org/en/OurWork/Security/Guide_to_Maritime_Security/Documents/MSC.1-CIRC.1526(E).pdf

[13] https://homeport.uscg.mil/missions/cybersecurity/cyber-information