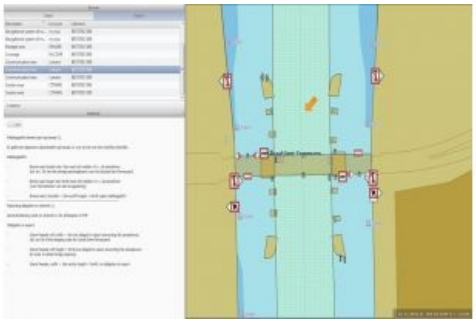
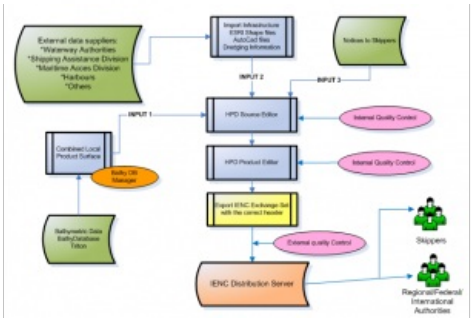
INLAND ELECTRONIC NAVIGATIONAL CHARTS PRODUCED BY FLEMISH HYDROGRAPHY

IENCs in Flanders





Safety of navigation on inland waterways is as important as in maritime waters. To guarantee this, Electronic Navigational Charts (ENCs) have now been produced for several years. As inland waterways have specific features and regulations different from the maritime area, the use of ENCs is not sufficient. International standards have been developed specifically for Inland ENCs, which contain chart information required for safe navigation on inland waterways and in mixed traffic zones.

These navigational charts are extremely important as they cover not only the maritime navigation zone, but also the adjacent inland waterways in Flanders which have not been mapped on nautical charts before.

European Regulations

As opposed to maritime navigation, which is governed by the worldwide regulations of the International Maritime Organisation (IMO), the navigation on inland waterways is regionally regulated. In Europe, it is regulated by the European Code for Inland Waterways (CEVNI) of the United Nations.

In order to support inland waterway transport the European Directive 2005/44/EC of 7 September 2005, also known as the RIS Directive, establishes a framework for the development and use of harmonised River Information Services (RIS). This Directive provides a framework for the establishment and further development of technical requirements, specifications and conditions to ensure harmonised, interoperable, and open RIS on the European inland waterways.

The same Directive obliges authorities to make official digital charts available for waterways of class Va (UNECE, 1998) and above, including the ports on such waterways. The commissioning bodies provide all the data that are to be charted by the Flemish Hydrography as Inland ENCs.

Definition of IENC

A detailed definition of Inland ENC has been elaborated by the Inland ENC Harmonization Group (IEHG, 2007):

'The database, standardised as to content, structure and format, for use with inland electronic chart display and / or information systems operated on board of vessels transiting inland waterways.

An IENC is issued by or on the authority of a competent government agency, and conforms to standards initially developed by the International Hydrographic Organization (IHO) and refined by the Inland ENC Harmonization Group.

An IENC contains all the chart information necessary for safe navigation on inland waterways and may contain supplementary information in addition to that contained in the paper chart (e.g. sailing directions, machine-readable operating schedules, etc.) which may be considered necessary for safe navigation and voyage planning. [IENC Encoding Guide, Edition 2.2, Feb 2010]'

Features and Attributes

Inland ENCs have to cover the specific features of the inland waterways. They contain a lot more details about bridges and locks for instance, than a maritime ENC. Buoys, traffic signs and other features that are specific to inland navigation are also charted.

IENCs are also produced for the so-called mixed traffic zones in which not only inland navigation but also maritime navigation occurs. In Flanders, the channel Ghent-Terneuzen and the Scheldt are defined as mixed traffic zones.

To ensure a common understanding and the same encoding in different areas, a very detailed Encoding Guide for Inland ENCS (IEHG, 2011(b)) has been established.

Inland ENCs are compiled for a variety of navigational purposes, the so-called usages. For maritime ENCs, S-57 defines 6 usages: Overview, General, Coastal, Approach, Harbour and Berthing. Additionally 4 usages specifically related to Inland ENCs have been defined: River, River harbour, River berthing and Overlay.

Inland ENCs are displayed on board ships using an Inland ECDIS system.

Compiled IENCS

Since 2010, Flemish Hydrography produces Inland ENCs in Flanders, Belgium. As the already existing production of maritime ENCs with the CARIS Hydrographic Production Database (HPD) software met the requirements, it was obvious to choose the same software and database. After a successful test period an integrated system for all existing chart products within the FlemishHydrography was established.

During the test period, an important decision to be made was to determine whether the S-57 objects in the HPD source database, used for ENC production, could be the same objects as used in the IENC production. HPD has the principle of one source, multiple products, so in theory this was possible. The advantage would be that an object, such as a buoy, could be updated once in the source and can then be used on both the ENC and IENC.

The same physical buoy that is, for example, shown on an ENC of Antwerp, is also shown on the IENC of Antwerp, but it might have some extra attributes on the IENC and its feature acronym could be lower case instead of uppercase. So there are some differences, however, it was found that it was technically possible to indeed store the buoy once in HPD, using mapping files within HPD.

Specific Data for Different Users

However, in the end it was decided that in the case of Flemish Hydrography it would actually be easier to maintain the source data on separate usages in HPD. This means that there are two copies of the same buoy stored in the source database. One reason for this is organisational, as different people are responsible for the ENC data and the IENC data. Another reason was that after closer inspection there were too many changes between ENCs and IENCs, as there were different users of both types of products. For example, a quay that would be shown in detail on an IENC would be shown as a simple line on an ENC.

The Flemish Hydrography uses the Inland ECDIS Standard 2.3 (IEHG, 2011(a)). All compiled Inland ENCs are on usage 7, River, and meant to navigate the inland waterways. The used compilation scale is 1/10000.

The total area that has been charted is approximately 640km². This area is divided into 7 separate Inland ENCs to be able to comply with the maximum recommended size of each individual cell of 5MB (see Figure 1).

Only IENC 3 and 7 are typical Inland ENCs, charting inland canals. All the others are situated in mixed areas where inland navigation and maritime navigation occur simultaneously. IENCs 2 and 6 include respectively the harbour Zeebrugge and Ostend with the adjacent 5-miles zone of the Belgian Continental Shelf where inland vessels and coasters have to navigate in order to move from one harbour to another. In these areas, IENC and ENC co-exist.

The Inland charts are produced on the authority of the Shipping Assistance Division of the Agency for Maritime and Coastal Services and on the authority of the Ports of Ghent, Zeebrugge and Ostend.

Practical Example

Figure 2 below, for example, shows details of the Inland ENC Channel Ghent-Terneuzen . The charted area of the entire Inland ENC is approximately 56km². One of the most important objects to be mapped on this channel is the bridge at Zelzate. A lot of metadata is linked to this object. The detail below shows the information concerning the ’Communication Area’ which is defined nearby this bridge. The additional information is given at the bottom left (inspector window).

Compilation Workflow

The data for the production of IENCs comes from different sources. Bathymetrical survey data is stored and managed in a gridded format in the CARIS Bathy Database Suite. The bathymetry is then exported to an S-57 vector format.

The (maritime) infrastructure is mainly furnished by waterway authorities, shipping assistance and maritime access services and harbours. Data is usually delivered in the form of ESRI Shape or AutoCAD vector formats and imported in the CARIS HPD where it is stored in an S-57 vector format and combined with the bathymetry.

HPD is a database-driven solution, based upon Oracle, which consists of different components. In the HPD Source Editor all hydrographic vector information is stored, managed, validated and verified. The data is stored on different usages, corresponding to different generalisation levels of the cartographic products. Verified data is used in the HPD Product Editors, for the creation of Paper Charts, ENCs and Inland ENCs.

Like ENCs, Inland ENCs are exported from HPD in S-57 format and put into a so-called Exchange Set. After an external quality control using software of TRESCO, SevenCs and Periskal, the Inland ENCs are placed on the River Information Services Portal from which they can be downloaded to be used on board ships.

Internal as well as external quality control is based upon the IHO Standard S-58, Ed. 4.2 *Recommended ENC Validation Checks* and the *Product Specification for Inland ENCs Edition 2.3*.

The workflow is shown in Figure 3.

Availability and Use

The Inland ENCs are intended for any inland vessels that travel in the areas shown in Figure 1 and have an Inland ECDIS system on board. The Inland ENCs are free of charge and can be downloaded through the Flemish RIS portal.

Additionally, the charts made on the authority of the ports can be downloaded through their own websites.

Conclusion

The Flemish Hydrography has been able to set up an efficient Inland ENC Production unit using the CARIS HPD software, creating Inland ENCs according to the European Regulations. The use of these Inland ENCs will hopefully increase the safety on inland waterways in Flanders.

More Information

- IEHG, 2007. Inland ENC Harmonization Group. http://ienc.openecdis.org.
- IHO, 2010. S-100 Universal Hydrographic Data Model. 1.0.0th edition, January 2010. .
- IHO, 2000. S-57 IHO Transfer Standard for Digital Hydrographic data. 3.1th edition, November 2000.
- IEHG, 2011(a). Inland ECDIS Standard 2.3. Draft.
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