ANNEX 1
PRODUCT SPECIFICATION FOR INLAND ENCS, EDITION 2.5

TABLE OF CONTENTS

1. Introduction

Inland Electronic Navigational Chart (IENC) means the database, standardized as to content, structure and format, for use with inland electronic chart display and / or information systems operated onboard of vessels transiting inland waterways. An IENC is issued by or on the authority of a competent government agency, and conforms to standards 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.

This Product Specification for Inland ENC (IENC) is a set of specifications intended to enable ENC manufacturers to produce consistent IENC, and to use data efficiently in applications. An IENC shall be produced in accordance with the regulations defined in:

- this Product Specification for Inland ENC,
- the Feature Catalogue for Inland ENC,
- the Encoding Guide for Inland ENCs.

The numbering correlates to the ENC Product Specification, S-57 Appendix B.1, Edition 2.0.

2. General Information

2.1 Navigational purpose (usage)

IENC data is compiled for a variety of navigational purposes. The navigational purpose for which an individual IENC has been compiled is indicated in the “Data Set Identification” [DSID] field, “Intended Usage” [INTU] subfield and in the name of the data set files. The following codes are used:

Nr.	Navigational purpose (usage)	Intended use
1 S57	Overview	For route planning and oceanic crossing.
2 S57	General	For navigating oceans, approaching coasts and route planning.
3 S57	Coastal	For navigating along the coastline, either inshore or offshore.
4 S57	Approach	Navigating the approaches to ports or mayor channels or through intricate or congested waters.
5 S57	Harbour	Navigating within ports, harbours, bays, rivers and canals, for anchorages.
6 S57	Berthing	Detailed data to aid berthing.
7 (new)	River	Navigating the inland waterways (skin cell).
8 (new)	River harbour	Navigating within ports and harbours on inland waterways (skin cell).
9 (new)	River berthing	Detailed data to aid berthing manoeuvring in inland navigation (skin cell).
A (new)	Overlay	Overlay cell to be displayed in conjunction with skin cells

The navigational purposes 1 to 8 and A may be used by authorities as well as private bodies. Navigational purpose 9 should be used by private bodies only.

It is allowed to assign a range of usages to overlay cells (see clause 5.6.3).

Overlay cells may not contain skin-of-the-earth features (see clause 3.10).

2.2 Cells

In order to facilitate the efficient processing of ENC data the geographic coverage of a given usage must be split into cells. Each cell of data must be contained in a physically separate, uniquely identified file on the transfer medium, known as a data set file (see clauses 5.4 and 5.6.3).

The geographic extent of the cell must be chosen by the ENC producer to ensure that the resulting data set file contains no more than 5 Megabytes of data. Subject to this consideration, the cell size must not be too small in order to avoid the creation of an excessive number of cells.

The coordinates of the borders of the cell are encoded in decimal degrees in the “Catalogue Directory” [CATD] field.

Point or line feature objects which are at the border of two cells with the same navigational purpose must be part of only one cell. They are put in the south or west cell (i.e. north and east borders of the cell are part of the cell, south and west borders are not).

When a feature object exists in several cells its geometry must be split at the cell boundaries and its complete attribute description must be repeated in each cell.

In IENC, skin-of-the-earth features (group 1) within two overlapping cells with the same navigational purpose must not overlap. Features of overlay cells (always group 2) are allowed to overlap other features in other cells.

The minimum size of coverage at both sides of the waterway should be outside the radar coverage.

2.3 Topology

ENC data must be encoded using chain-node topology (see S-57 Part 2, clause 2.2.1.2).

3. Features and attributes

3.1 Feature object identifiers

Each feature object must have a unique world-wide identifier. This identifier, called the feature object identifier, is formed by the binary concatenation of the contents of the subfields of the “Feature Object Identifier” [FOID] field.

For IENC the feature object identifier may be used to identify multiple instances of the same feature. For example, the same feature may appear in different usages, or an feature may be split by the cell structure. In these circumstances each instance of this feature may have the same identifier. Feature object identifiers must not be reused, even when a feature has been deleted.

3.2 Standard features and attributes

Only features, attributes and enumerations which are defined in the IENC Feature Catalogue at http://ienc.openecdis.org may be used in an IENC.

3.3 Features permitted for use in IENC and their geometric primitives

The geometric primitives of the features permitted for use in IENC can be found in the Encoding Guide for Inland ENCs.

3.4 Meta features

The maximum use must be made of meta features to reduce the attribution on individual features. In a base data set (EN Application profile, see clause 6.3), some meta features are mandatory (see Encoding Guide for Inland ENCs).

3.5 Geo and meta feature attributes

3.5.1 Missing enumerations

In a base data set (EN application profile), when an attribute code is present but the enumeration is missing, it means that the producer wishes to indicate that this enumeration is unknown.

In a revision data set (ER application profile), when an attribute code is present but the enumeration is missing it means:

- that the enumeration of this attribute is to be replaced by an unknown enumeration if it was present in the original data set,
- that an unknown enumeration is to be inserted if the attribute was not present in the original data set.

In both cases the missing enumeration is encoded by the means described in S-57 Part 3, clause 2.1.

3.5.2 Mandatory attributes

For mandatory attributes of features see Encoding Guide for Inland ENCs.

3.5.3 Prohibited attributes

not applicable.

3.5.4 Numeric enumerations

Floating point or integer enumerations must not be padded by non-significant zeroes.

E.g.: For a signal period of 2.5 sec, the enumeration of SIGPER must be 2.5 and not 02.500.

3.5.5 Text enumerations

The lexical level used for the “Feature Record Attribute” [ATTF] field must be 1 (ISO 8859-1). Lexical level 1 or 2 may be used for the “Feature Record National Attribute” [NATF] field. Format effecting (C0) characters as defined in S-57 Part 3, Annex B are prohibited. The delete character is only used in the update mechanism (see S-57 part 3, clause 8.4.2.2.a and 8.4.3.2.a).

3.5.6 Hierarchy of meta data

The following table indicates:

- individual attributes that supersede meta feature attributes,
- meta feature attributes that supersede the data set subfields (see clauses 6.3.2 and 6.4.2).

Field	Subfield	Meta feature class	Meta feature attribute	Geo or spatial feature attribute
DSPM	VDAT	m_vdat	Verdat	verdat
DSPM	SDAT	m_sdat	Verdat	verdat
		m_nsys	Marsys	marsys
		M_QUAL	CATZOC	POSACC, SOUACC and TECSOU
		M_QUAL	SOUACC	SOUACC
		M_QUAL	POSACC	POSACC
		M_SREL	QUASOU	QUASOU
		M_SREL	SURATH	SORIND
		M_SREL	SUREND	SORDAT
		M_SREL	SURSTA	SORDAT
		M_SREL	TECSOU	TECSOU
		M_ACCY	POSACC	POSACC
		M_ACCY	SOUACC	SOUACC
		M_ACCY	VERACC	VERACC
		M_ACCY	HORACC	HORACC
		M_ACCY	CATTEV	CATTEV

When there is no meta feature attribute, an individual attribute can supersede a data set subfield.

It is prohibited to use an attribute on an individual feature, if this attribute has the same enumeration as the general enumeration defined by the meta feature or the equivalent data set subfield.

It is prohibited to use a meta feature, if the information given by this meta feature is the same as the enumeration given by the equivalent data set subfield.

3.6 Cartographic features

not applicable.

3.7 Time varying features

The IENC may contain information about magnetic variation, tides, tidal streams and currents. The IENC may contain time independent depth information in accordance with the Encoding Guide for Inland ENCs.

3.8 Geometry

Edges must be encoded using SG2D fields only. ARCC fields (curves) must not be used.

Despite the saving in data volume offered by the use of arcs/curves, the disadvantages are such (e.g. during updating, generating warnings/alarms) that they must not be used for IENC.

Linear features must not be encoded at a point density greater than 0.3 mm at compilation scale.

The presentation of symbolised lines may be affected by line length. Therefore, the encoder must be aware that splitting a line into numerous small edges may result in poor symbolisation.

In certain circumstances, the symbolisation of an edge may need to be suppressed. This is done using the value {1} in the “Masking Indicator” [MASK] subfield of the “Feature Record to Spatial Record Pointer” [FSPT] field. If the value in the “Usage Indicator” [USAG] subfield is set to {3} (exterior boundary truncated by the data limit), the MASK subfield must be set to {255} (null), in all other cases it must set to {2}.

3.9 Relationships

There are two ways to define relationships between features:

- nominated master feature record,
- collection features of classes “aggregation” (C_AGGR), or “association” (C_ASSO).

The use of the Catalogue Cross Reference record is prohibited.

All hierarchical relationships (master to slave) must be encoded by using a nominated “master” feature record carrying the pointers to the “slave” features in the “Relationship Indicator” [RIND] subfield in the “Feature Record to Feature Object Pointer” [FFPT] field with the value {2} = slave.

All association or aggregation relationships using collection features are assumed to be peer to peer. The “Relationship Indicator” [RIND] subfield of these collection feature records must be {3} = peer.

The use of these relationships is described in the Encoding Guide for Inland ENCs.

3.10 Groups

There are two groups defined for IENC. These are Group 1 (skin of the earth) and Group 2 for all other geo feature objects.

The group number is indicated in the “Group” [GRUP] subfield of the “Feature Record Identifier” [FRID] field.

3.10.1 Group 1 (skin of the earth)

Each area covered by a meta feature M_COVR with CATCOV = 1 must be totally covered by a set of geo features of type area that do not overlap each other (the skin of the earth).

These features make up Group 1.

The list below contains the features that must always be in Group 1, if they appear in the dataset and if they are of type area.

DEPARE, depare, DRGARE, FLODOC, HULKES, LNDARE, PONTON, UNSARE;

flodoc, hulkes and ponton are not Group 1 features.

3.10.2 Group 2 (all other features)

All feature objects which are not in Group 1 are in Group 2.

3.11 Language and alphabet

3.11.1 Language

See Encoding Guide for Inland ENCs.

3.11.2 Use of lexical level 2

If the national language cannot be expressed in lexical levels 0 or 1, the following rules apply:

- the exact spelling in the national language is encoded in the “National Attributes” [NATF] field using lexical level 2.
- translated text, including transliterated or transcribed national geographic names is encoded in the “International Attributes” [ATTF] field using lexical level 0 or 1.

Where possible international standards should be used for the transliteration of non-Latin alphabets.

4. Cartographic framework

4.1 Horizontal datum

The horizontal datum must be WGS 84. Therefore, the “Horizontal Geodetic Datum” [HDAT] subfield in the “Data Set Parameter” [DSPM] field must have the value of {2}.

The boatmaster may have to display information other than IENC data and IENC updates. In cases where this information is based on a horizontal datum other than WGS-84, it can be converted to WGS 84 by means of the meta feature Horizontal datum shift parameter (M_HOPA).

In the case that the data are transformed to WGS-84 from a local datum the responsible authority shall define the area where the local transformation parameters apply. Within this area, the difference between transformed coordinates and the surveyed WGS-84 coordinates may not exceed 0.5 m. For approval purposes, the responsible authority shall define appropriate reference points (surveyed WGS-84 coordinates) preferably exactly at the limit line of two adjacent areas. Reference points, transformation parameters and the algorithm shall be published and shall be the basis for IENC production for that area.

4.2 Vertical and sounding datum

The various levels which are used on paper charts for elevations and soundings will be used. The default values are encoded in the “Vertical Datum” [VDAT] subfield and the “Sounding Datum” [SDAT] subfield in the “Data Set Parameter” [DSPM] field.

4.3 Projection

No projection is used, therefore the “Data Set Projection” [DSPR] field must not be used. Coordinates must be encoded as geographical positions (latitude, longitude).

4.4 Units

Units to be used in an IENC are:

- Position: latitude and longitude in decimal degrees (converted into integer values, see below).
- Depth: metres.
- Height: metres.
- Positional accuracy: metres.
- Distance: nautical miles, statute miles, kilometres or metres as defined in the Feature Catalogue.

The default values for depth units, height units and positional accuracy units are encoded in the “Units of Depth Measurement” [DUNI], “Units of Height Measurement” [HUNI] and “Units of Positional Accuracy” [PUNI] subfields in the “Data Set Parameter” [DSPM] field.

Latitude and longitude values are converted from decimal degrees to integers by means of the “Coordinate Multiplication Factor” [COMF] subfield value in the “Data Set Parameter” [DSPM] field. The integer values are encoded in the “Coordinate in Y-axis” [YCOO] subfield and the “Coordinate in X-axis” [XCOO] subfield. The number of decimal digits is chosen by the data producer and is valid throughout the data set.

E.g.: If the producer chooses a resolution of 0.0001° (10-4), then the value of COMF is 10 000 (104).

A longitude = 34.5678° is converted into XCOO = longitude * COMF = 34.5678*10 000 = 345678.

The integer value of the converted coordinate is encoded in binary form.

Depths are converted from decimal meters to integers by means of the “3-D (Sounding) Multiplication Factor” [SOMF] subfield value in the “Data Set Parameter” [DSPM] field. The integer values are encoded in the “3-D (Sounding) Value” [VE3D] subfield. Soundings are never encoded with a resolution greater than one decimetre, so the value of SOMF must be 10 encoded in binary form.

5. Provision of data

5.1 Implementation

The binary implementation of S-57 must be used for IENC. Therefore, the “Implementation” [IMPL] subfield of the “Catalogue Directory” [CATD] field must be set to “BIN” for the data set files.

5.2 Compression

The use of compression algorithms is prohibited.

5.3 Encryption

IENC data may be protected from unauthorised use, possibly by the use of encryption algorithms.

5.4 Exchange set

5.4.1 Content of the exchange set

The records defined in this Annex are grouped in two file types: catalogue and data set files.

An exchange set is composed of one and only one catalogue file and at least one data set file.

Text and picture files may also be included in the IENC exchange set. These files may be included in an exchange set by a data producer to provide additional information such as that normally contained in sailing directions or coastal pilots. For format of these files see Encoding Guide for Inland ENCs.

An exchange set may also contain a README file.

Exchange set
|
|--<1>-- README file
|
|--<1>-- Catalogue file
|
|--<R>-- Data set file
|
|--<R>-- Text file
|
|--<R>-- Picture file

The README file is an optional ASCII file of general information.

The catalogue file acts as the table of contents for the exchange set.

Each data set file contains data for one cell (see clause 2.2). This includes:

- data set descriptive information that is specific to the data set,
- the description and location of the real-world entities.

Text and picture files do not conform to ISO/IEC 8211 and are not described. These files are specific to this Product Specification.

5.4.2 Volume naming

An exchange set may be split across several media volumes, therefore, each media volume must be uniquely identified within the exchange set. A file must not be split across volumes. Individual volumes must conform to the following naming convention:

VSSXNN

where:

V is the mandatory first character.
SS is the sequence number of the specific volume within the exchange set.
X is the mandatory separator character.
NN is the total number of media volumes within the exchange set.

For example, volume one of a three volume exchange set would be named V01X03.

5.4.3 Directory structure

The following directory structure is mandatory.

On each volume within an exchange set there must be a root directory called ENC_ROOT. The catalogue file for the exchange set must be in the ENC_ROOT directory of the first volume of the exchange set. The ENC_ROOT directory of the first volume may also contain a README file, containing ASCII text. Further directories and sub-directories may be defined under the root directory on any volume in the exchange set. The following example shows an example directory structure for a MS-DOS volume:

```
Volume in drive A is V01X02
Directory of A:\ENC_ROOT

.               <DIR>           09-15-96 12:40p   .
..              <DIR>           09-15-96 12:40p   ..
CATALOG     031         1,584   09-15-96 12:46p   CATALOG.031
NL600021    000        45,584   09-15-96 12:50p   NL600021.000
NL600021    001         1,095   09-15-96 12:54p   NL600021.001
NL600021    002           722   09-15-96 12:54p   NL600021.002
README      TXT           504   09-15-96 12:44p   README.TXT
      5 file(s)     49,489 bytes
      2 dir(s)      1,405,952 bytes free
```

For each file in the exchange set the catalogue file must contain the name of the volume on which it is held and the full path name relative to the root directory of that volume. The full path name relative to the root directory must be encoded in the FILE subfield of the “Catalogue Directory” [CATD] field. The LFIL subfield of the CATD field may be used for other purposes. The full path name of the NL600021.000 file shown in the example is NL600021.000.

5.5 Data sets

Four kinds of data sets may be produced:

- new data set: no IENC data has previously been produced for this area and for the same navigational purpose.
- update: changing some information in an existing data set.
- re-issue of a data set: including all the updates applied to the original data set up to the date of the reissue. A re-issue does not contain any new information additional to that previously issued by updates.
- new edition of a data set: including new information which has not been previously distributed by updates.

Each new data set, re-issue, or new edition is called a base cell file.

A data set containing updates to one base cell file is called an update cell file.

5.6 File naming

5.6.1 README file

README.TXT is the mandatory name for this file.

5.6.2 Catalogue file

The catalogue file of the exchange set must be named CATALOG.EEE.

Where EEE is the edition number of S-57 used for this exchange set, i.e. 031 for the currently [2006] used edition (3.1).

No other file may be named CATALOG.

5.6.3 Data set files

A valid data set file must be uniquely identified worldwide by its name.

The data set files are named according to the specifications given below:

```
CCPRRRRR.EEE
|  |  |     |
|  |  |     |-----  EEE     = update number
|  |  |
|  |  |-----------  RRRRR   = waterway code and waterway distance (kilometre) or
|  |                        identification of the equivalent paper chart number (in Brazil)
|  |-----------------  P     = navigational purpose (usage)
|--------------------  CC    = producer code
```

The main part forms an eight-character identifier where:

The first two characters (CC) identify the producer. This list is published in the S-100 registry at http://registry.iho.int. The list includes all producers which aren't already mentioned in IHO S-62.

The third character (P) indicates the navigational purpose (see clause 2.1). The letter "A" (in the position "usage") indicates that the cell is displayed as overlay over other cells within a range of usages. The range of usages of overlay cells is indicated in the Data Set Identification Field of the header of the overlay cell (see S57, Part 3, Data Structure, ch. 7.3.1.1). The 8th bit of the intended usage subfield (INTU) has to be set. The other seven bits describe the range:

Definition of range	from	to
Mathematical description	(INTU-128) div 10	(INTU-128) mod 10
Example (INTU=207)	(207-128) div 10 = 7	(207-128) mod 10 = 9

The fourth to eighth characters (RRRRR) identify the waterway and the waterway distance.

- For waterways with a length of more than 999 km: e.g. D1923
- For waterways with a length of more than 99 km: e.g. RH123
- For waterways with a length of more than 9 km: e.g. DCC23

The use of the fourth to eighth characters is only a recommendation.

The primarily produced base cell file has the extension (EEE) 000.

The extension is used for updating. Update cell files have the same name as the original base cell file, with an extension number greater than or equal to 001. They cover the same geographical area as the base cell file to which they apply.

5.6.4 Text and picture files

The text and picture files must be named according to the Encoding Guide for Inland ENCs.

5.7 Updating

In order to ensure that updates are incorporated into the SENC in the correct sequence without any omission, the file extension and a number of subfields in the “Data Set Identification” (DSID) field are used in the following way:

file extension	every new data set, re-issue or new edition must have a “000” extension. For update cell files the extension is the number of the update, ranging from “001” to “999”. These numbers must be used sequentially, without omission. Number “001” is the first update after a new data set or a new edition, but not after a re-issue. The update sequence is not interrupted by a re-issue. After a re-issue, subsequent updates may be incorporated into the SENC created from this re-issue or to the SENC created from the original data and kept continuously updated.
edition number	when a data set is initially created, the edition number 1 is assigned to it. The edition number is increased by 1 at each new edition. Edition number remains the same for a re-issue.
update number	update number 0 is assigned to a new data set. The first update cell file associated with this new data set must have update number 1. The update number must be increased by one for each consecutive update, until a new edition is released. The new edition must have update number 0. A re-issue of a data set must have the update number of the last update applied to the data set. In the case of an update cell file the file extension is the same as the update number.
update application	this date is only used for the base cell files (i.e. new data sets, re-issue and new edition), not update cell files. All updates dated on or before this date must have been applied by the producer.
issue date	date on which the data was made available by the data producer.

Table 5.1 gives examples of the way to manage the file extension, the “Edition Number” [EDTN], the “Update Number” [UPDN], the “Update Application Date” [UADT] and the “Issue Date” [ISDT] sub-fields.

Event	File extension	EDTN	UPDN	UADT	ISDT
New data set	.000	1	0	19950104	19950104
Update 1	.001	1	1	prohibited	19950121
Update 2	.002	1	2	prohibited	19950225
...					
Update 31	.031	1	31	prohibited	19950905
Re-issue of a data set	.000	1	31	19950905	19950910
Update 32	.032	1	32	prohibited	19951023
...					
Update 45	.045	1	45	prohibited	19951112
New edition	.000	2	0	19951201	19951201
Update 1 to edition 2	.001	2	1	prohibited	19960429
...					

This example table relates to the specifications given in S-52 App 1, “*Guidance on Updating the Electronic Navigational Chart*”, in the following way:

- The update information encoded in each individual cell file is called a sequential update.
- The collection of the update information encoded in the update cell files which have been issued since the last new data set, the last re-issue of a data set or since the last update was applied to the SENC is called a cumulative update. In the example, the cumulative update for the new data set starts with update number 1. The cumulative update for the re-issue of a data set starts with update number 32. The cumulative update for a data set to which update number n has been applied starts with update number n+1.
- The update information which has been incorporated in a re-issue of a data set is called a compilation update.

Each re-issue or new edition of a data set must have the same name as the base cell file which it replaces.

The update mechanism is described in S-57 Part 3, clause 8.

In order to delete a data set, an update cell file is created, containing only the Data Set General Information record with the “Data Set Identifier” [DSID] field. The “Edition Number” [EDTN] subfield must be set to 0. This message is only used to cancel a base cell file.

To inform the mariner that a new edition is available, an update cell file is created, containing only the Data Set General Information record with the “Data Set Identifier” [DSID] field. The “Edition Number” [EDTN] subfield must contain a value one higher than the current edition number.

In order to modify a text, picture or application file, a new file with the same name is created.

When an feature pointing to a text, picture or application file is deleted or updated so that it no longer references the file, the ECDIS software should check to see whether any other feature reference the same file, before that file is deleted.

An exchange set may contain base cell files and update cell files for the same cells. Under these circumstances the update cell files must follow on in the correct sequential order from the last update applied to the base cell file.

The record version of each feature or vector record is indicated in the “Record Version” [RVER] subfield of the “Feature Record Identifier” [FRID] field or the “Vector Record Identifier” [VRID] field. At each update of a record, this version number is incremented by 1.

5.8 Media

Data must be made available on CD-ROM. It may also be made available on any other physical media by private arrangement.

Data may be provided via telecommunication links.

5.9 Error detection

File integrity checks are based on the CRC-32 algorithm (a 32 bit Cyclic Redundancy Check algorithm) as defined in ANSI/IEEE Standard 802.3 (=IEEE Standards for Local Area Networks, Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications).

5.9.1 Implementation

The checksums for each data set are held in the “CRC” [CRCS] subfield of the “Catalogue Directory” [CATD] field. They allow the integrity of each file in the exchange set to be checked on receipt. The CRC value computed on the received file must the same as the CRC value transmitted.

The CRC values are recorded in ASCII as a hexadecimal number least significant byte first.

5.9.2 Processing

Encoding is defined by the following generating polynomial:

$$G(x) = x^{32} + x^{26} + x^{23} + x^{22} + x^{16} + x^{12} + x^{11} + x^{10} + x^8 + x^7 + x^5 + x^4 + x^2 + x + 1$$

Processing is applied to relevant files as they appear in the exchange set.

The CRC value of the file is defined by the following process:

1. The first 32 bits of the data are complemented.
2. The n bits of the data are then considered to be the coefficients of a polynomial M(x) of degree n-1.
3. M(x) is multiplied by x^{32} and divided by G(x), producing a remainder R(x) of degree <31.
4. The coefficients of R(x) are considered to be a 32-bit sequence.
5. The bit sequence is complemented and the result is the CRC.

The hexadecimal format of CRCs is converted to ASCII characters and stored in the “Catalogue Directory” [CATD] field.

An example of coding in C language is given in Annex B of S-57 published by IHO.

6. Application profiles

6.1 General

The application profiles define the structure and content of the catalogue file and data set file in an exchange set.

6.1.1 Catalogue and data set files

These files are composed of the records and fields defined in the following tree structure diagrams (see clauses 6.2.1, 6.3.1 and 6.4.1).

The order of data in each base or update cell file is described below:

Data set file
- Data set general information record
- Data set geographic reference record (for EN application profile)
- Vector records
  - Isolated nodes (SG3D)
  - Isolated nodes (SG2D)
  - Connected nodes
  - Edges
- Feature records
  - Meta features
  - Geo features (ordered from slave to master)
  - Collection features

This order of records will enable the import software to check that the child record exists each time the parent record references it (i.e. it will already have read the child record so it will know if it exists or not).

6.1.2 Records

Records and fields that do not appear in the following tree structure diagrams are prohibited. The order of records in the files must be the same as that described in these tree structure diagrams.

The combination of the file name and the “Name” of the record must provide a unique worldwide identifier of the record.

6.1.3 Fields

For base cell files, some fields may be repeated (indicated by <R>) and all of their content may be repeated (indicated by *). In order to reduce the volume of data, the encoder should repeat the sequence of subfields, in preference to creating several fields.

6.1.4 Subfields

Mandatory subfields must be filled by a non-null value.

Prohibited subfields must be encoded as missing subfields values (see S-57 Part 3, clause 2.1).

The exact meaning of missing enumerations is defined in clause 3.5.1.

In the tables following the tree structure diagrams, mandatory subfields are shown by “M” in the “use” column and prohibited subfields by “P” in the same column. If there is nothing in this column, it means that the use of this subfield is optional. When a subfield value is prescribed, it is indicated in the “value” column. The “comment” column contains general comments and an indication of whether the subfield is ASCII or binary coded.

6.2 Catalogue file

The catalogue has the same structure for EN and ER application profiles.

6.2.1 Catalogue file structure

```
Catalogue file
  |
  |--<R>-Catalogue Directory record
        |
        |--0001-- ISO/IEC 8211 Record identifier
             |
             |--<1>-- CATD - Catalogue Directory field
```

6.2.2 Catalogue Directory field - CATD

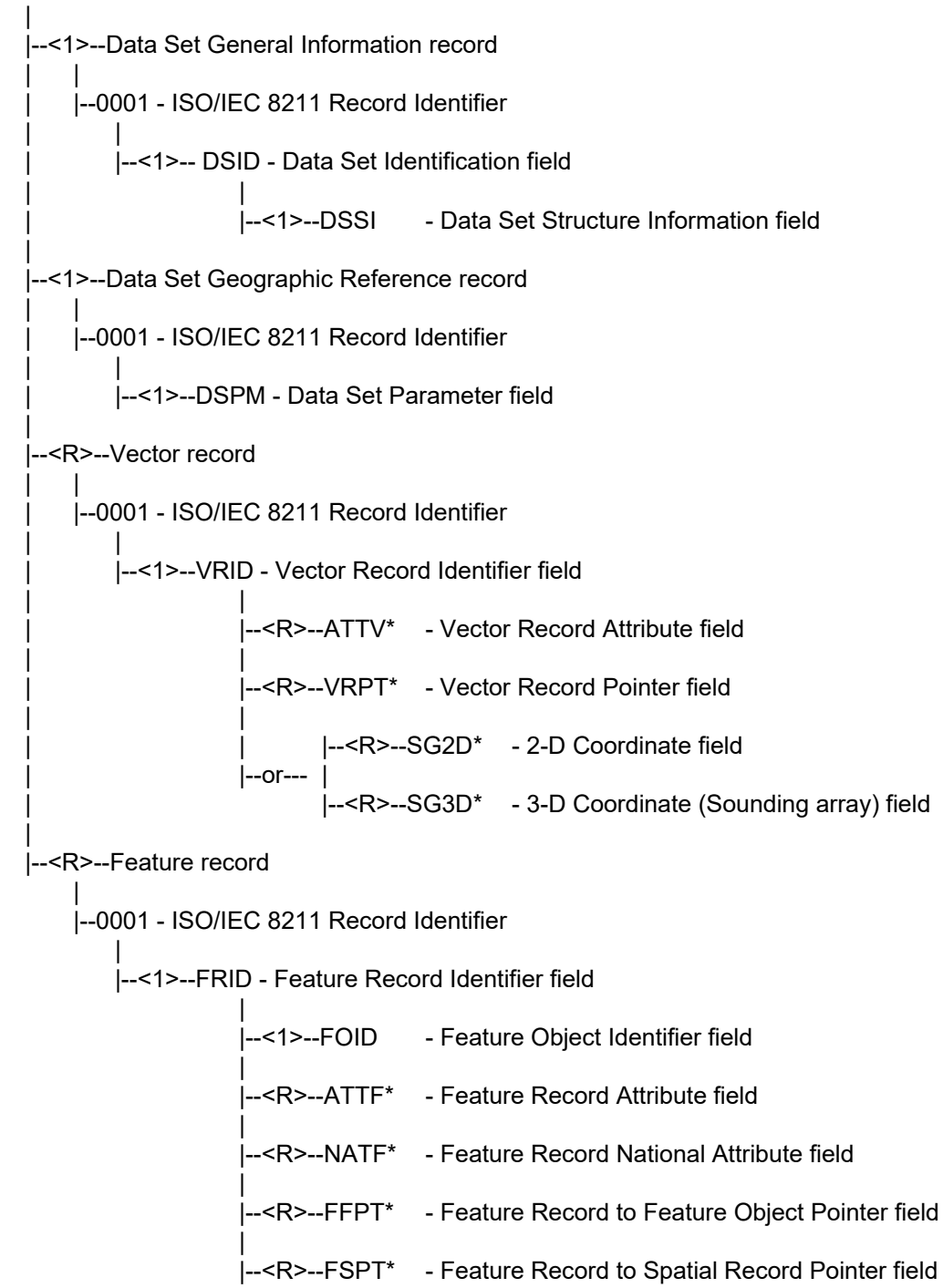
NB: All subfield values are encoded as ASCII.

Tag	subfield name	use	value	comment
RCNM	Record name	M	CD	
RCID	Record identification number	M		
FILE	File name	M		full path from ENC_ROOT directory
LFIL	File long name			
VOLM	Volume	M		name of volume on which file appears
IMPL	Implementation	M	ASC BIN TXT TIF ...	for the catalogue file for the data set files for ASCII text files (including the README.TXT file) for picture files or any other usual file extension for file provided through private agreements (see clause 5.6.4)
SLAT	Southernmost latitude			mandatory for data set files
WLON	Westernmost longitude			mandatory for data set files
NLAT	Northernmost latitude			mandatory for data set files
ELON	Easternmost longitude			mandatory for data set files
CRCS	CRC	M		except for README and catalogue files
COMT	Comment			

6.3 EN application profile

The EN application profile applies to any base cell file (i.e. new data set, re-issue and new edition of a data set).

6.3.1 Base cell file structure



6.3.2 Field content (EN)

6.3.2.1 Data set identification field - DSID

NB: Subfield values are encoded as ASCII or binary as indicated.

IENCs are considered as an independent product besides ENCs. To recognise a S-57 dataset as an IENC the content of the subfields PRSP and PRED differs from S-57.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{10}	= DS, binary
RCID	Record identification number	M		Binary
EXPP	Exchange purpose	M	{1}	Data set is new, binary
INTU	Intended usage	M	{1} to {9}, {A}	Navigational purpose, see clause 2.1 and 5.6.3, binary
DSNM	Data set name	M		File name with extension excluding path, ASCII
EDTN	Edition number	M		See clause 5.7, ASCII
UPDN	Update number	M		ASCII
UADT	Update application date	M		ASCII
ISDT	Issue date	M		ASCII
STED	Edition number of S-57	M	03.1	ASCII
PRSP	Product Specification	M	{10}	= IENC, binary
PSDN	Product specification description	P		Empty, ASCII
PRED	Product Specification Edition Number	M	2.5	=ASCII
PROF	Application profile identification	M	{1}	= EN, binary
AGEN	Producing agency	M		Binary
COMT	Comment			ASCII

6.3.2.2 Data Set Structure Information field – DSSI

NB: All subfield values are encoded as binary.

Tag	subfield name	use	Value	comment
DSTR	Data structure	M	{2}	= chain node
AALL	ATTF lexical level	M	{0} or {1}	
NALL	NATF lexical level	M	{0}, {1} or {2}	
NOMR	Number of meta records	M		
NOCR	Number of cartographic records	M	{0}	cartographic records are not permitted
NOGR	Number of geo records	M		
NOLR	Number of collection records	M		
NOIN	Number of isolated node records	M		

Tag	subfield name	use	Value	comment
NOCN	Number of connected node records	M		
NOED	Number of edge records	M		
NOFA	Number of face records	M	{0}	faces are not permitted in chain node structure

6.3.2.3 Data Set Parameter field - DSPM

NB : Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	Value	comment
RCNM	Record name	M	{20}	= DP, binary
RCID	Record identification number	M		binary
HDAT	Horizontal geodetic datum	M	{2}	= WGS 84, binary
VDAT	Vertical datum	M		binary
SDAT	Sounding datum	M		binary
CSCL	Compilation scale of data	M		binary
DUNI	Units of depth measurement	M	{1}	=metres, binary
HUNI	Units of height measurement	M	{1}	=metres, binary
PUNI	Units of positional accuracy	M	{1}	=metres, binary
COUN	Coordinate units	M	{1}	= lat/long, binary
COMF	Coordinate multiplication factor	M		binary, see clause 4.4
SOMF	3-D (sounding) multiplication factor	M	{10}	binary, see clause 4.4
COMT	Comment			ASCII

6.3.2.4 Vector Record Identifier field - VRID

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	Comment
RCNM	Record name	M	{110} or {120} or {130}	= VI, isolated node = VC, connected node = VE, edge
RCID	Record identification number	M		
RVER	Record version	M		
RUIN	Record update instruction	M	{1}	= insert

6.3.2.5 Vector Record Attribute field - ATTV

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Enumeration	M		ASCII value. Missing enumeration = attribute is relevant but value is unknown.

6.3.2.6 Vector Record Pointer field - VRPT

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{255}	= null
USAG	Usage indicator	M	{255}	= null
TOPI	Topology indicator	M	{1} or {2}	= beginning node = end node
MASK	Masking indicator	M	{255}	= null

6.3.2.7 2-D Coordinate field - SG2D

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
YCOO	Coordinate in Y axis	M		latitude (see clause 4.4)
XCOO	Coordinate in X axis	M		longitude (see clause 4.4)

6.3.2.8 3-D Coordinate (Sounding array) field - SG3D

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
YCOO	Coordinate in Y axis	M		latitude (see clause 4.4)
XCOO	Coordinate in X axis	M		longitude (see clause 4.4)
VE3D	3-D (sounding) value	M		value of sounding (see clause 4.4)

6.3.2.9 Feature Record Identifier field - FRID

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{100}	= FE
RCID	Record identification number	M		
PRIM	Feature geometric primitive	M	{1} or {2} or {3} or {255}	= point = line = area = no geometry
GRUP	Group	M	{1} or {2}	Group 1, see clause 3.10.1 Group 2, see clause 3.10.2
OBJL	Feature label	M		binary code for a feature class
RVER	Record version	M		
RUIN	Record update instruction	M	{1}	= insert

6.3.2.10 Feature Object Identifier field - FOID

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
AGEN	Producing agency	M		
FIND	Feature identification number	M		
FIDS	Feature identification subdivision	M		

6.3.2.11 Feature Record Attribute field - ATTF

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Enumeration			ASCII value. Missing enumeration = attribute is relevant but value is unknown.

6.3.2.12 Feature Record National Attribute field - NATF

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Enumeration			ASCII value. Missing enumeration = attribute is relevant but value is unknown

6.3.2.13 Feature Record to Feature Object Pointer field - FFPT

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
LNAM	Long name	M		binary
RIND	Relationship indicator	M	{2} or {3}	= slave, binary = peer, binary
COMT	Comment			ASCII

6.3.2.14 Feature Record to Spatial Record Pointer field - FSPT

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{1} or {2} or {255}	= forward = reverse = null
USAG	Usage indicator	M	{1} or {2} or {3} or {255}	= exterior = interior = exterior boundary, truncated by the data limit = null
MASK	Masking indicator	M	{1} or {2} or {255}	= mask = show = null

6.4 ER application profile

The ER application profile only applies to update cell files.

6.4.1 Update cell file structure

```
Update cell file
  |
  |--<1>--Data Set General Information record
  |     |
  |     |--0001 - ISO/IEC 8211 Record Identifier
  |           |
  |           |--<1>--DSID - Data Set Identification field
  |                       |
  |                       |--<1>--DSSI - Data Set Structure Information field
  |
  |--<R>--Vector record
  |     |
  |     |--0001 - ISO/IEC 8211 Record identifier
  |           |
  |           |--<1>--VRID - Vector Record Identifier field
  |                       |
  |                       |--<R>--ATTV*    - Vector Record Attribute field
  |                       |
  |                       |--<1>--VRPC     - Vector Record Pointer Control field
  |                       |
  |                       |--<R>--VRPT*    - Vector Record Pointer field
  |                       |
  |                       |--<1>--SGCC     - Coordinate Control field
  |                       |
  |                       |         |--<R>--G2D* - 2-D Coordinate field
  |                       |---or--  |
  |                                 |--<R>--G3D* - 3-D Coordinate (Sounding array) field
  |
  |--<R>--Feature record
        |
        |--0001 - ISO/IEC 8211 Record identifier
              |
              |--<1>--FRID - Feature Record Identifier field
                          |
                          |--<1>--FOID      - Feature Object Identifier field
                          |
                          |--<R>--ATTF*     - Feature Record Attribute field
                          |
                          |--<R>--NATF*     - Feature Record National Attribute field
                          |
                          |--<1>--FFPC      - Feature Record to Feature Object Pointer Control field
                          |
                          |--<R>--FFPT*     - Feature Record to Feature Object Pointer field
                          |
                          |--<1>--FSPC      - Feature Record to Spatial Record Pointer Control field
                          |
                          |--<R>--FSPT*     - Feature Record to Spatial Record Pointer field
```

6.4.2 Field content (ER)

6.4.2.1 Data Set Identification Field - DSID

NB: Subfield values are encoded as ASCII or binary as indicated.

IENCs are considered as an independent product besides ENCs. To recognise a S-57 dataset as an IENC the content of the subfields PRSP and PRED differs from S-57.

tag	subfield name	use	value	comment
RCNM	Record name	M	{10}	= DS, binary
RCID	Record identification number	M		Binary
EXPP	Exchange purpose	M	{2}	Data set is a revision, binary
INTU	Intended usage	M	{1} to {9}, {A}	Navigational purpose, see clause 2.1 and 5.6.3, binary
DSNM	Data set name	M		File name with extension excluding path, ASCII
EDTN	Edition number	M		See clause 5.7, ASCII
UPDN	Update number	M		ASCII
UADT	Update application date	M		ASCII
ISDT	Issue date	M		ASCII
STED	Edition number of S-57	M	03.1	ASCII
PRSP	Product Specification	M	{10}	= IENC, binary
PSDN	Product specification description	P		Empty, ASCII
PRED	Product Specification Edition Number	M	2.5	= ASCII
PROF	Application profile identification	M	{2}	= ER, binary
AGEN	Producing agency	M		Binary
COMT	Comment			ASCII

6.4.2.2 Data Set Structure Information field – DSSI

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
DSTR	Data structure	M	{2}	= chain node
AALL	ATTF lexical level	M	{0} or {1}	
NALL	NATF lexical level	M	{0} or {1} or {2}	
NOMR	Number of meta records	M		
NOCR	Number of cartographic records	M	{0}	cartographic records are not permitted
NOGR	Number of geo records	M		
NOLR	Number of collection records	M		
NOIN	Number of isolated node records	M		
NOCN	Number of connected node records	M		
NOED	Number of edge records	M		
NOFA	Number of face records	M	{0}	faces are not permitted in chain node structure

6.4.2.3 Vector Record Identifier field - VRID

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{110} or {120} or {130}	= VI, isolated node = VC, connected node = VE, edge
RCID	Record identification number	M		
RVER	Record version	M		
RUIN	Record update instruction	M	{1} or {2} or {3}	= insert = delete = modify

6.4.2.4 Vector Attribute field - ATTV

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Enumeration			ASCII value, missing enumeration = enumeration is deleted or unknown (see clause 3.5.1)

6.4.2.5 Vector Record Pointer Control field - VRPC

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
VPUI	Vector record pointer update instruction	M	{1} or {2} or {3}	= insert = delete = modify
VPIX	Vector record pointer index	M		
NVPT	Number of vector record pointers	M		

6.4.2.6 Vector Record Pointer field - VRPT

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
NAME	Name	M		
ORNT	Orientation	M	{255}	= null
USAG	Usage indicator	M	{255}	= null
TOPI	Topology indicator	M	{1} or {2}	= beginning node = end node
MASK	Masking indicator	M	{255}	= null

6.4.2.7 Coordinate Control field - SGCC

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
CCUI	Coordinate update instruction	M	{1} or {2} or {3}	= insert = delete = modify
CCIX	Coordinate index	M		
CCNC	Number of coordinates	M		

6.4.2.8 2-D Coordinate field - SG2D

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
YCOO	Coordinate in Y axis	M		latitude (see clause 4.4)
XCOO	Coordinate in X axis	M		longitude (see clause 4.4)

6.4.2.9 3-D Coordinate (Sounding array) field - SG3D

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
YCOO	Coordinate in Y axis	M		latitude (see clause 4.4)
XCOO	Coordinate in X axis	M		longitude (see clause 4.4)
VE3D	3-D (sounding) value	M		value of sounding (see clause 4.4)

6.4.2.10 Feature Record Identifier field - FRID

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
RCNM	Record name	M	{100}	= FE
RCID	Record identification number	M		
PRIM	Feature geometric primitive	M	{1} or {2} or {3} or {255}	= point = line = area = no geometry
GRUP	Group	M	{1} or {2}	Group 1, see clause 3.10.1 Group 2, see clause 3.10.2
OBJL	Feature label	M		binary code for a feature class
RVER	Record version	M		
RUIN	Record update instruction	M	{1} or {2} or {3}	= insert = delete = modify

6.4.2.11 Feature Object Identifier field - FOID

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
AGEN	Producing agency	M		
FIND	Feature identification number	M		
FIDS	Feature identification subdivision	M		

6.4.2.12 Feature Record Attribute field - ATTF

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	comment
ATTL	Attribute label/code	M		binary code for an attribute
ATVL	Enumeration			ASCII value. Missing enumeration = enumeration is deleted or unknown (see clause 3.5.1)

6.4.2.13 Feature Record National Attribute field - NATF

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	Comment
ATTL	Attribute label/code	M		Binary code for an attribute
ATVL	Enumeration			ASCII value. Missing enumeration = enumeration is deleted.

6.4.2.14 Feature Record to Feature Object Pointer Control field - FFPC

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	Comment
FFUI	Feature object pointer update instruction	M	{1} or {2} or {3}	= insert = delete = modify
FFIX	Feature object pointer index	M		
NOPT	Number of feature object pointers	M		

6.4.2.15 Feature Record to Feature Object Pointer field - FFPT

NB: Subfield values are encoded as ASCII or binary as indicated.

Tag	subfield name	use	value	Comment
LNAM	Long name	M		Binary
RIND	Relationship indicator	M	{2} or {3}	= slave, binary = peer, binary
COMT	Comment			ASCII

6.4.2.16 Feature Record to Spatial Record Pointer Control field - FSPC

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	Comment
FSUI	Feature to spatial record pointer update instruction	M	{1} or {2} or {3}	= insert = delete = modify
FSIX	Feature to spatial record pointer index	M		
NSPT	Number of feature to spatial record pointers	M		

6.4.2.17 Feature Record to Spatial Record pointer field - FSPT

NB: All subfield values are encoded as binary.

Tag	subfield name	use	value	comment
NAME	name	M		
ORNT	orientation	M	{1} or {2} or {255}	= forward = reverse = null
USAG	usage indicator	M	{1} or {2} or {3} or {255}	= exterior = interior = exterior boundary, truncated by the data limit = null
MASK	Masking indicator	M	{1} or {2} or {255}	= mask = show = null

7. Maintenance

Every member of the Inland ENC Harmonization Group (IEHG) is entitled to publish proposals for amendments or changes of this Product Specification for Inland ENCs including:

- the IENC Feature Catalogue and
- the Encoding Guide for Inland ENCs

on the IEHG discussion forum at http://ienc.openecdis.org. Each proposal has to contain an explanation, why the amendment or the change is needed.

Proposals for amendments of the IENC Feature Catalogue have to include a proposal for an amendment of the Encoding Guide for Inland ENCs with regard to the use of these amendments.

The members of the Inland ECDIS Expert Group and the IEHG are requested to react as soon as possible. A veto against a proposal has to contain an explanation for the objection. If there is no veto within six weeks, the proposal is adopted. If there is a veto, there are the following possibilities to proceed:

- The party, which has transmitted the proposal, can decide to withdraw the proposal.
- If an updated proposal is transmitted, it is handled as a new proposal.
- If the party, which has transmitted the proposal, wants to keep up the original proposal without any changes, the proposal will be discussed and decided upon at the next meeting of the IEHG.

The members of the IEHG discussion forum, who have actively participated in the development of the Product Specification and its annexes within the twelve months before a meeting of the IEHG, are entitled to take part in this meeting.

Each new version of the Feature Catalogue for Inland ENC results in a new version of the Product Specification for Inland ENCs.

Appendix 1 IENC Feature Catalogue, Edition 2.5.1, 2021-04-21 (Distributed separately)

Appendix 2 Encoding Guide for Inland ENCs, Edition 2.5.1, 2021-04-21 (Distributed separately)

ANNEX 2
PRESENTATION LIBRARY FOR INLAND ENCS, EDITION 2.5

TABLE OF CONTENTS

1. Lookup Tables

The up-to-date Look-up Tables for areas, lines and points are published at https://ienc.openecdis.org.

2. Conditional Symbology Procedures

2.1 Top marks

The CS (TOPMAR01) of S-52 has to be modified because in this CS it is checked on which structure the top mark is fixed. Since the ENC feature BOYLAT was copied, in the CS the feature boylat has to be added to the list of floating structures. If the top mark is located on a boylat the symbols TOPMA1* have to be drawn according to the top shape and colour.

2.2 Daymars

A new CS DAYMAR01 has to be introduced. This CS is similar to the CS TOPMAR01 (see clause 2.1) with the exception that there is no need for the distinction of floating and fixed structures, because daymarks exists only for beacons, i.e. fixed structures.

2.3 Restricted areas

Since the ENC feature RESARE and the attribute RESTRN were copied the CS (RESARE03) of S-52 has to be modified because in this CS the values of the attribute RESTRN are checked. That means that in the case that RESTRN is not given it has to be checked for the copied attribute restrn instead.

2.4 Lights

The CS for LIGHTS (LIGHTS05) of S-52 is affected because in this CS there is a check whether a light is located on a floating object or on a fixed object. The list of floating platforms must be extended by the new feature “boylat”. To avoid a copy of this CS which would lead to a copy of the official feature LIGHTS, the Inland ECDIS manufacturers have to extend the official CS for LIGHTS as described above.

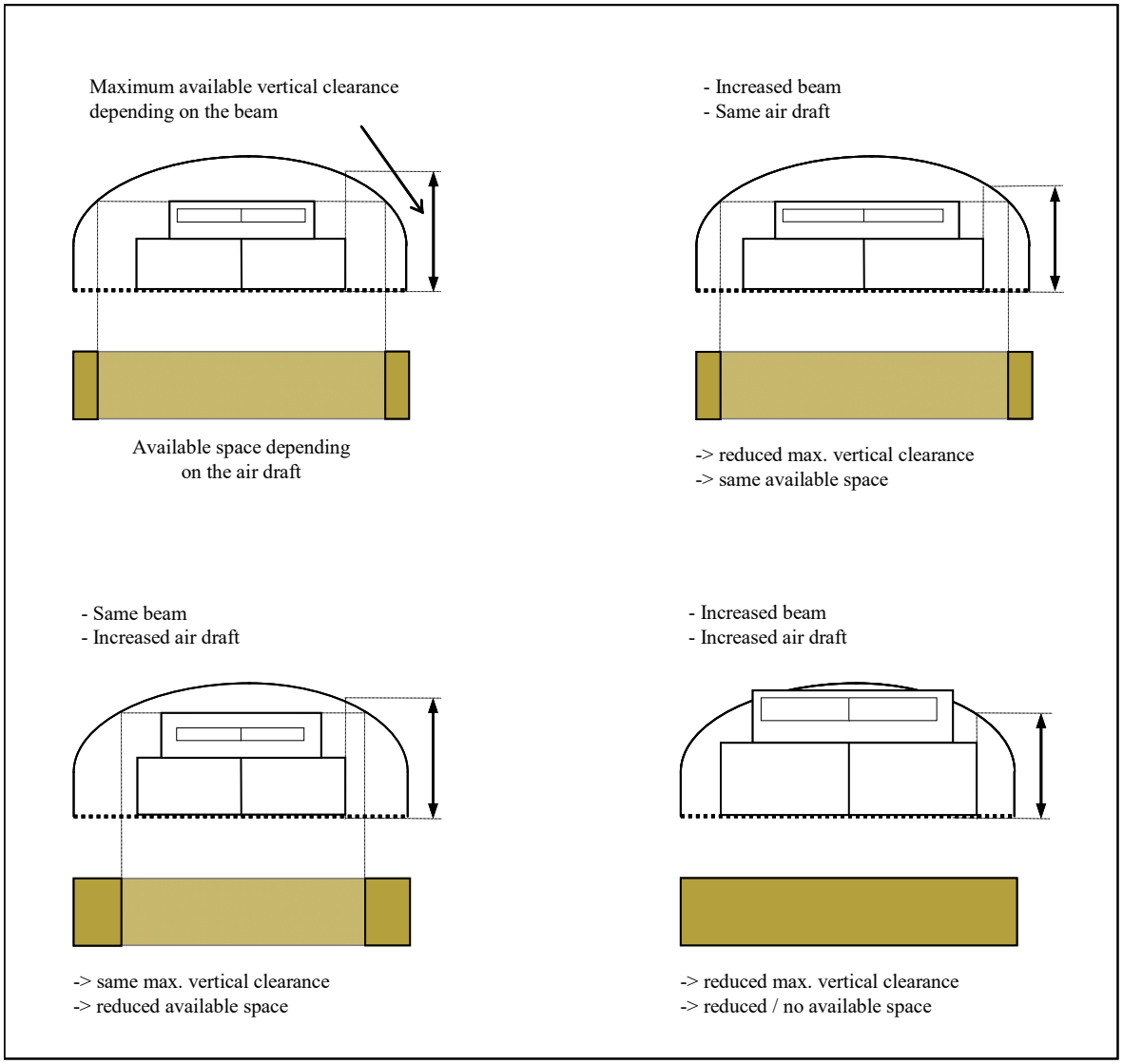
2.5 Bridges

A new CS for bridges has to be introduced to be able to indicate for bridge arches

a) the maximum vertical clearance depending on the given beam,
b) the available space depending on the given beam and air draft.

The condition for this is the encoding of a bridge arch as it is described in the Encoding Guide for Inland ENCs.

The Inland ECDIS manufacturers have to calculate the vertical clearance of aggregated bridge objects according to the given beam of the ship.



If the vertical clearance of a single bridge object of the aggregation is less than the calculated vertical clearance, this single bridge object must be symbolized by the symbol instruction “AC(CHBRN,3);TX('clr %.1f',1,2,3,'14108',1,1,CHBLK,11)”

If the vertical clearance of a single bridge object of the aggregation is larger or equal than the calculated vertical clearance, this single bridge object must be symbolized by the symbol instruction “AC(CHBRN,2)” without the indication of the non sufficient vertical clearance.

The boundaries of the bridge sequences which are not safe for navigation must be symbolized with the symbol instruction "LS(SOLD,2,DEPSC)".

The boundaries of the bridge sequences which are safe for navigation must be symbolized with the symbol instruction "LS(SOLD,1,CHGRD)".

The boundaries of the single bridge objects inside a bridge sequence, either safe or not safe for navigation, may not be symbolized.

2.6 Notice marks

A new CS has to be introduced for notice marks. If there are several notice marks at the same point the fnctnm attributes have to be evaluated for the selection of the correct symbol:

- if there is at least one notice mark with fnctnm = 1 (prohibition mark), the symbol notmrk04 has to be used;
- if there is no prohibition mark, but at least one notice mark with fnctnm = 2 (regulation mark) or fnctnm = 3 (restriction mark), the symbol notmrk05 has to be used;
- if there are only notice marks with fnctnm = 4 (recommendation mark) and/or notice marks with fnctnm = 5 (information mark), the symbol notmrk06 has to be used.

The symbols NMKREG21, NMKREG22, NMKREG23, NMKREG24, NMKRCD07, NMKRCD08, and NMKINF60 shall only be used if the attribute ORIENT is encoded and only for an optional display of detailed notice mark symbols. If ORIENT is not encoded, the symbols NMKREG02, NMKREG03, NMKREG10, NMKREG11, NMKRCD05, NMKRCD06, and NMKINF38 have to be used.

2.7 M_COVR

The CS (DATCVR02) of S-52 has to be modified for the display of bathymetric Inland ENCs. The M_COVR object of the bIENC shall be displayed with a blue outline for a clear distinction between areas which are covered by bIENCs and areas which are not.

2.8 Anchorage areas, depth areas, exceptional navigational structures, shoreline constructions and underwater rocks

The CS procedures for

- anchorage areas (RESTRN01),
- depth areas and exceptional navigational structures (DEPARE02),
- shoreline constructions (SLCONS04) and
- underwater rocks (OBSTRN07)

of S-52 have to be modified to include the display of achare, depare, excnst, slcons and uwtroc.

3. Symbols for Inland ECDIS

Symbols can be defined in vector format or in raster format. Symbols which will be rotated must be defined in vector format. The size of vector symbols is adapted automatically to the resolution and size of the screen. In case of raster symbols, different symbol sets must be designed to meet the requirements of a readable display.

A list of all Inland ECDIS symbols and their pictures is in Chapter 4 and 5. The symbols are supplied in digital form at https://ienc.openecdis.org.

4. List of symbol names

4.1 New Symbols to be shown on the chart display

4.1.1 Raster symbols

4.1.1.1 Symbols in general

BORDER01: check point, border

BUNSTA01: bunker station, diesel oil station

BUNSTA02: bunker station, water

BUNSTA03: bunker station, ballast

BUNSTA04: power supply

CUSTOM01: control point, custom

DISMAR05: distance mark on river axis

HECMTR01: hectometre point, 100 m

HECMTR02: hectometre point, 1 km

HGWTMK01: high water mark

LIFEBUOY: rescue station with life buoy, ring buoy, life ring or life saver

NOTMRK01: notice mark, prohibition

NOTMRK02: notice mark, regulation, restriction

NOTMRK03: notice mark, information, recommendation

NOTMRK04: several notice marks, at least one prohibition mark

NOTMRK05: several notice marks, no prohibition mark, at least one regulation or restriction mark

NOTMRK06: several notice marks, only information and/or recommendation marks

REFDMP01: refuse dump

SSENTR01: port entry

SSLOCK01: signal station, lock

SSWARS01: signal station, Wahrschau

TRNBSN01: turning basin

VEHTRF01: vehicle transfer

VTCLMK01: vertical clearance mark at bridges

WTLVGG02: gauge, height of water

4.1.1.2 Navigational aids

BCNSTK03: river beacon, stake – pole

BCNLAT23: river beacon, separation - simplified

BOYLAT25: river buoy, fairway separation – simplified

BOYLAT26: river buoy, obstruction at the right side

BOYLAT27: river buoy, obstruction at the left side

BOYINL01: river buoy right-hand side of the fairway (1.B of CEVNI, can be combined with a LIGHTS to 1.A or a TOPMA114 to 1.C or 1.D)

BOYINL02: river buoy left-hand side of the fairway (2.B of CEVNI, can be combined with a LIGHTS to 2.A or a TOPMA115 to 2.C or 2.D)

BOYINL03: river buoy bifurcation of the fairway (3.B of CEVNI, can be combined with a LIGHTS to 3.A, a TOPMA117 to 3.C or 3.D, a TOPMA114 to 3.E or 3.F and a TOPMA115 to 3.E1 or 3.F1)

BOYINL08: river buoy yellow float (8.C of CEVNI)

TOPMA100: beacon top mark, red cone, point down

TOPMA101: beacon top mark, red boarded cone, point down

TOPMA102: beacon top mark, green cone, point up

TOPMA103: beacon top mark, green boarded cone, point up

TOPMA104: beacon top mark, red boarded cone, point down, green boarded cone, point up, simplified

TOPMA105: beacon top mark, red boarded cone, point down, green boarded cone, point up, simplified

TOPMA106: beacon top mark, white-red square board, vertical

TOPMA107: beacon top mark, red boarded square board, vertical

TOPMA108: beacon top mark, white-green square board, diagonal

TOPMA109: beacon top mark, green boarded square board, diagonal

TOPMA110: beacon top mark, yellow-black square board, vertical

TOPMA111: beacon top mark, yellow St. Georg cross

TOPMA112: beacon top mark, yellow-black square board, diagonal

TOPMA113: beacon top mark, yellow Andreas-cross

TOPMA114: buoy top mark, red cylinder

TOPMA115: buoy top mark, green cone, point up

TOPMA116: buoy top mark, red-white-red board, entry prohibited

TOPMA117: buoy top mark, red-green sphere

4.1.1.3 Harbour facilities and terminals

HRBFAC10: default harbour facility

HRBFAC11: harbour facility naval base

HRBFAC12: harbour facility ship yard
HRBFAC13: harbour facility harbour-master's office
HRBFAC14: harbour facility pilot
HRBFAC15: water police
HRBFAC16: customs office
HRBFAC17: harbour facility service and repair
HRBFAC18: harbour facility quarantine station
TERMNL01: terminal, passenger terminal
TERMNL02: terminal, ferry terminal
TERMNL03: terminal, Container trans-shipment
TERMNL04: terminal, Bulk trans-shipment
TERMNL05: terminal, Oil trans-shipment
TERMNL06: terminal, Fuel trans-shipment
TERMNL07: terminal, Chemical trans-shipment
TERMNL08: terminal, Liquid Goods trans-shipment
TERMNL09: terminal, Explosive goods trans-shipment
TERMNL10: terminal, Fish trans-shipment
TERMNL11: terminal, Car trans-shipment
TERMNL12: terminal, General Cargo trans-shipment
TERMNL13: terminal, RoRo Terminal

4.1.2 Vector symbols for European inland waterways (must be rotated, the numbers refer to CEVNI)

NMKPRH02: no entry (general sign) (A.1)
NMKPRH12: no passing on left side (A.10)
NMKPRH13: no passing on right side (A.10)
NMKRCD01: recommended channel in both directions (D.1a)
NMKRCD02: recommended channel only in the direction indicated (D.1b)
NMKRCD03: you are recommended to keep on right side (D.2)
NMKRCD04: you are recommended to keep on left side (D.2)
NMKINF01: entry permitted (E.1)
NMKREG50: wreck pontoon, passage allowed on side showing red-white sign
NMKREG51: wreck pontoon, passage allowed on both sides

4.2 New symbols to be shown in the "information window on notice marks"

4.2.1 Notice marks for European inland waterways (the numbers refer to CEVNI)

NMKPRH03: sections closed to use, no entry except for non-motorized small craft (A.1.1a)

NMKPRH04: no overtaking (A.2)

NMKPRH05: no overtaking of convoys by convoys (A.3)

NMKPRH06: no passing or overtaking (A.4)

NMKPRH07: no berthing (i.e. no anchoring or making fast to the bank) on the side of the waterway on which the sign is placed (A.5)

NMKPRH08: no anchoring or trailing of anchors, cables or chains on the side of the waterway on which the sign is placed (A.6)

NMKPRH09: no making fast to the bank on the side of the waterway on which the sign is placed (A.7)

NMKPRH10: no turning (A.8)

NMKPRH11: do not create wash likely to cause damage (A.9)

NMKPRH14: motorized craft prohibited (A.12)

NMKPRH15: sports or pleasure craft prohibited (A.13)

NMKPRH16: water skiing prohibited (A.14)

NMKPRH17: sailing vessels prohibited (A.15)

NMKPRH18: all craft other than motorized vessels or sailing craft prohibited (A.16)

NMKPRH19: use of sail boards prohibited (A.17)

NMKPRH20: water bikes prohibited (A.20)

NMKPRH21: end of zone authorized for high speed navigation of small sport and pleasure craft (A.18)

NMKPRH22: no launching or beaching of vessels (A.19)

NMKREG01: there are restrictions on navigation: make enquiries (with additional sign at bottom of main sign) (C.4)

NMKREG02: proceed in left direction (B.1)

NMKREG03: proceed in right direction (B.1)

NMKREG04: move to the side of the fairway on your port side (B.2a)

NMKREG05: move to the side of the fairway on your starboard side (B.2b)

NMKREG06: keep the side of the fairway on your port side (B.3a)

NMKREG07: keep the side of the fairway on your starboard side (B.3b)

NMKREG08: cross fairway to port (B.4a)

NMKREG09: cross fairway to starboard (B.4b)

NMKREG10: stop as prescribed in the regulations (B.5)

NMKREG11: give a sound signal (B.7)

NMKREG12: keep a particularly sharp outlook (B.8)

NMKREG13: do not enter the main waterway until certain that this will not oblige vessels proceeding on it to change their course or speed (B.9a)

NMKREG14: do not cross the main waterway until certain that this will not oblige vessels proceeding on it to change their course or speed (B.9b)

NMKREG15: obligation to enter in a radiotelephone link on the channel as indicated on the board (B.11)

NMKREG16: depth of water limited (C.1)

NMKREG17: headroom limited (C.2)

NMKREG18: width of passage or channel limited (C.3)

NMKREG19: the channel lies at a distance from the left bank (C.5)

NMKREG20: the channel lies at a distance from the right bank (C.5)

NMKREG21: proceed in left direction (B.1), orientation encoded

NMKREG22: proceed in right direction (B.1), orientation encoded

NMKREG23: stop as prescribed in the regulations (B.5), orientation encoded

NMKREG24: give a sound signal (B.7), orientation encoded

NMKREG25: obligation to use onshore power supply point (B.12)

NMKRCD05: you are recommended to proceed in the left direction (D.3)

NMKRCD06: you are recommended to proceed in the right direction (D.3)

NMKRCD07: you are recommended to proceed in the left direction (D.3), orientation encoded

NMKRCD08: you are recommended to proceed in the right direction (D.3), orientation encoded

NMKINF02: overhead cable crossing (E.2)

NMKINF03: weir (E.3)

NMKINF04: ferry-boat not moving independently (E.4)

NMKINF05: ferry-boat moving independently (E.4b)

NMKINF06: berthing (i.e. anchoring or making fast to the bank) permitted on the side of the waterway on which the sign is placed (E.5)

NMKINF07: berthing area reserved for pushing navigation vessels that are not required to carry blue lights or blue cones on the side of the waterway on which the sign is placed (E.5.4)

NMKINF08: berthing area reserved for pushing navigation vessels that are required to carry one blue light or one blue cone on the side of the waterway on which the sign is placed (E.5.5)

NMKINF09: berthing area reserved for pushing navigation vessels that are required to carry two blue lights or two blue cones on the side of the waterway on which the sign is placed (E.5.6)

NMKINF10: berthing area reserved for pushing navigation vessels that are required to carry three blue lights or three blue cones on the side of the waterway on which the sign is placed (E.5.7)

NMKINF11: berthing area reserved for vessels other than pushing navigation vessels that are not required to carry blue lights or blue cones on the side of the waterway on which the sign is placed (E.5.8)

NMKINF12: berthing area reserved for vessels other than pushing navigation vessels that are required to carry one blue light or one blue cone on the side of the waterway on which the sign is placed (E.5.9)

NMKINF13: berthing area reserved for vessels other than pushing navigation vessels that are required to carry two blue lights or two blue cones on the side of the waterway on which the sign is placed (E.5.10)

NMKINF14: berthing area reserved for vessels other than pushing navigation vessels that are required to carry three blue lights or three blue cones on the side of the waterway on which the sign is placed (E.5.11)

NMKINF15: berthing area reserved for all vessels that are not required to carry blue lights or blue cones on the side of the waterway on which the sign is placed (E.5.12)

NMKINF16: berthing area reserved for all vessels that are required to carry one blue light or one blue cone on the side of the waterway on which the sign is placed (E.5.13)

NMKINF17: berthing area reserved for all vessels that are required to carry two blue lights or two blue cones on the side of the waterway on which the sign is placed (E.5.14)

NMKINF18: berthing area reserved for all vessels that are required to carry three blue lights or three blue cones on the side of the waterway on which the sign is placed (E.5.15)

NMKINF19: anchoring or trailing of anchors, cables or chains permitted on the side of the waterway on which the sign is placed (E.6)

NMKINF20: making fast to the bank permitted on the side of the waterway on which the sign is placed (E.7)

NMKINF21: berthing area reserved for loading and unloading vehicles (E.7.1)

NMKINF22: turning area (E.8)

NMKINF23: crossing with secondary waterway ahead (E.9a)

NMKINF24: secondary waterway ahead on the right (E.9.b)

NMKINF25: secondary waterway ahead on the left (E.9.c)

NMKINF26: secondary waterway ahead (main waterway right)

NMKINF27: secondary waterway ahead (main waterway left)

NMKINF28: secondary waterway left (main waterway right)

NMKINF29: secondary waterway right (main waterway left)

NMKINF30: secondary waterway ahead and left (main waterway right)

NMKINF31: secondary waterway ahead and right (main waterway left)

NMKINF32: crossing with main waterway ahead (E.10.a)

NMKINF33: junction with main waterway ahead (E.10.b)

NMKINF34: junction with main waterway ahead and right

NMKINF35: junction with main waterway ahead and left

NMKINF36: junction with main waterway ahead and right (secondary waterway left)

NMKINF37: junction with main waterway ahead and left (secondary waterway right)

NMKINF38: end of prohibition or obligation applying to traffic in one direction only, or end of restriction (E.11)

NMKINF39: drinking water supply (E.13)

NMKINF40: telephone (E.14)

NMKINF41: motorized vessels permitted (E.15)

NMKINF42: sport and pleasure craft permitted (E.16)

NMKINF43: water skiing permitted (E.17)

NMKINF44: sailing vessels permitted (E.18)

NMKINF45: craft other than motorized vessels or sailing craft permitted (E.19)

NMKINF46: use of sailboards permitted (E.20)

NMKINF47: possibility of obtaining nautical information by radiotelephone on the channel indicated (E.23)

NMKINF48: water bikes permitted (E.24)

NMKINF49: zone authorized for high speed navigation of small sport and pleasure craft (E.21)

NMKINF50: launching or beaching of vessels small craft permitted (E.22)

NMKINF51-55: maximum number of vessels permitted to berth abreast (E.5.3)

NMKINF56: electrical power supply point (E.25)

NMKINF57: winter harbour (E.26)

NMKINF58: winter shelter (E.27)

NMKINF59: use of spuds permitted (E.6.1)

NMKINF60: end of prohibition or obligation applying to traffic in one direction only, or end of restriction (E.11), orientation encoded

4.2.2 Notice marks for Russian inland waterways (the numbers refer to GOST 26600-98)

NMKPR101: no anchoring or trailing of anchors, cables or chains (1.1)

NMKPR102: no passing or overtaking of convoys (1.2)

NMKPR103: no passing or overtaking (1.3)

NMKPR104: do not create wash (1.4)

NMKPR105: small crafts prohibited (1.5)

NMKRE101: Attention! (keep caution) (2.1)

NMKRE102: fairway crossing (2.2)

NMKRE103: headroom limited (2.4)

NMKIN101: turning area (3.2)

NMKIN102: shipping inspection point (3.3)

4.2.3 Auxiliary panels (CEVNI Annex 7, Section II)

ADDMRK01: right (triangle to the right)

ADDMRK02: left (triangle to the left)

ADDMRK03: bottom (rectangle, portrait main board)

ADDMRK04: top (rectangle, portrait main board)

ADDMRK05: bottom (rectangle)

ADDMRK06: top (rectangle)

ADDMRK07: right (triangle to the right, landscape main board)

ADDMRK08: left (triangle to the left, landscape main board)

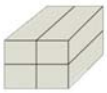
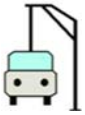
ADDMRK09: bottom (triangle to the bottom)

ADDMRK10: bottom (triangle to the bottom, portrait main board)

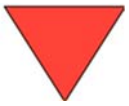
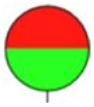
5. Pictures of Inland ECDIS symbols

5.1 Raster symbols

5.1.1 Symbols in general

 BORDER01	 BUNSTA01	 BUNSTA02	 BUNSTA03	 BUNSTA04	 CUSTOM01
 DISMAR05	 HECMTR01	 HECMTR02	 HGWTMK01	 LIFEBUOY01	 NOTMRK01
 NOTMRK02	 NOTMRK03	 NOTMRK04	 NOTMRK05	 NOTMRK06	 REFDMP01
 SSENTR01	 SSLOCK01	 SSWARS01	 TRNBSN01	 VEHTRF01	 VTCLMK01
 WTLVGG02					

5.1.2 Navigational aids

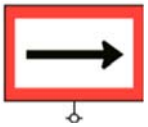
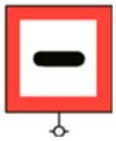
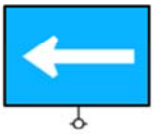
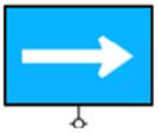
 BCNSTK03	 BCNLAT23	 BOYLAT25	 BOYLAT26	 BOYLAT27	 TOPMA100
 TOPMA101	 TOPMA102	 TOPMA103	 TOPMA104	 TOPMA105	 TOPMA106
 TOPMA107	 TOPMA108	 TOPMA109	 TOPMA110	 TOPMA111	 TOPMA112
 TOPMA113	 TOPMA114	 TOPMA115	 TOPMA116	 TOPMA117	 BOYINL01
 BOYINL02	 BOYINL03	 BOYINL08			

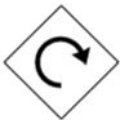
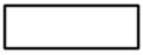
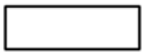
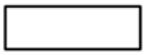
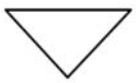
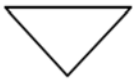
5.1.3 Harbour facilities, terminals

 HRBFAC10	 HRBFAC11	 HRBFAC12	 HRBFAC13	 HRBFAC14	 HRBFAC15
 HRBFAC16	 HRBFAC17	 HRBFAC18	 TERMNL01	 TERMNL02	 TERMNL03
 TERMNL04	 TERMNL05	 TERMNL06	 TERMNL07	 TERMNL08	 TERMNL09
 TERMNL10	 TERMNL11	 TERMNL12	 TERMNL13		

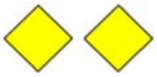
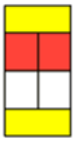
5.2 Symbols for the "information window on notice marks"

 NMKPRH03	 NMKPRH04	 NMKPRH05	 NMKPRH06	 NMKPRH07	 NMKPRH08
 NMKPRH09	 NMKPRH10	 NMKPRH11	 NMKPRH12	 NMKPRH13	 NMKPRH14
 NMKPRH15	 NMKPRH16	 NMKPRH17	 NMKPRH18	 NMKPRH19	 NMKPRH20
 NMKPRH21	 NMKPRH22	 NMKPR101	 NMKPR102	 NMKPR103	 NMKPR104
 NMKPR105	 NMKREG01	 NMKREG02	 NMKREG03	 NMKREG04	 NMKREG05
 NMKREG06	 NMKREG07	 NMKREG08	 NMKREG09	 NMKREG10	 NMKREG11
 NMKREG12	 NMKREG13	 NMKREG14	 NMKREG15	 NMKREG16	 NMKREG17

 NMKREG18	 NMKREG19	 NMKREG20	 NMKREG21	 NMKREG22	 NMKREG23
 NMKREG24	 NMKREG25	 NMKRE101	 NMKRE102	 NMKRE103	
 NMKRCD05	 NMKRCD06	 NMKRCD07	 NMKRCD08	 NMKINF02	 NMKINF03
 NMKINF04	 NMKINF05	 NMKINF06	 NMKINF07	 NMKINF08	 NMKINF09
 NMKINF10	 NMKINF11	 NMKINF12	 NMKINF13	 NMKINF14	 NMKINF15
 NMKINF16	 NMKINF17	 NMKINF18	 NMKINF19	 NMKINF20	 NMKINF21
 NMKINF22	 NMKINF23	 NMKINF24	 NMKINF25	 NMKINF26	 NMKINF27
 NMKINF28	 NMKINF29	 NMKINF30	 NMKINF31	 NMKINF32	 NMKINF33

 NMKINF34	 NMKINF35	 NMKINF36	 NMKINF37	 NMKINF38	 NMKINF39
 NMKINF40	 NMKINF41	 NMKINF42	 NMKINF43	 NMKINF44	 NMKINF45
 NMKINF46	 NMKINF47	 NMKINF48	 NMKINF49	 NMKINF50	 NMKINF51
 NMKINF52	 NMKINF53	 NMKINF54	 NMKINF55	 NMKINF56	 NMKINF57
 NMKINF58	 NMKINF59	 NMKINF60	 NMKINF58	 NMKIN101	 NMKIN102
 ADDMRK01	 ADDMRK02	 ADDMRK03	 ADDMRK04	 ADDMRK05	 ADDMRK06
 ADDMRK07	 ADDMRK08	 ADDMRK09	 ADDMRK10		

5.3 Vector symbols

 NMKINF01	 NMKPRH02	 NMKPRH12	 NMKPRH13	 NMKRCD01	 NMKRCD02
 NMKRCD03	 NMKRCD04	 NMKREG50	 NMKREG51		

6. Bathymetric Inland ENCs

Bathymetric Inland ENCs must be displayed as complementary layer only. It is not allowed to display bIENCs if the respective geographic area is not fully covered by an IENC or ENC. The usage of the respective ENCs/IENCs must be within the usage band of the bIENC. This means for example a bIENC with usage 5 to 7 may not be displayed together with an IENC of usage 4.

The bIENC has display priority over:

depare

DEPARE

DRGARE

DEPCNT

SOUNDG

UNSARE

M_COVR

and over the safety contour of the ENC or IENC. The bIENC must not have display priority over any other features of the IENC.

ANNEX 3
PRODUCT SPECIFICATION FOR BATHYMETRIC INLAND ENCS, EDITION 2.5

Unless it is specifically stated different in this Annex, the Inland ENC Product Specification (Annex 1) is applicable for bathymetric Inland ENCs as explained in the table below:

<adopted>	The definitions and sections of the IENC Product Specification apply completely for the bIENC Product Specification (100%)
<adopted with modifications>	The IENC Product Specification is relevant but for bIENCs slight deviations must be considered (e.g. exceptions). These modifications are described in the text of the relevant section.
<changed>	There's no need to refer to the IENC Product Specification. Everything is defined in the relevant section marked as <changed>.
<n/a>	This section of the IENC Product Specification is not applicable for the bIENC Product Specification.

In the following the modifications, changes and/or extensions are listed.

1. Introduction

<changed>

The bathymetric Inland ENC is a S-57 based product in addition to the already existing products (ENC, Inland ENC).

The content of bathymetric ENCs is limited to the bathymetry data only. The depth information can be encoded by means of the object classes depth area (DEPARE, depare), dredged area (DRGARE), depth contour (DEPCNT) and soundings (SOUNDG). Navigable areas without depths information are encoded as unsurveyed areas (UNSARE). Meta data is used to provide information about the pre-mentioned feature objects (e.g. accuracy and quality information).

Due to its limited content a bathymetric Inland ENC does not comply with the existing ENC Product Specification. And it complies with the Product Specification for Inland ECDIS Edition 2.0, 2.1, 2.2, 2.3 neither.

Bathymetric Inland ENCs must be regarded as bathymetric complement to ENCs and Inland ENCs. To make use of bathymetric Inland ENCs a dedicated Product Specification for bathymetric Inland ENCs is required. This Product Specification describes the dataset structure, topology, contents, meta information, object classes/attributes etc.

The use of bathymetric Inland ENCs facilitates the incorporation of survey-sensor based depth information during the ENC production process. This is because the bathymetry is stored in separate datasets which are simply replaced when new depth data is available.

Unless it is specifically stated different in this document the Inland ENC Product Specification is applicable for bathymetric Inland ENCs. In the following the modifications changes and/or extensions are listed.

A bathymetric Inland ENC shall be produced in accordance with the regulations defined in:

- this Product Specification for bathymetric Inland ENC;
- the Feature Catalogue for bathymetric Inland ENC;
- the Encoding Guide for Inland ENCs (especially pages C.1.1, C.1.4, C.1.6, C.1.7, C.1.8, I.1.1, I.1.2, I.1.3, I.1.6, I.1.7, I.1.8, I.1.9 and I.2.1).

The numbering correlates to the ENC Product Specification, S-57 Appendix B.1, Edition 2.0

1.1 Definitions

<adopted with modifications>

1.2 Contents of the document

The bENC Product Specification contains one application profile for the basic bENC used to populate the SENC (EN application profile). An application profile for updating of the SENC (ER application profile) is not defined. The application profile is described in S-57 Part 3, clause 1.4.2.

2. General information

2.1 Navigational purpose

<changed>

Bathymetric Inland ENCs make use of the same navigational purposes as ENCs (1 to 6) and Inland ENCs (1 to 9). However, a bathymetric Inland ENC has a range of categories of navigational purposes (e.g. from usage 4 to 9) it belongs to.

The INTU field of the S-57 Data Set Identification Record is used to indicate the navigational purpose of a cell. The expected input must be a binary value of type “unsigned integer”. This is why each possible range of bIENC navigational purpose categories must be mapped to a value of this type.

The mapping is done by means of the following formula:

$V_{INTU} = NP_{LC} *10 + NP_{HC} + 128$

Where

V_{INTU}: value of INTU field

NP_{LC}: lower category of navigational purpose

NP_{HC}: higher category of navigational purpose

Example: A usage range from 4 to 9 is mapped to the value 4*10+9+128 = 177.

2.2 Cells

<changed>

In order to facilitate the efficient processing of bathymetric Inland ENC data the geographic coverage of a given usage must be split into cells. Each cell of data must be contained in a physically separate, uniquely identified file on the transfer medium, known as a data set file (see clauses 5.4 and 5.6.3).

The geographic extent of the cell must be chosen by the bathymetric Inland ENC producer to ensure that the resulting data set file contains no more than 5 Megabytes of data. Subject to this consideration, the cell size must not be too small in order to avoid the creation of an excessive number of cells.

The coordinates of the borders of the cell are encoded in decimal degrees in the “Catalogue Directory” [CATD] field.

Point or line feature objects which are at the border of two cells with the same navigational purpose must be part of only one cell. They are put in the south or west cell (i.e. north and east borders of the cell are part of the cell, south and west borders are not).

When a feature object exists in several cells its geometry must be split at the cell boundaries and its complete attribute description must be repeated in each cell.

Bathymetric Inland ENCs do not have to be rectangular. The meta-object M_COVR with CATCOV1 is used to represent the geographic area containing data.

Data within bathymetric cells of the same navigational purpose must not overlap.

2.3 Topology

<changed>

Bathymetric Inland ENCs use planar graph topology without faces (edges must not cross).

3. Features and attributes

3.1 Feature object identifiers

<adopted>

3.2 Standard features and attributes

<adopted with amendments>

Object classes defined in the Feature Catalogue for Inland ENCs, but not listed in the following section of this document are prohibited for use in bIENCs.

3.3 Objects permitted for use in bENC and their geometric primitives

<changed>

Following is a list of those features allowed in a bathymetric Inland ENC and the geometric primitives allowed for each of them (P = point, L = line, A = area).

#		P	L	A
1	DEPCNT		L	
2	DEPARE			A
3	DRGARE			A
4	UNSARE			A
5	SOUNDG	P		
6	M_COVR			A
7	M_QUAL			A
8	M_SREL			A
9	M_SDAT			A
10	M_CSCL			A
11	M_NPUB			A
12	depare			A
13	m_sdat			A

The attributes and enumerations which may be used for the features are defined in the Feature Catalogue for bathymetric Inland ENCs.

3.4 Meta features

<adopted with modifications>

A meta feature M_COVR is not required to cover any part of the cell that does not contain geographical data.

The meta features M_NSYS and m_nsys are not used.

3.5 Geo and meta feature attributes

3.5.1 Missing enumerations

<adopted>

3.5.2 Mandatory attributes

<changed>

The following table gives the attributes which are mandatory for each feature. When a feature is not in the list it means that there are no mandatory attributes for this feature.

Feature	Attributes					
DEPCNT	VALDCO					
DEPARE	DRVAL1	DRVAL2				
DRGARE	DRVAL1					
M_COVR	CATCOV 1					
M_QUAL	either:	CATZOC	or at least one of:	POSACC	SOUACC	TECSOU
M_SDAT	VERDAT					
M_CSCL	CSCALE					
depare	DRVAL1	DRVAL2	hunits	wtwdis		
m_sdat	verdat					

3.5.3 Prohibited attributes

<adopted>

3.5.4 Numeric enumerations

<adopted>

3.5.5 Text enumerations

<adopted>

3.5.6 Hierarchy of meta data

<adopted>

3.6 Cartographic features

<adopted>

3.7 Time varying objects

<adopted>

3.8 Geometry

<adopted>

3.9 Relationships

<n/a>

3.10 Groups

<adopted>

3.10.1 Group 1 (skin of the earth)

<adopted with modifications>

The list below contains the features that must always be in Group 1, if they appear in the dataset and if they are of type area.

DEPARE DRGARE UNSARE depare

3.10.2 Group 2 (all other features)

<adopted>

3.11 Language and alphabet

3.11.1 Language

<adopted>

3.11.2 Use of lexical level 2

<adopted>

4. Cartographic framework

4.1 Horizontal datum

<adopted>

4.2 Vertical and sounding datum

<adopted>

4.3 Projection

<adopted>

4.4 Units

<adopted>

5. Provision of data

5.1 Implementation

<adopted>

5.2 Compression

<adopted>

5.3 Encryption

<adopted>

5.4 Exchange set

If bIENC data is made available via SENC distribution section 5.4 is not applicable.

5.4.1 Content of the exchange set

<adopted with modifications>

Picture files must not be included

5.4.2 Volume naming

<adopted>

5.4.3 Directory structure

<adopted>

5.5 Data sets

<modified>

Two kinds of data sets may be produced:

new data set: no bathymetric Inland ENC data has previously been produced for this area and for the same navigational purpose.

new edition of a data set: new information which has not been previously distributed.

Updates and re-issues must not be produced.

5.6 File naming

5.6.1 README file

<adopted>

5.6.2 Catalogue file

<adopted with modifications>

Not applicable in case of SENC distribution.

5.6.3 Data set files

<modified>

The data set files are named according to the specifications given below:

```
CCBRRRRR.000
|    | |   |       |
|    | |   |       |------ 000 = extension*
|    | |   |-------------- RRRRR =   waterway code and waterway distance (kilometre) or other
|    | |                             individual cell code.
|    | |-----------------
|    |---------------------- B = Product Id (bathymetric ENC)
|------------------------- CC = producer code
```

The main part forms an eight character identifier where:

- the first two characters identify the producer.
- the third character indicates the Product Id
- the fourth to eighth characters are used for the cell code. This code can be used in any way (e.g. to identify the waterway and the waterway distance) by the producer to provide the unique file name. If characters other than numbers are used only uppercase letters are allowed.

A valid base cell file must be uniquely identified worldwide by its name, and have the extension 000.

*In case of SENC distribution the extension may vary.

5.6.4 Text and picture files

<adopted with modifications>

Picture files are not used.

5.7 Updating

<changed>

In order to ensure that new editions are incorporated into the SENC in the correct sequence without any omission, the file extension and a number of subfields in the Data Set Identification [DSID] field are used in the following way:

file extension	every new data set or new edition must have a 000 extension. In case of SENC distribution the extension may vary.
edition number	when a data set is initially created, the edition number 1 is assigned to it. The edition number is increased by 1 at each new edition.
update number	update number 0 is assigned to a new data set.
update application	update application date
issue date	date on which the data was made available by the data producer.

Each new edition of a data set must have the same name as the base cell file which it replaces. The ENC update mechanism is described in S-57 Part 3, clause 8.

In order to modify a text file, a new file with the same name is created.

5.8 Media

<adopted>

5.9 Error detection

<adopted>

6. Application profiles

6.1 General

<adopted>

6.2 Catalogue file

<adopted with modifications>

This section is not applicable in case of SENC distribution.

6.3 EN application profile

<adopted with modifications>

Data Set Identification field [DSID]

The value of the INTU sub-field must be “unsigned binary”. It is determined by means of the following formula:

$V_{INTU} = NP_{LC} *10 + NPHC + 128$

Where

V_{INTU}: value of INTU field

NP_{LC}: lower category of navigational purpose

NP_{HC}: higher category of navigational purpose

Example: A usage range from 4 to 9 is mapped to the value 4*10+9+128 = 177

In the PRSP (Product specification) subfield the value {200} is used as the indicator for a bathymetric ENC. The Product specification edition number is 1.0 (PRED subfield).

Data Set Parameter field – DSPM

In the VDAT (vertical datum) sub-field the value {255} (= null) is used.

In the SOMF (sounding multiplication factor) sub-field the value {100} is used.

6.4 ER application profile

<n/a>

ANNEX 4
COMPARISON OF THE STRUCTURES OF THE STANDARD FOR MARITIME ECDIS AND OF ES-RIS

Maritime ECDIS	ES-RIS	OPEN ECDIS FORUM https://ienc.openecdis.org
IMO MSC.232(82) revised Performance Standards for ECDIS, December 2006 Appendix 1: Reference documents Appendix 2: SENC Information available for display during route planning and route monitoring Appendix 3: Navigational elements and parameters Appendix 4: Areas for which special conditions exist Appendix 5: Alarms and indicators Appendix 6: Back-up requirements Appendix 7: Raster Chart Display System (RCDS), mode of operation	Part I, Chapter 1: General provisions and references Part I, Chapter 2: General requirements and specifications of Inland ECDIS Part I, Chapter 3: System configurations (Figures)	
IHO S-57: Transfer Standard for Digital Hydrographic Data, Edition 3.1, Supplement No 2, June 2009 Part 1: General Introduction Part 2: Theoretical Data Model Part 3: Data Structure	Part I, Chapter 4: Data Standard for IENCs	
Appendix A: IHO Object catalogue Introduction Chapter 1: Object Classes Chapter 2: Attributes Annex B: Attributes/Object Classes Cross Reference		IENC Feature Catalogue Bathymetric IENC Feature Catalogue

Maritime ECDIS	ES-RIS	OPEN ECDIS FORUM https://ienc.openecdis.org
Appendix B: Product specifications Appendix B.1: ENC Product specification Annex A: Use of the Object Catalogue for ENC Annex B: Example of Cyclic Redundancy Check (CRC) Coding Appendix B.2: IHO Object Catalogue Data Dictionary Product Specification		Product Specification for IENCs Product Specification for bathymetric IENCs IENC Encoding Guide
IHO S-62 ENC Producer Codes, Edition 2.5, December 2009		Codes for Producers and Waterways
IHO S-52 Specification for Chart Content and Display Aspects of ECDIS, Edition 6, March 2010 Annex A: IHO ECDIS presentation library Annex B: Procedure for initial calibration of colour displays Annex C: Procedure for maintaining the calibration of displays Appendix 1: Guidance on updating the electronic chart Annex A: Definitions and acronyms Annex B: Current updating practice for paper charts Annex D: Estimate of data volume	Part I, Chapter 6: Presentation Standard for Inland ECDIS	Presentation Library for Inland ECDIS Look-up tables Symbols Conditional Symbology Procedures
IEC 61174 Edition 3.0: ECDIS - Operational and Performance Requirements, Methods of Testing and Required Test Results, 2008-09	Part V	
S-32 Appendix 1: Hydrographic Dictionary – Glossary of ECDIS-Related Terms	Part I, Chapter 7: Glossary of Terms	