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## **INTERNATIONAL HYDROGRAPHIC ORGANIZATION**



### **IHO TRANSFER STANDARD For DIGITAL HYDROGRAPHIC DATA**

**Enhancements Required to Encode S-57 Edition 3.1.1 ENC Data**

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## 1. Introduction to S-57 Supplement No1 (Edition 3.1.1)

This document provides a set of enhancements to S-57 Edition 3.1. These are comprised of:

- three new feature object classes;
- three new attributes, and;
- two new attribute values for Category of Restricted Area.

This document is structured so that its contents may be easily used in conjunction with the existing S-57 Edition 3.1. It contains pages for the new features and attributes (Edition 3.1.1) as well as numbered sections corresponding to the relevant sections of the ENC Product Specification (Edition 2.0) and the Use of the Object Catalogue for ENCs (Edition 2.1). When these enhancements are applied to S-57 Edition 3.1, the resulting updated standard will be referred to as S-57 Edition 3.1.1.

Use of these enhancements is optional and the decision to use them is at the discretion of each ENC producer. It is anticipated that only those ENC producers needing to encode Archipelagic Sea Lanes, Environmentally Sensitive Sea Areas or Particularly Sensitive Sea Areas will use these enhancements. The enhancements will only be published in this form and there are no plans to reissue the entire S-57 document.

A third new feature object class – New Object - has been added with its associated new attributes, for possible future use by the IHO, to accommodate features that need to be encoded in an ENC specified by the IMO and that affect safety of navigation which cannot adequately be encoded by any existing object class. The 'New Object' feature object class is only to be used in conjunction with an ENC Encoding Bulletin issued by the IHO. The Bulletin will provide the specifics on how to use the object for a particular application. The 'New Object' feature object class is not to be used under any other circumstances. For example, an ENC producer must not use New Object to encode a national feature unless it has been issued by the International Hydrographic Organization (IHO).

If an ENC producer chooses to implement these enhancements, when an S-57 Edition 3.1 ENC is upgraded to S-57 Edition 3.1.1 the ENC must be issued as a new edition.

The latest version of the IHO Test Data Set (S-64) contains an example of each of these new feature object classes and attributes.

The rationale for issuing these enhancements is explained in IHO Circular Letter 94 of 2005 which reads in part:

“At the 17th meeting of the Committee on Hydrographic Requirements for Information Systems (CHRIS) it was agreed that ENCs based on the next major revision of the IHO Data Transfer Standard (S-57) will not occur before 2012. However, the International Maritime Organization (IMO) recently adopted measures that require new chart features, such as Particularly Sensitive Sea Areas and Archipelagic Sea Lanes. These features cannot be adequately encoded in an ENC using S-57 Edition 3.1. As a result, the CHRIS has asked its Transfer Standard Maintenance and Application Development Working Group (TSMAD) to develop a minor revision to the S-57 standard to accommodate the new requirements. This revision (S-57 Edition 3.1.1) will also add *placeholders* that can be used to accommodate any other new features that IMO may require in the future.”

Further, it explains:

“In the event that a 3.1.1 cell is loaded into an ECDIS that has not been upgraded, any new 3.1.1 features will be shown as “*Unknown Objects*” and displayed using the ECDIS “?” symbol. Further information about these features is available in the ‘*Information*’ attribute. But the mariner must obtain this using the ECDIS “*Pick Report*” functionality. As a result, the data is available but is not presented intuitively. As such, upgrading ECDIS equipment to 3.1.1 to correctly display the new IMO requirements is highly desirable. The CHRIS has instructed TSMAD that the changes they develop for this minor revision should not result in a requirement for ECDIS equipment to be re-tested for type-approval.”

However tests carried out on various ECDIS displays have indicated that not all ECDIS perform as expected and accordingly, new S-52 *Deferred Amendments (in CSMWG Maintenance Document No 5)* are being issued to ensure that mariners are warned when an 'unknown object' is loaded and that valid attributes, especially INFORM and TXTDSC, are made available to the mariner by pick report, so that he can ascertain what the 'unknown object' is. HO's are also strongly advised to issue Notices to Mariners describing any of the new object classes (as specified in this Supplement) encoded in a new edition ENC.

## 2. S-57 (EDITION 3.1.1) Appendix A Chapter 1 (IHO Object Catalogue)

The following new object classes have been included in order to encode Archipelagic Sea Lanes.

### 2.1 New Object Classes - Archipelagic Sea Lane

#### GEO OBJECT CLASSES

Object Class: <b>Archipelagic Sea Lane</b>
--

Acronym: **ARCSLN**

Code: **161**

Set Attribute\_A: DATEND; DATSTA; NATION; NOBJNM; OBJNAM;

Set Attribute\_B: INFORM; NINFOM; NTXTDS; PICREP; SCAMAX; SCAMIN; TXTDSC;

Set Attribute\_C: RECDAT; RECIND; SORDAT; SORIND;

#### Definition:

Article 53 of the United Nations Convention on the Law of the Sea (UNCLOS) states that:

‘an archipelagic State may designate sea lanes ..., suitable for the continuous and expeditious passage of foreign ships ... through ... its archipelagic waters and the adjacent territorial sea. ... All ships ... enjoy the right of archipelagic sea lanes passage in such sea lanes ... [which] include all normal passage routes used as routes for international navigation ... through archipelagic waters’.

(Note: references to aircraft and air routes in UNCLOS have been omitted in these extracts from Article 53). (IHO M-4 B-435.10, S-51 Appendix 2 Part II)

#### References:

INT 1: M 17;

M-4: B-435.10;

#### Remarks:

The object class Archipelagic Sea Lane encodes the area of an Archipelagic Sea Lane.

Distinctions: administrative area; archipelagic sea lane axis; caution area; fairway; inshore traffic zone; recommended traffic lane part; restricted area; submarine transit lane; traffic separation scheme lane part; traffic separation zone; two-way route part.

## 2.2 New Object Classes - Archipelagic Sea Lane Axis

### GEO OBJECT CLASSES

Object Class: <b>Archipelagic Sea Lane Axis</b>
---

Acronym: **ASLXIS**

Code: **162**

Set Attribute\_A: DATEND; DATSTA; NATION; NOBJNM; OBJNAM;

Set Attribute\_B: INFORM; NINFOM; NTXTDS; PICREP; SCAMAX; SCAMIN; TXTDSC;

Set Attribute\_C: RECDAT; RECIND; SORDAT; SORIND;

#### Definition:

The reference line used to determine the maximum extents of an Archipelagic Sea Lane. It may not indicate the deepest water nor any recommended route or track.

Article 53 of the United Nations Convention on the Law of the Sea (UNCLOS) states that:

'an archipelagic State may designate sea lanes ..., suitable for the continuous and expeditious passage of foreign ships ... through ... its archipelagic waters and the adjacent territorial sea. ... All ships ... enjoy the right of archipelagic sea lanes passage in such sea lanes ... [which] include all normal passage routes used as routes for international navigation ... through archipelagic waters'.

#### References:

INT 1: M 17;

M-4: B-435.10;

#### Remarks:

In the definition, references to aircraft and air routes in UNCLOS have been omitted in these extracts from Article 53. (IHO M-4 B-435.10, S-51 Appendix 2 Part II)

Distinctions: administrative area; archipelagic sea lane; caution area; deep water route centreline; fairway; inshore traffic zone; navigation line; recommended route centreline; recommended track; recommended traffic lane part; restricted area; submarine transit lane; traffic separation scheme lane part; traffic separation line; traffic separation zone; two-way route part.



### 2.3 'New Object' Feature Object Class

The following 'New Object' feature object class has been included in order to cater for possible future requirements specified by the IMO and that affect safety of navigation which cannot adequately be encoded by any existing object class. It must not be used unless approved by the Transfer Standard Maintenance and Application Development Working Group (TSMAD) and the Colours and Symbols Maintenance Working Group (CSMWG) and issued as an ENC Encoding Bulletin.

#### GEO OBJECT CLASSES

Object Class: <b>New Object</b>
---------------------------------

Acronym: **NEWOBJ**

Code: **163**

Set Attribute\_A: CLSDEF; CLSNAM; COLOUR; COLPAT; CONDTN; CONRAD;  
CONVIS; DATEND; DATSTA; NATION; NOBJNM; OBJNAM;  
PEREND; PERSTA; RESTRN; STATUS; WATLEV;

Set Attribute\_B: INFORM; NINFOM; NTXTDS; PICREP; SCAMAX; SCAMIN;  
SYMINS; TXTDSC;

Set Attribute\_C: RECDAT; RECIND; SORDAT; SORIND;

#### Definition:

A new feature specified by the IMO and that affects safety of navigation which cannot adequately be encoded by any existing object class for use in an S-57 data set.

#### References:

INT 1: not specified;

M-4: not specified;

#### Remarks:

The 'New Object' feature object class has been included in order to cater for possible future requirements of the IMO that affects safety of navigation which cannot adequately be encoded by any existing object class. It must not be used unless approved by the Transfer Standard Maintenance and Application Development Working Group (TSMAD) and the Colours and Symbols Maintenance Working Group (CSMWG) and issued as an ENC Encoding Bulletin.

Distinction: caution area;

### 3. S-57 (EDITION 3.1.1) Appendix A Chapter 2 (*Attributes*)

The following new attribute values for Environmentally Sensitive Sea Area (ESSA) and Particularly Sensitive Sea Area (PSSA) have been included for CATREA. The additions are in bold font.

#### 3.1 New Attribute values for CATREA

##### FEATURE OBJECT ATTRIBUTES

Attribute: <b>Category of restricted area</b>
---

Acronym: **CATREA**

Code: **56**

Attribute type: L

Expected input:

ID	Meaning	INT 1	M-4
1	: offshore safety zone	L 3;	
2	: <del>anchoring prohibition area</del>		
3	: <del>fishing prohibition area</del>		
4	: nature reserve	N 22;	
5	: bird sanctuary	N 22;	
6	: game reserve	N 22;	
7	: seal sanctuary	N 22;	
8	: degaussing range	N 25;	B-448.1-3;
9	: military area	N 31;	
10	: historic wreck area	N 26;	B-449.5;
11	: <del>inshore traffic zone</del>		
12	: navigational aid safety zone	M 29.1;	B-435.7;
13	: <del>danger of stranding area</del>		
14	: minefield	N 34;	B-441.8;
15	: <del>diving prohibition area</del>		
16	: <del>area to be avoided</del>		
17	: <del>Prohibited area</del>		
18	: swimming area		
19	: waiting area		
20	: research area		
21	: dredging area	N 63;	B-446.4;
22	: fish sanctuary		
23	: ecological reserve		
24	: no wake area		
25	: swinging area		
26	: water skiing area		
27	: <b>Environmentally Sensitive Sea Area (ESSA)</b>	<b>N 22;</b>	<b>B-437.1;</b>
28	: <b>Particularly Sensitive Sea Area (PSSA)</b>	<b>N 22;</b>	<b>B-437.6;</b>

Definitions:

offshore safety zone: the area around an offshore installation within which vessels are prohibited from entering without permission; special regulations protect installations within a safety zone and vessels of all nationalities are required to respect the zone. (IHO Dictionary, S-32, 5th Edition, 4471)

nature reserve:	a tract of land managed so as to preserve its flora, fauna, physical features, etc.
bird sanctuary:	a place where birds are bred and protected.
game reserve:	a place where wild animals or birds hunted for sport or food are kept undisturbed for private use.
seal sanctuary:	a place where seals are protected.
degaussing range:	an area, usually about two cables diameter, within which ships' magnetic fields may be measured; sensing instruments and cables are installed on the sea bed in the range and there are cables leading from the range to a control position ashore. (IHO Chart Specifications, M-4)
military area:	an area controlled by the military in which restrictions may apply. (Hydrographic Service, Royal Australian Navy)
historic wreck area:	an area around certain wrecks of historical importance to protect the wrecks from unauthorized interference by diving, salvage or deposition (including anchoring). (IHO Chart Specifications, M-4)
navigational aid safety zone:	an area around a navigational aid which vessels are prohibited from entering.
minefield:	an area laid and maintained with explosive mines for defence or practice purposes.
swimming area:	an area in which people may swim and therefore vessel movement may be restricted.
waiting area:	an area reserved for vessels waiting to enter a harbour.
research area:	an area where marine research takes place.
dredging area:	an area where dredging is taking place.
fish sanctuary:	a place where fish are protected
ecological reserve:	a tract of land managed so as to preserve the relation of plants and living creatures to each other and to their surroundings.
no wake area:	an area in which a vessels' speed must be reduced in order to reduce the size of the wake it produces.
swinging area:	an area where vessels turn. (Service Hydrographique et Océanographique de la Marine, France).
water skiing area:	an area within which people may water ski and therefore vessel movement may be restricted.

**Environmentally Sensitive Sea Area (ESSA):**

**a generic term which may be used to describe a wide range of areas, considered sensitive for a variety of environmental reasons. (IHO Chart Specifications, M-4)**

**Particularly Sensitive Sea Area (PSSA):**

**an area that needs special protection through action by IMO because of its significance for regional ecological, socio-economic or scientific reasons and because it may be vulnerable to damage by international shipping activities. (IHO Chart Specifications, M-4)**

**Remarks:**

The official legal status of each kind of restricted area defines the kind of restriction(s), e.g. the restriction for a 'game reserve' may be 'entering prohibited'.

### 3.2 New Attribute – Object Class Definition

The following new attributes have been included to describe the characteristics for the “New Object” object class.

#### FEATURE OBJECT ATTRIBUTES

Attribute: <b>Object Class Definition</b>
---

Acronym: **CLSDEF**  
Attribute type: S

Code: **190**

Definition:

Specifies the defining characteristics of a ‘new object’.

Remarks:

Identical definitions must be used for other instances of identical features being encoded.

The wording for the attribute CLSDEF must be approved by TSMAD before use.

### 3.3 New Attribute – Object Class Name

#### FEATURE OBJECT ATTRIBUTES

Attribute: <b>Object Class Name</b>
-------------------------------------

Acronym: **CLSNAM**  
Attribute type: S

Code: **191**

Definition:

Specifies the descriptive name of a 'new object' feature object class.

Remarks:

All 'new objects' of the same class must share the same CLSNAM.

The wording for the attribute CLSNAM must be approved by TSMAD before use.

### 3.4 New Attribute - Symbol Instruction

#### FEATURE OBJECT ATTRIBUTES

Attribute: <b>Symbol Instruction</b>
--------------------------------------

Acronym: **SYMINS**

Code: **192**

Attribute type: S

Definition:

This specifies the S-52 Presentation Library symbol instruction to be adopted in ECDIS for the new object class (as specified in the S-52 Symbol Library - Addendum to S-52 Presentation Library).

Remarks:

The string for the attribute SYMINS must be approved by CSMWG and TSMAD before use.

Point, simple and complex lines, area or text symbol instructions may be specified. If SYMINS is not populated, a default symbol is provided.

Symbol instructions are explained in the Presentation Library Users' Manual, Part A, sections 3.3 and 7 "DESCRIPTION OF THE SYMBOLOGY INSTRUCTIONS".

Note that the separator between two instructions is the character ';' (semi-colon).

Example:

SYMINS = "SY(CHINFO11);LS(DASH,2,CHMGD)"

#### 4. S-57 (EDITION 3.1.1) Appendix B.1 (*Product Specifications for ENC*)

The following clauses are supplementary to the “ENC Product Specification” document (Edition 2.0), and may be necessary for Edition 3.1.1 requirements.

##### 3.3.1 New object classes and their geometric primitives permitted by this enhancement for use in ENC.

The following is a list of additional object classes allowed in an ENC and the geometric primitives allowed for each of them (P = point, L = line, A = area, N = none).

ARCSLN			A		ASLXIS		L			NEWOBJ	P	L	A	
--------	--	--	---	--	--------	--	---	--	--	--------	---	---	---	--

For reasons of backward compatibility with Edition 3.1, the new feature object classes which appear in S-57 3.1.1 which are listed above, must have their meaning described in at least one of the attributes INFORM or TXTDSC. For consistency, when one or both of these attributes is used, the text must commence with the approved object class name of the feature, such as ‘Archipelagic Sea Lane’.

The ‘New Object’ must only be used in conjunction with an ENC Encoding Bulletin issued by the IHO. The Bulletin will provide the specifics on how to use the object class for a particular application. The ‘New Object’ must not be used under any other circumstances.

##### 3.5.2.1 New mandatory attributes

Object Class	Attributes					
ARCSLN	NATION	At least one of INFORM or TXTDSC				
ASLXIS	NATION	At least one of INFORM or TXTDSC				
NEWOBJ	CLSDEF	CLSNAM	At least one of INFORM or TXTDSC			
RESARE	INFORM or TXTDSC only mandatory when values 27 or 28 are used.		(as well as existing mandatory attributes)			

##### 3.5.7.1 New attribute values

For reasons of backward compatibility with Edition 3.1, the new attribute values which appear in S-57 3.1.1 which are listed below, must have their meaning described in the attributes INFORM or TXTDSC. For consistency, when one or both of these attributes is used, the text must commence with the name of the feature, such as ‘Environmentally Sensitive Sea Area’.

CATREA 27: Environmentally Sensitive Sea Area (ESSA)  
28: Particularly Sensitive Sea Area (PSSA)

### **3.5.8 New attributes**

Three new attributes are added and are of type "Free Text".

CLSDEF  
CLSNAM  
SYMINS

#### **6.3.2.1 Data Set Identification field – DSID (EN)**

The STED subfield content must remain "03.1".

The PRED subfield content must remain "2.0".

To indicate that the data set is Edition 3.1.1 data, the text "STED:3.1.1;" must be included in the COMT subfield.

#### **6.4.2.1 Data Set Identification field – DSID (ER)**

The STED subfield content must remain "03.1".

The PRED subfield content must remain "2.0".

To indicate that the update applies to a 3.1.1 data set, the text "STED:3.1.1;" must be included in the COMT subfield.



## 5. S-57 (EDITION 3.1.1) APPENDIX B.1, Annex A (Use of the Object Catalogue for ENC, Edition 2.1)

The following clauses are supplementary to the "Use of the Object Catalogue" document (Edition 2.1), and may be necessary for Edition 3.1.1 requirements.

### 10.5 Archipelagic Sea Lane

If it is required to encode an Archipelagic Sea Lane, it must be done using **ARCSLN** and/or **ASLXIS** objects, and possibly navigational aids objects.

The unique character of Archipelagic Sea Lanes (ASLs) is specified by UNCLOS Article 53 and Part H, General Provision of IMO Ships Routing.

The encoding of relationships between these objects is defined in clause 10.5.3.

Remarks:

- In some cases only accurate information on the axes (**ASLXIS**) may be available and in such cases the extents of the ASL (**ARCSLN**) may not be able to be encoded.

#### 10.5.1 Archipelagic Sea Lanes (see M-4 - B-435.10)

The object class **ARCSLN** must only be used to encode the area of an Archipelagic Sea Lane.

Geo object:	Archipelagic Sea Lane ( <b>ARCSLN</b> )				
Attributes:	DATEND	DATSTA	NATION	NOBJNM	OBJNAM

For reasons of backward compatibility with Edition 3.1, at least one of the attributes INFORM or TXTDSC must be populated with the object class name *Archipelagic Sea Lane* as the initial text entered.

#### 10.5.2 Archipelagic Sea Lane Axis (see M-4 - B-435.10)

The object class **ASLXIS** must only be used to encode the axes defining an Archipelagic Sea Lane.

Geo object:	Archipelagic Sea Lane Axis ( <b>ASLXIS</b> )				
Attributes:	DATEND	DATSTA	NATION	NOBJNM	OBJNAM

For reasons of backward compatibility with Edition 3.1, at least one of the attributes INFORM or TXTDSC must be populated with the object class name *Archipelagic Sea Lane Axis* as the initial text entered.

#### 10.5.3 Archipelagic Sea Lane systems

To encode an Archipelagic Sea Lane (ASL) system, the **ARCSLN**, **ASLXIS** object classes, and any navigational aids object classes (if they are stated in the regulation defining the ASL), should be aggregated using the collection object **C\_AGGR** (see clause 15). The attribute OBJNAM for the **C\_AGGR** object classes may be used to encode the name of the ASL (if applicable).

### 11.15 Environmentally Sensitive Sea Areas (see M-4 - B-437)

If it is required to encode an Environmentally Sensitive Sea Area, it must be done using a **RESARE** object (see clause 11.1), with attribute CATREA = 27 (ESSA) or 28 (PSSA).

An Environmentally Sensitive Sea Area that is shown on the source as a point symbol should be encoded using a small **RESARE** object.

### 16. New Object

If it is required to encode a new object specified by the IMO and that affects safety of navigation which cannot adequately be encoded by any existing S-57 E3.1 object class, it must be done using the feature object class **NEWOBJ**. The 'New Object' feature object class must only be used in conjunction with an Encoding Bulletin issued by the IHO. The Bulletin will provide the specifics on how to use the object class for a particular application. The 'New Object' feature object class must not be used under any other circumstances.

Geo Object: New Object (**NEWOBJ**)

Attributes: CLSDEF CLSNAM COLOUR COLPAT CONDTN CONRAD CONVIS  
DATEND DATSTA NATION NOBJNM OBJNAM PEREND PERSTA  
RESTRN STATUS WATLEV INFORM NINFOM NTXTDS SYMINS TXTDSC

Remarks:

- When approved for use, the attribute CLSDEF must be defined in the data itself and is the detailed definition of all objects comprising the new object class. It is comparable to the definition section of an existing object class in the object catalogue. All objects that belong to the same object class (CLSNAM) must use an identical definition and this definition must also be used for the proposal to the S-100 feature data dictionary manager.
- When approved for use, the attribute CLSNAM must also be defined in the data itself and contains the descriptive name of the object class. For an object class that is defined in an existing object catalogue, this is the name of the object class e.g. 'Depth Area'. CLSNAM must not be used for the common name of the real world object. Common names must be encoded by use of OBJNAM and or NOBJNM. CLSNAM is a generic name to categorize all objects of one class and therefore all objects that belong to the same object class must have an identical CLSNAM. The value used for CLSNAM must also be used for the new feature object class when it is proposed to the S-100 feature data dictionary manager.
- At least one of INFORM or TXTDSC is mandatory, not both. INFORM is used to describe the feature for ECDIS systems that are not yet E3.1.1 compatible, as was done for the new attribute values for S-57 E3.1. For consistency, when one or both of these attributes is used, the text must commence with the approved object class name (CLSNAM) of the feature, such as 'Archipelagic Sea Lane'.
- This object class has default symbology in the S-52 Presentation Library Edition 3.4 (and later editions), however for features that are considered to affect safety of navigation, an existing symbol must be approved by TSMAD and CSMWG from the S-52 Symbol Library, in order to portray the feature more accurately on an ECDIS. If the attribute SYMINS is populated with a valid symbol instruction, this will override the default symbology. Note that there are separate symbol names for point, simple and complex lines, area and text symbology.
- A corresponding Encoding Bulletin will provide the specific attribute values (strings) and instructions on how to use the object class for a particular application. This object class must not be used without an ENC Encoding Bulletin issued by the IHO on the authority of TSMAD/CSMWG.

- In addition to the issue of the Encoding Bulletin, a new feature object class proposal (and new attributes if necessary) must also be made to the S-100 feature data dictionary manager. For future editions of the product specification, the new object class will be considered for inclusion in the object catalogue.