S-130

POLYGONAL DEMARCATIONS OF GLOBAL SEA AREAS

Annex A. Data Classification and Encoding Guide

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IHO

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1 Overview

1.1 Preface

The “Data Classification and Encoding Guide” has been developed to provide consistent, standardized instructions for encoding S-100 compliant Polygonal Demarcations of Global Sea Areas (S-130) data.

This document describes how to encode information that the modeller considers relevant to a Polygonal Demarcations of Global Sea Areas data product. The content of a dataset is at the discretion of the producing authority provided that the conventions described within this document are followed.

The entire S-100 Universal Hydrographic Data Model, including the S-130 Product Specification, is available at the following website, http://www.iho.int.

1.2 S-130 Annex A - Data Classification and Encoding Guide - Metadata

Note: This information uniquely identifies this Annex to the Product Specification and provides information about its creation and maintenance.

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Maintenance: Changes to S-130 Annex A - Data Classification and Encoding Guide are coordinated by the HSSC S-130 Project Team and must be made available via the IHO web site.

1.3 Terms, definitions and abbreviations

1.3.1 Terms and definitions

aggregation

special form of **association** that specifies a whole-part relationship between the aggregate (whole) and a component (see composition)

association

semantic relationship between two or more classifiers that specifies connections among their instances

NOTE: A binary association is an association among exactly two classifiers (including the possibility of an association from a classifier to itself)

attribute

named property of an entity

NOTE: Describes the geometrical, topological, thematic, or other characteristic of an entity

composition

a strong **aggregation**; if a container object is deleted than all of its containee objects are deleted as well (that is, containee objects cannot exist without the container object)

curve

1-dimensional **geometric primitive**, representing the continuous image of a line

NOTE: The **boundary** of a **curve** is the **set** of **points** at either end of the **curve**. If the **curve** is a cycle, the two ends are identical, and the **curve** (if topologically closed) is considered to not have a boundary. The first **point** is called the **start point**, and the last is the **end point**. Connectivity of the curve is guaranteed by the "continuous image of a line"

enumeration

A fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list (source: ISO 19136:2007, *Geographic information — Geography Markup Language (GML)*)

feature

Abstraction of real world phenomena

NOTE: A feature may occur as a type or an instance. The terms "feature type" or "feature instance" should be used when only one is meant

EXAMPLE: The feature instance named "Eiffel Tower" may be classified with other phenomena into a feature type "tower"

geometric primitive

geometric object representing a single, connected, homogeneous element of geometry

NOTE: Geometric primitives are non-decomposed objects that present information about geometric configuration. They include **points**, **curves**, **surfaces**

maximum display scale

the largest value of the ratio of the linear dimensions of features of a dataset presented in the display and the actual dimensions of the features represented (largest scale) of the scale range of the dataset

minimum display scale

the smallest value of the ratio of the linear dimensions of features of a dataset presented in the display and the actual dimensions of the features represented (smallest scale) of the scale range of the dataset

point

0-dimensional geometric primitive, representing a position

NOTE: The **boundary** of a point is the empty set

pointset

definition required

skin of the earth

a subset of the geographic (geo) features that must create a complete non-overlapping coverage of the area of data coverage of an ENC dataset

surface

connected 2-dimensional geometric primitive, representing the continuous image of a region of a plane

NOTE: The boundary of a surface is the set of oriented, closed **curves** that delineate the limits of the surface

1.3.2 Abbreviations

ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigational Chart
GML	Geography Markup Language
GNSS	Global Navigation Satellite System
HO	Hydrographic Office
IHO	International Hydrographic Organization
IMO	International Maritime Organization
ISO	International Organization for Standardization
SENC	System Electronic Navigational Chart
SOLAS	Safety of Life at Sea
TSMAD	Transfer Standard Maintenance and Application Development Working Group
UNCLOS	United Nations Convention on the Law of the Sea

1.4 Use of language

Within this document:

"Must" indicates a mandatory requirement;

"Should" indicates an optional requirement, that is the recommended process to be followed, but is not mandatory;

"May" means "allowed to" or "could possibly", and is not mandatory.

1.5 Maintenance

Changes to the Data Classification and Encoding Guide must occur in accordance with the S-130 PDGSA Product Specification.

2 General

2.1 Introduction

This S-130 Data Classification and Encoding Guide (DCEG) contains rules and guidance for converting data describing the real world into data products that conform to the S-130 specification.

The S-130 specification contains an application schema (UML model) describing the conceptual domain model in terms of classes and relationships, and a Feature Catalogue (see S-130 Annex B) that specifies the data model, i.e., specifies the data model types and associations corresponding to the various classes and relationships in the application schema.

To simplify the DCEG text, the various data model types will be provided without the suffixes “class”, “type” or “instance”; e.g. the term “feature” should be understood as “feature class” or “feature type” or “feature instance” as best fits the immediate context in which it is used (and where there might be confusion, it is written out in full as feature class/type/instance). The model defines real world entities as a combination of descriptive and spatial characteristics.

This section of the DCEG contains general information needed to understand the encoding rules and describes fundamental common rules and constraints. It also describes datasets and metadata. The data model object types used within S-130 and their encoding rules and guidelines are defined in detail in subsequent sections of this document.
Within this document the features, information types, associations and attributes appear in **bold text**.

2.2 Descriptive characteristics

2.2.1 Feature

A feature contains descriptive attributes that characterize real world entities.

The word ‘feature’ as used in the ISO 191xx series and in S-100 based product specifications has two distinct but related senses – ‘feature type’ and ‘feature instance’. A feature instance is a single occurrence of the feature and is represented as an object in a dataset.

The location of a feature instance on the Earth’s surface is indicated by a relationship to one or more spatial primitive instances. A feature instance may exist without referencing a spatial primitive instance.

2.2.1.1 Geographic feature class

Geographic (Geo) feature types carry the descriptive characteristics of a real world entity which is provided by a spatial primitive instance.

2.2.1.2 Meta feature class

Meta feature type contains information about other features.

2.2.2 Information type

An information type has no geometry and therefore is not associated to any spatial primitives to indicate its location.

An information type may have attributes and can be associated with features or other information types in order to carry information particular to these associated features or information types.

2.3 Spatial characteristics

2.3.1 Spatial primitives

The allowable spatial primitive for each feature is defined in the Feature Catalogue. Allowable spatial primitives are point, curve and surface.

Within this document, allowable spatial primitives are included in the description of each feature. For easy reference, Table 2-1 below summarises the allowable spatial primitives for each feature. In the table, abbreviations are as follows: point (P), curve (C), surface (S) and none (N).

Feature	P	C	S	N
Global Sea Area	x	x	x	x

Table 2-1 Features permitted for PDGSA and their spatial primitives

2.3.2 Capture density guideline

A curve consists of one or more curve segments. Each curve segment is defined as a loxodromic line on WGS84, or as an arc or circle. Long lines may need to have additional coordinates inserted to cater for the effects of projection change.

The presentation of line styles may be affected by curve length. Therefore, the encoder must be aware that splitting a curve into numerous small curves may result in poor symbolization.

2.4 Attributes

Attributes may be simple type or complex type. Complex (C) attributes are aggregates of other attributes that can be simple type or complex type. Simple attributes are assigned to one of 10 types.

The binding of attributes to feature types, the binding of attributes to attributes to construct complex attributes, and attribute multiplicity is defined in the Feature Catalogue. Within this document, the allowable attributes are included in the description of each feature type, as well as the allowable values for enumeration type attributes.

2.4.1 Multiplicity

In order to control the number of allowed attribute values or sub-attribute instances within a complex attribute, S-100 uses the concept of multiplicity. This defines lower and upper limits for the number of values, whether the order of the instances has meaning and if an attribute is mandatory or not. Common examples are shown in the table below:

Format : *MinOccurs*, *MaxOccurs* (if * Infinite) *(ordered)* – sequential

Multiplicity	Explanation
0,1	An instance is not required; there can be only one instance.
1,1	An instance is required and there must only be one instance.
0,*	An instance is not required and there can be an infinite number of instances.
1,*	An instance is required and there can be an infinite number of instances.
1,* (ordered)	An instance is required and there can be an infinite number of instances, the order of which has a specific meaning.
2,2	Two instances are required and no more than two.

Table 2-2 Multiplicity

2.4.2 Simple attribute types

Each simple attribute is assigned to one of 10 types:

EN Enumeration: A fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.

CL Codelist: An open enumeration, or the identifier of a vocabulary (mapping between codes, labels and definitions).

BO Boolean: A value representing binary logic. The value can be either *True* or *False*. The default state for Boolean type attributes (that is, where the attribute is not populated for the feature) is *False*.

RE Real: A signed Real (floating point) number consisting of a mantissa and an exponent. The representation of a real is encapsulation and usage dependent.

Examples: 23.501, -0.0001234, -23.0, 3.141296

IN Integer: A signed integer number. The representation of an integer is encapsulation and usage dependent.

Examples: 29, -65547

TE Free text: A CharacterString, that is an arbitrary-length sequence of characters including accents and special characters from a repertoire of one of the adopted character sets.

TD Truncated Date: One or more significant components of the modelling date are omitted.

Example: – – – –02– – (Year and date not encoded)

The exact format depends on the encoding. A GML dataset would use a GML built-in type and encode it as `<gMonth>--02<gMonth>`. An 8211 data format based dataset would truncated encode the date as – – – –02– –.

TI Time: A time is given by an hour, minute and second. Character encoding of a time is a string that follows the local time (complete representation, basic format) format defined in ISO 8601:2004.

Time zone according to UTC is optional.

Example: 183059 or 183059+0100 or 183059Z

The complete representation of the time of 27 minutes and 46 seconds past 15 hours locally in Geneva (in winter one hour ahead of UTC), and in New York (in winter five hours behind UTC), together with the indication of the difference between the time scale of local time and UTC, are used as examples.

Geneva*:* 152746+0100

New York: 152746-0500

DA Date: A date provides values for year, month and day according to the Gregorian Calendar

Example: 19980918 (YYYYMMDD)

DT Date and Time: A DateTime is a combination of a date and a time type. Character encoding of a DateTime shall follow ISO 8601:2004 (see TD and TI above).

Example: 19850412T101530

Real or integer attribute values must not be padded by non-significant zeroes. For example, for a signal period of 2.5 seconds, the value populated for the attribute **signal period** must be 2.5 and not 02.50.

2.4.3 Mandatory and conditional attributes

Some attributes are mandatory and must be populated for a given feature type. There are some reasons why attribute values may be considered mandatory:

- They are required to support correct portrayal;

- Certain features make no logical sense without specific attributes;
- Some attributes are required for safety of navigation.

Within this document, mandatory attributes (multiplicity 1,1; 1,n (n>1); or 1,*) are identified in the description of each feature type. For easy reference, Table 2-3 below summarises the mandatory attributes for each feature type (note that mandatory sub-attributes of complex attributes are not included in this table):

Feature	Mandatory Attributes
Global Sea Area	numericalIdentifier maximumDisplayScale

Table 2-3 Mandatory attributes for PDGSA feature classes

2.4.4 Missing attribute values

Where a value of a mandatory attribute is not known, the attribute must be populated with an empty (null) value. Where the value of a non-mandatory attribute is not known, the attribute should not be included in the dataset. In a base dataset, when an attribute code is present but the attribute value is missing, it means that the producer wishes to indicate that this attribute value is unknown.

In an Update dataset, when an attribute code is present but the attribute value is missing it means:

- that the value of this attribute is to be replaced by an empty (null) value if it was present in the original dataset, or
- that an empty (null) value is to be inserted if the attribute was not present in the original dataset.

3 Geo Features

3.1 Global Sea Area

IHO Definition: An area demarcating the limits of global seas and oceans.				
S-130 Geo Feature: GlobalSeaArea				
Super Type:				
Primitives: noGeometry, Point, Curve, Surface				
Real World	*Paper Chart Symbol*	*ECDIS Symbol*		
S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
numericalIdentifier			IN	1, 1
version			TE	0, 1
fixedDateRange			C	0, 1
dateStart	(DATSTA)		(S) DA	0, 1
dateEnd	(DATEND)		(S) DA	0, 1
maximumDisplayScale	(SCAMAX)		IN	1, 1
minimumDisplayScale	(SCAMIN)		IN	0, 1
sourceIndication	(SORIND)		C	0, *
reportedDate	(SORDAT)		(S) DA	0, 1
source			(S) TE	1, 1
sourceType		1: law or regulation 2: official publication 10: remotely sensed images 12: products issued by HO services	(S) EN	0, 1
INT 1 Reference: Remarks: • The way in which contributing points, construction lines and location references are currently being represented within the Application Schema will be further discussed for the next version. • Definition to be proposed to the IHO GI Registry for the next version.				

Distinction:

Feature/Information associations							
Type	**Association Name**	**Association Ends**					
		Class	**Role**	**Mult**	**Class**	**Role**	**Mult**
Asso	AdditionalInformation	**GlobalSeaArea**	informationProvidedFor	1, *	**AdditionalSpatialInformation**	providesInformation	0, *
Aggr	Aggregation	**GlobalSeaArea**	consistsOf	0, *	**GlobalSeaArea**	componentOf	0, *

4 Information types

4.1 Additional Spatial Information

IHO Definition: Additional textual information relating to one or more geographic locations.				
S-130 Information Type: AdditionalSpatialInformation				
Super Type:				
Primitives: None				
Real World	*Paper Chart Symbol*	*ECDIS Symbol*		
S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
locationReference			C	1, *
textLat			(S) TE	0, 1
locationByText			(S) TE	0, 1
referenceSystem			(S) TE	1, 1
textLon			(S) TE	0, 1
INT 1 Reference: Remarks: Distinction:				

5 Association Names

5.1 AdditionalInformation

IHO Definition: A feature association for the binding between at least one instance of a geo feature and an instance of an information type. Remarks: •No remarks.			
Role Type	**Role**	**Associated With**	**Multiplicity**
Association	providesInformation	**AdditionalSpatialInformation**	0, *
	informationProvidedFor	**GlobalSeaArea**	1, *

5.2 Aggregation

IHO Definition: A parent-child relationship where the child can exist independently of the parent. Remarks: •No remarks.			
Role Type	**Role**	**Associated With**	**Multiplicity**
Aggregation	componentOf	**GlobalSeaArea**	0, *
	consistsOf	**GlobalSeaArea**	0, *

6 Association Roles

6.1 providesInformation

IHO Definition: A pointer to an object that provides more information about the referencing feature or information type.

6.2 informationProvidedFor

IHO Definition: A pointer to a specific feature(s) for which further information is required.

6.3 consistsOf

IHO Definition: A pointer to a part in a whole-part relationship.

6.4 componentOf

IHO Definition: A pointer to the aggregate in a whole-part relationship.

7 Attribute and Enumerate Descriptions

7.1 reportedDate

IHO Definition: The date that the item was observed, done, or investigated.

Remarks:

•No remarks.

7.2 source

IHO Definition: The publication, document, or reference work from which information comes or is acquired.

Remarks:

•No remarks.

7.3 dateStart

IHO Definition: The earliest date on which an object (for example a buoy) will be present.

Remarks:

•No remarks.

7.4 dateEnd

IHO Definition: The latest date on which an object (for example a buoy) will be present.

Remarks:

•No remarks.

7.5 locationByText

IHO Definition: A textual rendering of a geographic location.

Remarks:

•No remarks.

7.6 textLat

IHO Definition: Textual description of latitude information.

Remarks:

• Definition to be proposed to the IHO GI Registry for the next version.

7.7 textLon

IHO Definition: Textual description of longitude information.

Remarks:

• Definition to be proposed to the IHO GI Registry for the next version.

7.8 referenceSystem

IHO Definition: A textual rendering of a coordinate reference system (CRS).

Remarks:

•No remarks.

7.9 numericalIdentifier

IHO Definition: An identifier referencing an object or feature that is external to the dataset, expressed in Uniform Resource Name (URN) format.

Remarks:

• The intention is to move to MRN Persistent Unique Identifiers if there is no compelling reason not to.

7.10 maximumDisplayScale

IHO Definition: The largest intended viewing scale for the data.

Remarks:

•No remarks.

7.11 minimumDisplayScale

IHO Definition: The smallest intended viewing scale for the data.

Remarks:

•No remarks.

7.12 version

IHO Definition: Identification of a specific form or variation of a feature instance.

Remarks:

• Definition to be proposed to the IHO GI Registry for the next version.

7.13 sourceType

IHO Definition: Type of the source.

1) **law or regulation**

IHO Definition: Treaty, convention, or international agreement; law or regulation issued by a national or other authority.

2) **official publication**

IHO Definition: Publication not having the force of law, issued by an international organisation or a national or local administration.

12) **products issued by HO services**

IHO Definition: Information obtained from products issued by Hydrographic Offices.

10) **remotely sensed images**

IHO Definition: Information obtained from satellite images.

Remarks:

• The use of remotely sensed images is only intended for improvement of the coastline geometry.

8 Complex Attributes

8.1 fixedDateRange

IHO Definition: An active period of a single fixed event or occurrence, as the date range between discrete start and end dates.

Sub-attributes:

dateStart (see clause 5.3)

dateEnd (see clause 5.4)

Remarks:

•No remarks.

8.2 locationReference

IHO Definition: Textual information to describe a geographic location.

Sub-attributes:

textLat (see clause 5.6)

locationByText (see clause 5.5)

referenceSystem (see clause 5.8)

textLon (see clause 5.7)

Remarks:

• Definition to be proposed to the IHO GI Registry for the next version.

8.3 sourceIndication

IHO Definition: Information about the source document, publication, or reference from which object data or textual material included or referenced in a dataset are derived.

Sub-attributes:

reportedDate (see clause 5.1)

source (see clause 5.2)

sourceType (see clause 5.13)

Remarks:

•No remarks.