S-130

POLYGONAL DEMARCATIONS OF GLOBAL SEA AREAS

Annex A. Data Classification and Encoding Guide

Edition 2.0.0 – 20250320

IHO

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CONTENTS

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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, https://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)

composite curve

sequence of curves such that each curve (except the first) starts at the end point of the previous curve in the sequence [ISO 19107]

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

populated

an attribute is **populated** when it is present and has a non-nilled value

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

HO   Hydrographic Office

IHO   International Hydrographic Organization

ISO   International Organization for Standardization

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 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 Product Specification.

The S-130 Product 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 C) 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
Construction Line		x		
Contributing Point	x			
Data Coverage			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. Long lines may need to have additional coordinates inserted.

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 the following 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 (S100_TruncatedDate): Allows a partial date to be encoded as an extension to the ISO 8601 compliant date attribute type values for year, month and day according to the Gregorian Calendar

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 the above example as `<gMonth>--02<gMonth>`. An 8211 data format based dataset would encode the truncated 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 XML Schema standard type for time because S-130 uses GML, which is an XML-based format.

Time zone according to UTC is optional.

Example: 18:30:59Z; 18:30:59+01:00; 18:30:59

DA   Date: A date provides values for year, month and day according to the Gregorian Calendar, conforming to the XML Schema format for dates because S-130 uses GML, which is an XML-based format.

Example: 1998-09-18 (YYYY-MM-DD)

URN   A persistent, location-independent, resource identifier that follows the syntax and semantics for URNs specified in RFC 2141.

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	featureIdentifier

Construction Line	lineType
Contributing Point	--
Data Coverage	maximumDisplayScale minimumDisplayScale

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 (nilled) 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 XML tag is present but the attribute value is missing it means:

- that the value of this attribute is to be replaced by an empty (nilled) value if it was present in the original dataset, or

- that an empty (nilled) value is to be inserted if the attribute was not present in the original dataset.

2.4.5 Text attribute types

Character string values for text attributes must be UTF-8 character encoding.

2.4.6 Spatial attribute types

Spatial attribute types must contain referenced geometry. Each spatial attribute instance must be referenced by a feature instance or another spatial attribute instance.

2.4.7 Dates

Values for dates must conform to the data format. Specifically, since GML is an XML-based format and uses XML Schema types for dates, the XML Schema format for dates is used (see Table 1-2 in S-100 Part 1).

EXAMPLE: January 1, 2025 is encoded as 2025-01-01

Encoded date ranges are inclusive, see S-100 Part 3, clause 3-8.3. For example:

> fixed date range/date start = 2022-09-22   Commences at 000000 hours on 22 September 2022

> fixed date range/date end = 2022-10-22   Ends at 240000 hours on 22 October 2022.

2.4.8 Feature identifier

The numeric component of *featureIdentifier* attributes must be encoded as:

`YYYYYYXXXXXX`

where:

- YYYYYY: number computed by adding an offset of 90.000 to the latitude coordinate of the centroid in decimal degrees (3 decimals);
- XXXXXX: number computed by adding 180.000 to the longitude coordinate of the centroid in decimal degrees (3 decimals);
- leading and trailing zeros are used as necessary so that each number computed as above is exactly 6 digits.

EXAMPLE: A feature with a centroid of 50.0° N 40.0° W (latitude=+50.0, longitude=-40.0 in decimal degrees) will have numeric identifier component `140000140000`

2.5   Datasets

A Dataset is a grouping of features, meta-features, information types, attributes, and spatial objects referenced by features and meta-features, which together comprise a specific coverage.

2.5.1   Data coverage

An S-130 dataset can contain more than one **DataCoverage** meta-feature (see clause 3.1). The data boundary is defined by the extent of the **DataCoverage** Meta features. Data must only be present within **DataCoverage** meta-features.

An Update dataset must not change the extent of the data coverage for the base dataset. Where the extent of the data coverage for a base dataset is to be changed, this must be done by issuing a New Edition of the dataset.

Areas of a dataset which contain no S-130 data must be excluded from the area(s) covered by the meta-feature **DataCoverage**. The areas that contain S-130 data must be completely covered by **DataCoverage** features.

Features should not have an attribute with value identical to a corresponding attribute of a meta feature they are covered by.

2.6   Description of table format for S-130 geo features and information types

X.X   Clause heading

IHO Definition: **FEATURE:** Definition. (Authority for definition).				
S-130 Geo Feature: Feature S-130 feature type name				
Primitives: Point, Curve, Surface, None Allowable geometric primitive(s)				
Real World Example(s) of real-world instance(s) of the Feature.	*Paper Chart Symbol* Example(s) of paper chart equivalent symbology for the Feature.		*ECDIS Symbol* Example(s) of ECDIS symbology for the Feature.	
S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
category of beer		1 : ale 2 : lager 3 : porter 4 : stout 5 : pilsener 6 : bock beer 7 : wheat beer 8 : pale ale 9 : indian pale ale	EN	1,1
This section lists the full list of allowable attributes for the feature. Attributes are listed in alphabetical order. Sub-attributes (Type prefix (S)) of complex (Type C) attributes are listed in alphabetical order and indented directly under the entry for the complex attribute (see below for example). Note that a complex attribute may have simple or complex attributes as sub-complex attributes.	This section lists the corresponding S-57 attribute acronym. A blank cell indicates no corresponding S-57 acronym.	This section lists the allowable encoding values (for enumeration (E) Type attributes only).	Attribute type (see clause 2.4.2).	Multiplicity describes the "cardinality" of the attribute in regard to the feature. See clause 2.4.1.

fixed date range		See clause 2.4.8	C	0,1
date end	(DATEND)		(S) TD	0,1
date start	(DATSTA)		(S) TD	0,1
information		See clause 2.4.6	C	0,*
file locator			(S) TE	0,1
file reference	*(TXTDSC)* *(NTXTDS)*		(S) TE	0,1
headline			(S) TE	0,1
language		ISO 639-2/T	(S) TE	1,1
text	*(INFORM)* *(NINFOM)*		(S) TE	0,1
pictorial representation	(PICREP)	See clause 2.4.12.2	TE	0,1

Feature Associations

S-130 Role	Association Type	Associated to	Type	Multiplicity
Role name (see clause 6.xx)	**Name of Association** (see clause 5.xx)	**Feature or Information Type(s)**	Association/ Aggregation/ Composition	0,1
See clause 6.	See clause 5.	Corresponds to the feature(s) that the subject feature may be associated to. See clause 5	Association type.	The individual multiplicity to which the subject feature may be associated to the "Associated to" feature(s) (see clause 5).

INT 1 Reference: The INT 1 location(s) of the Feature – by INT1 Section and Section Number. (Not applicable to S-130).

X.X.X   Sub-clause heading(s)

Introductory remarks. Includes information regarding the real world entity/situation requiring the encoding of the Feature, and where required nautical cartographic principles relevant to the Feature to aid the compiler in determining encoding requirements.

Specific instructions to encode the feature.

Remarks:
• Additional encoding guidance relevant to the feature.

X.X.X.X   Sub-sub-clause heading(s)

Clauses related to specific encoding scenarios for the Feature. (Not required for all Features).

Remarks:
• Additional encoding guidance relevant to the scenario (only if required).

Distinction: List of features in the Product Specification distinct from the Feature.

Remarks**:**

• S-130 Attribute: Indentation of attributes indicates sub-attributes of complex attributes. Complex attributes may also be sub-attributes of complex attributes, which is indicated by further indentation of the attribute name in the tables.

- Allowable Encoding Value: For enumeration (EN) type attributes, the enumerate values listed are only those allowable for the particular binding of the attribute relevant to the feature. Allowable values may vary for the attribute depending on the feature to which the attribute is bound. Such bindings are defined in the Feature Catalogue. The full list of enumerate values that may be assigned to an attribute in S-101 can be found in clause 7 of this document.

- Type: The prefix (C) indicates that the attribute is a complex attribute. Complex attributes are aggregates of other attributes that can be simple type or complex type. The prefix (S) indicates that the attribute is a sub-attribute of a complex attribute. Complex attributes that are sub-attributes of a complex attribute, and their sub-attributes, are indicated by indentation of the attribute name in the S-130 Attribute column.

- Feature/Feature and Feature/Information associations, including allowable features for association ends, are described in clause 5 of this document. S-130 does not use Spatial/Information associations.

3   Meta Feature

3.1   Data Coverage

IHO Definition: A geographical area that describes the coverage and extent of spatial objects.
S-130 Meta Feature: DataCoverage
Super Type: None
Primitives: Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
maximumDisplayScale		maximum display scale < minimum display scale	IN	1, 1
minimumDisplayScale		minimum display scale > maximum display scale	IN	1, 1

INT 1 Reference: None

3.1.1   Data Coverage

The Meta feature **DataCoverage** encodes the area covered by data within the dataset. This feature is also used to provide scale information for the dataset. There must be a minimum of one **DataCoverage** feature in the dataset. **DataCoverage** features must cover the equivalent area to the extent of the spatial types in the dataset, and must not overlap.

S-130 uses **DataCoverage** features to designate the areas within the dataset bounding box where S-130 features are present and the minimum display scale for the dataset as a whole. All **DataCoverage** features in an S-130 dataset must have the same value for the *minimumDisplayScale* attribute.

The mandatory attribute *minimumDisplayScale* is used to indicate the smallest intended viewing scale for the data. Where an empty (nilled) value is populated for minimum display scale, the application will continue to display the data regardless of how small the user selected viewing scale becomes. The value populated for *minimumDisplayScale*, therefore, is intended to be used in a series of datasets covering a geographic area to determine the dataset rendering (display) priority as the user-selected viewing scale becomes larger.

The mandatory attribute *maximumDisplayScale* is used to indicate the scale at which the Data Producer considers the dataset to be grossly overscaled and may be used by the application to trigger an appropriate indicator.

In order to provide a consistent relationship between the encoded data and the way the data is displayed in applications, the values for *maximumDisplayScale* and *minimumDisplayScale* must be taken from the values listed in the following Table:

maximum display scale	minimum display scale
Any value	empty
	10,000,000
	3,500,000
	1,500,000

		700,000
		350,000
		180,000
		90,000
		45,000
		22,000
		12,000

[NOTE: The selection of values for *maximumDisplayScale* and *minimumDisplayScale* are at the discretion of the Data Producer. That is, any of the values listed above may be selected, with the only restrictions being that *maximumDisplayScale* must be a smaller value than *minimumDisplayScale* (or any value if *minimumDisplayScale* is populated with an empty value) and all DataCoverage features have the same *minimumDisplayScale*]

Remarks:

- **DataCoverage** features should not be unnecessarily split. Features with coincident boundaries and identical attribution must be merged into a single feature.

Distinction:

Feature/Information associations

S-130 Role	Association Type Name	Associated to	Type	Multiplicity
(no associations)	(none)	--	--	--

4 Geo Features

This section describes abstract as well as non-abstract types. The abstract type **FeatureType** cannot be used directly, but defines attributes inherited by its sub-types. The encoding remarks in the description of **FeatureType** apply to its sub-types but may be overridden by remarks in the sub-type.

4.1 Feature Type

IHO Definition: Generalized feature type which carries all the common attributes.				
S-130 Geo Feature: FeatureType (Abstract)				
Primitives: none				
Real World	*Paper Chart Symbol*		*ECDIS Symbol*	
S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
maximumDisplayScale	(SCAMAX)	maximum display scale < minimum display scale	IN	0, 1
minimumDisplayScale	(SCAMIN)	minimum display scale > maximum display scale	IN	0, 1

INT 1 Reference:

None

Remarks:

- The attribute **minimumDisplayScale** is used to indicate the smallest intended viewing scale for the feature.

- The attribute **maximumDisplayScale** is used to indicate the value considered by the Data Producer to be the maximum (largest) scale at which the feature is to be displayed before it can be considered to be "grossly overscaled".

- As an abstract type, there are no direct instances of **FeatureType** encoded in datasets. Instead the attributes and associations of **FeatureType** are inherited by its non-abstract sub-types **GlobalSeaArea**, **ConstructionLine**, and **ConstructionPoint**, and encoded in instances of those types.

Distinction:

Feature/Information associations

S-130 Role	**Association Type Name**	**Associated to**	**Type**	**Multiplicity**
theInformation	AdditionalInformation	AdditionalSpatialInformation	Association	0, *
theFeatureDataSource	FeatureTypeSource	SourceInformation	Association	0, *

4.2   Global Sea Area

IHO Definition: An area describing the extents of global seas and oceans.

S-130 Geo Feature: GlobalSeaArea

Super Type: FeatureType

Primitives: noGeometry, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
featureIdentifier			URN	1, 1
version		version ≥ 1	IN	0, 1
fixedDateRange			C	0, 1
dateStart	(DATSTA)		TD	0, 1
dateEnd	(DATEND)		TD	0, 1
Inherited attributes				
maximumDisplayScale	(SCAMAX)	maximum display scale < minimum display scale	IN	0, 1
minimumDisplayScale	(SCAMIN)	minimum display scale > maximum display scale	IN	0, 1

INT 1 Reference:

None

Remarks:

- If *fixedDateRange* is present at least one of its sub-attributes *dateStart* or *dateEnd* must be present.

- If both *dateStart* and *dateEnd* are present, *dateStart* must precede *dateEnd*.

- If a sea area consists of unconnected spatial components (for example, if an intervening peninsular land area requires splitting a **GlobalSeaArea** into disjoint polygonal regions), the polygonal regions must be encoded as separate **GlobalSeaArea** feature instances with the same values for *featureIdentifier*, and with each having a single connected polygon as its geometry. An additional **GlobalSeaArea** instance without geometry must be created with a **GlobalSeaAreaAggregation** association to each of the component features, and with the same value for *featureIdentifier*.

- Features associated with a **GlobalSeaAreaAggregation** must have the same values of *maximumDisplayScale* and *minimumDisplayScale*.

- **GlobalSeaAreaAggregation** could also be used when encoding the relation between the overall area and sub-divisions (for example, a sea and a bay within the sea).

Distinction:

Feature/Information associations				
S-130 Role	**Association Type Name**	**Associated to**	**Type**	**Multiplicity**
theComponent	GlobalSeaAreaAggregation	GlobalSeaArea	Association	0,*
theCollection	GlobalSeaAreaAggregation	GlobalSeaArea	Aggregation	0,*
zoneConstructionLimit	ZoneLimit	ConstructionLine	Association	0,*
zoneContributingLocation	ZoneLocation	ContributingPoint	Association	0,*
theInformation	AdditionalInformation (inherited)	AdditionalSpatialInformation	Association	0,*
theFeatureDataSource	FeatureTypeSource (inherited)	SourceInformation	Association	0,*

4.3   Construction Line

IHO Definition: An arc used for constructing Limit or Boundary features typically linking to a Contributing Point.	
S-130 Geo Feature: ConstructionLine	
Super Type: FeatureType	
Primitives: Curve	

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
lineType		1: rhumb line 2: great circle 3: undetermined/unknown	(S) EN	1, 1
Inherited attributes				
maximumDisplayScale	(SCAMAX)	maximum display scale < minimum display scale	IN	0, 1
minimumDisplayScale	(SCAMIN)	minimum display scale > maximum display scale	IN	0, 1

INT 1 Reference:
None
Remarks:
• **ConstructionLine** features must be associated with at least one **GlobalSeaArea**.

Distinction:

Feature/Information associations

S-130 Role	Association Type Name	Associated to	Type	Multiplicity
lineDerivedZone	ZoneLimit	GlobalSeaArea	Aggregation	1,*
lineContributingLocation	LimitLocation	ContributingPoint	Association	0,*
theInformation	AdditionalInformation (inherited)	AdditionalSpatialInformation	Association	0,*
theFeatureDataSource	FeatureTypeSource (inherited)	SourceInformation	Association	0,*

4.4   Contributing Point

IHO Definition: A point, typically on a Baseline, used for the computation of a maritime Limit or Boundary feature.
S-130 Geo Feature: ContributingPoint
Super Type: FeatureType
Primitives: Point

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-130 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
maximumDisplayScale	(SCAMAX)	maximum display scale < minimum display scale	IN	0, 1
minimumDisplayScale	(SCAMIN)	minimum display scale > maximum display scale	IN	0, 1

INT 1 Reference:
None
Remarks:
• **ContributingPoint** features must be associated with at least one **GlobalSeaArea** and one **ConstructionLine** feature.
Distinction:

Feature/Information associations				
S-130 Role	**Association Type Name**	**Associated to**	**Type**	**Multiplicity**
pointDerivedZone	ZoneLocation	GlobalSeaArea	Aggregation	1,*
contributedLimit	LimitLocation	ConstructionLine	Aggregation	1,*
theInformation	AdditionalInformation (inherited)	AdditionalSpatialInformation	Association	0,*
theFeatureDataSource	FeatureTypeSource (inherited)	SourceInformation	Association	0,*

5 Information types

5.1 Additional Spatial Information

<table>
<tr><td colspan="6">IHO Definition: Additional textual information relating to one or more geographic locations.</td></tr>
<tr><td colspan="6">S-130 Information Type: AdditionalSpatialInformation</td></tr>
<tr><td colspan="6">Super Type:</td></tr>
<tr><td colspan="6">Primitives: None</td></tr>
<tr><td colspan="2">Real World</td><td colspan="2">Paper Chart Symbol</td><td colspan="2">ECDIS Symbol</td></tr>
<tr><td>S-130 Attribute</td><td>S-57 Acronym</td><td>Allowable Encoding Value</td><td colspan="2">Type</td><td>Multiplicity</td></tr>
<tr><td>locationReference</td><td></td><td></td><td colspan="2">C</td><td>1, *</td></tr>
<tr><td>locationByText</td><td></td><td></td><td colspan="2">(S) TE</td><td>0, 1</td></tr>
<tr><td>textLatitude</td><td></td><td></td><td colspan="2">(S) TE</td><td>0, 1</td></tr>
<tr><td>textLongitude</td><td></td><td></td><td colspan="2">(S) TE</td><td>0, 1</td></tr>
<tr><td>referenceSystem</td><td></td><td></td><td colspan="2">(S) TE</td><td>1, 1</td></tr>
<tr><td colspan="6">INT 1 Reference:

None

Remarks:

- Positions in *textLatitude* and *textLongitude* must be encoded in the exact format that they are described in the source document they were extracted from. If a position is described in a source document in degrees, minutes and seconds then this description must be retained in the textual string as degrees, minutes and seconds.

- If the sub-attribute *locationByText* is omitted or not populated, the sub-attributes *textLatitude* and *textLongitude* must both be populated.

- If *textLatitude* or *textLongitude* is omitted or not populated, the sub-attribute *locationByText* must be populated.

- The sub-attributes *textLongitude* and *textLatitude* must either be both populated or both omitted.

- The S-100 Feature Catalogue model does not permit bindings from information types to feature types. Between feature types and information types, only the feature-to-information binding is permitted. Instances of **AdditionalSpatialInformation** therefore do not link to any instance of a geographic feature type and the **AdditionalInformation** association is not included in the Information Associations section of this table.

Distinction:

</td></tr>
</table>

Information associations				
S-130 Role	**Association Type Name**	**Associated to**	**Type**	**Multiplicity**
theSpatialInformationSource	AdditionalSpatialInformationSource	AdditionalSpatialInformation	Association	0, *

5.2   Source Information

IHO Definition: Information about source material(s) from which data can be derived.					
S-130 Information Type: SourceInformation					
Primitives: None					
Real World		*Paper Chart Symbol*		*ECDIS Symbol*	
S-130 Attribute	**S-57 Acronym**	**Allowable Encoding Value**		**Type**	**Multiplicity**
sourceIndication	(SORIND)			C	1, *
reportedDate	(SORDAT)			TD	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	1, 1

INT 1 Reference:

None

Remarks:

- The S-100 Feature Catalogue model does not permit bindings from information types to feature types. Between feature types and information types, only the feature-to-information binding is permitted. Instances of **SourceInformation** therefore do not link to any instance of a geographic feature type and the **FeatureTypeSource** association is not included in the Information Associations section of this table.

Distinction:

Information associations				
S-130 Role	**Association Type Name**	**Associated to**	**Type**	**Multiplicity**
theAdditionalSpatialInformation	AdditionalSpatialInformationSource	AdditionalSpatialInformation	Association	0, *

6   Association Names

Roles left blank in the tables are not encoded in the dataset, generally because they correspond to information-to-feature bindings, which are not permitted by the S-100 Feature Catalogue model.

The Role Type describes the type of binding (aggregation, association, or composition) This corresponds to the *roleType* attribute in a feature or information binding in the feature catalogue (see S-100 clauses 5-4.2.5.2 (Feature Bindings) and 5-4.2.5.3 (Information Bindings)). If the binding in that direction is not included in the feature catalogue (for the reason given in the previous paragraph), this cell too is left blank.

6.1   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:
>
> - An **AdditionalInformation** association links an instance of a geo feature to an instance of the information type **AdditionalSpatialInformation** using the role "theInformation".
>
> - The reverse link (**AdditionalSpatialInformation** to geo feature instance) is not encoded and therefore does not have a role or role type in the table.

Role Type	Role	Associated With	Multiplicity
Association	theInformation	**AdditionalSpatialInformation**	0, *
		(any subtype of FeatureType)	1, *

6.2   GlobalSeaAreaAggregation

> IHO Definition: A feature association for the binding between related areas comprising a Global Sea Area.
>
> Remarks:
>
> - No remarks.

Role Type	Role	Associated With	Multiplicity
Aggregation	theCollection	**GlobalSeaArea**	0, *
Association	theComponent	**GlobalSeaArea**	0, *

6.3   FeatureTypeSource

> IHO Definition: An association between a feature and information about the source from which the feature was defined.
>
> Remarks:
>
> - A **FeatureTypeSource** association links an instance of a geo feature to an instance of the information type **SourceInformation** using the role "theFeatureDataSource".

• The reverse link (**SourceInformation** to geo feature instance) is not encoded and therefore does not have a role or role type in the table.			

Role Type	Role	Associated With	Multiplicity
Association	theFeatureDataSource	**SourceInformation**	0, *
		(any subtype of FeatureType)	0, *

6.4   AdditionalSpatialInformationSource

IHO Definition: Spatial information as a supplement to source information.

Remarks:

• No remarks.

Role Type	Role	Associated With	Multiplicity
Association	theSpatialInformationSource	**SourceInformation**	0, *
Association	theAdditionalSpatialInformation	**AdditionalSpatialInformation**	0, *

6.5   ZoneLimit

IHO Definition: The relationship between a sea area and a construction line used in defining its boundaries.

Remarks:

• No remarks.

Role Type	Role	Associated With	Multiplicity
Aggregation	lineDerivedZone	**GlobalSeaArea**	1, *
Association	zoneConstructionLimit	**ConstructionLine**	0, *

6.6   ZoneLocation

IHO Definition: The relationship between a maritime limitation area or boundary area and a point used for computing the area.

Remarks:

• No remarks.

Role Type	Role	Associated With	Multiplicity
Aggregation	pointDerivedZone	**GlobalSeaArea**	1, *
Association	zoneContributingLocation	**ContributingPoint**	0, *

6.7   LimitLocation

IHO Definition: The relationship between a line used for construction of the location or extent of a area, maritime limit or boundary, and a point location used for computation of the line.

Remarks:

- No remarks.

Role Type	Role	Associated With	Multiplicity
Aggregation	contributedLimit	**ConstructionLine**	1, *
Association	lineContributingLocation	**ContributingPoint**	0, *

7 Association Roles

7.1 theInformation

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

7.2 theComponent

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

7.3 theCollection

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

7.4 theAdditionalSpatialInformation

IHO Definition: A reference to supplemental information about location or extent.

7.5 theSpatialInformationSource

IHO Definition: A reference to a source from which location or extent information has been obtained or derived.

7.6 theFeatureDataSource

IHO Definition: A reference to a source from which data about a feature has been obtained or derived.

7.7 lineDerivedZone

IHO Definition: Reference to an area whose location or boundaries are derived either wholly or partially from one or more construction lines.

7.8   pointDerivedZone

IHO Definition: Reference to an area whose location or boundaries are derived either wholly or partially from one or more contributing points.

7.9   zoneConstructionLimit

IHO Definition: Reference to a construction line upon which demarcation of an area is based.

7.10   zoneContributingLocation

IHO Definition: Reference to a contributing point upon which demarcation of an area is based.

7.11   lineContributingLocation

IHO Definition: Reference to a point location used for computing one or more of the lines used for constructing a limit or the boundaries of an area.

7.12   contributedLimit

IHO Definition: Reference to a construction line derived from one or more contributing points.

8   Attribute and Enumerate Descriptions

8.1   reportedDate

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

Attribute Type: S100_TruncatedDate

Remarks:

•No remarks.

8.2   source

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

Attribute Type: Text

Remarks:

•No remarks.

8.3   dateStart

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

Attribute Type: S100_TruncatedDate

Remarks:

•No remarks.

8.4   dateEnd

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

Attribute Type: S100_TruncatedDate

Remarks:

•No remarks.

8.5   locationByText

IHO Definition: A textual rendering of a geographic location.

Attribute Type: Text

Remarks:

•No remarks.

8.6   textLatitude

IHO Definition: Textual description of latitude information.

Attribute Type: Text

Remarks:

•No remarks.

8.7   textLongitude

IHO Definition: Textual description of longitude information.

Attribute Type: Text

Remarks:

•No remarks.

8.8   referenceSystem

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

Attribute Type: Text

Remarks:

•No remarks.

8.9   featureIdentifier

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

Attribute Type: URN

Remarks:

• A unique worldwide identifier of feature records is provided through a feature attribute (featureIdentifier) utilizing the Maritime Resource Name (MRN) concept and namespace.

8.10 maximumDisplayScale

IHO Definition: The value considered by the Data Producer to be the maximum (largest) scale at which the data is to be displayed before it can be considered to be "grossly overscaled".

Attribute Type: Integer

Indication: The modulus of the scale is indicated, that is 1:22 000 is encoded as 22000.

Unit: none

Minimum range: 1

Maximum range: 10000000

Range Closure: closedInterval (minimum range ≤ value ≤ maximum range)

Remarks:

•No remarks.

8.11 minimumDisplayScale

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

Attribute Type: Integer

Indication: The modulus of the scale is indicated, that is 1:22 000 is encoded as 22000.

Unit: none

Minimum range: 1

Maximum range: 10000000

Range Closure: closedInterval (minimum range ≤ value ≤ maximum range)

Remarks:

•No remarks.

8.12 version

IHO Definition: Identification of a specific form or variation of an entity.

Attribute Type: Integer

Unit: none

Minimum range: 1

Range Closure: geSemiInterval (minimum range ≤ value)

Remarks:

•No remarks.

8.13 sourceType

IHO Definition: Type of the source.

Attribute Type: Enumeration

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.

8.14 lineType

IHO Definition: Indication of the nature of the path between two points, associated with a line segment.

Attribute Type: Enumeration

1) rhumb line

IHO Definition: A line on the surface of the earth making the same oblique angle with all meridians; a loxodrome spiralling toward the poles in a constant true direction. parallels and meridians, which also maintain constant true directions, may be considered special cases of the rhumb line. A rhumb line is a straight line on a Mercator projection. Sometimes shortened to rhumb.

2) great circle

IHO Definition: The intersection of a sphere and a plane through its center. See also Orthodrome.

3) undetermined/unknown

IHO Definition: Having an unknown value.

Remarks:

•No remarks.

9   Complex Attributes

9.1   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 8.3)

dateEnd (see clause 8.4)

Remarks:

•No remarks.

9.2   locationReference

IHO Definition: Comprehensive description of a geographic location through textual elements and/or geospatial coordinates.

Sub-attributes:

locationByText (see clause 8.5)

textLatitude (see clause 8.6)

textLongitude (see clause 8.7)

referenceSystem (see clause 8.8)

Remarks:

•Definition proposed to the IHO GI Registry.

9.3   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 8.1)

source (see clause 8.2)

sourceType (see clause 8.13)

Remarks:

•No remarks.