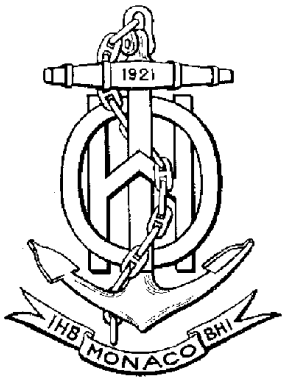
INTERNATIONAL HYDROGRAPHIC ORGANIZATION



IHO UNIVERSAL HYDROGRAPHIC DATA MODEL

Draft Version – March 2015

Special Publication No. 122
Marine Protected Area Product Specification

Appendix A
Data Classification and Encoding Guide

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Document Control

Version	Version Type	Date	Approved By	Signed Off By	Role
0.0.0	Editing Committee Draft	26.06.2012	SNPWG		SNPWG Chair
0.0.1	Editing Draft	2014	SNPWG		SNPWG Chair
0.3.4	New NPUBS text content model,	2014			
0.3.8	Again, text content model	23.12.2014			SNPWG Chair
0.3.9	Editorial	21.01.2015			SNPWG Chair
0.4.0	Content restructure; some sub-clauses added; Revision of tables uses from S-101	03.02.2014			SNPWG Chair
0.5.0	Certain empty paragraphs have been filled with text Additional comments laced elsewhere	13.03.2015			SNPWG Chair

Overview

1.1 Preface

The “Data Classification and Encoding Guide” has been developed to provide consistent, standardized instructions for encoding S-100 compliant Marine Protected Area (MPA) data.

The purpose of the Data Classification and Encoding Guide is to facilitate S-122 encoding to meet IHO standards for the proper display of Marine Protected Area information in an ECDIS. The document describes how to encode information that the modeller considers relevant to an MPA. The content of an MPA product is at the discretion of the producing authority provided that the conventions described within this document are followed. A “producing authority” is a Hydrographic Office (HO) or an organization authorized by a government, HO or other relevant government institution to produce nautical publication information.

The entire S-100 Standard, including the S-122 MPA Product Specification, is available at the following web site, http://www.iho.int.

1.2 S-122 Appendix A; Data Classification and Encoding Guide – Metadata

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

Title:	The International Hydrographic Organization Marine Protected Area Product Specification, Appendix A – Data Classification and Encoding Guide
Version:	0.0.1
Date:	January 2015
Language:	English
Classification:	Unclassified
Contact:	International Hydrographic Bureau 4 Quai Antione 1er B.P. 445 MC 98011 MONACO CEDEX Telephone: +377 93 10 81 00 Fax: +377 93 10 81 40 URL: www.iho.int
Identifier:	S-122 Appendix A
Maintenance:	Changes to S-122 Appendix A; Data Classification and Encoding Guide are coordinated by the IHO Nautical Information Provision Working Group (NIPWG) 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

special form of **association** that specifies a "strong aggregation". In a composition association, if a container object is deleted then all of the objects it contains are deleted as well.

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 **point** is the **end point**. Connectivity of the curve is guaranteed by the "continuous image of a line"

enumeration

A fixed list which contains valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.

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

Comment [JS1]: What should be stated here?

Comment [rmm2]: Considering our email discussion about the content of the DCEG, we should compare this to the same section in the S-122 core product specification. I think we have two choices:
1) The core PS has a longer list of terms and abbreviations. The DCEG defines only those terms with which cartographers/encoders are unlikely to be familiar.
2) Both the core PS and DCEG contain exactly the same content for the "Terms and Abbreviations" clause (so we can maintain that as a separate Word file and include that in both core PS and DCEG.)

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

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
MPA	Marine Protected Area
SOLAS	Safety of Life at Sea
UNCLOS	United Nations Convention on the Law of the Sea

1.3.3 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.

1.3.4 Maintenance

Changes to the Data Classification and Encoding Guide must occur in accordance with the S-122 MPA Product Specification clause ????.

Comment [JS3]: Reference to the S-122 core part

2 General

The S-122 Data Classification and Encoding Guide describes how data describing the real world should be captured using the types defined in the S-122 Feature Catalogue (see S-122 XXXX). It provides the encoding rules and guidance required to create S-122 MPAs. This standard is specifically concerned with those entities in the real world that are of relevance to marine protection. The hydrographic regime for MPAs is considered to be geo-spatial. As a result, the model defines real world entities as a combination of descriptive and spatial characteristics. Within the model these sets of characteristics are defined in terms of spatial, feature and information types. A type is defined as a stereotype of class that is used to specify a domain of instances (objects) together with the operations applicable to the objects. A type may have attributes and may be related to other types.

The types used within S-122 are described below. Within this document feature types, information types, associations and attributes appear in bold text.

2.1 Feature types

Feature types contain descriptive attributes and do not contain any geometry (i.e. information about the shape and position of a real world entity).

Features have two aspects – feature type and feature instance. A feature type is a class and is defined in a Feature Catalogue. A feature instance is a single occurrence of the feature type and represented as an object in a dataset. A feature instance is located by a relationship to one or more spatial instances. A feature instance may exist without referencing a spatial instance.

S-122 makes use of the following feature types:

Geographic (Geo) feature type – carries the descriptive characteristics of a real world entity.

Meta feature type – contains information about other features.

2.1.1 Context features

An MPA product could be used as an overlay of the respective ENC or as a stand-alone product. For the purpose of providing a charted background a limited set of features were specified. The features are ordered in thematic groups and tabled below.

All information ~~of~~ in the S-101 product specification (Edition 1.0) related to the context features ~~have to~~ applies,~~y~~ with the exceptions noted in S-122 product specification or DCEG.

For the correct encoding of those context features the encoder must refer to the version 1.0 of the S-101 (ENC) product specification Data Capture and Encoding Guide (DCEG). Furthermore, attributes driving portrayal have to be defined mandatorily.

Depth Area	Dredged Area	Lock Ba~~s~~sin
Dock Area	Land Area	Unsurveyed Area

Table 2-1 Skin of the Earth features permitted for MPA context features and their geometric primitives

Canal	Gate	River
Coastline	Island Group	Shoreline Construction
Dam	Lake	Tunnel
DryDock	Land Area	

Table 2-2 Additional Topography features permitted for MPA context features and their geometric primitives

Administration Area	Continental Shelf Area	Straight Territorial Sea Baseline
Contiguous Zone	Exclusive Economic Zone	Territorial Sea Area

Comment [JS4]: reference

Comment [JS5]: Edition vs. version

Comment [rmm6]: probably none, but just in case…

Comment [JS7]: Edition vs. Version

Table 2-3 Additional Administrative and Legal features permitted for MPA context features and their geometric primitives

Depth Contour	Obstructions	Underwater Awash Rock
Depth No Bottom Found	Sounding	Wreck

Table 2-4 Additional Bathymetry features permitted for MPA context features and their geometric primitives

Land Region	Seabed Area	Weed Kelp
Restricted Area	Vegetation	

Table 2-5 Additional Environmental features permitted for MPA context features and their geometric primitives

Beacon Special or General	Light Air Obstruction	Retroreflector
Buoy Special or Generic	Light Fog Detector	Pile
Daymark	Light Sectored	Physical AIS Aid to Navigation
Light All Around	Light Vessel	Virtual AIS Aid to Navigation

Table 2-6 Additional Navigational Marks features permitted for MPA context features and their geometric primitives

Restricted Area

Table 2-7 Additional Operational Context feature permitted for MPA context features and their geometric primitives

2.1.2 Geometric primitives

The allowable geometric primitive for each feature type is defined in the Feature Catalogue. Within this document, allowable primitives are included in the tables containing a description of each feature type. Allowable geometric primitives are point, curve and surface.

Each spatial value must be referenced by at least one feature instance.

Within this document, allowable primitives are included in the description of each feature type. For easy reference, Table 2.1 below summarises the allowable geometric primitives for each feature type. In the Tables, abbreviations are as follows: point (P), curve (C) and surface (S). A feature having no allowable geometric primitive is annotated as none (N).

	P	C	S	N
Marine Protected Area	X		X	
Information Area	X		X	
Marine Service	X		X	

Table 2-8 Features permitted for MPA and their geometric primitives

2.1.3 Capture density guideline

It is recommended that curves and surface boundaries should not be encoded at a point density greater than 0.3mm at the maximum display scale for the MPA data.

[Note: Compilation scale is the scale the data is captured to, and is not stored in the dataset. Only minimum and maximum display scales values are stored in the dataset.]

A curve consists of one or more curve segments. Each curve segment is defined as a loxodromic line on WGS84. 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.

[consider diagram]

Comment [JS8]: That was a note of the S-101

2.2 Information types

An information type is an identifiable object that can be associated with features in order to carry information particular to the associated features. An example of the use of an information type may be the requirement to include a note on particular regulations which apply for a specified area. Information types can also be associated with other information types. This may be done where there is further information that is relevant to the information type.

Information types carry attributes but not geometry.

2.3 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 (see clause xxxxx).

Comment [JS9]: Link to the appropriate section

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.

For attributes related to context features see clause 2.1.1.

2.3.1 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:

Comment [JS10]: Do we need this explanation or would it be sufficient to refer to the appropriate S-100 section?

Comment [rmm11]: I think yes, it is a novel concept compared to S-57. But I don't mind if you remove it and just say the number of values of an attribute can be controlled, and refer to S-100 (and/or the template table later in this document).

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 2-9 Multiplicity of attributes

2.3.2 Simple attribute types

Each simple attribute is assigned to one of 10 types:

Comment [JS12]: I replaced the ISO references by the reference to the appropriate S-100 section

CL	Code Lists:	A redefined list from which some information take their values. A code list could either be closed or open. A code list has following properties: 1. A description of the code list type, 2. The URI where the list could be found and 3. An encoding instruction.
EN	Enumeration:	A fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.
BO	Boolean:	A value representing binary logic. The value can be either True or False. The default state for Boolean type attributes (i.e. 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.
DA	Date:	A date provides values for year, month and day according to the Gregorian Calendar. Character encoding of a date is a string which must follow the calendar date format (complete representation, basic format) for date specified by the appropriate S-100 section. Example: 19980918 (YYYYMMDD)
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 by the appropriate S-100 section. 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 DT Date and Time: A DateTime is a combination of a date and a time type. Character encoding of a DateTime shall follow the rules described by the appropriate S-100 section. Example: 19850412T101530
TD	Truncated Date:	One or more significant components of the modelling date are omitted. Example: ----02-- (Year and date not encoded)

Comment [JS13]: S-100 Ed 2 provides only minimal instructions. I selected one example. Table 3-17 at section 3-8

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.

2.3.3 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, the tables below summarise the

Comment [JS14]: Everything which is relevant to portrayal should be mandatory

mandatory attributes for each feature type (note that mandatory sub-attributes of complex attributes are not included in these tables):

Feature	Mandatory Attributes
Marine Protected Area	To be determined
Information Area	To be determined
Marine Service	To be determined

Table 2-10 Mandatory attributes for MPA features

NOTE 1: In the Tables below describing each feature and its attributes, mandatory attributes are described with a multiplicity of "1,1" "1,n" (n>1); or "1,*". Note that sub-attributes of complex attributes, as well as the complex attribute itself, may also be designated as mandatory (see NOTE 2 below). "Conditional" mandatory attributes are not identified in the Tables below other than by comments in the Remarks for the relevant feature, but are indicated in Tables above by the following additional text:

at least one of	for **Land Region, Obstruction, Restricted Area, Wreck**
if navigable at….	for **Gate**

Compilers must consider these conditional circumstances when encoding features for MPA, as well as any additional information given in the feature class descriptions in this document. For example, when encoding a **Restricted Area**, the mandatory attributes are at least one of **category of restricted area** or restriction – if **restriction** is known but **category of restricted area** is not known, then **category of restricted area** must not be populated with an empty (null) value, as it is not mandatory in this case.

NOTE 2: For complex attributes, at least one sub-attribute is mandatory (or conditionally mandatory) so as such mandatory sub-attributes of complex attributes have not been included in the Table above. Where the sub-attribute of a complex is conditionally mandatory (e.g. for the feature **Seabed Area** at least one of the sub-attributes **nature of surface** or **nature of surface – qualifying terms** must be populated for the complex attribute **surface characteristics**), this is indicated in the Remarks section for the relevant feature Table entries below.

NOTE 3: The attribute **colour pattern** is mandatory for any feature (except lights features) that has more than one value populated for the attribute colour.

Comment [JS15]: Needs revision

I know that some conditional circumstances have to be considered

2.3.4 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 (EN application profile), 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 (ER application profile), 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.

2.3.5 Portrayal feature attributes

The primary use of MPA is within ECDIS where ENC data is displayed based on the rules defined within the S-101 Portrayal Catalogue. While most ECDIS portrayal is based on

attributes describing the instance of a particular feature in the real world, certain feature attributes are used in portrayal rules to provide additional functionality in the ECDIS or information to the mariner. The following attributes have specific influence on portrayal:

Display name	this Boolean attribute determines if the text for a name should display. If not populated the default rules provided in the portrayal catalogue will be used.
Information	population of this complex attribute will result in the display of the magenta information symbol to highlight additional information to the user.
Pictorial representation	population of this attribute will result in the display of the magenta information symbol to highlight additional information to the user.
Scale minimum	value at which the feature will be removed from the display if application of scale minimum is enabled in the ECDIS (see clause X.X).
Textual description	population of this complex attribute will result in the display of the magenta information symbol to highlight additional information to the user.
Visually conspicuous	this Boolean attribute determines that visually conspicuous features are shown in black colour rather than brown.

Comment [JS16]: I think that the presence of one of the catRXN candidates should drive the portrayal of such a symbol in an MPA ProdSpec. That would be a simpler approach than trying to generate a new symbol.

2.3.6 Textual information

The information classes **Restrictions, Recommendation, Regulations, Nautical Information** and **Supplementary Information** (see clause X.X) may be used to encode additional textual information associated to a feature or a group of features. The **Supplementary Information** is associated to the relevant features using the association additional information (see clause X.X). The **Restrictions, Recommendation, Regulations, Nautical Information** are associated to the relevant features using the association **providedBy**. Controversy, the relevant features are associated by the **Restrictions, Recommendation, Regulations, Nautical Information** using the association **provides**.

Comment [JS17]: reference

Comment [JS18]: reference

Comment [JS19]: Is that correct or does it work the opposite way?

The complex attributes **information** and **textual description** must not be used when it is possible to encode the information by means of any other attribute. Under certain ECDIS display settings the "information" symbol will display when these attributes are populated. Therefore producers should carefully consider use of these attributes as the symbol may contribute significantly to ECDIS screen clutter.

Character strings contained in **information** sub-attribute **text** must be UTF-8 character encoding. **Information** should generally be used for short notes or to transfer information which cannot be encoded by other attributes, or to give more detailed information about a feature. Text populated in **text** must not exceed 300 characters.

The exchange language for textual information should be English; therefore it is not required to populate the sub-attribute **language** for an English version of textual information. Languages other than English may be used as a supplementary option, for which **language** must be populated with an appropriate value to indicate the language. Generally this means, when a national language is used in the textual attributes, the English translation must also exist.

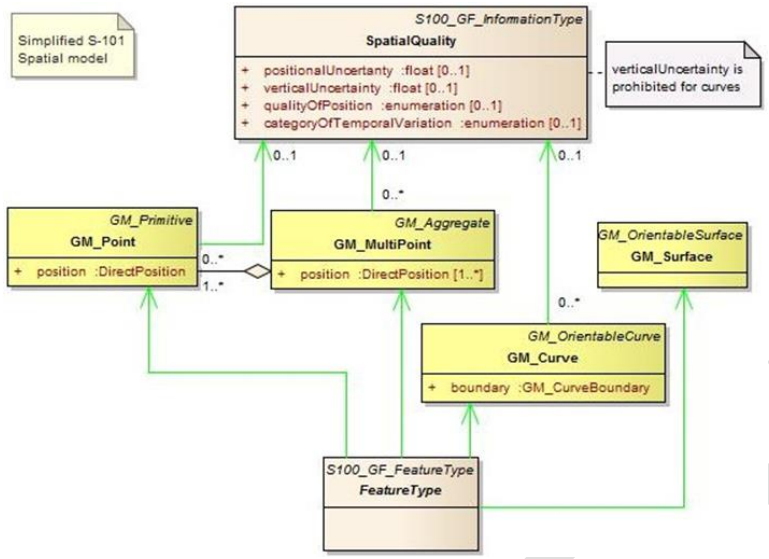
Remarks:

- For Guidance on encoding names of features, see clause X.X.

Comment [JS20]: reference

2.3.7 Spatial attribute types

Spatial attribute types must contain a referenced geometry and may be associated with spatial quality attributes. Each spatial attribute instance must be referenced by a feature instance or another spatial attribute instance.



Spatial quality attributes are carried in an information class called **Spatial quality**. Only points, multipoints and curves can be associated with Spatial quality. Currently no use case for associating surfaces with spatial quality attributes is known, therefore this is prohibited. Vertical uncertainty is prohibited for curves as this dimension is not supported by curves.

Comment [JS21]: Where is that defined? Does the QualityOfNonBathymetricData supporting this?

2.3.8 Dates

Comment [JS22]: Reference to S-100?

Comment [rmm23]: This is actually the "truncated date" format; S-101 did not take edition 2 of s-100 into account

When encoding dates using the attributes **fixed date range**, **periodic date range**, **reported date** and no specific year, month or day is required, the values must apply in conformance to the relevant S-100 Part.

- No specific year required, same day each year: ----MMDD
- No specific year required, same month each year: ----MM--
- No specific day required: YYYYMM--
- No specific month required: YYYY----

Notes: YYYY = calendar year; MM = month; DD = day.

The dashes (-) indicating that the year, month or date is not needed must be included.

2.3.9 Indeterminate dates

Comment [JS24]: Should we provide a comprehensive description here or is the reference sufficient?

See S-100 Edition 2.0.0 section 1-4.5.3.9.

Comment [rmm25]: How about a brief description as well as the reference to S-100.

2.3.10 Predefined derived Types

See S-100 Edition 2.0.0 section 1-4.6.

Comment [JS26]: Should we provide a comprehensive description here or is the reference sufficient?

2.3.11 Times

Comment [JS27]: Reference to S-100?

If it is required to show the beginning and end of the active period of a feature, it must be encoded using the complex attribute **time range**, sub-attributes **time end** and **time start**. When using these sub-attributes, all times must be encoded as Coordinated Universal Time (UTC). The attribute descriptions for **time end** and **time start** states that the mandatory format is YYYYMMDDThhmmss, where T is the separator, and this format must be used.

2.3.12 Attributes referencing external files

2.3.12.1 Reference to textual files

The information classes **Restrictions, Recommendation, Regulations, Nautical Information** should be used to encode textual information.

The information class **Supplementary Information** and the related attributes must not be used when it is possible to encode the information by means of the information classes mentioned above. Under certain ECDIS display settings the "information" symbol will display when these attributes are populated. Therefore producers should carefully consider use of these attributes as the symbol may contribute significantly to ECDIS screen clutter.

Comment [JS28]: Do we need that fact? We don't use this construction for the context features.

The files referenced by **textual content**, sub-complex attribute **information**, sub attribute **file reference** must be TXT, .HTM or .XML files, and may contain formatted text. It is up to the Producing Authority to determine the most suitable means of encoding a particular piece of text. Files must only use UTF-8 character encoding.

Remarks:

- Clause X.X of this Product Specification main document specifies the content of an exchange set, including the option to include textual files.

Comment [JS29]: reference

- In some cases, for external files referenced by the **text content** sub-complex attribute **information** with sub-attribute **language** populated as a language other than English, encoders have created text files using local character encoding that may not be interpreted correctly by an ECDIS and therefore not readable by the user. Encoders must encode national text files (files referenced by the sub-attribute **file reference**) using UTF-8 character encoding. This means that the encoding of the characters in text files must match the encoding of other textual national attributes (i.e. **feature name, information** with value other than English populated for sub-attribute **language**) within the dataset.

2.3.12.2 Reference to pictorial files

Comment [JS30]: Should we keep that as it is?
Actually, pictorial representation is not been supported by catRXN unless we store it in an external file.
So, IMO we have two options:
1.Proceed with Supplementary Information to provide pic rep, or
2.Make a statement here that pics should be placed in the files accessed by catRXN.
Due to the fact that we decide to not support supplementary information classes explicitly and taking into account that we decided that supplementary information should only be used as a fall back if the encoder has no other chance to fit in the information, I would prefer the latter option.

Or would it better to say some words on Graphic which we introduced instead of Pictorial rep?

If it is required to indicate a drawing or a photograph, the information class **Supplementary Information** (see clause X.X), attribute **pictorial representation** must be used to indicate the file name (without the path) of the external graphical file. The **Supplementary Information** is associated to the relevant feature using the association **additional information** (see clause X.X). Picture files that form part of the ENC must be in Tagged Image File (TIF) format 6.0.

Comment [JS31]: reference

Consideration should be given to the addition of the "information" symbol in some ECDIS display settings where **pictorial representation** is populated, which may contribute to ECDIS screen clutter. **Pictorial representation** should therefore only be populated where the information is considered important in terms of safety of navigation and protection of the marine environment.

Comment [JS32]: reference

Encoders should also consider, when including a reference to an external graphics file, whether the file is appropriate in terms of:

- Size of the file: Graphics files should be kept to a minimum file size, and should be considered in relation to the maximum allowable size of an ENC dataset (10Mb). Therefore, for example, a graphic file of 100Mb should be considered to be inappropriate. Using the following values as a guideline will ensure acceptable size files:

Recommended Resolution:	96 DPI
Minimum Size x,y:	200,200 pixels
Maximum Size x,y:	800,800 pixels
Bit Depth:	8 Bit Indexed Colour
Compression:	LZW
Format:	Tiff 6.0

- Content of the graphic: The information contained in the graphic should supplement, in terms of navigational relevance, the encoding of the associated feature. For example, an image of a standard IALA special purpose buoy that duplicates the attribution of the associated Buoy Special **Purpose/General** provides no relevant supplementary information to the mariner (and may be considered to be double encoding), and therefore should not be included.
- Aspect: Graphics should provide perspective relevant to the view of the mariner. For example, an image of the top of a bridge derived from a photograph taken from the top of a bridge tower or nearby building does not provide the mariner with any information relevant to their location, and should not be included. However, an image derived from a photograph taken from a vessel approaching the bridge may be considered relevant.
- Suitability for display in ECDIS: Graphics should be such that all the information in the graphic is legible in the ECDIS display. For example, text included in diagrams or tables must be large enough so as to be legible when the file is opened in the ECDIS display. Images included in a graphical file should also be appropriately scaled such that they comfortably fit in the picture display window on the ECDIS (i.e. do not only take up a very small area of the window; or are so large that the image needs to be panned to see the entire image). Consideration must also be given to variation in ships' bridge lighting conditions. It is recommended that, where possible, associated files are tested by opening the file in an ECDIS prior to publication of the ENC.

2.4 Associations

2.4.1 Association classes

Association classes allow relationships to be characterized by one or more attributes. The attributes of the association class belong to the association itself, not to any of the classes it connects. An association class is both an association and a class.

Example: There are two pilot boarding places in the fairway approaching a particular harbor, for "close" and "distant". Due to channel, tide, and prevailing weather conditions, port regulations state that vessels with hazardous cargo & larger dimensions *must* embark or disembark pilots at the distant pilot boarding place, vessels of smaller dimensions are *recommended* to use the distant boarding place, and national warships are *exempt* from using pilots and need not use the pilot boarding place. The relationship between the boarding place feature and the class that is characterized by "must", "should", or "need not". It can be modeled as:

- A class defining "who". Instances of the "who" class are sets of vessels characterized by specified cargo type, dimensions, and military vs. civilian ownership.
- A feature corresponding to the pilot boarding place, i.e., "where."
- The relationship between "who" and "where" is an association class characterized by an attribute which can take values must/should/need-not.

2.5 Datasets

Comment [JS33]: Is the DCEG the correct place to describe that fact or should it be better placed in the ProdSpec core text?

2.5.1 Types of Datasets

A dataset is a grouping of features, attributes, geometry and metadata which comprises a specific coverage.

Four types of MPA dataset may be produced and contained within an exchange set:

Update:	Changing some information in an existing dataset.

Re-issue of a dataset:	Including all the Updates applied to the original dataset up to the date of the reissue. A Rere-issue does not contain any new information additional to that previously issued by Updates.
New dataset:	Including new information which has not been previously distributed by Updates. Each New Edition of a dataset must have the same name as the dataset that it replaces. A New Edition can also be MPA data that has previously been produced for this area and at the same maximum display scale.
New Edition of a dataset:	

2.5.2 Standalone and overlay exchange sets

Overlay S-122 exchange sets are intended to be used together with S-101 ENC (or similar data products) as a base layer. The base layer is expected to provide navigational and visual context. Generally, an overlay S-122 dataset does not provide "skin of the earth" coverage and there will be large areas with no data coverage because the S-122 application schema does not include any feature for designating a region as "other", or "not a protected area" (i.e., there is no S-122 equivalent to the S-101 **Unsurveyed Area**). Further, an overlay exchange set does not include features that provide auxiliary information such as bathymetry within a protected area or marks that may have been installed to indicate the limits of a protected area.

Standalone S-122 data sets can be used with or without an S-101 ENC or equivalent base layer. They include all the information in the overlay dataset plus extra feature classes that provide navigational and visual context. The Data coverage extent is greater and more contiguous than the overlay datasets when the context features are included (the dataset may still have regions without data coverage but these will be fewer and without coverage for more "traditional" reasons such as being inland areas, or territorial waters of a different nation),

Context features provide background and auxiliary information for a "standalone" product, e.g., one that can be depicted without S-101 ENC data. For example, showing the underlying land and water areas is necessary to provide a human viewer with meaningful portrayal of MPA information. Additional themes may provide information that is only of secondary relevance, such as the bathymetry in a protected area, or marks indicating its boundaries. The additional information in standalone datasets is intended to:

- Provide a portrayal context for data (e.g., support correct portrayal)
- Provide physical, topographic, operational, thematic, legal, or administrative context for MPA information.

The context added to a standalone dataset is not necessarily the whole context required for navigational purposes and does not meet navigation requirements. For example, it may not include all marks, and bathymetry outside of S-122 protected areas may be omitted.

2.5.3 Data coverage

A MPA dataset can contain more than one **Data Coverage** (see clause X.X). The data boundary is defined by the extent of the **Data Coverage** meta features. Data must only be present within **Data Coverage** meta features.

Comment [JS34]: reference

When a feature extends across datasets of overlapping scale ranges, its geometry must be split at the boundaries of the **Data Coverage** features and its complete attribute description must be repeated in each dataset.

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

2.5.4 Discovery metadata

Comment [JS35]: Query sent to TSMAD

Comment [rmm36]: text drafted by me, likely to be revised since metadata has not received much attention in TSMAD. Also, ISO 19115 was revised in April 2014 and S-100 has not yet been updated to match the new standard.

Discovery metadata is intended to allow applications to find out important information about datasets and accompanying support files to be examined without accessing the data itself (or without reading the support file). Discovery metadata includes, but is not limited to:

- information identifying the product specification and encoding format;
- edition and version numbers, production/release date, and other details of data creation and updating;
- data coverage of the dataset;
- summary descriptions of content, purpose, use, and limitations;
- identification and contact information for the producer and distributor of the dataset.

The mandatory components for discovery metadata are defined in S-100 Edition 2.0.0 Appendix 4A-D and consist of:

1) Exchange catalogue – a single exchange catalogue for an exchange set. (Subsets of exchange sets are not envisaged – if they are necessary, each may need its own catalogue?) Elements are defined in S-100 App. 4A § D-2.2 (**S100_ExchangeCatalogue**).
2) Dataset discovery metadata for each dataset in the exchange set. Elements are defined in S-100 App. 4A § D-2.6 (**S100_DatasetDiscoveryMetaData**).
3) Support file discovery metadata for each support file in the exchange set. Elements are defined in S-100 App. 4A § D-2.11 (**S100_SupportFileDiscoveryMetaData**).

Discovery metadata is generally encoded separately from the dataset itself so as to allow applications to read it without processing the dataset itself (i.e., decrypt, decompress, or load the dataset). The encoding format should be easily machine-readable and therefore may be different from the dataset, e.g., the discovery data may be in XML while the data is encoded as ISO 8211 format.

The content and structure of discovery metadata for this product specification is defined in ... (XML format defined by an XML schema available from www.iho.int? URL: [TBD]?)

Comment [rmm37]: schemas are yet to be made available by IHO, and distribution of XML schemas is still to be discussed.

2.5.5 Dataset attributes

Dataset attributes contain metadata that apply to the whole dataset. Some context feature attributes have designated ISO 8211 encoding subfields; MPA attributes use the ATTR subfield. See table below for details.

Comment [JS38]: That was inserted because it is likely and ISO 8211 is different from the GML ISO we normally use.

Comment [JS39]: Is that correct?

[Insert table with all dataset attributes]

2.5.6 Dataset units

The depth, height and positional uncertainty units in a dataset must be metres.

2.5.7 Dataset coordinate multiplication factor

The coordinate multiplication factor stored in the CMFX and CMFY subfield values in the Dataset Structure Information field must be set to 10000000 (10^7).

2.5.8 Dataset Coverage

MPA datasets are spatially limited. All data within the dataset must have the same minimum scale. The maximum scale can be different.

In areas which include neighbouring producer nations, producing agencies should co-operate to agree on dataset boundaries and ensure no data overlap within scale ranges. Where possible, adjoining nations should agree on common data boundaries within a technical arrangement based on cartographic convenience and benefit to the mariner.

If an MPA extend the product coverage and the adjoining, e.g. due to delay in the production process by the neighbouring HO product doesn't exist, an indication should be placed at the outer edge of the product.

Comment [JS40]: Could we say that in this way or should the last two paragraphs rather be placed at the core text?

2.5.9 Dataset Feature Object Identifiers

Each feature and information instance within an MPA must have a unique universal Feature Object Identifier [FOID]. Where a real-world feature has multiple geometric elements within a single MPA dataset due to the MPA dataset scheme, the same FOID may be used to identify multiple instances of the same feature. Features within a dataset may carry multiple geometries.

Features split across multiple datasets may be identified by the same FOID. Features repeated in different scale ranges may be identified by the same FOID.

Comment [JS41]: We need to specify how that works if an area exceeds the HO boundary.

How has TSMAD managed that issue?

Is the FOID only applicable for the MPA dataset or is it valid for all HO data?

Feature Object Identifiers must not be reused, even when a feature has been deleted.

2.5.10 180° Meridian of Longitude

Datasets must not cross the 180° meridian of longitude.

2.6 Geographic names

2.6.1 Feature names

If it is required to encode an international or national geographic name, it must be done using complex attribute feature name (see clause X.X).

If it is required to encode a geographic name for which there is no existing feature, a specific **Marine Protected Area, Restricted Area** or **Marine Service** area feature must be created (see clauses X.X, X.X and X.X). In order to minimise the data volume, these features should, where possible, use the geometry of existing features.

National geographic names can be left in their original national language in a non-English iteration of the sub-attribute **feature name** (but only if the national language can be expressed using lexical level 0 or 1), or transliterated or transcribed and used in an English iteration of the sub-attribute **feature name**, in which case the national name should be populated in an additional iteration of the **feature name** with sub-attribute **language** populated with the relevant national language value in accordance with the relevant S-100 section.

Geographic names should be encoded using **feature name** based on the following criteria and at the Producing Authority's discretion:

1. Named points or capes that do not contain navigational aids should be encoded as **Land Region** features (of type surface or point), with the geographic name encoded using **feature name**.
2. Named points or capes that contain one navigational aid should be encoded using **feature name** on the structure feature associated with the navigational aid. If more than one navigational aid exists on the point or cape or if the point or cape and the structure feature have different names, a **Land Region** feature (of type surface or point) should be encoded, with the geographic name of the point or cape encoded using **feature name.**
3. A group of hydrographic features (e.g. **Seabed Area, Underwater/Awash Rock, Obstruction**), associated with a particular geographic name, should have the name encoded using **feature name** on a **Sea Area/Named Water Area** feature (of type

surface or point). The name should not be encoded on the individual hydrographic features.

4. A major island name close to primary shipping corridors should be encoded using **feature name** on the **Land Area** feature delimiting the island. A group of islands associated with a geographic name should have the name encoded using **feature name** on a **Land Region** feature (of type surface or point).
5. A named island group or archipelago should be encoded using **feature name** on an **Island Group** named aggregation feature (see clause X.X). Where individual islands within the group are named, these should be encoded using **feature name** on the **Land Area** feature delimiting the island.
6. Named features listed in Hydrographic Office's Sailing Directions that may assist in navigation should be encoded using feature name on the relevant feature (e.g. **Land Region, Underwater/Awash Rock, Seabed Area, Sea Area/Named Water Area, Obstruction**).
7. If it is required to encode an administrative area of international, national, provincial or municipal jurisdiction that may have legal inference, it must be done using an **Administration Area** feature, with the name encoded using **feature name**.
8. If it is required to encode a major city along the coast, it must be done using **Built-Up Area** or **Administration Area** features (see clause X.X), with the name encoded using **feature name**.
9. If it is required to encode the name of a navigable river, lake or canal, it must be done using a **Sea Area/Named Water Area** feature, with the name encoded using feature name.

In all instances, if the exact extent of the feature to be named is known, a surface feature must be created. If the exact extent is not known, or the area is too small at the maximum display scale of the MPA dataset, an existing or specifically encoded point feature should be used to encode the geographic name.

Comment [JS42]: that needs extensive discussion, when to use what?

2.6.2 Text placement

The cartographic feature Text Placement (see S-101 DCEG clause X.X) is used specifically to place text cartographically. The properties of the text placement feature are described as follows;

Geometry (point) – the point location of the centre of the text string.

Text type – the attribute (or class) which is to be placed.

Flip bearing – the angle forming a semi circle within which the text can be placed.

The Text Placement feature is associated to the feature which carries the text being placed. The attribute text type determines which text string is to be displayed if more than one is present. The Text Placement feature ensures that as an MPA screen rotates from "north up" (e.g. if display is set to "course up") text can remain readable, or clear other important charted information.

To avoid clutter by providing the same name of a feature in both underlying ENC and MPA product, the text placement rules of MPA context features should be identical to the rules used for the underlying ENC.

2.7 Sample scale minimum policy

The following policy for the application of **scale minimum** (see clause X.X) to an MPA portfolio is based on the mandatory ENC cell compilation scales listed in the S-101 DCEG clause X.X. While the procedure described below to determine the **scale minimum** value for features in an MPA Product is recommended, the **scale minimum** values used are at the discretion of the Producing Authority. Authorities should cooperate at the regional or RENC

level to determine a **scale minimum** policy that results in suitable and consistent display of MPA data for the mariner across and, where required between, regions.

Scale minimum values used must be selected from the following list:

19999999
9999999
4999999
3499999
1499999
999999
699999
499999
349999
259999
179999
119999
89999
59999
44999
29999
21999
17999
11999
7999
3999
2999
1999
999

- **scale minimum** values for features within an MPA should be set to either 1, 2, 3 or 4 steps smaller scale than the maximum display scale of the MPA data.
- The table below lists the step values (i.e. 1, 2, 3 or 4) that may be applied for specific feature classes together with any relevant conditions and additional flexibilities.

Following this process provides an automated approach to setting **scale minimum** which takes account of the relative importance of different feature classes, and will achieve sufficient de-cluttering even where there are large gaps in the scales of coverage available.

Unless the step values outlined in the table have been manually adjusted, this approach takes no direct account of the relative importance of individual occurrences of a feature, and may result in the situation where a feature disappears and then reappears as the user zooms out on their ECDIS display. To address these remaining issues, the following additional process steps should be applied:

- Linear and area features (excluding those features subject to extensive generalisation e.g. **Depth Contour**) that extend beyond the coverage of a dataset and exist in an overlapping smaller scale dataset should be assigned the same **scale minimum** value as the **scale minimum** value of the corresponding feature in the smaller scale dataset.
- The **scale minimum** value of an individual occurrence of a feature should be set to either 1, 2, 3 or 4 steps smaller scale than the compilation scale of the smallest scale MPA that the feature would appear on (i.e. assuming full coverage across all compilation scales).

The following notes apply to the table below:

1. Producers should be prepared to deviate from the step values specified when the significance of the feature dictates, e.g. the recommended number of steps for a **Light** feature is 4, but there will be circumstances where a **Light** feature is so

important that no **scale minimum** value be applied; alternatively, the light could be so minor that a step value of 1 can be applied.

2. **Scale minimum** should only be applied to navigational aids where they contribute to "screen clutter" and where their removal from the display does not constitute a risk to safe navigation.
3. It is generally accepted that features making up a navigational aid will have the same attributes, and therefore those with Master/Slave relationships should be assigned the same **scale minimum** value.
4. The elements comprising a range system (see clause X.X.X) must have the same **scale minimum** value, which should be the value corresponding to the largest step value of the features comprising the range system. For instance, for a range system comprising a **Navigation Line, Recommended Track** and navigation aids, the decision may be not to apply **scale minimum** to the navigation aids (in accordance to Note 2 above), in which case the **Navigation Line** and **Recommended Track** must also not have **scale minimum** applied. Similarly, all features comprising a routeing measure (see clause 10.2) should have the same **scale minimum** value.

FEATURE	PRIMITIVE	CONDITION	scale minimum STEPS
Marine Protected Area	Point/Surface	to be determined	
Information Area	Point/Surface	to be determined	
Marine Service	Point/Surface	to be determined	

2.8 Masking

To improve the look and feel of the display of MPAs in ECDIS for the mariner certain features, or certain edges of features, should be masked (see S-122 clause X.X). For example, the boundaries of anchorage area symbols overwrite coincident pontoon symbols:

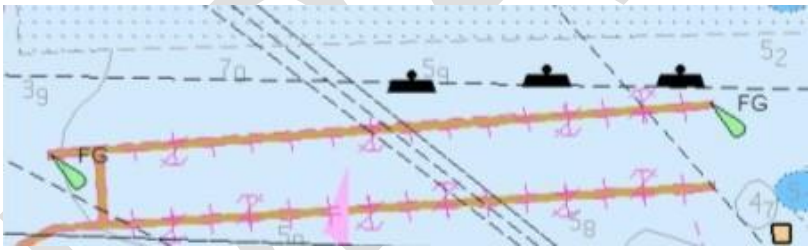


Figure 1 Overwriting symbols - example

2.8.1 Surface features crossing MPA cell boundaries

When a single feature of type surface crosses the boundaries of adjoining MPA products, mask the edge where it shares the geometry of the boundary in each MPA:

Comment [JS43]: Do we find a MPA example?

Comment [rmm44]: may not be relevant to MPA?

Comment [rmm45]: I don't think S-101 has these any more

Comment [rmm46]: none in S-122?

Comment [JS47]: Look for a MPA example

Comment [rmm48]: Paragraph 2.8 and 2.8.1 provide figures on masking. Whereas the figures at 2.8.1 are designed to fit any purpose we have to check whether we could provide a better figure of 2.8

Comment [JS49]: Find a MPA example and an appropriate screen shot

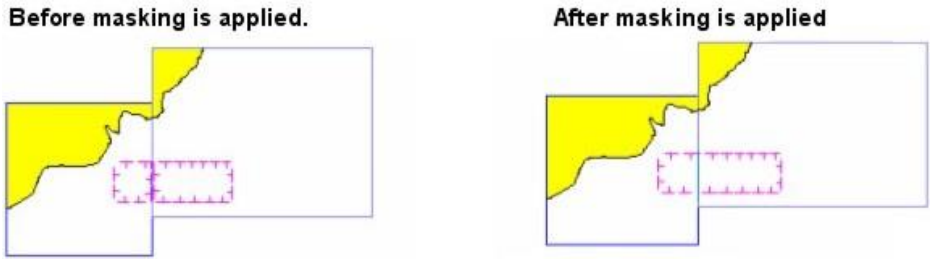


Figure 2 Surface feature crossing MPA products boundaries

This allows the features to be displayed as a single feature of type surface rather than being divided at the MPA product boundary and having the representation of two separate features. Note that some production software will automatically truncate (mask) features at the cell boundary.

NOTE: Occasionally an edge of the boundary of an area actually coincides with the MPA product boundary. Where this occurs and the production system applies automatic truncation (masking) of this edge, the compiler must "unmask" that edge so as to avoid the appearance of the area to be "open ended".

Where features of type surface extend beyond the entire limit of data coverage for the MPA product (see S-101 DCEG clause X.X), all edges of these area features should be masked.

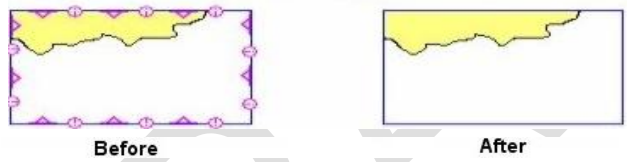


Figure 3 Surface features extending beyond the entire limit of data coverage

The following table lists those features of type surface that should have edges masked where the boundary of the area crosses or extends beyond the MPA product limit or the area of data coverage of the MPA product.

Feature Type	Comment
Marine Protected Area	
Information Area	
Marine Service	

Table 2-11Features of which edges have to be masked when crossing the MPA product boundary

2.8.2 Surface objects having symbol pattern fill

Comment [JS50]: Use an MPA example when a fill is determined. If not, delete the whole section.

I remember that we intend to get a portrayal proposal which contains a dash or a T-Line with shades of green. That implies to me that the whole section could be deleted.

Surfaces symbolised with a patterned fill, and for which the outer edge of the surface has no significance (or is subject to change or intermittent), e.g. **Vegetation** (see Figure Surface feature with pattern fill below) feature, may have the boundary of the surface masked to reduce screen clutter.

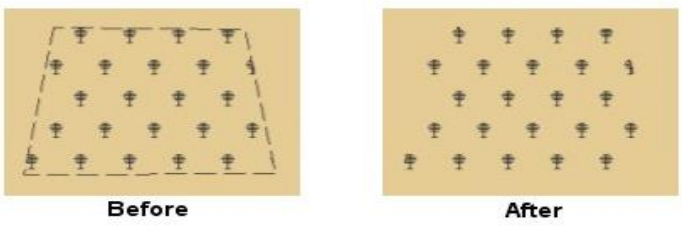


Figure 4 Surface feature with pattern fill

Compilers must take care that the surface is large enough at the maximum display scale of the MPA data (and at smaller maximum display scales at which it is intended that the feature should be displayed) so that at least one pattern symbol is displayed in the area. If this is not the case, the boundary of the surface should not be masked. Alternatively, a point feature may be encoded instead of the surface feature. It may be useful to load and display the MPA in an ECDIS in order to assist with making decisions as to the best encoding option to adopt in individual circumstances.

2.8.3 "Linear" surface features

If it is required to encode a linear feature when the only allowable primitive for the relevant feature type is surface (e.g. a "linear" maritime jurisdiction area (see clause X.X)), a "very narrow surface" should be encoded. An edge of this surface should correspond to the position of the line. All other edges should be masked.

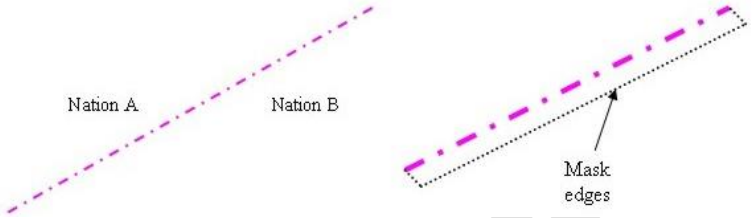


Figure 5 "Linear" maritime jurisdiction area

3 Description of table format for S-122 meta and geo features

X.X Clause heading

IHO Definition: **FEATURE:** Definition. (Authority for definition).

S-101 [Geo/Information] Feature: **Feature (S-57 Acronym)** S-101 feature and corresponding S-57 acronym (if applicable)

Primitives: Allowable geometric primitive(s) [**Point, Curve, Surface]**

Real World	*Paper Chart Symbol*	*ECDIS Symbol*
Example if real world instance(s) of the Feature.	Example(s) of paper chart equivalent symbology for the Feature (if applicable).	Example(s) of proposed ECDIS symbology for the Feature.

S-101 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	EN	1,1
This section lists the full list of allowable attributes for the S-101 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).	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 S-101 (for enumerate (E) Type attributes only). Further information about the attribute is available in Section XX.	Attribute type (see clause X.X).	Multiplicity describes the "cardinality" of the attribute in regard to the feature. If "(ordered)" is included, the order of the instances matters. See clause X.X.
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Association Aggregation Composition	Name of the Association	Role Name	Features that are at the other end of the association	

INT 1 Reference: The INT 1 location(s) of the Feature – by INT1 Section and Section Number (if applicable).

X.X.X Sub-clause heading(s) (see S-4 – B-YYY.Y)

Introductory remarks. Includes information regarding the real world entity/situation requiring the encoding of the Feature in the ENC, 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) (see S-4 – B-CCC.C)

Clauses related to specific encoding scenarios for the Feature (if required).

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

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

Remarks:

- S-122 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.
- S-122 Attribute: Attributes shown in grey text are ECDIS "system" attributes which are not visible to the encoder, but are populated by the ENC production system in order to assist with portrayal of ENC data in ECDIS (see Section X.X).
- S-57 Acronym: S-57 attribute acronyms shown in italic style text have been re-modelled in S-101 from S-57.
- Allowable Encoding Value: For (EN) type attributes, the enumerates listed are only those allowable for the particular occurrence 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 S-122 Feature Catalogue. The full list of enumerates that may be assigned to an attribute in S-122 can be found in Section X.X – Attribute and Enumerate Descriptions – 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 (see clause X.X). 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-122 Attribute column.

4 Metadata Features

4.1 Introduction

The maximum use must be made of meta features to reduce the attribution on individual features. In a base dataset (EN Application profile, see S-122 MPA Product Specification main document clause X.X), some meta features are mandatory.

4.2 Mandatory meta features

These mandatory meta features are in the following list:

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

4.3 Data coverage meta feature

Data Coverage: In order to assist in data discovery, the meta feature **Data Coverage** must be used to provide coverage of the part of the dataset covered by Skin of the Earth features. See clause X.X.

4.4 Quality of non-bathymetric data

IHO Definition: **QUALITY OF NON-BATHYMETRIC DATA**. An area within which the best estimate of the overall uncertainty of the data is uniform. The overall uncertainty takes into account for example the source accuracy, chart scale, digitising accuracy etc. (Adapted from S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.208, November 2000).

S-101 Metadata Feature: Quality of non-bathymetric data (M_ACCY)

Primitives: Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Horizontal distance uncertainty	(HORACC)		RE	0,1
Orientation uncertainty			RE	0,1
Positional uncertainty	(POSACC)		RE	1,1
Survey date range			C	0,1
Date end	*(SUREND)*	ISO 8601:2004	(S) DA	1,1
Date start	*(SURSTA)*	ISO 8601:2004	(S) DA	0,1
Vertical uncertainty	(VERACC)		RE	0,1

INT 1 Reference:

Quality of positions

The meta feature **Quality of Non-bathymetric Data** may be used to provide an indication of the overall uncertainty of position for all non-bathymetric features. It must not be used to provide the uncertainty of bathymetric information.

The attributes **quality of position** and **positional uncertainty** may be applied to any spatial type, in order to qualify the location of a feature.

Horizontal distance uncertainty, quality of position and **positional uncertainty** must not be applied to the spatial type of any geo feature if they are identical to the **horizontal distance uncertainty, quality of position** and **positional uncertainty** values of the underlying meta feature.

quality of position gives qualitative information, whereas **positional uncertainty** gives quantitative information.

Positional uncertainty on the **Quality of Non-bathymetric Data** applies to non-bathymetric data situated within the area, while **quality of position** or **positional uncertainty** on the associated spatial types qualifies the location of the **Quality of Non-bathymetric Data** feature itself.

Meta features **Quality of Non-bathymetric Data** and **Quality of Bathymetric Data** should not overlap.

Remarks:

- No remarks.

Distinction: Quality of bathymetric data; quality of survey.

5 Geo Features

5.1 Marine Protected Area

IHO Definition: **MARINE PROTECTED AREA:** Any area of the intertidal or sub tidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment. (IUCN – The World Conservation Union. 1998. Resolution 17.38 of the 17th General Assembly of the IUCN. Gland, Switzerland and Cambridge, UK.).
S-101 Geo Feature: MarineProtectedArea
Primitives: Curve, Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*
.		

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of IUCN		1 : Category Ia 2 : Category Ib 3 : Category II 4 : Category III 5 : Category IV 6 : Category V 7 : Category VI	EN	0,1
Category of restrictions	(CATREA)	4: nature reserve 5: bird sanctuary 6: game reserve 7: seal sanctuary 10: historic wreck area 20: research area 22: fish sanctuary 23: ecological reserve 27: Environmentally Sensitive Sea Area (ESSA) 28: Particularly Sensitive Sea Area (PSSA) 29: Coral Sanctuary	EN	0,*
Jurisdiction	(JRSDTN)	1: international 2: national 2: national sub-division	EN	
Restriction	(RESTRN)	1: anchoring prohibited 2: anchoring restricted 3: fishing prohibited	EN	0,*

		4: fishing restricted 5: trawling prohibited 6: trawling restricted 7: entry prohibited 8: entry restricted 9: dredging prohibited 10: dredging restricted 11: diving prohibited 12: diving restricted 13: no wake 14: area to be avoided 15: construction prohibited 16: discharging prohibited 17: discharging restricted 18: industrial or mineral exploration/ development prohibited 19: industrial or mineral exploration/ development restricted 20: drilling prohibited 21: drilling restricted 22: removal of historical artifacts prohibited 23: cargo transhipment (lightering) prohibited 24: dragging prohibited 25: stopping prohibited 26: landing prohibited 27: speed restricted		
Status	(STATUS)	1: permanent 2: occasional 3: recommended 4: not in use 5: periodic/intermittent 6: reserved 7: temporary 8: private 9: mandatory 13: historic 14: public	EN	0,*

		16 : watched 17: un-watched		
Graphic			C	0,*
Pictorial representation	(PICREP)		TE	0,1
Picture Caption			TE	0,1
Source Date			S(DA)	0,1
Picture Information			TE	0,1
Bearing Information			C	0,1
Cardinal Direction			~~2~~EN	0,1
Distance			RE	0,1
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
Orientation	(ORIENT)		C	0,1
Orientation Uncertainty			R	0,1
Orientation Value			R	
Sector Limit			C	0,1
Sector Limit One			R	
Sector Limit Two			R	
Scale maximum	(SCAMAX)	See clause X.X	IN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Textual Content			C	1,*
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1

File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		((((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Online Resource			C	0,1
Linkage		ISO 19115-1:2014	URL	
Protocol		ISO 19115	(S) TE	0,1
Application Profile		ISO 19115	(S) TE	0,1
Name of Resource		ISO 19115	(S) TE	0,1
Description		ISO 19115	(S) TE	0,1
Online function		1: download 2: information 3: offline access 4: order 5: search 6: complete metadata 7: browse graphic 8: upload 9: email service 10: browsing 11: file access	EN	0,1
Protocol Request		ISO 19115	(S) TE	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		((((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)*		(S) TE	1,1

	(NOBJNM)			

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Association		Supported by	**Authority**	0,*
Association		Supported by	**Restrictions, Regulations, Recommendations, Nautical Information**	0,*

INT 1 Reference: nil

Introductory remarks. Marine Protected Areas normally specified by IUCN. If the specification can't be provided the CATIUC attribute has to set to "unknown".

Navigation within Marine Protected areas can be limited by regulations/restrictions and recommendations. That information is usually provided by relevant authorities.

Remarks:

nil

Remarks:

nil

Distinction: Caution area; Marine farm/culture; Military practice area; Restricted area

5.2 Marine Services

IHO Definition: **MARINE SERVICES:** A service implemented by a relevant authority for shipping, e.g. traffic control, information, assistance.

S-101 Geo Feature: MarineServices

Primitives: Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*
.		

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of marine services		1 : Vessel Traffic Service 2 : Port Service 3 : Ship Reporting System 4 : Broadcast Service	EN	0,1
Scale maximum	(SCAMAX)	See clause X.X	IN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1

Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Textual Content			C	1,*
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Language		ISO 639-3	(S) TE	0,1
File reference	*(TXTDSC)* *(NTXTDS)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Online Resource			C	0,1
Linkage		ISO 19115-1:2014	URL	
Protocol		ISO 19115	(S) TE	0,1
Application Profile		ISO 19115	(S) TE	0,1
Name of Resource		ISO 19115	(S) TE	0,1
Description		ISO 19115	(S) TE	0,1
Online function		1: download	EN	0,1

		2: information 3: offline access 4: order 5: search 6: complete metadata 7: browse graphic 8: upload 9: email service 10: browsing 11: file access		
Protocol Request		ISO 19115	(S) TE	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		((((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Association		Supported by	**Service Hours**	0,*
Association		Supported by	**Ship Report**	0,*
Association		Supported by	**Contact Details**	0,*
Association		Supported by	**Applicability**	0,*
Association		Supported by	**Restrictions, Regulations, Recommendations, Nautical Information**	0,*

INT 1 Reference: nil

Introductory remarks.

Remarks:

The area geometry presents where the service is provided.

Remarks:

nil

Distinction:

Comment [rmm51]: ?

5.3 Restricted Area

IHO Definition: **RESTRICTED AREA:** A specified area on land or water designated by an appropriate authority within which access or navigation is restricted in accordance with certain specified conditions. (Adapted from IHO Dictionary – S-32).

Comment [AR52]: ???

S-101 Geo Feature: **Restricted Area (RESARE)**				
Primitives: **Surface**				
Real World .	*Paper Chart Symbol*	*ECDIS Symbol*		
S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of restrictions	(CATREA)	4: nature reserve 5: bird sanctuary 6: game reserve 7: seal sanctuary 10: historic wreck area 20: research area 22: fish sanctuary 23: ecological reserve 27: Environmentally Sensitive Sea Area (ESSA) 28: Particularly Sensitive Sea Area (PSSA) 29: Coral Sanctuary	EN	0,*
Restriction	(RESTRN)	1: anchoring prohibited 2: anchoring restricted 3: fishing prohibited 4: fishing restricted 5: trawling prohibited 6: trawling restricted 7: entry prohibited 8: entry restricted 9: dredging prohibited 10: dredging restricted 11: diving prohibited 12: diving restricted 13: no wake 14: area to be avoided 15: construction prohibited 16: discharging prohibited 17: discharging restricted 18: industrial or mineral exploration/ development	EN	0,*

		prohibited 19: industrial or mineral exploration/ development restricted 20: drilling prohibited 21: drilling restricted 22: removal of historical artifacts prohibited 23: cargo transhipment (lightering) prohibited 24: dragging prohibited 25: stopping prohibited 26: landing prohibited 27: speed restricted		
Status	(STATUS)	1 : permanent 2 : occasional 3 : recommended 4: not in use 5 : periodic/intermittent 6 : reserved 7: temporary 8: private 9 : mandatory 13: historic 14: public 16 : watched 17 : un-watched	EN	0,*
Scale maximum	(SCAMAX)	See clause X.X	IN	0,1
Scale minimum	(SCAMIN)	See clause X.X	IN	0,1
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Textual Content			C	1,*
Category of Text		1: Abstract or summary	EN	0,1

		2: Extract 3: Full text		
Language		ISO 639-3	(S) TE	0,1
File reference	*(TXTDSC)* *(NTXTDS)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Online Resource			C	0,1
Linkage		ISO 19115-1:2014	URL	
Protocol		ISO 19115	(S) TE	0,1
Application Profile		ISO 19115	(S) TE	0,1
Name of Resource		ISO 19115	(S) TE	0,1
Description		ISO 19115	(S) TE	0,1
Online function		1: download 2: information 3: offline access 4: order 5: search 6: complete metadata 7: browse graphic 8: upload 9: email service	EN	0,1

		10: browsing 11: file access		
Protocol Request		ISO 19115	(S) TE	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1

Feature associations

Role Type	Association Name	Role	Features	Multiplicity
Association		Supported by	**Authority**	0,*
Association		Supported by	**Restrictions, Regulations, Recommendations, Nautical Information**	0,*

INT 1 Reference: L 3, 5.2; M 29.1, N 2.1-2, 20-22, 25, 26, 31, 34, 63

16.26.1 Restricted areas in general (see S-4 – B-431.4; B-435.7; B-435.11; B-437.1-7; B-439.2-4; B-445.9; B-448; B-448.1 and B-449.5)

There are many types of areas within which certain activities are discouraged or prohibited, or from which certain classes of vessels are excluded. The general term for all areas in which certain aspects of navigation may be restricted or prohibited by regulations is “Restricted Area”, or equivalent. The word “prohibited”, or its equivalent, may appear in terms relating to activities which are contrary to the regulations, e.g. “Anchoring Prohibited”, “Entry Prohibited”.

If it is required to encode a restricted area, it must be done using the feature **Restricted Area** or **Marine Protected Areas.**

Remarks:

· The attribute **category of restricted area** is used to describe the reason for the regulation, while the attribute **restriction** describes the restrictions.

· An associated instance of the information types **Restrictions**, **Regulations**, **Recommendations** and **Nautical Information**, complex attributes **text content** sub-attribute **information** or solely attribute **information** may be used to provide an additional explanation about the restriction, where required.

Supplementary Information (see clause X.X), complex attributes **information** or **textual description** may be used if the information cannot be encoded by using the information types mention at the paragraph above.

If it is required to encode an area for which the mariner must be made aware of circumstances influencing the safety of navigation, it must be done using the feature **Caution Area** (see clause X.X). This feature may be

used to identify a danger, a risk, a rule or advice (e.g. an area of continually changing depths) which is not directly related to a particular feature.

Comment [JS53]: That has nothing to do with the intention of the MPA. Should we remove it?

16.26.1.3 Nature reserves (see S-4 – B-437.3)

If it is required to encode a marine nature reserve area, it must be done using a **Restricted Area** feature, with attribute **category of restricted area** = *4* (nature reserve).

16.26.1.4 Speed limits (see S-4 – B-430.2)

Speed is often limited inside MPAs in order to protect the species that inhabit the area. If it is required to encode this restriction, it must be done using a **Restricted Area** feature, with the attribute **restriction** = *27* (speed restricted), with the speed limit and its unit of measurement encoded using an associated instance of the information type **Regulations** (see clause X.X),

16.26.1.5 Anchoring restricted (see S-4 – B-431.4)

If it is required to encode a restricted anchoring area, it must be done using a **Restricted Area** feature, or using other features with the attribute **restriction** (see clause X.X), where **restriction** = *1* (anchoring prohibited), or *2* (anchoring restricted). Additional information about the restriction should be encoded using an associated instance of the information type **Regulations** (see clause X.X).

16.26.1.6 Areas to be avoided (see S-4 – B-435.7)

If it is required to encode an IMO designated Area to be Avoided, it must be done using a **Restricted Area** feature, with attribute **restriction** = *14* (area to be avoided).

16.26.1.7 Environmentally Sensitive Sea Areas (see S-4 – B-437)

Environmentally Sensitive Sea Areas (ESSA) should be included on ENCs where there is a specifically identified requirement, and where it is practicable, given the maximum display scale of the ENC data and the extent of the ESSA. If there is no such requirement, or if it is not practicable, details of ESSA should only be inserted in associated publications, such as Sailing Directions. It should be noted that the inclusion of ESSA on smaller maximum display scale of the ENC data may be appropriate for voyage planning purposes.

If it is required to encode an Environmentally Sensitive Sea Area, it must be done using a **Restricted Area** feature, with attribute **category of restricted area** = *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 surface **Restricted Area** feature.

Distinction: Marine Protected Area

Remarks:

nil

5.4 Information Area

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

6 Context Geo Features

6.1 Context Geo Features derived from S-101 (Version 1.0)

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7 Cartographic Features

7.1 Cartographic Features derived from S-101 (version 1.0)

Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet. Lorem ipsum dolor sit amet, consetetur sadipscing elitr, sed diam nonumy eirmod tempor invidunt ut labore et dolore magna aliquyam erat, sed diam voluptua. At vero eos et accusam et justo duo dolores et ea rebum. Stet clita kasd gubergren, no sea takimata sanctus est Lorem ipsum dolor sit amet.

8 Information Types

8.1 Information Types derived from S-101 (version 1.0)

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8.2 Authority

IHO Definition: **AUTHORITY**. A person or organisation having political or administrative power and control. (Oxford Dictionary of English).				
S-101 Information Feature: Authority				
Primitives: None				
Real World	*Paper Chart Symbol*	*ECDIS Symbol*		
S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of Authority		1 : customs 2 : border control	EN	0,1

		3 : police 4 : port 5 : immigration 6 : health 7 : coast guard 8: agricultural 9: military 10: private company 11: maritime police 12: environmental 13: fishery 14: finance 15: maritime		
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Textual Content			C	1,*
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Language		ISO 639-3	(S) TE	0,1
File reference	*(TXTDSC)* *(NTXTDS)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Information			C	1,*

Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Online Resource			C	0,1
Linkage		ISO 19115-1:2014	URL	
Protocol		ISO 19115	(S) TE	0,1
Application Profile		ISO 19115	(S) TE	0,1
Name of Resource		ISO 19115	(S) TE	0,1
Description		ISO 19115	(S) TE	0,1
Online function		1: download 2: information 3: offline access 4: order 5: search 6: complete metadata 7: browse graphic 8: upload 9: email service 10: browsing 11: file access	EN	0,1
Protocol Request		ISO 19115	(S) TE	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1

Information associations				
Role Type	**Association Name**	**Role**	**Features**	**Multiplicity**
Association		Supports	Marine Protected Area	0,*
Association		Supported by	Contact Details	0,*
Association		Supported by	Ship Report	0,*
Association		Supported by	Service Hours	0,*

INT 1 Reference:

Remarks:
- No remarks.

Distinction:

8.3 Ship Report

IHO Definition: **SHIP REPORT**. This describes how a ship should report to a maritime authority, including when to report, what to report and whether the format conforms to the IMO standard.

S-101 Information Feature: Ship Report

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of Ship Report		1 : Sailing Plan 2 : position report 3 : deviation report 4 : final report 5 : dangerous goods report 6 : harmful substances report 7 : marine pollutants report 8 : any other report	EN	1,*
IMO Format for Reporting		True (Yes)	BO	
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1

Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Textual Content			C	1,*
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Language		ISO 639-3	(S) TE	0,1
File reference	*(TXTDSC)* *(NTXTDS)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Online Resource			C	0,1
Linkage		ISO 19115-1:2014	URL	
Protocol		ISO 19115	(S) TE	0,1
Application Profile		ISO 19115	(S) TE	0,1
Name of Resource		ISO 19115	(S) TE	0,1
Description		ISO 19115	(S) TE	0,1
Online function		1: download 2: information 3: offline access 4: order 5: search 6: complete metadata 7: browse graphic 8: upload 9: email service	EN	0,1

		10: browsing 11: file access		
Protocol Request		ISO 19115	(S) TE	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Notice Time			C	1,*
Notice Time Hours				0,* (ordered)
Notice Time Text				0,1
Operation				0,1

Information associations

Role Type	Association Name	Role	Features	Multiplicity
Additional Information		Supports	Authority	0,*
Additional Information		Supports	Marine Service	0,*
Additional Information		Supported by	Applicability	0,*

INT 1 Reference:

Remarks:

- TXTCON is used to describe non-standard ship reports. The Associated Information Object APPLIC indicates characteristics of vessels which use this report.
- Distinction:

8.4 Contact Details

IHO Definition: **CONTACT DETAILS**. Information on how to reach a person or organisation by postal, internet, telephone, telex and radio systems.

S-101 Information Feature: Contact Details

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity

Call name (unchanged from the current DCEG draft)	(CALNAM)		S(TE)	0,1
Call sign (unchanged from the current DCEG draft)	(CALSGN)			
COMCHA (it is proposed to use it not exclusively for VHF Channels; see below)	(COMCHA)		TE	0..*
Maritime Mobile Service Identity (MMSI) Code			I	0,1
Category of channel or frequency preference			EN	0,1
Contact Instructions			S(TE)	0,1
Contact Address			C	0,*
Delivery Point			S(TE)	0,*
City Name			S(TE)	0,1
Administrative Division			S(TE)	0,1
Country			S(TE)	0,1
Postal Code			S(TE)	0,1
Frequency pair			C	0,1
Frequency shore station transmits			I	0,*
Frequency shore station receives			I	0,*
Contact Instructions			S(TE)	0,*
Online Resource			C	0,*
Linkage		ISO 19115:2014	S(URL)	1,1
Protocol		ISO 19115:2014	S(TE)	0,1
Application Profile		ISO 19115:2014	S(TE)	0,1
Name of Resource		ISO 19115:2014	S(TE)	0,1
Description		ISO 19115:2014	S(TE)	0,1
Online function		ISO 19115:2014	E(CL)	0,1
Protocol Request		ISO 19115:2014	S(TE)	0,1
Telecommunications			C	0,*
Telecommunication Identifier			S(TE)	1,1
Telecommunications Service Carrier			S(TE)	0,1
Contact Instructions			S(TE)	0,1
Telecommunications Service			E(CL)	0,*
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*

Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1

Information associations

Role Type	Association Name	Role	Features	Multiplicity
Additional Information		Supports	Authority	0,*

INT 1 Reference:

Remarks:

- No remarks.

Distinction:

8.5 Service Hours

IHO Definition: **SERVICE HOURS** The time when a service is available and known exceptions.

S-101 Information Feature: Service Hours

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Working Schedule			C	1,*
Day of the Week			EN	0,7 (ordered)
Working Hours of Day			C	0,1
Time reference			EN	1
Time of Start of Work			TI	1,* (ordered)
Time of End of Work			TI	1,* (ordered)
Day of Wee Range			C	0,1
Day of Week			EN	2 (ordered)
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		((((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1

Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1

Information associations

Role Type	Association Name	Role	Features	Multiplicity
Additional Information		Supports	Authority	0,*
Additional Information		Supported by	Non Standard Working Day	0,*

INT 1 Reference:

Remarks:
- No remarks.

Distinction:

8.6 Non Standard Working Day

IHO Definition: **NON STANDARD WORKING DAY** Days when many services are not available. Often days of festivity or recreation when normal working hours are limited, esp. a national or religious festival, etc.

S-101 Information Feature: Non Standard Working Day

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Fixed Date		(((S-100 truncated Date))))		0,*
Variable Date			S(TE)	0,*
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1

File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1

Information associations

Role Type	Association Name	Role	Features	Multiplicity
Additional Information		Supports	Service Hours	

INT 1 Reference:

Remarks:
- No remarks.

Distinction:

8.7 Applicability

IHO Definition: **APPLICABILITY** Describes the relationship between vessel characteristics and: (i) the applicability of an associated information object or feature to the vessel; or, (ii) the use of a facility, place, or service by the vessel; or, (iii) passage of the vessel through an area.

S-101 Information Feature: Service Hours

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Ballast		1=Yes	BO	0,1
Category of Cargo		1 : bulk 2 : container 3 : general 4 : liquid 5 : passenger 6 : livestock 7 : dangerous or hazardous	EN	0,*

Category of Dangerous or Hazardous Cargo		1 : Class 1; Division 1.1 2 : Class 1; Division 1.2 3 : Class 1; Division 1.3 4 : Class 1; Division 1.4 5 : Class 1; Division 1.5 6 : Class 1; Division 1.6 7 : Class 2.1 8 : Class 2.2 9 : Class 2.3 10 : Class 3 11 : Class 4.1 12 : Class 4.2 13 : Class 4.3 14 : Class 5.1 15 : Class 5.2 16 : Class 6.1 17 : Class 6.2 18 : Class 7 19 : Class 8 20 : Class 9 21 : Harmful Substances in packaged form	EN	0,*
Category of Vessel Registry		1: domestic 2: foreign	EN	0,1
Category of Vessel		1: general cargo vessel 2: container carrier 3: tanker 4: bulk carrier 5: passenger vessel 6: roll-on roll-off 7: refrigerated cargo vessel 8: fishing vessel 9: service 10 : warship 11: towed or pushed composite unit 12: tug and tow	EN (CL)	0,1
Thickness of Ice Capability			IN	
Logical Connectives		1: logical conjunction 2: logical disjunction	EN	0,1
Vessel Performance			TE	
Underkeel Allowance			C	0,1

underkeelAllowanceFixed			S (Real)	0,1
underkeelAllowanceVariable			C	0,1
underkeelAllowance VariableBeamBased			S (Real)	0,1
underkeelAllowance VariableDraughtBased			S (Real)	0,1
operation		1: largest value 2: smallest value	EN	0,1
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1
Date start	(DATSTA)		(S) DA	0,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		(((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Vessel Measurements			C	0,*
Comparison Operator		1: greater than 2: greater than or equal to		1

		3: less than 4: less than or equal to 5: equal to 6: not equal to		
Vessel Characteristics				1,1
Vessel Characteristics Value			RE	1,1
Vessel Characteristics Units			EN	1,1

Information associations

Role Type	Association Name	Role	Features	Multiplicity
Additional Information		Supports	Marine Protected Area, Marine Service, Restricted Area	0,*
Additional Information		Supported by	Ship report	0,*
Additional Information		Supported by	**Restrictions, Regulations, Recommendations, Nautical Information**	0,*

INT 1 Reference:

Remarks:

- Vessel characteristics are specified as follows:

  BALAST: The vessel is ballasted as described by this attribute.

  VSLMSM: The vessel or cargo matches the attribute value (for multi-valued attributes, matches at least one of the values).

  ICECAP, UKCLRN, PRFMNC attributes: The vessel matches the specified requirement. Absent attributes or null values are ignored.

  LOGCON states whether “all” or “at least one” of the specifications must be met.

  CATREL indicates the relationship between matching vessels and the associated information object or feature.

  Example:

  With one instance of APPLIC:

  VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=greater than, VSLVAL=50], CATVSL=3 (tanker), LOGCON=1 (and), CATREL=5 (required); associated to a PILBOP object: tankers with LOA > 50.0 m must use the PILBOP

  PRFMNC="Vessels with thrusters", MBRSHP=2; associated to a REGLTS object: Vessels with thrusters are exempted from the regulation.

  If VSLMSM becomes repeatable:

  VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=(>), VSLVAL=50], VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=(<), VSLVAL=90], CATDHC=19, LOGCON=1 (and), MBRSHP=1 (included);

  associated with **Regulations**: the regulation applies to vessels with LOA with more than 50.0 and less than 90.0 m. carrying MARPOL Class 8 corrosive substances.

  Same situation as above with one instance of VSLMSM:

  VSLMSM [[VSLCAR=length; VSLUNT=metre, VSLVAL=50; COMPOP=(>)],[VSLCAR=length; VSLUNT=metre, VSLVAL=90; COMPOP=(<)]], CATVSL=3 (tanker), LOGCON=1 (and), MBRSHP=1 (included);

  associated with a REGLTS: the regulation applies to vessels with LOA with more than 50.0 and less than 90.0 m. carrying MARPOL Class 8 corrosive substances.

- Multiple values of **Category of Cargo** and of **Category of Dangerous Or Hazardous Cargo** should be

treated as “inclusive OR” (i.e., if **Category of Cargo** =1 and 2, then it means vessels with either bulk or container cargo or both). Distinction:

8.8 Regulations

See principle structure at section 8.11

8.9 Restrictions

See principle structure at section 8.11

8.10 Recommendations

See principle structure at section 8.11

8.11 Nautical Information

See principle structure at section

IHO Definition: **NAUTICAL INFORMATION** Nautical information about a related area or facility.				
S-101 Information Feature: Nautical information				
Primitives: None				
Real World	*Paper Chart Symbol*	*ECDIS Symbol*		
S-101 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of Authority		1 : customs 2 : border control 3 : police 4 : port 5 : immigration 6 : health 7 : coast guard 8: agricultural 9: military 10: private company 11: maritime police 12: environmental 13: fishery 14: finance 15: maritime	EN	0,1
Fixed date range			C	0,1
Date end	(DATEND)		(S) DA	0,1

Date start	(DATSTA)		(S) DA	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Periodic date range			C	0,*
Date end	*(PEREND)*	ISO 8601: 2004	(S) DA	1,1
Date start	*(PERSTA)*	ISO 8601: 2004	(S) DA	1,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		((((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Textual Content			C	1,*
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Language		ISO 639-3	(S) TE	0,1
File reference	*(TXTDSC)* *(NTXTDS)*		(S) TE	1,1
Information			C	1,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Source Indication	(SORIND)		(S) TE	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date		((((S-100 truncated Date))))		0,1
Country		ISO3166-1-alpha2		0,1

Category of Authority	(CATAUT)		EN	0,1
Feature name			C	0,*
Display name			(S) BO	0,1
Language		ISO 639-3	(S) TE	0,1
Name	*(OBJNAM)* *(NOBJNM)*		(S) TE	1,1
Online Resource			C	0,1
Linkage		ISO 19115-1:2014	URL	
Protocol		ISO 19115	(S) TE	0,1
Application Profile		ISO 19115	(S) TE	0,1
Name of Resource		ISO 19115	(S) TE	0,1
Description		ISO 19115	(S) TE	0,1
Online function		1: download 2: information 3: offline access 4: order 5: search 6: complete metadata 7: browse graphic 8: upload 9: email service 10: browsing 11: file access	EN	0,1
Protocol Request		ISO 19115	(S) TE	0,1

Information associations

Role Type	Association Name	Role	Features	Multiplicity
Additional Information		Provides for	**Each Feature Type** or **Information Area**	
Additional Information		Supported by	Applicability	0,*

INT 1 Reference:

Remarks:

Distinction: **Regulations, Recommendations, Restrictions, Supplementary information**

9 Association Class

9.1 Additional Information

TBD

9.2 Permission Type

IHO Definition: **PERMISSION TYPE** ??????????????????????????????

S-101 Information Feature: Permission Type

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of Relationship		1 : prohibited 2 : not recommended 3 : permitted 4 : recommended 5 : required	EN	0,1

Information associations

Comment [JS54]: Is that correct??

Role Type	Association Name	Role	Features	Multiplicity
Permission Information		Permission	Ship report	

INT 1 Reference:

Remarks:

Distinction:

9.3 Inclusion Type

IHO Definition: **INCLUSION TYPE** ??????????????????????????????

S-101 Information Feature: Inclusion Type

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-101 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Membership		1 : included 2 : excluded	EN	0,1

Information associations

Comment [JS55]: Is that correct??

Role Type	Association Name	Role	Features	Multiplicity
If applicable to		Permission		

INT 1 Reference:

Remarks:

Distinction:

10 Associations

10.1 Association names

10.1.1 Additional information

Additional information: IHO Definition: An information association for the binding between at least one instance of a geo feature and an instance of an information type.

Remarks:
- A single information feature instance may be associated with more than one geo feature instance.

Role Type	Role	Features	Multiplicity
Association	Provided by	All Geo Features	0,*
	Provides	**Supplementary Information**	0,1

10.1.2 ??????????

??????????????: IHO Definition: ??????????????????????????????.

Remarks:
- No remarks.

Role Type	Role	Features	Multiplicity
Association	Component of		
	Consists of		

10.2 Association Roles

10.2.1 Component of

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

10.2.2 Consists of

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

10.2.3 Identifies

Identifies: IHO Definition: A pointer to a specific feature(s).

10.2.4 Positions

Positions: IHO Definition: A pointer to a specific cartographically positioned location for text.

10.2.5 Provided by

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

10.2.6 Provides

Provides: IHO Definition: Acts as the authority and provider of a specified service.

10.2.7 Supported by

Supported by: IHO Definition: A pointer to the master feature that equipment feature(s) are supported by.

10.2.8 Supports

Supports: IHO Definition: A pointer to the equipment feature(s) supported by a master feature.

10.2.9 Updates

Updates: IHO Definition: A pointer to a feature that has been updated.

11 Geo Feature Attribute and Enumerate Descriptions

11.1 Geo Feature Attribute and Enumerate Descriptions derived from S-101 (version 1.0)

12 Meta Feature and Spatial Attribute and Enumerate Descriptions

12.1 Meta Features and Spatial Attributes and Enumerate Descriptions derived from S-101 (version 1.0)

13 Complex Attributes

13.1 Complex Attributes derived from S-101 (version 1.0)

14 ECDIS System (Portrayal) Attributes

14.1 ECDIS System (Portrayal) Attributes derived from S-101 (version 1.0)

15 Updating (see S-4 – B-600)

Comment [JS56]: Should we refer to S-4 as well or should we define another update regime