INTERNATIONAL HYDROGRAPHIC ORGANIZATION

MARINE RADIO SERVICES PRODUCT SPECIFICATION

IHO Publication S-123

Appendix A
Data Classification and Encoding Guide

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1 Overview

1.1 Preface

The “Data Classification and Encoding Guide” has been developed to provide consistent, standardized instructions for encoding S-100 compliant Marine Radio Services (MRS) (S-123) data.

The purpose of the Data Classification and Encoding Guide is to facilitate S-123 encoding to meet IHO standards for the proper display of Marine Radio Services information in an ECDIS and other electronic charting displays. This document describes how to encode information that the modeller considers relevant to an MRS. The content of an MRS 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 other organization authorized by a government, to produce definitive nautical information.

The entire S-100 Universal Hydrographic Data Model, including the S-123 MRS Product Specification, is available at the following web site, http://www.iho.int.

1.2 S-123 Appendix A - Data Classification and Encoding Guide – Metadata

Note: This information uniquely identifies this Data Classification and Encoding Guide to the Product Specification and provides information about its creation and maintenance.

Metadata	Content
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Table 1-1 MRS product specification metadata

1.3 Terms and definitions

This list is identical with the list in the main body of this product specification.

Term	Definition
aggregation	special form of **association** that specifies a whole-part relationship between the aggregate (whole) and a component (see composition)
application	manipulation and processing of data in support of user requirements (ISO 19101)
application schema	**conceptual schema** for data required by one or more **applications** (ISO 19101)
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
boundary	set that represents the limit of an entity (ISO 19107)
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.
conceptual model	model that defines concepts of a **universe of discourse** (ISO 19101)
conceptual schema	formal description of a **conceptual model** (ISO 19101)
coverage	**feature** that acts as a function to return values from its range for any direct position within its spatial, temporal or spatiotemporal **domain** (ISO 19123) *EXAMPLE Raster image, polygon overlay, digital elevation matrix.*
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"
data product	**dataset** or **dataset series** that conforms to a **data product specification**
data product specification	detailed description of a **dataset** or **dataset series** together with additional information that will enable it to be created, supplied to and used by another party *NOTE: A data product specification provides a description of the universe of discourse and a specification for mapping the universe of discourse to a dataset. It may be used for production, sales, end-use or other purpose.*
dataset	identifiable collection of data (ISO 19115)

NOTE: A dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset may be as small as a single feature contained within a larger dataset. A hardcopy map or chart may be considered a dataset.

dataset series collection of **datasets** sharing the same product specification (ISO 19115)

domain well-defined set (ISO/TS 19103)

NOTE: Well-defined means that the definition is both necessary and sufficient, as everything that satisfies the definition is in the set and everything that does not satisfy the definition is necessarily outside the set.

end point last point of a curve (ISO 19107)

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 (ISO 19101)

NOTE: A feature may occur as a type or an instance. Feature type or feature instance shall be used when only one is meant.

EXAMPLE: The feature instance named “Turning Torso Tower” may be classified with other phenomena into a feature type “tower”.

feature association relationship that links instances of one **feature** type with instances of the same or a different **feature** type (ISO19110)

NOTE 1; A feature association may occur as a type or an instance. Feature association type or feature association instance is used when only one is meant.

NOTE 2: Feature associations include aggregation of features.

feature attribute characteristic of a **feature** (ISO 19101)

NOTE 1: A feature attribute may occur as a type or an instance. Feature attribute type or feature attribute instance is used when only one is meant.

NOTE 2: A feature attribute type has a name, a data type and a domain associated to it. A feature attribute for a feature instance has an attribute value taken from the domain.

geographic data data with implicit or explicit reference to a location relative to the Earth (ISO 19109)

NOTE: Geographic information is also used as a term for information concerning phenomena implicitly or explicitly associated with a location relative to the Earth.

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,** surface

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

metadata data about data (ISO 19115)

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
model	abstraction of some aspects of reality (ISO 19109)
point	0-dimensional geometric primitive, representing a position NOTE: The **boundary** of a point is the empty set
portrayal	presentation of information to humans (ISO 19117)
quality	totality of characteristics of a product that bear on its ability to satisfy stated and implied needs (ISO 19101)
set	unordered collection of related items (objects or values) with no repetition (ISO 19107)
start point	first point of a curve (ISO 19107)
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
universe of discourse	view of the real or hypothetical world that includes everything of interest (ISO 19101)

Table 1-2 List of terms and definitions

1.4 Abbreviations

Abbreviation	Description
DCEG	Data Classification and Encoding Guide
ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigational Chart
GML	Geography Markup Language
HO	Hydrographic Office
IHO	International Hydrographic Organization
IMO	International Maritime Organization
ISO	International Organization for Standardization
MRS	Marine Radio Services
RENC	Regional ENC co-ordinating centre
UML	Unified Modelling Language
URL	Universal Resource Locator
XML	eXtensible Markup Language

Table 1-3 List of abbreviations

1.5 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, or recommended.

1.6 Maintenance

Changes to the Data Classification and Encoding Guide must occur in accordance with the S-123 MRS Product Specification clause 4.3.

2 General

2.1 Introduction

This S-123 Data Classification and Encoding Guide (DCEG) contains rules and guidance for converting data describing the real world into data products that conform to the S-123 specification.

The S-123 specification contains an application schema (UML model) describing the conceptual domain model in terms of classes and relationships, and a Feature Catalogue (see S-123 Annex B) that specifies the data model, i.e., specifies the data model types and associations corresponding to the various classes and relationships in the application schema.

To simplify the DCEG text, the various data model types will be provided without the suffixes “class”, “type” or “instance”; e.g. the term “feature” should be understood as “feature class” or “feature type” or “feature instance” as best fits the immediate context in which it is used (and where there might be confusion, it is written out in full as feature class/type/instance). The model defines real world entities as a combination of descriptive and spatial characteristics (S-123 MRS Product Specification clause 4.4).

This section of the DCEG contains general information needed to understand the encoding rules and describes fundamental common rules and constraints. It also describes datasets and metadata. The data model object types used within S-123 and their encoding rules and guidelines are defined in detail in subsequent sections of this document.

Within this document the features, information types, associations and attributes appear in **bold text**.

2.2 Descriptive characteristics

2.2.1 Feature

A feature contains descriptive attributes that characterize real world entities.

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

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

2.2.1.1 Geographic feature class

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

2.2.1.2 Meta feature class

Meta feature type contains information about other features.

2.2.1.3 Charted background feature

The MRS product would mostly be visualized as an overlay of an ENC or other GIS applications. Consequently, all necessary descriptive and spatial characteristics to provide a charted background should be provided by the underlying application.

2.2.2 Information type

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

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

2.3 Spatial characteristics

2.3.1 Spatial primitives

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

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

Feature	P	C	S	N
Radio Station	X			
Navtex Station Area			X	
Weather Forecast Warning Area			X	
Indeterminate Zone			X	
Forecast Area Aggregate				X
Radio Services Area Aggregate				X
Landmark	X		X	
Building	X		X	
Coastguard Station	X		X	
Radio Service Area			X	
Navigational Meteorological Area			X	
Imarsat Ocean Region Area			X	
GMDSS Area			X	

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

2.3.2 Capture density guideline

The MRS capture density will follow the recommendation of the S-101 (ENC) DCEG, that states curves and surface boundaries should not be encoded at a point density greater than 0.3 mm at permitted display scale.

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

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

2.4 Attributes

Attributes may be simple type or complex type. Complex (C) attributes are aggregates of other attributes that can be simple type or complex type attributes. Simple (S) attributes are assigned to one of the types collected at clause 2.4.1.

The binding of attributes to a feature, the binding of attributes to attributes to construct complex attributes, and attribute multiplicity are all defined in the Feature Catalogue.

Within this document, the allowable attributes are included in the description of each feature, as well as the allowable values for enumeration type attributes.

2.4.1 Simple attribute types

Each simple attribute (S) is assigned to one of attribute types in Table 2-2 (in alphabetic order):

Abbre viation	Attribute type	Description
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.
CL	Code List	A type of flexible enumeration (see "EN" below). A code list type is a list of literals which may be extended only in conformance with specified rules. Attributes of a code list type may take values from the list or other values which are defined according to the rules. The rules should be part of the specification of the individual codelist type. A code list could either be closed (fixed) or open (extensible). A code list type has the following properties: 1. A description of the code list type, 2. The URI where the list could be found, and 3. An encoding instruction.
DA	Date	A date provides values for year, month and day according to the Gregorian Calendar. Example: 19980918 (YYYYMMDD)
DT	Date and Time	A DateTime is a combination of a date and a time type. Example: 19850412T101530 (YYYYMMDDThhmmss)
EN	Enumer-ation	A fixed list of valid identifiers of named literal values. Attributes of an enumerated type may only take values from this list.
IN	Integer	A signed integer number. The representation of an integer is encapsulation and usage dependent. Integer attribute values must not be padded by non-significant zeroes. For example, for a number of 19, the value populated for the attribute must be 19 and not 019. Examples: 29, -65547
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. Real 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. Examples: 23.501, -0.0001234, -23.0, 3.141296
TD	Trun-cated Date	One or more significant components of the modelling date are omitted. Example: – – – –02– – (Year and date not encoded) The exact format depends on the encoding. A GML dataset would use a GML built-in type and encode it as `<gMonth>--02<gMonth>`. An 8211 data format based dataset would truncated encode the date as – – – –02– –.
TE	Free text	A CharacterString is an arbitrary-length sequence of characters including accents and special characters from a repertoire of one of the adopted character sets.
TI	Time	A time is given by an hour, minute and second. Time zone according to UTC is optional. Character encoding of a time is a string that follows the local time Example: 183059 or 183059+0100 or 183059Z

Table 2-2 Simple attribute types

2.4.2 Mandatory attributes

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

They are fundamental to the definition of a feature;

They are required to support the correct portrayal of a feature instance;

Certain features make no logical sense without specific attributes;

Some attributes are required for safety of navigation.

Within this document, mandatory attributes are those with a multiplicity of 1,1 or 1,n (n>1) or 1,*. The attribute multiplicity is identified in the description of each feature class.

For easy reference, the Table 2-3 summarises the mandatory attributes for each feature.

Feature	Mandatory Attributes
Radio Station	none
Navtex Station Area	txIdentChar
Weather Forecast Warning Area	categoryOfFrcstAndWarningArea
Indeterminate Zone	informationConfidence
Forecast Area Aggregate	none
Radio Services Area Aggregate	none
Landmark	categoryOfLandmark
Building	none
Coastguard Station	none
Radio Service Area	none
Navigational Meteorological Area	none
Imarsat Ocean Region Area	none
GMDSS Area	categoryOfGMDSSArea

Table 2-3 Mandatory attributes for MRS feature classes

2.4.3 Conditional attributes

The MRS feature classes or information types do not contain conditional attributes.

Complex attributes which are assigned to MRS feature classes or information types have at least one sub-attribute which is mandatory (or conditionally mandatory). Mandatory sub-attributes of complex attributes have not been included in Table 2-3. Where the sub-attribute of a complex attribute is conditional, this is indicated in the Remarks section for the relevant feature class entries in chapter 5.

If a complex attribute with all its sub-attributes optional (e.g., multiplicity 0..1 or 0..*) is encoded, at least one of the sub-attributes must be populated.

2.4.4 Missing attribute values

Where a value of a mandatory attribute is not known, the attribute must be populated with an empty (null) value.

Where the value of a non-mandatory attribute is not known, the attribute must not be included in the dataset.

2.4.5 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 is significant and if an attribute is mandatory. Common examples are shown in theTable 2-4:

Format: MinOccurs, MaxOccurs (a * indicates that infinite instances are possible, the term (ordered) indicates that the order of the provided instances is significant)

Multiplicity	Explanation
0,1 or 0..1	An instance is not required; if provided there must only be one instance.
1,1 or 1..1	An instance is required and there must only be one instance.
0,* or 0..*	An instance is not required and there can be an infinite number of instances.
1,* or 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 is significant.
2,2 or 2..2	Two instances are required and there must be no more than two.

Table 2-4 Multiplicity of attributes

2.4.6 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.

2.4.6.1 Quality of spatial attributes

The quality of spatial attributes in S-123 is described in a **Quality of Non-Bathymetric Data** meta-feature. This meta-feature defines areas within which uniform assessment exists for the quality. It is described in detail later in this document.

If the spatial quality attributes for an individual instance of a spatial primitive differ from the quality indicated in the overlying **Quality of Non-Bathymetric Data** meta-feature, the quality attributes for that instance are carried in an information class called **spatial quality**. Only points and curves can be associated with **spatial quality**. S-123 does not use multi-points. 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.

Note: S-123 does not make use of the S-101 **Quality of Bathymetric Data** meta- feature since depth range uncertainties are not needed. The **Quality of Non-Bathymetric Data** meta-feature has all the quality attributes needed by S-123.

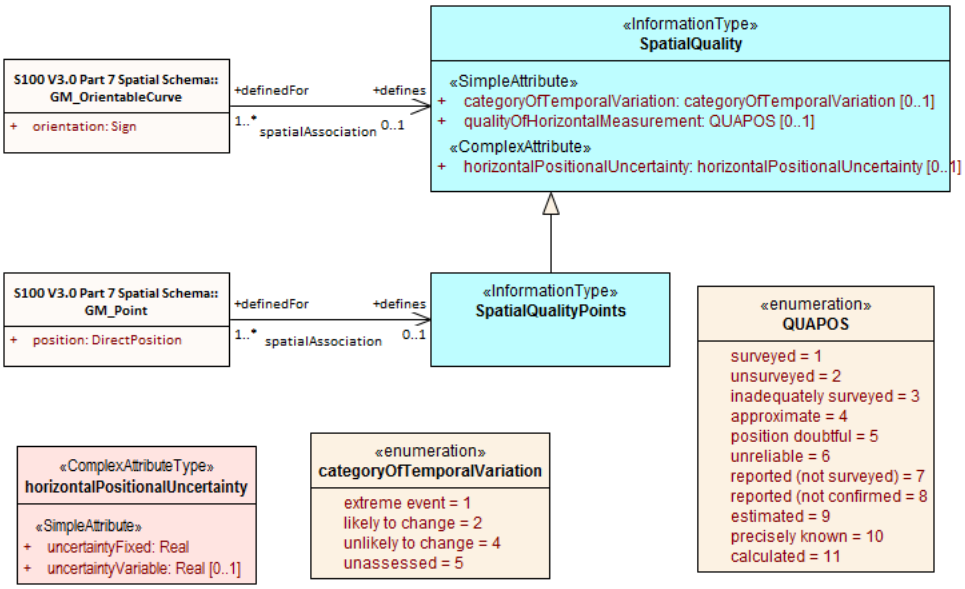

Figure 1 Spatial quality information

2.4.7 Portrayal feature attributes

MRSs will be used 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. Table 2-5 provides a list of attributes which have been adopted from the S-101 (ENC) product specification and which have specific influence on the MRS portrayal.

Attribute	Effects on portrayal
displayName	This Boolean attribute determines if the text for a name should be displayed. 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.
pictorialRepresentation	The population of this Text attribute will result in the display of the magenta information symbol to highlight additional information to the user.
textContent	The population of this complex attribute will result in the display of the magenta information symbol to highlight additional information to the user.

Table 2-5 Attributes which have effects on portrayal

Note: Since S-123 data is scale-independent, the S-101 attribute scaleMinimum is superfluous and not used in S-123 datasets.

2.4.8 Textual information

Textual information may provide additional information essential to understand the presence of the MRS and other features of an S-123 product. This information may also provide legal information pertaining to the S-123 product features.

The methods to provide textual information vary from the simple provision of short text, to the more structured provision of extensive text. The length of the text determines the method and the attribute selection, see section 2.4.8.2.

2.4.8.1 Specialized information types for common kinds of textual information

The information types **Restrictions, Recommendation, Regulations, NauticalInformation** must be used to encode text information when the DCEG allows them to be associated to the feature or information type and the information is of the appropriate kind (a restriction, regulation, etc.).

In exceptional circumstances and only if the use of the information types **Restrictions, Recommendation, Regulations** is not sufficient, **NauticalInformation** can be used to encode additional textual information associated to a feature or a group of features.

In some cases, there may be a specialized attribute that is specifically intended for the data in question. If an appropriate specialized attribute is available, it must be used in preference to **information** or **textContent**. For example, feature names will generally be encoded in the **name** sub-attribute of complex attribute **featureName**, instead of **information**->**text**.

2.4.8.2 Textual information attributes

Textual information which is not appropriate for any of the Text-type attribute (or sub-attribute) allowed for the feature/information type should be encoded using either **information** or **textContent** complex attributes. Generally, either **information** or **textContent** is allowed, but not both.

2.4.8.3 Languages

Complex attribute **information** defines a **language** sub-attribute for specifying the language in which the text or referenced file is encoded.

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.

When a national language is used in the textual attributes, the English translation must also exist.

2.4.8.4 Minimal use of generalized text attributes

The complex attributes **information** and **textContent** must not be used when it is possible to encode the information by means of any other attribute. The population of these attributes provides symbols on an ECDIS screen. Therefore producers should carefully consider use of these attributes as the symbol may contribute significantly to ECDIS screen clutter and text attributes should be populated only when the content conveys useful information.

2.4.8.5 Short textual information

The **text** sub-attribute of complex attribute **information** should generally be used for short notes or to transfer information which cannot be encoded by other attributes, or to give brief information about a feature. The use of the complex attribute **information** as a stand-alone complex attribute is intentionally limited to the information types **ContactDetails, Applicability, NonStandardWorkingDay** and **ServiceHours,** which do not need the additional attributes defined in **textContent**. The reason for the limited use of **information** as a stand-alone complex attribute is to provide a structured and harmonised approach to textual information within the S-123 product data sets.

The text populated in **text** must not exceed 300 characters. Character strings contained in **text** sub-attribute must be UTF-8 character encoding.

If the **text** sub-attribute of **information** is populated, the **headline**, **fileReference**, and **fileLocator** sub-attributes must not be populated.

2.4.8.6 Complex or lengthy textual information

More complex encodings of text may use either **information** or **textContent**. The feature catalogue and the feature/information type definitions in this DCEG indicate whether **information** or **textContent** is allowed.

The complex attribute **textContent** also has **information** as a complex sub-attribute. If a short note must be encoded in a feature or information type which has only **textContent** as an attribute, it should be encoded as **textContent**->**information**->**text**.

Complex text information, such as text longer than 300 characters, formatted text, or HTML extracts from shipping regulations, must be encoded in a file named in either **information**->**fileReference** or **textContent**->**information**->**fileReference**. The construction **textContent**->**information**->**fileReference** should be used if the feature/information type provides **textContent** as complex attribute.

The complex attribute **information** defines an optional sub-attribute **headline** which may be used for a short title not exceeding 60 characters. The content should be short but informative – if the textual information is divided into sections, the most relevant section header from the referenced content may be a good choice for **headline**.

The complex attribute **textContent** defines an optional sub-attribute **categoryOfText** for indicating whether the text is the full text from the source, an extract from the source, or a summary prepared by the encoder. Populating **categoryOfText** is recommended whenever the textual information is taken or summarized from a law or regulation.

If it is considered necessary to include a description of the source of the textual information, the sub-attribute **sourceIndication** of **textContent** must be used. Encoding a description of the source is strongly recommended for textual information whose source is considered as information the end-user must have, e.g., because the date of issue must be conveyed or because it cites official regulations which are frequently updated.

COMMENT: Some government documents are frequently updated, e.g., the U.S. Electronic Code of Federal Regulations, which is currently updated every working day even though a particular section may be stable for years.

2.4.9 Attributes referencing external files

2.4.9.1 Predefined derived types

Table 2-6 presents the following predefined derived types which are described in S-100 (§ 1-4.6 in Edition 3.0.0):

Name	Description	Derived from
URI	A uniform resource identifier which character encoding shall follow the syntax rules as defined in RFC 3986. EXAMPLE http://registry.iho.int	CharacterString
URL	A uniform resource locator (URL) is a URI that provides a means of locating the resource by describing its primary access mechanism (RFC 3986). EXAMPLE http://registry.iho.int	URI
URN	A persistent, location-independent, resource identifier that follows the syntax and semantics for URNs specified in RFC 2141. EXAMPLE urn:iho:s101:1:0:0:AnchorageArea	URI

Table 2-6 Predefined derived types

2.4.9.2 Reference to textual files

The information types **Restrictions, Recommendation, Regulations, NauticalInformation** should be used to encode textual information.

The files referenced by **textContent**, sub-complex attribute **information** and its sub attribute **fileReference** 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 even when the sub-attribute **language** is populated with a language other than English.

If it is necessary to indicate a specific section within a large text file, this may be done by encoding the location in the **fileLocator** sub-attribute of **information**, as described in the tableTable 2-7.

Format	File extension	Content of fileLocator
Text	TXT	The offset of the start of the section relative to the beginning of the file (the first character in the file has offset 0).
HTML	HTM	The HTML fragment identifier, i.e., the value of the HTML *name* or *id* attribute of the target (as defined in the relevant HTML specification).
XML	XML	The XML fragment identifier as defined in the relevant specification, e.g., the value of an *xml:id* attribute.

Table 2-7 Locators for external files

2.4.9.3 Reference to external sources

References to Internet sources should be encoded using the **onlineResource** sub-attribute of **textContent**. Encoders should be aware that systems may not be able to access the Internet, so **onlineResource** should be used only for non-essential information.

Only sources that can be certified as secure should be provided.

2.4.9.4 Reference to graphics

If it is required to indicate a graphic, the complex attribute **graphic** must be used. The sub-attribute **pictorialRepresentation** must be used to indicate the file name (without the path) of the external graphical file. Graphic files that form part of the MRS product must be content with the characteristics collected in Table 2-8.

Characteristics	Values
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
File size	Minimum, consider that 10 MB is the maximum allowable size of an MRS dataset

Table 2-8 Graphics Characteristics

Additional information about the graphic file may be encoded in other sub-attributes of attribute **graphic**, as described in Section 2.4.13.

2.4.10 Dates

Dates may be complete or truncated values. The definition of the attribute will indicate if it must take a complete value (type *Date* or *DA*) or is allowed to take a truncated value (type *S100_TruncatedDate* or *TD*). Complete and truncated dates are different value types (see S-100 § 1-2 Table 1-2; also Table 2-9 of this DCEG).

For attributes that use the complete date type (type *Date* or *DA*), all their components (year, month, and day) must be specified.

For attributes that use the truncated date type (type *S100_TruncatedDate* or *TD*), zero, one, or two of the year/month/day components may be omitted. If the year component is included, it must be specified using exactly 4 digits.

2.4.10.1 Complete Dates (Informative)

Complete date values must be encoded in conformance with the Date format as specified in S-100 Ed. 2.0.0 (§§ 1-4.5.2) which is the same as the DA format in Table 2-2 in this document. The data values have to be provided in accordance with the Gregorian Calendar starting with four digits for the year, two digits for the month and two digits for the day.

Example: The date 18 September 2010 is encoded as follows:

In the ISO 8211 format: 20100918

In the GML format: <date>2010-09-18</date>

2.4.10.2 Truncated Dates (Informative)

In Truncated Dates one or more components (year, month, or day) of the date is not specified. Truncated date values must be encoded in conformance with the S100_TruncatedDate format or equivalent as specified in S-100 Ed. 3.0.0 (§§ 1-4.5.2 and 3-9) which is the same as the *TD* format in Table 2-2 in this document. If encoding attributes which can take truncated date values (e.g., **fixedDateRange**, **periodicDateRange**, **reportedDate)** and no specific year, month or day is required, the values must be encoded in conformance with the truncated date format as specified in S-100 (§§ 1-4.5.2 and 3-9 in Edition 3.0.0) which define a default format (for ISO 8211) but also allow the use of built-in types.

To encode partial dates in the GML and ISO 8211 data formats:

Description	ISO 8211	GML
No specific year, same day each year	– – – –MMDD	<gMonthDay>– –MM–DD</gMonthDay>

No specific year, same month each year	– – – –MM– –	<gMonth>– –MM</gMonth>
No specific day	YYYYMM– –	<gYearMonth>>YYYY–MM </gYearMonth>
No specific month and no specific day	YYYY– – – –	<gYear>YYYY</gYear>

Table 2-9 Date encoding in GML and ISO 8211 data formats

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

The dashes (–) indicating that the year, month or date which is not specified must be included in the encoding (with no space between the dashes).

2.4.10.3 Start and end of ranges

In accordance with S-100 Ed. 3.0.0 § 3-8, the start and end instants of a range or period are included in the range or period.

EXAMPLE 1: If the beginning of a date range is encoded as the complete date 01 January 2016, the period begins at 00:00:00 on 1 January 2016, and the whole of New Year's Day is included in the period. If the end of the date range is encoded as 01 January 2016, the period ends at 24:00:00 on 1 January 2016, i.e., again the whole of New Year's Day is included in the period.

EXAMPLE 2: If the beginning of a period is encoded in truncated date format as – – – –01– – (i.e., year and day not specified), the period begins at 00:00:00 on 1 January each year. If the end of the period is encoded as – – – –01– –, the period ends at 24:00:00 on 31 January each year.

Note 1) Particular care should be taken if the start or end date is 28 or 29 February. S-100 Ed. 2.0.0 § 3-8 explains the implications for end of February. For example, the truncated date – – – –02– – will be interpreted as 29 February in leap years and 28 February in non-leap years, while – –– –0228 will be interpreted as 28 February in every year.

Note 2) In accordance with ISO practice, 00:00:00 means midnight at the start of a day and 24:00:00 means midnight at the end of a day.

2.4.10.4 Schedules

Weekly service schedules of a feature can be comprehensively described by using the information types **ServiceHours** and **NonStandardWorkingDay**.

EXAMPLE: A feature service is available under normal operation status 24 hours/day on Monday and Wednesday and from 08:00 to 16:00 LT from Thursday to Saturday. The service is not available on public holidays and the 5 of August of each year.

ServiceHours

scheduleByDoW

categoryOfSchedule =1 (normal operation)

tmIntervalsByDoW

dayOfWeek =1(Monday), 3(Wednesday)

dayOfWeekRanges =0 (false)

timeReference = 2 (LT)

tmIntervalsByDoW

dayOfWeek =4(Thursday), 6(Saturday)

dayOfWeekRanges =1 (true)

timeReference = 2 (LT)

timeOfDayStart = 080000

timeOfDayEnd = 160000

NonStandardWorkingDay

fixedDate = – – – – 0805 (5 August)

variableDate = public holidays

If the days of week are known but the hours of availability are unknown, there is no time attribute and the **timeReference** attribute must be nilled as described in section 2.4.4.

To encode two or more periods within the same day, repeat the **timeOfDayStart** and **timeOfDayEnd** attributes. If one of the times is not known, it may be nilled as described in section 2.4.4.

For example, to encode open hours of 8 a.m. to 12 noon and 1 p.m. to 5 p.m. on Thursdays and Saturdays:

tmIntervalsByDoW

dayOfWeek =4(Thursday), 6(Saturday)

dayOfWeekRanges =1 (true)

timeReference = 2 (LT)

timeOfDayStart = 080000

timeOfDayStart = 130000

timeOfDayEnd = 120000

timeOfDayEnd = 170000

The order of repeated **timeOfDayStart** and **timeOfDayEnd** attributes is significant, since intervals are specified by matching them pairwise in order.

2.4.11 Times

If it is required to provide information of the start time and end time of an active period of a feature, it must be encoded using the attributes **timeOfDayStart** and **timeOfDayEnd**. The order has significance.

2.4.12 Combination of date schedules and times

Schedule information can also include time of day. The complex attribute **tmIntervalsByDoW** also includes **timeOfDayStart** and **timeOfDayEnd** attributes to encode the daily start and end times of service. Complete instructions on how to encode schedules are described in section 2.4.10.4.

2.4.13 Graphic information

A graphic file should be appropriate for the purpose and should supplement the information in terms of navigational relevance. Preferably, the graphic should provide perspective relevant to the view of the mariner. Graphics should be such that all the information in the graphic is legible in the application display.

Graphic information must be encoded using the complex attribute **graphic**. The simple sub-attribute **pictureInformation** should be used to provide credits to the picture creator, copyright owner etc.

The source date can either be of a complete date (see chapter 2.4.10.1) or truncated date (see chapter 2.4.10.2) type.

Assuming that graphic information provides a coastal view, mariners are interested in knowing from which point on sea that graphic has been taken. The complex attribute **bearingInformation** (see chapter 2.4.13.1) provides all necessary information.

2.4.13.1 Bearing information

The most accurate information should be provided if it is necessary to indicate a position from where a picture has been taken. **information** is a sub-complex attribute of **bearingInformation** and should be used to specify that no bearing information can be provided whenever such is the case. The sub-attributes **sectorBearing** and **orientation** can be used to describe a certain level of inaccuracy in the position determination.

2.5 Associations

2.5.1 Introduction

An association expresses a relationship between two classes - features, information types, or a feature and an information type. Objects in the dataset (instances of feature/information types) are related only if the link between them is encoded in the dataset.

EXAMPLE: An **Authority** information type provides the responsible authority information to the **Radio Station** feature. An association named **Service Control (srvControl)** is used to relate the two classes; roles are used to convey the meaning of the relationship.

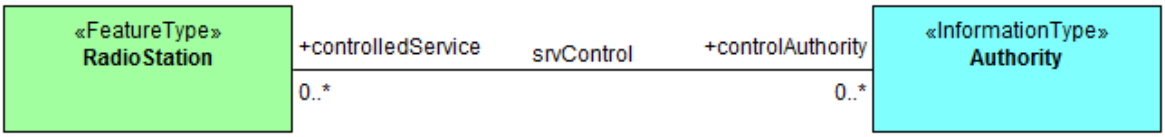

Figure 2 Information association relating a feature to an information type

An association end may have a multiplicity which describes how many instances the feature or information type instance at the other end is allowed to are to link to. In the figure, any single instance of **Radio Station** may link to any number of **Authority** instances, and vice versa.

2.5.2 Association names

The association name is normally provided by the UML diagram at the middle of the connection line/arrow between the two involved classes and can be obtained from the feature and information type tables provided in this document).

Association names may be omitted in the UML diagrams for the following reasons:

a) the association is defined by an association class, see 2.5.4 (the name of the association class is used);

b) to avoid cluttering the diagram – however, the name is always documented in the feature/information type tables.

2.5.3 Association roles

Either or both association ends can have a name (role). In Figure 2 the roles are controlledService and controlAuthority. This association expresses the relationship that a **Radio Station** may have any number of responsible **Authorit(ies)**, and an **Authority** may be responsible for any number of **Radio Stations**.

Roles may be also omitted from the diagram to reduce clutter – again, the role name is documented in the feature/information type tables.

Note: Instead of documenting every single role, Product Specifications may describe rules for defining default roles.

2.5.4 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 features or information types it connects. An association class is both an association and a class. Within

an S-123 product the association classes **Permission Type** and **Inclusion Type** may be used for relating vessel classes to feature and information types.

2.5.4.1 Permission Type

This association class specifies the relationship of the vessel class to a feature, e.g., whether access to a feature (or use of a facility) is prohibited or permitted for a specified class of vessel. The class of vessel is described by the simple and complex attributes of the information type **Applicability** such as length, cargo, etc. The attributes of the association class describe the nature of the relationship, i.e., whether access to an area is permitted or prohibited, or whether use of a service is required or recommended.

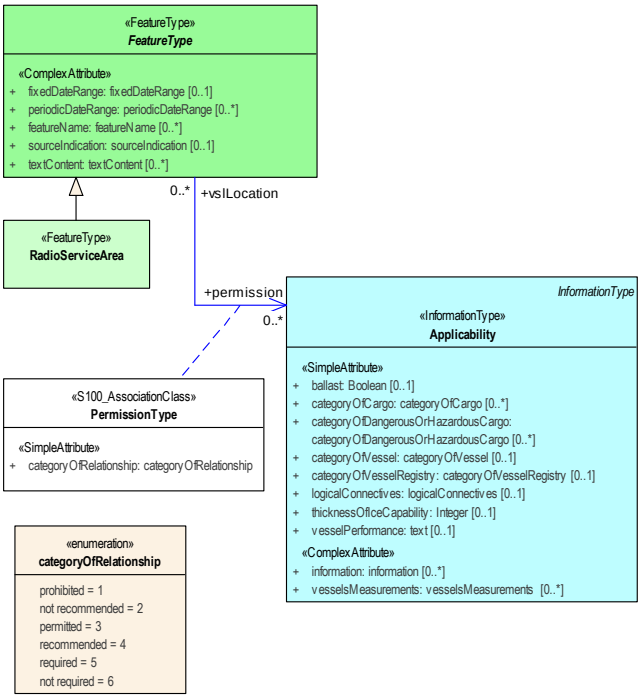

Figure 3 Association class for hypothetical requirement for use of a radio service by a vessel type

EXAMPLE: An association between an **Applicability** instance with attribute **categoryOfDangerousOrHazardousCargo** = Class 3 and an instance of feature **RadioServiceArea**, with **Permission Type**'s attribute **categoryOfRelationship** = required, means that vessels carrying flammable liquids (hazardous cargo type class 3 in the IMDG Code) must use the radio services provided in the **RadioServiceArea**.

2.5.4.2 Inclusion Type

This association class defines whether a specified customer (class of vessels, as described by **Applicability**) is excluded or included from a particular regulation, recommendation, etc. Again, the attributes of the association class describe the nature of the relationship; in this case whether the vessel is included or excluded from the regulation, etc.

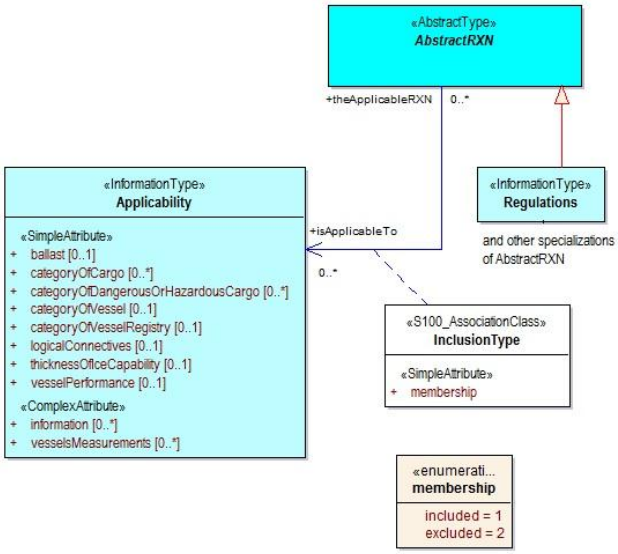

Figure 4 Association class for inclusion of vessel types in regulations

EXAMPLE: An association between an **Applicability** instance with attribute **categoryOfDangerousOrHazardousCargo** = IMDG Code Class 3, with **Inclusion Type**'s attribute **membership** = included, and an association of a **Regulation** instance to the same Inclusion Type, means that the information provided by the **Regulation** (a sub-type of **AbstractRXN)** applies to vessels carrying flammable liquids (hazardous cargo type class 3 in the IMDG Code).

Note (1) Since **AbstractRXN** is an abstract type, it cannot have direct instances in the dataset. Only instances of its (non-abstract) sub-types can be used.

Note (2) Specific tools may use different presentations in their user interfaces, e.g., as two associations (as described in the text of the example), or one association with an association class also shown (as shown in Figure 4).

2.5.5 Use of various associations

2.5.5.1 General

In general, associations must be encoded whenever the relationship is useful for navigation, monitoring, voyage or route planning, or reporting purposes, or any other purpose for which the dataset is intended. The multiplicity lower bound of "0" at an association end means only that the absence of a link to the relevant instance does not invalidate the dataset. The encoding instructions for individual feature and information types describe what associations are allowed and whether they are required or optional.

2.5.5.2 Generic association for uncategorized additional information

Unless other associations are specified, information types are associated to the relevant features using the association name **additionalInformation** and the role names **provides** and **providedBy**.

2.5.5.3 Associations to Restrictions, Recommendation, Regulations and Nautical Information

The **Restrictions, Recommendation, Regulations, Nautical Information** are associated to the relevant features using the association name **associatedRxN** (inherited from their common abstract super-type). The roles at the ends of this association are **appliesInLocation** and **theRxN** (the Restriction, Regulation etc.).

If the regulation applies only to a specific class, or if it mentions an exempt class, an additional association to an **Applicability** object is encoded using the **InclusionType** association class.

2.5.5.4 Conventional Association

Certain features and information types may be permitted or required to have associations to other feature or information types. The allowed or mandatory associations for a feature/information type are shown in the application schema (section 6 – Product Specification) and listed in the documentation for individual types (Appendix A - DCEG). Definitions of the associations and roles are also given in the DCEG.

2.5.6 Where to Encode Associations

The presentation and management of associations will be determined by the user interface of the encoding software tools. Since S-100 edition 3.0.0 permits feature-information associations to be encoded only from the geographic feature to the information type and not vice versa, the information-to-feature link might be unavailable or treated differently from the feature-to-information link.

2.6 Datasets

2.6.1 Types of Datasets

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

The following types of MRS dataset may be produced and contained within an exchange set:

Dataset	Explanations
New dataset:	Data for an area different (in coverage and/or extent) to existing datasets.
New Edition of a dataset:	A re-issue plus 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 and should have the same spatial extents. .
Update dataset	Updated or new information. Contains information about objects being added, modified, or deleted.

Table 2-10 MRS dataset types

2.6.2 Overlay data sets

S-123 datasets are intended to be used together with S-101 ENC (or similar data products) which will act as a base layer. The base layer is expected to provide navigational and visual context. Generally, an overlay dataset like S-123 does not provide “skin of the earth” coverage and there will be large areas with no data coverage because the S-123 application schema does not include any feature for designating a region as “other”, or “not a radio service area” (i.e., there is no S-123 feature equivalent to the S-101 Unsurveyed Area). Further, an overlay dataset does not include features that provide auxiliary information such as bathymetry within a radio services area.

2.6.3 Data coverage

An MRS dataset can contain one or more **Data Coverage** features (see clause 2.6.3). The data boundary is defined by the extent of the **Data Coverage** meta features. Data must only be present within **Data Coverage** meta features.

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 MRS New edition dataset must not change the extent of the data coverage for the previous edition MRS Product. Where the extent of the data coverage for a MRS Product is to be changed, this must be done by issuing a New Dataset and terminating the previous one(s).

2.6.4 Discovery metadata

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.

S-123 uses the same components of discovery metadata as S-100. The mandatory components for discovery metadata are defined in S-100 Edition 3.0.0 Appendix 4A-D and consist of:

1) Exchange catalogue – a single exchange catalogue for an exchange set. (Subsets of exchange sets are not envisaged.) The 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). Additional elements have been defined in the main specification.
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 GML 3.2.1 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 or the S-100 schema distribution site, provisionally https://github.com/IHO-S100WG.

2.6.5 Dataset header metadata

Dataset header metadata contains structural and discovery metadata that apply to the whole dataset and are encoded in the dataset file. The elements are described in S-100 clause 10b-9.6.

2.6.6 Dataset units

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

2.6.7 Dataset Coverage

MRS datasets are spatially limited.

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

If a radio services feature extends outside the product coverage and the adjoining object does not exist, e.g. due to delay in the production process by the neighbouring HO product, an indication should be placed at the outer edge of the product.

2.6.8 Dataset Feature Object Identifiers

Each feature and information instance within an MRS dataset must have a unique universal Feature Object Identifier [FOID]. Where a real-world feature has multiple geometric elements within a single MRS dataset due to the MRS 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.

FOID must not be reused, even when a feature has been deleted. However, the same feature can be deleted and added again later using the same FOID.

2.6.9 180° Meridian of Longitude

Datasets must not cross the 180° meridian of longitude.

2.7 Geographic names

2.7.1 Feature names

If it is required to encode an international or national geographic name, it must be done using complex attribute **featureName**.

If it is required to encode a geographic name for which there is no existing feature, a specific **RadioServiceArea** or other appropriate area feature defined in clause 5 must be created. In order to minimise the data volume, these features should, where possible, use the geometry of existing features.

Geographic names should be encoded with the complex attribute **featureName.** The complex attribute **featureName** consists of the simple sub-attributes **language**, **name** and a Boolean type to indicate whether that particular name is the **displayName** or not**.**

National geographic names can be left in their original national language in a non-English iteration of the complex attribute **featureName** (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 complex attribute **featureName**, in which case the national name should be populated in an additional iteration of the **featureName.**

All area and point features within an MRS product should be encoded using **featureName** if a name is available.

1. A group of features, associated with a particular geographic name, should have the name encoded using **featureName** on an aggregation feature (of type surface or point, or no geometry, as appropriate). The name should not be encoded on the individual hydrographic features.
2. A group of service or forecast areas with the same attribute values associated with the same name should be encoded as spatial attributes of the same feature (so there would be only one feature with multiple spatial attributes for location).
3. Named features listed in Hydrographic Office's Sailing Directions or other documents that may assist in locating service information should be encoded using feature name on the relevant feature (e.g. **Weather Forecast Warning Area**).

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

2.7.2 Text placement

The cartographic feature **TextPlacement** is used specifically to place text cartographically. The properties of the **TextPlacement** 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 **TextPlacement** feature is associated to the feature which carries the text being placed. The attribute **textType** determines which text string is to be displayed if more than one is present. The **TextPlacement** feature ensures that as maritime radio services screen rotates from “north up” (e.g. if display is set to “course up”) text can remain readable, or clear other important charted information.

2.8 Scale policy

MRS data must be compiled in the best applicable scale. The use of the data itself is "scale independent". That means that the data can be used at any scale. S-100 allows the association of multiple spatial attributes to a single feature instance. Each of these spatial attributes can in principle be qualified by maximum and minimum scales. **maximumDisplayScale** and **minimumDisplayScale** define the range of display scales within which a particular feature will be portrayed on the display if these scale minimum/maximum functions are enabled in the ECDIS or another GIS device. A geo feature with one or more spatial attributes can utilize the scale minimum and scale maximum attributes on the link to the spatial object. There are essentially two ways in which these attributes may be used.

1. A producer may decide to use only a scale minimum value. This option is employed when the data producer wish to turn off the display of a feature above certain scales. This is particularly useful in areas with high data density, and when it is expected that the data will be used a larger scale where data clutter might become an issue. Features are therefore encoded with an applicable value, which represent the scale at which the producer wishes to turn off the feature.

2. A producer may decide to provide several pairs of scale minimum and scale maximum values. This decision may be based on the fact that for one particular feature different spatial instances in different scale ranges should be provided to supply this particular feature with more detailed geographic representation at larger scales.

An example can be a building which has two spatial objects associated, first one with only scale minimum value encoded at 21999, and the second spatial object encoded with scale maximum at 22000 and scale minimum encoded with 999999. These values would enable the use of a highly-detailed geometry at larger scales than 22000, and a less detailed geometry at scales of 22000 and less, while the building would be turned off at scales of 999999 and less.

A similar strategy can be followed to enable boundaries to conform to a scale-dependent geometry such as a coastline. Conformance at different scales can achieved by using minimum/maximum scales on spatial attributes to indicate which particular geometry should be used at a given scale.

Authorities should cooperate at the regional or RENC level to determine a recommended scale range at which the portrayal of the MRS information is suitable and consistent.

Scale
NULL (only allowed on minimum display scale where the maximum display scale = 10,000,000)
1:10,000,000
1:3,500,000
1:1,500,000
1:700,000

1:350,000
1:180,000
1:90,000
1:45,000
1:22,000
1:12,000
1:8,000
1:4,000
1:3,000
1:2,000
1:1,000

Table 2-11 Minimum display and maximum display scales

2.9 Masking

To improve the look and feel of the display of MRSs in ECDIS for the mariner certain features, or certain edges of features, should be masked.

2.9.1 Surface features crossing MRS cell boundaries

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

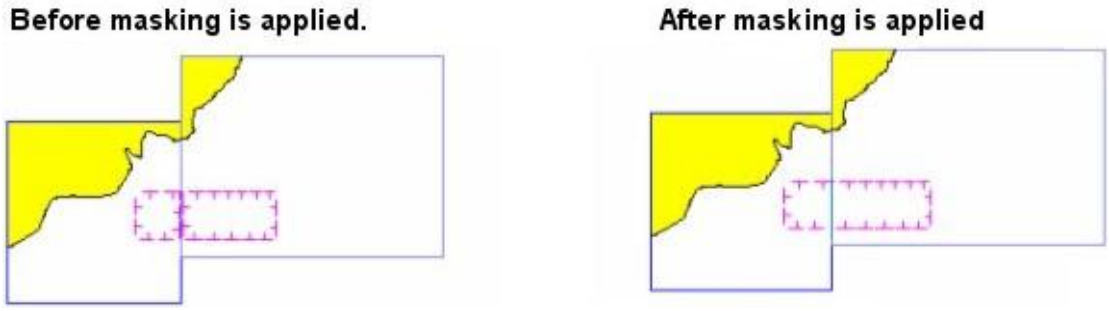

Figure 5 Surface feature crossing MRS products boundaries

This allows the features to be displayed as a single feature of type surface rather than being divided at the MRS product boundary and having the representation of two separate features.

NOTE: 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 MRS 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 MRS product (see clause 4.3), all edges of these area features should be masked.

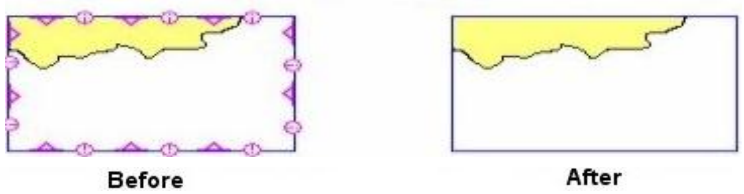

Figure 6 Surface features extending beyond the entire limit of data coverage

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 MRS product limit or the area of data coverage of the MRS product.

Feature Type	Comment
Navtex Station Area	
Weather Forecast Warning Area	
Indeterminate Zone	
Radio Service Area	
Navigational Meteorological Area	
Imarsat Ocean Region Area	
GMDSS Area	

Table 2-12 Features of which edges have to be masked when crossing the MRS product boundary

2.9.2 "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 service area along a track, or channel), a "very narrow surface" should be encoded. The suggested extent is 0.3mm wide at viewing scales (keeping in mind that S-100 permits different spatial attributes at different scales.) An edge of this surface should correspond to the position of the line. All other edges should be masked.

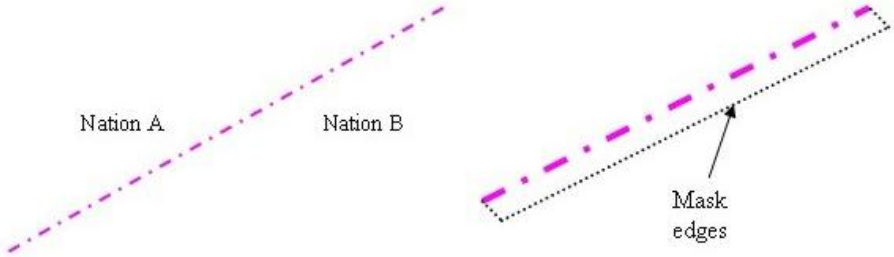

Figure 7 "Linear" Radio Services

3 Description of table format for feature and information types

X.X Clause heading

IHO Definition: **FEATURE:** Definition. (Authority for definition).
S-123[Geo Feature/Information Type]: Feature (S-57 Acronym) S-123 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-123 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 allowable attributes for the S-123 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-123 (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/information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Aggr Asso Comp	Name of the Association	**Feature or Information Type at "this" end**	At "this" end	At "this" end x..y	**Feature or Information Type(s) at "other" end**	Role name	At "other" end x..y

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-123 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-123 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.

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-123 Feature Catalogue. The full list of enumerates that may be assigned to an attribute in S-123 can be found in the Simple Attributes section of the printed feature catalogue 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 Product Specification main document clause 7.2.5.2). 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-123 Attribute column.

Association ends and multiplicities: A lower bound of 0 in the multiplicity at any end of an association indicates only that the association is not mandatory for any particular instance of the feature at the other end (i.e., it is not mandatory for an instance of “that” feature type to have an association to a feature of “this” type). A lower bound of “1” means that if an instance of “that” type exists, it must be associated to a instance of “this” type. If the association is actually encoded then it amounts to saying that “this relationship exists between these two instances” and there must be an appropriate feature instance at both ends. Associations that are not mandatory should be encoded if and only if they convey useful information.

4 Metadata Features

4.1 Introduction

The maximum use must be made of meta features to reduce the attribution on individual features. Some meta features are mandatory in a dataset, see S-123 MRS Product Specification main document clauses 10.9 and 10.11.

4.2 Mandatory meta features

The mandatory meta features are given in the following list:

DataCoverage: One or more **DataCoverage** features shall cover the dataset.

QualityOfNonBathymetricData: One or more **QualityOfNonbathymetricData** features shall cover the dataset.

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 the area of coverage of the S-123 dataset. This means that **Data Coverage** expresses where the presence or absence of S-123 geographic features is asserted. Unlike S-101 datasets, there is no ‘skin of the earth’ principle in S-123 and there may be regions covered by a **Data Coverage** but where no geographic S-123 feature is present.

.

IHO Definition: **COVERAGE**. A geographical area that describes the coverage and extent of spatial types. (Adapted from S-57 Edition 3.1, Appendix A – Chapter 1, Page 1.210, November 2000).

S-123 Metadata Feature: Data Coverage (M_COVR)

Primitives: Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Maximum display scale		maximum display scale < minimum display scale	IN	1,1
Minimum display scale		minimum display scale > maximum display scale	IN	1,1

INT 1 Reference:

4.3.1 Coverage

The meta feature **Data Coverage** encodes the area covered by the dataset. This feature is also used to provide the ECDIS with the scale information necessary for the determination of dataset loading and unloading in relation to the user selected viewing scale in the ECDIS. There must be a minimum of one **Data Coverage** feature in a dataset. **Data Coverage** features must cover at least the extent of the spatial types in the dataset, and must not overlap.

The use of S-123 data is scale-independent (see clause 2.8) and minimum display scale will normally be (null) and maximum display scale 1000 (the extreme values in the table of scales in the S-101 ENC, see Table 2-11). Should a producer need to encode different maximum and minimum display scales from the extreme (i.e., create scale-dependent datasets), the values of maximum and minimum display scales should be harmonized with base layer S-101 datasets (see the S-101 DCEG clause 3.4.1).

Given that S-123 data will overlay ENC and possibly other datasets, the conditions described in S-101 clause 3.4.1 for displaying overscale warnings and setting the viewing scale may be overridden by interoperability constraints or the presence of higher-priority datasets. The specification of such behaviour is out of scope for this document (the S-100 interoperability specification should address it for ECDIS).

Remarks:

- This meta feature is intended to support an indication of coverage.
- Where a dataset consists of only one Data Coverage feature, the value for the maximum display scale populated in the dataset discovery metadata must be the same as the value populated for maximum display scale on the Data Coverage.

Distinction: None

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-123 Metadata Feature: Quality of non-bathymetric data (M_ACCY)

Primitives: Surface

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Information			C	0,*
File locator			TE	0,1
File reference			TE	0,1
Headline			TE	0,1
language		ISO 639-3	TE	0,1
Text			TE	0,1
Category of temporal variation		1 : event 2 : likely to change 4 : unlikely to change 5 : unassessed	EN	1,1
Data assessment		1 : assessed 2 : oceanic 3 : unassessed	EN	1,1
Horizontal distance uncertainty	(HORACC)		RE	0,1
Direction uncertainty			RE	0,1
Horizontal Positional uncertainty	(POSACC)		C	0,1
Uncertainty fixed			RE	1,1
Uncertainty variable			RE	0,1
Source indication			C	0,1
Category of authority		(all values)	EN	0,1
country			TE	0,1
Reported date			TD	0,1
source			TE	0,1
Source type		(all values)	EN	0,1
Feature name			C	0,1
Display name			BO	0,1
Language			TE	0,1
Name			TE	1,1
Survey date range			C	0,1
Date end	*(SUREND)*	ISO 8601:2004	TD	1,1
Date start	*(SURSTA)*	ISO 8601:2004	TD	1,1
INT 1 Reference: --				

4.4.1 Quality of positions, distances, or directions

The meta feature **Quality of Non-bathymetric Data** may be used to provide an indication of the overall uncertainty of position, distance, or direction for all non-bathymetric features. It must not be used to provide the uncertainty of bathymetric information (which is not part of the S-123 data model as currently defined anyway) nor should it be used to delimit peripheral areas where radio reception is uncertain or variable.

The positional, distance, and direction uncertainty attributes give quantitative information, as compared to the S-101 attribute **quality of position** which gives qualitative information.

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

4.4.2 Source as a quality indicator

If the source from which encoded data or information are derived is expected to be a factor for mariner assessment of data, the **source indication** attribute of **Quality of Non-bathymetric Data** may be used to provide an indication of the source.

Remarks:
- No remarks.

Distinction: Quality of bathymetric data; quality of survey.

5 Geographic Features

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

5.1 FeatureType

IHO Definition: **FEATURETYPE**. Generalized feature type which carries all the common attributes.

S-123 Geo Feature: FeatureType (Abstract)

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Fixed date range			C	0,1
Date end	(DATEND)		TD	0,1
Date start	(DATSTA)		TD	0,1
Periodic date range			C	0,*
Date end	(PEREND)	ISO 8601: 2004	TD	1,1
Date start	(PERSTA)	ISO 8601: 2004	TD	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
Source Indication	(SORIND)		C	0,1
Source Type				0,1
Source			(S)TE	0,1
Reported Date			TD	0,1
Country		ISO3166-1-alpha2	TE	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
Text Content			C	0,*
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Information			C	0,*

File Locator			S (TE)	0,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
Headline			S (TE)	0,1
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	1,1
Online Resource			C	0,1
Linkage		ISO 19115-1:2014	URL	1,1
Protocol		ISO 19115	(S) TE	0,1
Application Profile		ISO 19115	(S) TE	0,1
Name of Resource		ISO 19115	(S) TE	0,1
Online Description		ISO 19115 (adapted)	(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		(all values)	EN	0,1
Source			(S)TE	0,1
Reported Date			TD	0,1
Country		ISO3166-1-alpha2		0,1
Category of Authority	(CATAUT)	(all values)	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

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso	additionalInformation	(any subtype of FeatureType)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso	associatedRxN	(any subtype of FeatureType)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*

Asso	PermissionType (association class)	(any subtype of FeatureType)	vslLocation	0..*	Applicability	permission	0..*
Feature Associations							
Asso	Text Association	(any subtype)	identifies	1..1	Text Placement	positions	0..1

INT 1 Reference: --

5.1.1 Geographic features in general

Where a complex attribute has all its sub-attributes optional (e.g., multiplicity 0..1 or 0..*), at least one of the sub-attributes must be populated.

The **featureName** attribute in complex attribute **sourceIndication** is intended for the name of the source.

The **additionalInformation** association to a **NauticalInfomation** object can be used to attach an additional chunk of information to an information type, and there is no applicable specific information type or association. This should be used sparingly if at all.

5.1.2 Restrictions, regulations, etc., related to geographic features

Navigation and other activities in areas can be limited by regulations/restrictions and recommendations. That information is usually provided by relevant authorities. If the feature has specific attributes to encode such information (such as a **restriction** attribute), those attributes must be used wherever possible; if the specific attributes are insufficient, an appropriate **Restrictions**, **Regulations**, **Recommendations**, or **NauticalInformation** information type can be associated to the feature using an *associatedRxN* association.

5.1.3 Restrictions, regulations, etc., that depend on vessel characteristics

Information that is conditional on vessel characteristics may be encoded using the **PermissionType** association to an information type that defines the set of vessels to which the conditions apply. (See sections 2.5, 7.8, and 8.1 of this DCEG and section 6.2 of the S-122 Product Specification for more information about coding such conditions.)

Remarks:
- No remarks.

Distinction:

5.2 Building

IHO Definition: **BUILDING:** A free-standing self-supporting construction that is roofed, usually walled, and is intended for human occupancy (for example: a place of work or recreation) and/or habitation.

S-123 Geo Feature: Building (BUISGL)

SuperType: FeatureType

Primitives: Point, Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Function	(FUNCTN)	29 : communication 31 : radio 34 : microwave 39 : control 44 : sea rescue control	EN	0,*

Status	(STATUS)	1 : permanent 2 : occasional 4 : not in use 5 : periodic/intermittent 7 : temporary 8 : private 14 : public	EN	0,*
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Features	Role	Mult.
Asso (inherited	additionalInformation	(any subtype of FeatureType)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(any subtype of FeatureType)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited	PermissionType (association class)	(any subtype of FeatureType)	vslLocation	0..*	Applicability	permission	0..*

Feature associations

Asso (inherited)	Text Association	(any subtype of FeatureType)	identifies	1..1	Text Placement	positions	0..1

INT 1 Reference: D 5-6, 8, 13; E 10.1, 10.3, 11, 13-18; F 51, 60-63

5.2.1 Buildings

(see S-4 – B-325; B-328.1; B-362.2; B-370.3; B-370.5; B-372 and B-373.1-4)

Building features are used only if needed to encode a location relevant to radiocommunications but for which a radio service or station is not appropriate. The radio communications information must be encoded using a **RadioStation** and/or **RadioServiceArea**.

In S-123 buildings are charted mainly for their interest for particular functions, where they could be useful references for showing the locations of radio broadcast sites. They should be encoded from the largest maximum display scale ENC data.

If it is required to encode a building (other than a landmark or MRCC/MRSC), it must be done using the feature **Building**.

Remarks: None

Distinction: **Landmark, Coastguard Station**

5.3 Coastguard station

IHO Definition: **COASTGUARD STATION:** A station at which a visual/radio/radar marine watch is kept either continuously or at certain times only. (IHO Dictionary – S-32).

S-123 Geo Feature: CoastguardStation (CGUSTA)

Supertype: FeatureType

Primitives:Point, Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Status	(STATUS)	1 : permanent 2 : occasional 4: not in use 5 : periodic/intermittent 7: temporary 16 : watched 17 : un-watched	EN	0,*
Is MRCC			BO	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	(this feature)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(this feature)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	(this feature)	vslLocation	0..*	Applicability	permission	0..*
Asso	srvContact	(this feature)	servicePlace	0..*	ContactDetails	theContactDetails	0..*
Asso	locationHours	(this feature)	location_srvHrs	0..1	ServiceHours	theServiceHours	0..*
Asso	srvControl	(this feature)	controlledService	0..*	Authority	controlAuthority	0..*

Feature associations

Asso (inherited)	Text Association	(any subtype of	identifies	1..1	Text Placement	positions	0..1

		Feature Type)					

INT 1 Reference:

5.3.1 Coast guard stations and marine radio services

The organisation of coast-watching and rescue services differs from country to country. For S-123 purposes it is assumed that those stations having a significant radiocommunications or radio watch function should be included, even though they may be parts of the same organisation co-ordinating and performing other services as well. These will often be Marine Rescue Coordination Centres (or Sub-centres). Smaller Coastguard stations whose radio watch service areas and communications functionality are completely covered (spatially and temporally) by a national or regional MRCC or MRSC should not be encoded.

Distinction: Building

Remarks:

Maritime Rescue and Coordination Centres (MRCC) are part of a constantly manned communications watch system. If it is required to encode a MRCC, it should be done using Coastguard Station, with the Boolean attribute is MRCC = True. The name of the station may be populated using the complex attribute feature name (sub-attribute name), for example MRCC Swansea.

Each VHF-channel should be indicated, using the attribute communication channel.

5.4 GMDSS area

IHO Definition: **GMDSS AREA:** An area defined for a global communications service based upon automated systems, both satellite based and terrestrial, to provide distress alerting and promulgation of maritime safety information for mariners.

S-123 Geo Feature: GMDSSArea

Supertype: FeatureType

Primitives:Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
categoryOfGMDSSArea		1 : Area A1 2 : Area A2 3 : Area A3 4 : Area A4	EN	1,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity

Asso (inherited)	additionalInformation	(this feature)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(this feature)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	(this feature)	vslLocation	0..*	Applicability	permission	0..*
Asso	srvControl	(this feature)	controlledService	0..*	Authority	controlAuthority	0..*
Feature associations							
Asso (inherited)	Text Association	(any subtype of Feature Type)	identifies	1..1	Text Placement	positions	0..1
Asso	serviceProvisionArea	(this feature)	serviceArea	0..*	RadioStation	serviceProvider	0..*

INT 1 Reference:

Remarks:

none

Distinction:

none

5.5 Inmarsat ocean region area

IHO Definition: **INMARSAT OCEAN REGION AREA:** The ocean region of the earth's surface, within which a station can obtain line-of-sight communication, with an Inmarsat satellite

S-123 Geo Feature: InmarsatOceanRegionArea

Supertype: FeatureType

Primitives:Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations							
Type	**Association Name**	**Class**	**Role**	**Mult.**	**Class**	**Role**	**Multiplicity**
Asso (inherited)	additionalInformation	(this feature)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(this feature)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	(this feature)	vslLocation	0..*	Applicability	permission	0..*
Asso	srvControl	(this feature)	controlledService	0..*	Authority	controlAuthority	0..*
Feature associations							
Asso (inherited)	Text Association	(any subtype of Feature Type)	identifies	1..1	Text Placement	positions	0..1
INT 1 Reference: Remarks: *nil* Distinction:							

5.6 Landmark

IHO Definition: **LANDMARK:** Any prominent object on land which can be used in determining a location or a direction.

S-123 Geo Feature: Landmark (LNDMRK)

Supertype: FeatureType

Primitives:Surface

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

S-123 Attribute	**S-57 Acronym**	**Allowable Encoding Value**	**Type**	**Multiplicity**
Category of landmark	(CATLMK)	4 : dish aerial 7 : mast 17 : tower	EN	1,*
Function	(FUNCTN)	29 : communication 31 : radio 34 : microwave 39 : control 44 : sea rescue control	EN	0,*
Status	(STATUS)	1 : permanent 2 : occasional	EN	0,*

		4 : not in use 5 : periodic/intermittent 7 : temporary 8 : private 14 : public		
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	Landmark	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	Landmark	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	Landmark	vslLocation	0..*	Applicability	permission	0..*

Feature associations

Asso (inherited)	Text Association	(any subtype of Feature Type)	identifies	1..1	Text Placement	positions	0..1

INT 1 Reference: D 8; E 10.2-10.4, 22-31; L 11; Q 100

5.6.1 Buildings, landmarks, tanks, silos

(see S-4 – B-373; B-373.6; B-374.3-5; B-374.7; B-375.1-2; B-456.2; B-487.3)

Depending on height and the topographic relief, structures considered to be landmarks may have a significant radiocommunications function (e.g., acting as radio masts or towers), and should be encoded up to several miles inland.

Landmark features are used only if needed to encode a location relevant to radiocommunications but for which a radio service or station is not appropriate. The related radio communications information must be encoded using a **RadioStation** and/or **RadioServiceArea**.

In S-123 buildings are charted mainly for their interest for particular functions, where they could be useful references for showing the locations of radio broadcast sites. They should be encoded from the largest maximum display scale ENC data.

Remarks:

- For buildings, see clause 5.2
- Radio and television masts and towers are likely to be visible over long distances and should be encoded as landmarks, even when well inland.

Distinction: **Building**

5.7 NAVAREA/METAREA

IHO Definition: **NAVAREA/METAREA:** The geographic areas in which various governments are responsible for navigation and weather warnings.

S-123 Geo Feature: NavigationalMeterorologicalArea

Supertype: FeatureType

Primitives:Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	(this feature)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(this feature)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	(this feature)	vslLocation	0..*	Applicability	permission	0..*
Asso	srvControl	(this feature)	controlledService	0..*	Authority	controlAuthority	0..*

Feature associations

Asso (inherited)	Text Association	(any subtype of Feature Type)	identifies	1..1	Text Placement	positions	0..1
Asso	serviceProvisionArea	(this feature)	serviceArea	0..*	RadioStation	serviceProvider	0..*

INT 1 Reference:

Remarks:

The roman number of NAV/METAREA is to be coded by using the feature name attribute. NAVTEX transmitting station identification characters are allocated within the same areas. The coordinator should be encoded as an associated Authority.

Distinction:

5.8 NAVTEX station area

IHO Definition: **NAVTEX STATION AREA:** The geographic areas in which radio stations are responsible for broadcast navigation and weather warnings.

S-123 Geo Feature: NavtexStationArea (NAVTEX)

Supertype: FeatureType

Primitives:Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
txIdentChar			TX	1,1
status	(STATUS)	1 : permanent 4 : not in use 7 : temporary	EN	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	(this feature)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(this feature)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	(this feature)	vslLocation	0..*	Applicability	permission	0..*
Asso	srvControl	(this feature)	controlledService	0..*	Authority	controlAuthority	0..*

Feature associations

Asso (inherited)	Text Association	(any subtype of Feature Type)	identifies	1..1	Text Placement	positions	0..1

Asso	serviceProvisionArea	(this feature)	serviceArea	0..*	RadioStation	service Provid er	0..*

INT 1 Reference:

Remarks:

The range of the broadcast may cover more than the area described but the responsibility is strictly limited by international agreed borders.

Distinction:

5.9 Radio service area

IHO Definition: **RADIO SERVICE AREA:** The area where a radio service can be obtained and the characteristics of the radio transmission.

S-123 Geo Feature: RadioServiceArea (RDOSVC)

Supertype: FeatureType

Primitives: Surface, None

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Call sign			TX	0,1
Category of broadcast communication		1 : commercial 2 : non-commercial 3 : public 4 : non-public	EN	1,1
Language information			TX	0,1
Status	(STATUS)	1 : permanent 2 : occasional 4 : not in use 5 : periodic/intermittent 7 : temporary 8 : private 14 : public 16 : watched 17 : un-watched	EN	0,1
Radiocommunications			C	0,*
Category of communication preference		1: preferred calling 2: alternate calling 3: preferred working 4: alternate working	EN	0.1
Category of maritime broadcast		1: navigational warning 2: meteorological warning 3: ice report 4: SAR information 5: pirate attack warning 6: meteorological forecast 7: pilot service message	EN	0,*

		8: AIS information 9: LORAN message 10: SATNAV message 11: gale warning 12: storm warning 13: tropical revolving storm warning 14: NAVAREA warning 15: coastal warning 16: local warning 17: low water level warning/negative tidal surge 18: icing warning 19: tsunami broadcast		
Category of radio methods		1: Low Frequency (LF) voice traffic 2: Medium Frequency (MF) voice traffic 3: High Frequency (HF) voice traffic 4: Very High Frequency (VHF) voice traffic 5: High Frequency Narrow Band Direct Printing 6: NAVTEX 7: SafetyNET 8: NBDP Telegraphy (Narrow Band Direct Printing Telegraphy) 9: facsimile 10: NAVIP 11: Low Frequency (LF) digital traffic 12: Medium Frequency (MF) digital traffic 13: High Frequency (HF) digital traffic 14: Very High Frequency (VHF) digital traffic 15: Low Frequency (LF) telegraph traffic 16: Medium Frequency (MF) telegraph traffic 17: High Frequency (HF) telegraph traffic 18: Medium Frequency (MF) Digital Selective Call traffic 19: High Frequency (HF) Digital Selective Call traffic 20: Very High Frequency (VHF) Digital Selective Call traffic	EN	0,*
Communication channel			TX	0,*
Contact instructions			TX	0,1
Facsimile drum speed			C	0.1
Drum speed			IN	1,1

Index of cooperation			IN	1,1
Frequency pair			C	0.*
Frequency shore station receives			IN	0,*
Frequency shore station transmits			IN	0,*
Selective call number			IN	0,*
Signal frequency			IN	0,*
Time of observation			C	0,1
Observation time			TI	1,1
Time reference		1: localTime 2: UTC	EN	1,1
Times of transmission			C	0,1
minutes past even hours			IN	0,1
minutes past every hour			IN	0,1
minutes past odd hours			IN	0,1
time reference		1: localTime 2: UTC	EN	0,1
transmission time			TI	0,*
Time intervals by day of week			C	0,*
Day of week		1: monday 2: tuesday 3: wednesday 4: thursday 5: friday 6: saturday 7: sunday	EN	0,7
Day of week is range			BO	0,1
Time reference		1: localTime 2: UTC	EN	1,1
Time of day start			TI	0,*
Time of day end			TI	0,*
Transmission content			TX	0,*
Transmission regularity			EN	0,*
Time reference		1 : localTime 2 : UTC	EN	0,1
Transmission power			RE	0,1
Transmitter identification character			TX	0,1
Transmission of traffic lists			BO	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*

Source Indication	(SORIND)		C	0,1	

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	RadioServiceArea	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	RadioServiceArea	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	RadioServiceArea	vslLocation	0..*	Applicability	permission	0..*
Asso	srvContact	RadioServiceArea	servicePlace	0..*	ContactDetails	theContactDetails	0..*
Asso	locationHours	RadioServiceArea	location_srvHrs	1..1	ServiceHours	theServiceHours	0..1
Asso	srvControl	RadioServiceArea	controlledService	0..*	Authority	controlAuthority	0..*

Feature associations

Asso	serviceProvisionArea	RadioServiceArea	serviceArea	0..*	RadioStation	serviceProvider	0..*
Agg	coreAggregation	RadioServiceArea	consistsOf	0..1	RadioServiceAreaAggregate	componentOf	0..1
Asso (inherited)	Text Association	(any subtype of Feature Type)	identifies	1..1	Text Placement	positions	0..1

INT 1 Reference:

5.9.1 Radio service areas

If the location of a station is known but the area covered by its communications is not available, the services are encoded as a **RadioServiceArea** feature with no spatial attribute or with a nilled geometry (as determined by the data format). In this case, the **RadioServiceArea** must be associated (using the *serviceProvisionArea* association) to a **RadioStation** feature that encodes the location of the station.

If neither service area nor the location of the radio station is available, the service may be encoded without a location. In this case there is no way for an application to display a geographic location for this feature to the user on a graphical (map/chart) display. Portrayal and application logic will determine whether the feature attribute values are shown in other forms of display e.g. a tabular text display.

5.9.1.1 AMVER services

AMVER report reception/forwarding services provided in an area may be encoded using the **transmissionContent** attribute of complex attribute **radioCommunications**.

Remarks:

Seasonal services can be encoded as distinct features with appropriate **periodicDateRange** attributes.

Distinction:

5.10 Radio station

IHO Definition: **RADIO STATION:** A place equipped to transmit radio waves.		
S-123 Geo Feature: RadioStation (RDOSTA) **Supertype: FeatureType**		
Primitives: Point		
Real World .	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Call sign			TX	0,1
Category of radio station		5 : radio direction-finding station 8 : Decca 9 : Loran C 10 : Differential GNSS 11 : Toran 12 : Omega 13 : Syledis 14 : Chaika (Chayka) 17 : facsimile transmission 19 : radio telephone station 20 : AIS base station	EN	0,1
Estimated range of transmission			RE	0,1
Orientation			C	0,1
Orientation uncertainty			RE	0,1
Orientation value			RE	1,1
radioCommunications		Limited to sub-attributes listed below	C	0,*
Category of maritime broadcast		1: navigational warning 2: meteorological warning 3: ice report 4: SAR information 5: pirate attack warning 6: meteorological forecast 7: pilot service message 8: AIS information 9: LORAN message 10: SATNAV message 11: gale warning 12: storm warning	EN	0,*

		13: tropical revolving storm warning 14: NAVAREA warning 15: coastal warning 16: local warning 17: low water level warning/negative tidal surge 18: icing warning 19: tsunami broadcast		
Communication channel			TX	0,*
Signal frequency			IN	0,1
Transmission content			TX	0,1
Status	(STATUS)	1 : permanent 2 : occasional 4 : not in use 5 : periodic/intermittent 7 : temporary 8 : private 16: watched 17: un-watched	EN	0,*
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	RadioStation	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	RadioStation	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	RadioStation	vslLocation	0..*	Applicability	permission	0..*
Asso	srvControl	RadioStation	controlledService	0..*	Authority	controlAuthority	0..*
Asso	locationHours	RadioStation	location_srvHrs	1..1	ServiceHours	theServiceHours	0..1
Asso	srvContact	RadioStation	servicePlace	0..*	ContactDetails	theContactDetails	0..*

Feature associations

Asso	serviceProvisionArea	RadioStation	serviceProvider	0..*	RadioServiceArea, NavtexStationArea, GMDSSArea, NavigationalMeteorologicalArea, WeatherForecastWarningArea	serviceArea	0..*
Asso (inherited)	Text Association	(any subtype of Feature Type)	identifies	1..1	Text Placement	positions	0..1

INT 1 Reference: S 10-16

5.10.1 Radio stations

(see S-4 – B-480-484)

Transmissions from radio stations may provide mariners with a line of position. Most radio position fixing systems require Radio Direction Finding (RDF) equipment to determine the bearing of the transmitting device; such equipment is generally no longer fitted on vessels. The exception is “emergency use only” VHF-based direction finding services (which do not use RDF equipment). Consequently, the following radio position-fixing stations are now obsolete and there is no longer any value in encoding them on ENCs:

- Circular (non-directional) (RC), directional (RD) and rotating pattern (RW) marine radiobeacons;
- Consol beacons (Consol);
- Aeronautical radiobeacons (Aero RC);
- Radio direction-finding stations (except VHF-based emergency stations) (RG);
- Coast Radio Stations providing ‘QTG’ service (R).

The feature “radio station” is used to encode the point of transmission of the signal.
If it is required to encode a radio station, it must be done using the feature **Radio Station**.

Remarks:

- The **Radio Station** must only be used to encode the technical equipment itself, independent of the building or structure in which it is installed. If it is required to encode the building or structure (e.g. mast, tower, radar dome), it must be done using an appropriate feature (e.g. **Building**, **Landmark**). There is no requirement to establish a Structure/Equipment association between the **Radio Station** feature and the structure in which it is installed, so the S-101 Structure/Equipment association is not included in S-123.
- Further information (e.g. transmission characteristic) may be encoded using an associated instance of the information class **Nautical Information** (see clause 8.11), complex attribute **information**.
- Each VHF-channel and communications frequency should be indicated, using the sub-attributes **communication channel** or **signalFrequency** of complex attribute **radiocommunications**
- DGPS services are not within the scope of S-123 as currently defined.
- Where required, the attribute **signal frequency** must be quoted in Hertz, e.g. a signal frequency of 950 MHz must be encoded as *950000000*.
- If it is required to encode that a Radio Station is capable to receive AMVER and other messages and forward the message to the relevant services, this must be done using **radiocommunications.transmissionContent** =AMVER, when the station is capable of receiving AMVER.
- Seasonally operating stations can be encoded as distinct **RadioStation** features with appropriate periodicDateRange attributes.

5.10.2 Radio direction-finding stations

(see S-4 – B-483)

If it is required to encode a radio direction-finding station, it must be done using a **Radio Station** feature, with attribute **category of radio station** = *5* (radio direction-finding station). The identification signal may be encoded using the attribute **call sign**.

Remarks:

Such a station may be either stationary or mobile, and may also be provided with a radio receiver. In British terminology, also called 'w/t station'. The transmission of a radio station may serve to provide mariners with a line of position (IHO Chart Specifications, M-4). The object 'radio station' is used to encode the point of transmission of the signal.

S-123 remarks: (1) The area in which the radio service can be obtained is described by an **RadioServiceArea** feature. (2) The S-123 definition differs from the 2016 S-101 definition by omitting the optional attribute **communicationChannel** (bound to the NPUBs domain complex attribute **radiocommunications** instead). The NPUBs domain feature also binds attribute **orientation** to **RadioStation**.

Distinction:

5.11 Weather forecast / warning area

IHO Definition: **WEATHER FORECAST / WARNING AREA:** An area for which weather forecasts and warnings are provided for specified periods.

S-123 Geo Feature: WeatherForecastWarningArea (WETFCA)

Supertype: FeatureType

Primitives:Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
categoryOfFrcstAndWarningArea		1 : World Meteorological Organization (WMO) 2 : National high seas 3 : National offshore 4 : National coastal 5 : National inshore 6 : National local 7 : Ice	EN	1,1
Nationality			TX	0,1
Status	(STATUS)	1 : permanent 2 : occasional 4 : not in use 5 : periodic/intermittent 7 : temporary 8 : private 14 : public	EN	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1
Information associations				

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	Weather Forecast / Warning area	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	Weather Forecast / Warning area	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	Weather Forecast / Warning area	vslLocation	0..*	Applicability	permission	0..*
Asso	srvControl	Weather Forecast / Warning area	controlledService	0..*	Authority	controlAuthority	0..*
Feature associations							
Aggr	coreAggregation	Weather Forecast / Warning area	consistsOf	0..1	ForecastAreaAggregate	componentOf	0..1
Asso (inherited)	Text Association	(any subtype of FeatureType)	identifies	1..1	Text Placement	positions	0..1
Asso	serviceProvisionArea	(this feature)	serviceArea	0..*	RadioStation	serviceProvider	0..*

INT 1 Reference:

Remarks:

The periodic data attributes are used to encode the periods when seasonal forecasts and warnings are provided.

Distinction:

6 Areas of uncertain service availability

Fuzzy areas are areas where the applicability of information described by a specific feature is uncertain, intermittent, or possible. The basic information concept can be the availability of a service, the existence of a natural phenomenon, etc. An example is an area where radio reception cannot be asserted with sufficiently high confidence to encode it as a definitely within the service area, but reception is sometimes or often possible under good conditions.

A ‘fuzzy area’ will therefore consist of a ‘core’ feature of the appropriate geographic feature type and the appropriate geometry (e.g., a **RadioServiceArea** area feature) and one or more ‘fuzzy’ Indeterminate Zone features (with surface geometry). Each **IndeterminateZone** feature has a thematic attribute expressing the level of confidence that the service described by the core feature will be available (or the natural phenomenon will occur) in the region demarcated by its spatial primitive(s). Fuzzy area aggregate features may also encode thematic attributes common to all the associated features.

A geographic feature other than **Indeterminate** Zone is required as the core feature. The totality of the area where the information may apply consists of the union of the location geometries encoded in the core and indeterminate zone features.

The usual standards of certainty apply to the core feature; for example, the confidence in the availability of the service in the core feature area must be high enough that the cartographer would encode the core feature even if indeterminate zones could not be added.

The geometry for the core feature should correspond to a very high confidence level (sufficient to encode it in an ENC if it were an ENC dataset). The ENC equivalent would be a confidence level high enough to avoid encoding horizontal measurements with quality of position = “approximate,” i.e., “third order accuracy, but within 30.5 metres of its correct geographic location” (S-101 DCEG Baseline 2 § 28.14).

If it is possible that a core feature instance may have no known geometry (i.e., there is no area, curve, or point where confidence is sufficient to encode a spatial primitive for a core feature instance), the product specification must allow core feature instances to have no spatial primitive (or area, point, etc., as appropriate). The cartographer must encode an instance of the core feature without a spatial primitive and **IndeterminateZone** features with the appropriate confidence levels.

Example: A particular radio service has no area where reception is definite or virtually certain, only areas where it is medium or low quality. This must be encoded as a **RadioServiceArea** feature with no spatial primitive and two **IndeterminateZone** features with distinct area geometries and feature information applicability confidence = ‘medium likelihood’ and ‘low likelihood’ respectively. The **RadioServiceArea** (which has in this case no geometry) and the two instances of the **IndeterminateZone** feature have a feature association to a **RadioServiceAreaAggregate** feature.

S-123 allows approximate areas to be encoded only for radio service areas and weather forecast areas.

6.1 Fuzzy area aggregate

IHO Definition: **FUZZY AREA AGGREGATE:** Definition: Aggregation of a geographic feature describing a service or phenomenon with zones of different confidence about the availability of the service, occurrence of the phenomenon, or applicability of the information described by the geographic feature

S-123 Geo Feature: FuzzyAreaAggregate (Abstract)

Supertype: FeatureType

Primitives: noGeometry

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited Attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1
Text Content			C	0,*

Feature associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Comp	fuzzyZoneAggregation	(any subtype	componentOf	1..1	IndeterminateZone	consistsOf	1..*

		of this feature)					

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso (inherited)	additionalInformation	(any subtype of this feature)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(any subtype of this feature)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	(any subtype of this feature)	vslLocation	0..*	Applicability	permission	0..*

INT 1 Reference: --

6.1.1 Aggregates of approximate areas in general

The **FuzzyAreaAggregate** feature type is an abstract type that acts as the parent of fuzzy aggregation feature types, e.g., **ForecastAreaAggregate** and **RadioServiceAreaAggregate**.

To encode fuzzy areas, cartographers must demarcate areas where the information is of uncertain applicability and associate the areas of uncertainty to the appropriate sub-type of **FuzzyAreaAggregate**, along with the area feature where the information is certain (the “core feature”).

Remarks: **FuzzyAreaAggregate** and its subtypes do not inherit associations to **TextPlacement**.

Distinction:

6.2 Indeterminate zone

IHO Definition: **INDETERMINATE ZONE:** A region in which the perception of a phenomenon or the availability of a service is known only to a specified level of confidence.

S-123 Geo Feature: IndeterminateZone (INDZON)

Supertype: FeatureType

Primitives:Surface

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
informationConfidence		1 : virtuallyCertain 2 : highLikelihood 3 : mediumLikelihood 4 : lowLikelihood	EN	1,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*

Source Indication	(SORIND)		C	0,1	

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	(this feature)	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	(this feature)	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	(this feature)	vslLocation	0..*	Applicability	permission	0..*

Feature associations

composition	fuzzyZoneAggregation	(this feature)	consistsOf	1..1	Forecast area aggregate, Radio service area aggregate	componentOf	1..*

INT 1 Reference: none

Remarks: **IndeterminateZone** does not inherit an association to **TextPlacement**

Distinction:

6.2.1 Indeterminate Zones

Indeterminate Zone features are used with geographic features that encode services or phenomena such as hazardous conditions that are intermittent, transient, occasional, or experienced only under certain conditions.

If availability or occurrence is according to a fixed schedule or between known dates or times, the complex attributes **fixed date range** or **periodic date range** must be used instead.

Uncertainty about the position of a feature must be encoded using the appropriate uncertainty attribute (e.g., **quality of horizontal measurement**, **horizontal position uncertainty, etc.),** meta-feature (Quality **of Bathymetric Data**, Quality **of Non-Bathymetric Data**), or information type (e.g., **Spatial Quality**) as described in the S-101 or other DCEG for those features.

6.2.1.1 Spatial primitives

Area boundaries may be encoded using appropriate sub-types of the curve spatial primitive, e.g., circular boundaries or arcs.

6.2.1.2 Statistical confidence

If confidence values are available, or can be easily computed, the recommended confidence thresholds for determining the confidence scale values are:

- Virtually certain: Virtually certain to be experienced by (or available to) an individual vessel; will be experienced by nearly all vessels. In statistical terms, this definition will correspond to 95% and higher probability of availability of service, or the phenomenon is encountered 95% of the time, or by 95% of vessels in the area.
- High likelihood: Frequently experienced by (or available to) an individual vessel; experienced by a majority of vessels. In statistical terms, this definition will correspond to 66% to 95% probability of availability of service, or the phenomenon is encountered 66% to 95% of the time or by 66% to 95% of vessels in the area.
- Medium likelihood: Occasionally experienced by (or available to) an individual vessel; experienced by (or available to) about half of all vessels. In statistical terms, this definition will correspond to 33% to 66% probability of availability of service, or the phenomenon is encountered 33% to 66% of the time or by 33% to 66% of vessels in the area.
- Low likelihood: Unlikely, or rarely experienced by (or available to) an individual vessel; experienced by (or available to) a minority of vessels). In statistical terms, this definition will correspond to 5% to 33% probability of availability of service, or the phenomenon is encountered 5% to 33% of the time or by 5% to 33% of vessels in the area.

6.2.1.3 Synonyms for confidence level ranks

General correspondences between terms in source material and the scale values for the confidence attribute are given below. Some terms are ambiguous and may correspond to multiple ranks – in this case consider the term's ranking in relation to other terms used in the source.

- Virtually certain: assured; almost always; very high probability; very likely; usually
- High likelihood: high probability; likely ; very probable; very likely; frequent; probable; often; generally
- Medium likelihood: moderate likelihood / probability; neutral; occasional; as likely as not; sometimes; possible
- Low likelihood: low likelihood; low probability ; possible but unlikely; infrequently; improbable; occasional; remote; rare; probably not; sometimes

Remarks:

- **Indeterminate Zone** feature instances associated to the same aggregate feature instance must not overlap.
- Portrayal catalogues must define suitable presentations (area fill color, symbol, line style, etc.) for **Indeterminate Zone** areas for cases where the core feature has point, curve, or no geometry.

Distinction: none

6.3 Forecast area aggregate

IHO Definition: **Forecast area aggregate:** Aggregation of areas where forecasts and warnings broadcasted for a Weather forecast and warning area may be available with differing levels of reliability.

S-123 Geo Feature: ForecastAreaAggregate

Supertype: FuzzyAreaAggregate

Primitives: noGeometry

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	ForecastAreaAggregate	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	ForecastAreaAggregate	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	ForecastAreaAggregate	vslLocation	0..*	Applicability	permission	0..*

Feature associations

Aggr	coreAggregation	ForecastAreaAggregate	componentOf	1..1	WeatherForecastWarningArea	consistsOf	1
Comp (inherited)	fuzzyZoneAggregation	ForecastAreaAggregate	componentOf	1..*	IndeterminateZone	consistsOf	1..*

INT 1 Reference: --

6.3.1 Forecast area aggregates

Attributes should be encoded only if they apply to the collection of core feature and indeterminate zones. For example, if it is necessary to provide a note that applies to all the features, it may be encoded in the attribute **textContent** of the **ForecastAreaAggregate**.

Remarks:

none

Distinction:

none

6.4 Radio service area aggregate

IHO Definition: **Radio service area aggregate:** Aggregation of areas where radio services from a single radio service are available to different levels of reliability.

S-123 Geo Feature: RadioServiceAreaAggregate

Supertype: FuzzyAreaAggregate

Primitives: noGeometry

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

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,*
Feature name			C	0,*
Text Content			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	additionalInformation	RadioServiceAreaAggregate	informationProvidedFor	1..*	Nautical Information	providesInformation	0..*
Asso (inherited)	associatedRxN	RadioServiceAreaAggregate	appliesInLocation	1..*	Any subtype of AbstractRxN	theRxN	0..*
Asso (inherited)	PermissionType (association class)	RadioServiceAreaAggregate	vslLocation	0..*	Applicability	permission	0..*

Feature associations

Aggr	coreAggregation	RadioServiceAreaAggregate	componentOf	1..1	RadioServiceArea	consistsOf	1
Comp (inherited)	fuzzyZoneAggregation	RadioServiceAreaAggregate	componentOf	1..*	IndeterminateZone	consistsOf	1..*

INT 1 Reference:

6.4.1 Radio service area aggregates

Attributes should be encoded only if they apply to the collection of core feature and indeterminate zones. For example, if it is necessary to provide a note that applies to all the features collectively, it may be encoded in the attribute **textContent** of the **RadioServiceAreaAggregate**.

Remarks: *none* Distinction: none

7 Cartographic Features

This product specification uses the **TextPlacement** cartographic features derived from S-101 (version 1.0). The structure of the feature and its usage are the same as in S-101 but the feature specification in S-123 omits elements which are not relevant to marine radio services, for example, 'light characteristic' is omitted as a listed value for the attribute **text type**.

7.1 Text Placement

IHO Definition: **TEXT PLACEMENT.** The Text Placement feature is used in association with the Feature Name attribute or a light description to optimise text positioning in ECDIS**.**.

S-123 Cartographic Feature: Text Placement

Primitives: Point

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Flip bearing			RE	0,1
Scale minimum			IN	0,1
Text justification		1 : left 2 : centred 3 : right	EN	1,1
Text			TE	0,1
Text type		1: feature name	EN	0,1

Feature associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso	Text Association	**Text Placement**	positions	0,1	All Geo Features	identifies	1,1

7.1.1 Text Placement

If it is required to place text on an MRS dataset to improve clarity of display, it must be done using the cartographic feature Text Placement. The Text Placement feature must associated with the relevant geo feature using the association Text Association.

Remarks:

• The Text Placement feature is used by the ECDIS to position the associated text, which has been populated using an attribute(s) for the related feature. This attribute is identified by populating the attribute text type. Alternatively, the text to be displayed may be encoded using the attribute text.

• Only one of the attributes text or text type are allowable for each instance of Text Placement.

• Text Placement should only be associated with features of type point, and used in areas where it is important that text clear navigationally relevant areas, for example shipping channels and dredged areas.

Distinction:

8 Information Types

This section describes abstract as well as non-abstract types. The two abstract types **InformationType** and **AbstractRxN** cannot be used directly, but define attributes inherited by their sub-types. The encoding remarks apply to their sub-types but may be overridden by remarks in the sub-type.

See Clause 6.2 (Application Schema) of the S-123 product specification for general guidance on which combinations of types should be used to encode concepts likely to be encountered in source material.

8.1 InformationType

IHO Definition: **INFORMATIONTYPE**. Generalized information type which carries all the common attributes

S-123 Information Type: InformationType (Abstract)

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Fixed date range			C	0,1
Date end	(DATEND)		TD	0,1
Date start	(DATSTA)		TD	0,1
Periodic date range			C	0,*
Date end	(PEREND)	ISO 8601: 2004	TD	1,1
Date start	(PERSTA)	ISO 8601: 2004	TD	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
Source Indication	(SORIND)		C	0,1
Source Type		(all values)	EN	0,1
Source			(S)TE	0,1
Reported Date			TD	0,1
Country		ISO3166-1-alpha2	TE	0,1
Category of Authority	(CATAUT)	(all values)	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

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso	additionalInformation	(any child of InformationType)	informationProvidedFor	0,*	Nautical Information	providesInformation	0,*

INT 1 Reference:

8.1.1 Information types in general

Where a complex attribute has all its sub-attributes optional (e.g., multiplicity 0..1 or 0..*), at least one of the sub-attributes must be populated.

The **featureName** attribute of an instance of an information type can be used for a short title that is either a proper name (if such is relevant) or which describes the instance. For example, the **featureName** attribute of an **Authority** information type can be the name of a government agency.

FeatureName attributes of information types should not duplicate the geographic feature name of an associated feature, but should pertain to the information instance itself.

The **featureName** attribute should be populated only if the value conveys useful information to the end user. Some examples of such situations are:

- providing the name of an organisation, such as the name of an **Authority**.
- distinguishing between instances – if multiple instances of the same information type are associated to the same feature type (or another information type), the different instances may be given descriptive names to make it easier for the mariner to distinguish their content.

Some information instances are associated to multiple features, in which case its name should be general enough to be relevant to all the features.

For example, if naming **Regulations** instances describing radio watch regulations for a service area, consider whether (for example) there is a general regulation applicable to all such areas in a jurisdiction and an exceptional **Regulations** object associated to a single area or a subset of areas in the jurisdiction. In this situation, the general regulations may be encoded with the name “General radio watch regulations” and associated to several features, while a specific service area feature can also have a specific regulation whose name is “Special radio regulations for (named area)”.

The **featureName** attribute in complex attribute **sourceIndication** is intended for the name of the source.

The **additionalInformation** association to a **NauticalInfomation** object can be used to attach an additional chunk of information to an information type, and there is no applicable specific information type or association. This should be used sparingly if at all.

Remarks:

- No remarks.

Distinction:

8.2 AbstractRxN

IHO Definition: **ABSTRACTRXN**. An abstract superclass for information types that encode rules, recommendations, and general information in text or graphic form.

Remark: Subtypes of **AbstractRxN** carry the same attributes, but differ in the nature of information they encode. There are currently four such subtypes: **Regulations**, **Restrictions**, **Recommendations**, and **NauticalInformation**.

S-123 Information Type: AbstractRxN (Abstract)

Supertype: InformationType

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 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
Text Content			C	1,*
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	0,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Source indication			C	0,1
Source Type		(all values)	EN	0,1

Source			(S)TE	0,1
Reported Date			TD	0,1
Country		ISO3166-1-alpha2	TE	0,1
Category of Authority	(CATAUT)	(all values)	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	1,1
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
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		1: N 2: NNE 3: NE 4: ENE 5: E 6: ESE 7: SE 8: SSE 9: S 10: SSW 11: SW 12: WSW 13: W 14: WNW	EN	0,1

		15: NW 16: NNW		
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			RE	0,1
Orientation Value			R	
Sector Bearing			RE	0,2 ordered
rxnCode			C	0,*
categoryOfRxN		1: navigation 2: communication 3: environmental protection 4: wildlife protection 5: security 6: customs 7: cargo operation 8: refuge 9: health 10: natural resources or exploitation 11: port 12: finance 13: agriculture	CL	0,1
Action or activity		1: navigating with a pilot 2: entering port 3: leaving port 4: berthing 5: slipping 6: anchoring 7: weighing anchor 8: transiting 9: overtaking 10: reporting 11: working cargo 12: landing 13: diving 14: fishing 15: discharging overboard 16: passing	CL	0,1
Headline			TE	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso	InclusionType (association class)	Subtypes of AbstractRxN	theApplicableRxN	0..*	Applicability	isApplicableTo	0,*
Asso	associatedRxN	Subtypes of AbstractRxN	theRxN	0..*	Subtypes of FeatureType	appliesInLocation	1..*
Asso	relatedOrganisation	Subtypes of AbstractRxN	theInformation	0..*	Authority	theOrganisation	0..*

INT 1 Reference:

8.2.1 Abstract supertype for information from textual sources

AbstractRxN is the supertype of the four types intended primarily for encoding information from regulatory or other text sources. The attributes **categoryOfRxN** and **actionOrActivity** should be encoded wherever possible in order to allow software to classify the content according to the type of regulation (**categoryOfRxN**) and its effects on common maritime activities by both commercial and recreational vessels.

At least one of the attributes **textContent** and **graphic** must be populated.

Subtypes of **AbstractRxN** must not be associated to **NauticalInformation**, since this leads to chains of information types which have little or no meaning in reality.

Remarks:

- Association *associatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction:

8.3 Authority

IHO Definition: **AUTHORITY**. A person or organisation having political or administrative power and control. (Oxford Dictionary of English).

S-123 Information Type: Authority

Supertype: informationType

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 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	EN	0,1

		8: agricultural 9: military 10: private company 11: maritime police 12: environmental 13: fishery 14: finance 15: maritime		
Text Content			C	0,1
Category of Text		1: Abstract or summary 2: Extract 3: Full text	EN	0,1
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	0,1
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			TD	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
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult	Class	Role	Mult
Assoc	srvControl	Authority	controlAuthority	0..*	RadioStation, RadioServiceArea, NavigationalMeteorologicalArea, NAVTEXStationArea, CoastguardStation, GMDSS Area, Inmarsat ocean region area, WeatherForecastWarningArea	controlledService	0..*
Assoc	authorityContact	Authority	theAuthority	0..*	Contact Details	theContactDetails	0..*
Assoc	authorityHours	Authority	theAuthority_srvHrs	0..*	Service Hours	theServiceHours	0..*
Assoc	relatedOrganisation	Authority	theOrganisation	0..*	Subtypes of AbstractRxN	theInformation	0..*

INT 1 Reference:

Remarks:

- Association *srvControl* is with geographic features. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

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-123 Information Type: Contact Details

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Call name	(CALNAM)		S(TE)	0,1

Call sign	(CALSGN)			0,1
CommunicationChannel	(COMCHA)		TE	0..*
Maritime Mobile Service Identity (MMSI) Code			I	0,1
Category of communication preference (categoryOfCommPref)		1: preferred calling 2: alternate calling 3: preferred working 4: alternate working	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,*
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
Telecommunication Carrier (telcomCarrier)			S(TE)	0,1
Contact Instructions			S(TE)	0,1
Telecommunication Service			E(CL)	0,*
RadioCommunications			C	0..*
Category Of Communication Preference (categoryOfCommPref)				
Category of radio methods		1: Low Frequency (LF) voice traffic 2: Medium Frequency (MF) voice traffic	EN	0,*

		3: High Frequency (HF) voice traffic 4: Very High Frequency (VHF) voice traffic 5: High Frequency Narrow Band Direct Printing 6: NAVTEX 7: SafetyNET 8: NBDP Telegraphy (Narrow Band Direct Printing Telegraphy) 9: facsimile 10: NAVIP 11: Low Frequency (LF) digital traffic 12: Medium Frequency (MF) digital traffic 13: High Frequency (HF) digital traffic 14: Very High Frequency (VHF) digital traffic 15: Low Frequency (LF) telegraph traffic 16: Medium Frequency (MF) telegraph traffic 17: High Frequency (HF) telegraph traffic 18: Medium Frequency (MF) Digital Selective Call traffic 19: High Frequency (HF) Digital Selective Call traffic 20: Very High Frequency (VHF) Digital Selective Call traffic		
Communication channel			TX	0,*
Contact instructions			TX	0,1
Frequency pair			C	0,*
Frequency shore station receives			IN	0,*
Frequency shore station transmits			IN	0,*
Time intervals by Day of Week (tmIntervalsByDoW)			C	0,*
Day of week		1: monday 2: tuesday 3: wednesday 4: thursday 5: friday 6: saturday 7: sunday	EN	0,7
Day of week is range			BO	0,1
Time reference		1: localTime 2: UTC	EN	1,1
Time of day start			TI	0,*

Time of day end			TI	0,*
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso	srvContact	Authority	theContactDetails	0..*	RadioStation, RadioServiceArea, CoastguardStation	servicePlace	0,*
Asso	authorityContact	Contact Details	theContactDetails	0,*	Authority	theAuthority	0..*

INT 1 Reference:

When the complex attribute **radioCommunications** is used in **ContactDetails**, it can have only the sub-attributes indicated in this table.

Remarks:

- Association *srvContact* is with geographic features. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction:

8.5 Service Hours

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

S-123 Information Type: Service Hours

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Schedule by day of week			C	1,*
Category of schedule		1: normal operation 2: closure 3: unmanned operation	EN	1,1
Time intervals by day of week			C	1,*
Day of the Week		1: monday 2: tuesday 3: wednesday	EN	0,7 (ordered)

		4: thursday 5: friday 6: saturday 7: sunday		
dayOfWeekIsRange			BO	0,1
timeReference		1: local time 2: UTC	EN	1,1
timeOfDayStart			TI	0,* (ordered)
timeOfDayEnd			C	0,* (ordered)
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	0,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Assoc	exceptionalWorkday	ServiceHours	theServiceHours_nsdy	0..*	NonStandardWorkingDay	partialWorkingDay	0..*
Assoc	authorityHours	Service Hours	theServiceHours	0,*	Authority	theAuthority_srvHrs	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-123 Information Type: Non Standard Working Day

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Fixed Date			TD	0,*
Variable Date			S(TE)	0,*
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	0,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Assoc	exceptionalWorkday	NonStandard WorkingDay	partialWorkingDay	0..*	Hours	theServiceHours_nsdy	0..*

INT 1 Reference: --

8.6.1 Exceptions to usual workdays

This information type is used to indicate days that are exceptions to a usual weekly office opening schedule or service availability schedule. It should be used to indicate holidays or similar exceptions to the normal weekly schedule described by an associated **ServiceHours** instance.

NonStandardWorkingDay should not be used to indicate days of the week when the office is normally closed or the service is normally unavailable. Regular weekly schedules can be described by **ServiceHours** alone.

The attribute **periodicDateRange** of **NonStandardWorkingDay** can be used in the event that service hours are the same but the variation in holidays or partial working days is seasonal – e.g., if an office is closed on "second Saturdays" only in December. To encode working hours that vary seasonally, encode multiple instances of **ServiceHours** instead, each with the appropriate **periodicDateRange**.

Attribute **periodicDateRange** should not be encoded if **fixedDate** or **variableDate** provide enough information to determine the day.

EXAMPLE: If the **variableDate** is "U.S. Thanksgiving" **periodicDateRange** need not be encoded (the formula for determining the date of the Thanksgiving holiday is fixed as "the fourth Thursday in November" for the foreseeable future. (This information may be encoded as part the **variableDate**, thus: "U.S. Thanksgiving - fourth Thursday in November".)

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-123 Information Type: Applicability

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Ballast (BALAST)		1=Yes 0=No	BO	0,1
Category of Cargo (CATCGO)		1 : bulk 2 : container 3 : general 4 : liquid 5 : passenger 6 : livestock 7 : dangerous or hazardous	EN	0,*
Category of Dangerous or Hazardous Cargo (CATDHC)		1: IMDG Code Class 1 Div. 1.1 2: IMDG Code Class 1 Div. 1.2 3: IMDG Code Class 1 Div. 1.3 4: IMDG Code Class 1 Div. 1.4 5: IMDG Code Class 1 Div. 1.5 6: IMDG Code Class 1 Div. 1.6 7: IMDG Code Class 2.1 8: IMDG Code Class 2.2 9: IMDG Code Class 2.3 10: IMDG Code Class 3 11: IMDG Code Class 4.1 12: IMDG Code Class 4.2 13: IMDG Code Class 4.3 14: IMDG Code Class 5.1 15: IMDG Code Class 5.2 16: IMDG Code Class 6.1 17: IMDG Code Class 6.2 18: IMDG Code Class 7 19: IMDG Code Class 8 20: IMDG Code Class 9 21: Harmful Substances in packaged form	EN	0,*
Category of Vessel Registry (CATRGY)		1: domestic 2: foreign	EN	0,1
Category of Vessel (CATVSL)		1: general cargo vessel 2: container carrier 3: tanker 4: bulk carrier 5: passenger vessel 6: roll-on roll-off 7: refrigerated cargo vessel	EN (CL)	0,1

		8: fishing vessel 9: service 10 : warship 11: towed or pushed composite unit 12: tug and tow 13 : light recreational 14 : semi-submersible offshore installation 15 : jack-up exploration or project installation 16 : livestock carrier 17 : sport fishing		
Thickness of Ice Capability (ICECAP)			IN	0,1
Logical Connectives (LOGCON)		1: logical conjunction 2: logical disjunction	EN	0,1
Vessel Performance (PRFMNC)			TE	0,1
Vessels Measurements (VSLMSM)			C	0,*
Comparison Operator (COMPOP)		1: greater than 2: greater than or equal to 3: less than 4: less than or equal to 5: equal to 6: not equal to	EN	1,1
Vessels Characteristics (VSLCAR)		1: length overall 2: length at waterline 3: breadth 4: draught 5: height 6: displacement tonnage 7: displacement tonnage, light 8: displacement tonnage, loaded 9: deadweight tonnage 10: gross tonnage 11: net tonnage 12: Panama Canal/Universal Measurement System net tonnage 13: Suez Canal net tonnage 14: Suez Canal gross tonnage	EN	1,1
Vessels CharacteristicsValue (VSLCAR)			RE	1,1
Vessels CharacteristicsUnits (VSLUNT)		1: metre 2: foot 3: metric ton 4: ton 5: short ton 6: gross ton 7: net ton	EN	1,1

		8: Panama Canal/Universal Measurement System net tonnage 9: Suez Canal Net Tonnage 10: none 11: cubic metres 12: Suez Canal Gross Tonnage		
Information			C	0,*
Language		ISO 639-3	(S) TE	0,1
Text	*(INFORM)* *(NINFOM)*		(S) TE	0,1
File Reference	*(TXTDSC)* *(NTXTDS)*		S (TE)	0,1
File Locator			S (TE)	0,1
Headline			S (TE)	0,1
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso class	PermissionType	Applicability	permission	0,*	Any subtype of Featuretype	vslLocation	0,*
Asso class	InclusionType	Applicability	isApplicableTo	0,*	Any subtype of AbstractRxN	theApplicableRxN	0,*

INT 1 Reference:

Remarks:

- Vessel characteristics are specified as follows. Absent attributes or null values are ignored.

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

  vessels measurements (VSLMSM): The vessel or cargo matches the attribute value condition given by the Comparison Operator and Characteristics Value sub-attributes (for multi-valued attributes, matches at least one of the values).

  ice capability (ICECAP), vessel performance (PRFMNC) attributes: The vessel meets or exceeds the specified requirement (vessel's ice-thickness rating, and performance characteristic, e.g., special equipment).

  logical connectives (LOGCON) states whether "all" or "at least one" of the specifications must be met.

  categoryOfRelationShip (CATREL) in PermissionType indicates the relationship between vessels satisfying the conditions described by Applicability and the associated feature (whether they are required, permitted, prohibited, etc., from transit or use of the feature).

  membership (MBRSHP) in InclusionType indicates the relationship between vessels satisfying the conditions described by **Applicability** and the associated information object (whether they are included or excluded from the scope of the associated regulation, restriction, recommendation, or general information).

  The enumeration attributes have the significances indicated by their allowed value sets.

  Example 1:

An **Applicability** with attributes:

VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=greater than, VSLVAL=50]

CATVSL=3 (tanker)

LOGCON=1 (and)

CATREL=5 (required)

associated to a Pilot Boarding Place object:

Means: Tankers with LOA > 50.0 m must use the Pilot Boarding Place

Example 2:

PRFMNC="Vessels with thrusters"

MBRSHP=2 (excluded);

associated to a Regulations object:

Vessels with thrusters are exempted from the regulation.

Example 3:

With repeated VSLMSM:

VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=(>), VSLVAL=50]

VSLMSM [VSLCAR=length, VSLUNT=metre, COMPOP=(<), VSLVAL=90]

CATDHC=19 (IMDG Code Class 8)

LOGCON=1 (and)

MBRSHP=1 (included);

associated with **Regulations**:

The regulation applies to vessels with LOA greater than 50.0 m. and less than 90.0 m. carrying IMDG Class 8 cargo (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).
- Conditions which cannot be encoded using the more specific attributes may be encoded in **information.text**. Using the **information.fileReference** attribute to point to a text file describing the condition is an allowed alternative, but encoding a short summary of the condition in **information.text** is recommended if there are other conditions encoded in other attributes of this instance of **Applicability**.
- Association *PermissionType* and *InclusionType* are association classes and encoded as described in ISO 19136-2 and S-100 10b-8.3. This should be handled by the production tools and transparent to the encoder.

Distinction:

8.8 Regulations

IHO Definition: **REGULATIONS** Regulations for a related area or facility.

S-123 Information Type: Regulations

Supertype: AbstractRxN

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1
Category of Authority			EN	0,1
Text Content			C	1,*
Graphic			C	0,*
rxnCode			C	0,*

Information associations

Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	InclusionType (association class)	Subtypes of AbstractRxN	theApplicableRxN	0..*	Applicability	isApplicableTo	0,*
Asso (inherited)	associatedRxN	Subtypes of AbstractRxN	theRxN	0..*	Subtypes of FeatureType	appliesInLocation	1..*
Asso (inherited)	relatedOrganisation	Subtypes of AbstractRxN	theInformation	0..*	Authority	theOrganisation	0..*

INT 1 Reference: --

8.8.1 Regulations information type

The **Regulations** information type is intended to be used for official rules, laws, and similar source material, i.e., sources that have the force of law or are mandated by a controlling authority. They will generally originate from some kind of administration or authority, including port authorities.

See the encoding remarks in super-type **AbstractRxN** for constraints on attributes and associations.

Remarks:

- Association *associatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction: **Nautical Information, Recommendations, Restrictions**

8.9 Restrictions

IHO Definition: **RESTRICTIONS** Restrictions for a related area or facility.

S-123 Information Type: Restrictions

Supertype: AbstractRxN

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1
Category of Authority			EN	0,1
Text Content			C	1,*
Graphic			C	0,*
rxnCode			C	0,*

Information associations

Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	InclusionType (association class)	Subtypes of AbstractRxN	theApplicableRxN	0..*	Applicability	isApplicableTo	0,*
Asso (inherited)	associatedRxN	Subtypes of AbstractRxN	theRxN	0..*	Subtypes of FeatureType	appliesInLocation	1..*
Asso (inherited)	relatedOrganisation	Subtypes of AbstractRxN	theInformation	0..*	Authority	theOrganisation	0..*

INT 1 Reference: --

8.9.1 Restrictions information type

Restrictions is intended for restrictions that constrain the activities of vessels temporarily with or without the legal force, or for longer terms without the force of law; they may be issued by a local authority such as a port captain or US Coast Guard district.

See the encoding remarks in super-type **AbstractRxN** for constraints on attributes and associations.

Remarks:

- Association *associatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction:**Nautical Information, Recommendations, Regulations**

8.10 Recommendations

IHO Definition: **RECOMENDATIONS** Recommendations for a related area or facility.

S-123 Information Type: Recommendations

Supertype: AbstractRxN

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1
Category of Authority			EN	0,1
Text Content			C	1,*
Graphic			C	0,*
rxnCode			C	0,*

Information associations

Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso (inherited)	InclusionType (association class)	Subtypes of AbstractRxN	theApplicableRxN	0..*	Applicability	isApplicableTo	0,*
Asso (inherited)	associatedRxN	Subtypes of AbstractRxN	theRxN	0..*	Subtypes of FeatureType	appliesInLocation	1..*
Asso (inherited)	relatedOrganisation	Subtypes of AbstractRxN	theInformation	0..*	Authority	theOrganisation	0..*

INT 1 Reference: --

8.10.1 Recommendations information type

Recommendations is intended for practices that are recommended but do not have the force of regulations.

See the encoding remarks in super-type **AbstractRxN** for constraints on attributes and associations.

Remarks:

- Association *associatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction: **Nautical Information, Recommendations, Restrictions**

8.11 Nautical Information

IHO Definition: **NAUTICAL INFORMATION** Nautical information about a related area or facility.

S-123 Information Type: Nautical information

Supertype: AbstractRxN

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Fixed date range			C	0,1
Periodic date range			C	0,1
Feature name			C	0,*
Source Indication	(SORIND)		C	0,1
Category of Authority			EN	0,1
Text Content			C	1,*
Graphic			C	0,*
rxnCode			C	0,*

Information associations

Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso	additionalInformation	Nautical Information	providesInformation	0,*	(any subtype of InformationType)	informationProvidedFor	0,*
Asso	additionalInformation	Nautical Information	providesInformation	0..*	(any subtype of FeatureType)	informationProvidedFor	1..*
Asso (inherited)	InclusionType (association class)	Subtypes of AbstractRxN	theApplicableRxN	0..*	Applicability	isApplicableTo	0,*
Asso (inherited)	associatedRxN	Subtypes of AbstractRxN	theRxN	0..*	Subtypes of FeatureType	appliesInLocation	1..*
Asso (inherited)	relatedOrganisation	Subtypes of AbstractRxN	theInformation	0..*	Authority	theOrganisation	0..*

INT 1 Reference:

8.11.1 General nautical information

Nautical information is intended for material that is largely informative in nature, of which does not fit into the category of regulation, recommendation, or restriction.

See the encoding remarks in super-type **AbstractRxN** for constraints on attributes and associations.

Remarks:

- Association *additionalInformation* may be with a geographic feature or an information type. Association *associatedRxN* is with a geographic feature. While an association from geographic feature to information type can be encoded in the geographic feature instance, the reverse association from the information type to the geographic feature may be omitted from the information type instance or encoded using the generic inverse association *invInformationAssociation* instead of the named role.

Distinction: **Regulations, Recommendations, Restrictions**

8.12 Spatial Quality

IHO Definition: **SPATIAL QUALITY** (Definition required.

S-123 Information Feature: SpatialQuality

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of temporal variation		1 : extreme event 2 : likely to change 4 : unlikely to change 5 : unassessed	EN	0,1
Quality of horizontal measurement		1 : surveyed 2 : unsurveyed 3 : inadequately surveyed 4 : approximate 5 : position doubtful 6 : unreliable 7 : reported (not surveyed) 8 : reported (not confirmed) 9 : estimated 10 : precisely known 11 : calculated	EN	0,1
Horizontal positional uncertainty			C	0,1
Uncertainty fixed			RE	1,1
Uncertainty variable			RE	0,1

Information associations

Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso	Spatial Association	Spatial Quality	defines	0,1	Curve spatial types	definedFor	1,*

INT 1 Reference:

8.12.1 Spatial quality

Spatial attribute types may be associated with spatial quality attributes. Such an association provides quality information for the referencing spatial primitive.

Spatial quality attributes are carried in the information class **Spatial Quality**. Only curves can be associated with **Spatial Quality** (points can be associated with its subtype **SpatialQualityPoints**). 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.

Each instance of **SpatialQuality** must be associated to the geometry to which the information applies using the association *spatialAssociation* (see clause 2.4.6.1). Note that the association is from the feature's geometry (spatial primitive).

Remarks: The specification of **Spatial Quality** in this edition is based on the DQWG model of data quality which is still to be integrated into S-101.

Distinction: Quality of Non-bathymetric data; Spatial Quality Points

8.13 Spatial Quality Points

IHO Definition: **SPATIAL QUALITY POINTS** (Definition required)

S-123 Information Feature: SpatialQualityPoints

Supertype: SpatialQuality

Primitives:None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Inherited attributes				
Category of temporal variation		1 : extreme event 2 : likely to change 4 : unlikely to change 5 : unassessed	EN	0,1
Quality of horizontal measurement		1 : surveyed 2 : unsurveyed 3 : inadequately surveyed 4 : approximate 5 : position doubtful 6 : unreliable 7 : reported (not surveyed) 8 : reported (not confirmed) 9 : estimated 10 : precisely known 11 : calculated	EN	0,1
Horizontal positional uncertainty			C	0,1
Uncertainty fixed			RE	1,1
Uncertainty variable			RE	0,1

Information associations

Role Type	Association Name	Class	Role	Mult.	Class	Role	Multiplicity
Asso	Spatial Association	Spatial Quality	defines	0,1	Point spatial types	definedFor	1,*

INT 1 Reference:

8.13.1 Spatial quality for points

SpatialQualityPoints is a subtype of **SpatialQuality** which can be associated to point spatial objects.

Each instance of **SpatialQualityPoints** must be associated to the geometry to which the information applies using the association *spatialAssociation* (see clause 2.4.6.1). Note that the association is from the feature's geometry (spatial primitive).

Remarks: The specification of **SpatialQualityPoints** in this edition is based on the DQWG model of data quality which is still to be integrated into S-101.

Distinction: Spatial Quality; Quality of Non-bathymetric Data

9 Association Class

9.1 Permission Type

IHO Definition: **PERMISSION TYPE** Association class for associations describing whether the subsets of vessels determined by the ship characteristics specified in Applicability may (or must, etc.) transit, enter, or use a feature.

S-123 Information Feature: Permission Type

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity
Category of Relationship		1: prohibited 2: not recommended 3: permitted 4: recommended 5: required 6: not required	EN	0,1

Information associations

Type	Association Name	Class	Role	Mult.	Class	Role	Mult.
Asso	PermissionType (association class)	PermissionType	vslLocation	1..1	Applicability	permission	1..1
Asso	PermissionType (association class)	PermissionType	permission	1..1	Subtypes of FeatureType	vslLocation	1..1

INT 1 Reference:

Remarks:

The GML format implements and used association classes in accordance with ISO 19136-2. The association class is implemented as an information type instance with information associations to and from the two classes linked by the association, as listed above. A generic inverse association must be used if it is necessary to encode a reverse link to a feature instance.

Distinction:

9.2 Inclusion Type

IHO Definition: **INCLUSION TYPE** Association class specifying the relationship between the subset of vessels described by an Applicability data object and a regulation (restriction, recommendation, or nautical information).

S-123 Information Type: Inclusion Type

Primitives: None

Real World	*Paper Chart Symbol*	*ECDIS Symbol*

S-123 Attribute	S-57 Acronym	Allowable Encoding Value	Type	Multiplicity

Membership		1: included 2: excluded	EN	0,1

Information associations

Type	Association Name	Class	Role	Mult	Class	Role	Mult
Asso	InclusionType (association class)	InclusionType	theApplicableRxN	1..1	Applicability	isApplicableTo	1..1
Asso	InclusionType (association class)	InclusionType	isApplicableTo	1..1	Subtypes of AbstractRxN	theApplicableRxN	1..1

INT 1 Reference:

Remarks:

The GML format implements and uses association classes in accordance with ISO 19136-2. The association class is implemented as an information type instance with information associations to and from the two classes linked by the association, as listed above. A generic inverse association must be used if it is necessary to encode a reverse link to a feature instance.

Distinction:

10 Geo Feature Attribute and Enumerate Descriptions

[See the Simple attributes and Complex attributes sections in Appendix C – Feature Catalogue.]

11 Associations

11.1 Association names

[See the Information Associations and Feature Associations section in Appendix C – feature Catalogue.]

11.2 Association roles

[See the Roles sections in Appendix C – Feature Catalogue.]

12 Meta Features and Spatial Attributes and Enumerations

[See the Simple attributes and Complex attributes sections Appendix C – Feature Catalogue.]

13 Complex Attributes

[See the Complex attributes section in Appendix C – Feature Catalogue.]

14 ECDIS System (Portrayal) Attributes

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

Portrayal attributes are not used in this edition of S-123 Radio Services Product Specification.

15 Updating (see S-4 – B-600)

Update datasets are described in the main S-123 product specification