

# **S-100 – Part 11**

## **Product Specifications**

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## 11-1 Scope

A data product specification is a precise technical description which defines a geospatial data product. It describes all the features, attributes and relationships of a given application and their mapping to a dataset. It includes general information for data identification as well as information for data content and structure, reference system, data quality aspects, data capture, maintenance, delivery and metadata. It may be created and used on different occasions, by different parties and for different reasons.

This Part of S-100 describes data product specifications for hydrographic requirements for geographic data products. Its aim is to provide a clear and similar structure for any data product specification to be written. This profile shall be in conformance with all the other standards that have been developed within the IHO S-100 Geospatial Standard for Hydrographic Data.

The product specification shall constitute a set of human readable documentation. Generally, it should also include machine readable files for information such as the feature catalogue, the application schema and the CRS parameters. An example of a compliant product specification is shown in Appendix P11-2.

In addition to a 'human readable' document, it is possible to create a machine readable (e.g. XML) summary of the Product Specification. The tables in the sections below indicate the structure for such a summary of the Product Specification.

## 11-2 References

### 11-2.1 Normative

- ISO 639-2:1998 Codes for the representation of names of languages -- Part 2: Alpha-3 code
- ISO 19115:2003 Geographic information – Metadata
- ISO 19131:2007 Geographic information – Data product specification

### 11-2.2 Informative

- ISO 8211:1994 Information technology — Specification for a data descriptive file for information interchange
- ISO 19104:2004 Geographic information - Terminology
- ISO 19106:2004 Geographic information – Profiles
- ISO 19109:2005 Geographic information – Rules for application schema
- ISO 19123 Geographic information – Schema for Coverage Geometry and Functions
- ISO 19136 Geographic information – Geography Markup Language
- ISO 19138 Geographic information – Data quality measures

### 11-3 General structure and content of a data product specification

A data product specification defines the requirements for a data product and forms the basis for producing or acquiring data. The data product specification shall contain sections covering the following aspects of the data product.

- a) Overview – see Clause 4
- b) Specification scopes – see Clause 5
- c) Data product identification – see Clause 6
- d) Data content and structure – see Clause 7
- e) Reference systems – see Clause 8
- f) Data quality – see Clause 9
- g) Data Capture – see Clause 10

NOTE This section can be covered by an encoding guide e.g. for the S-101 ENC product specification - the data capture and classification guide

- h) Data product format – see Clause 13
- i) Data product delivery – see Clause 14
- j) Metadata – see Clause 16

A data product specification may also contain sections covering the following aspects of the data product:

- k) Data Maintenance – see Clause 12
- l) Portrayal – see Clause 13
- m) Additional Information – see Clause 16

Each of these sections of the data product specification is described in the following clauses.

NOTE Sections are adopted from ISO 19131

### 11-4 Overview

The overview section provides a reader of a data product specification with general introductory information about the data product together with product specification metadata.

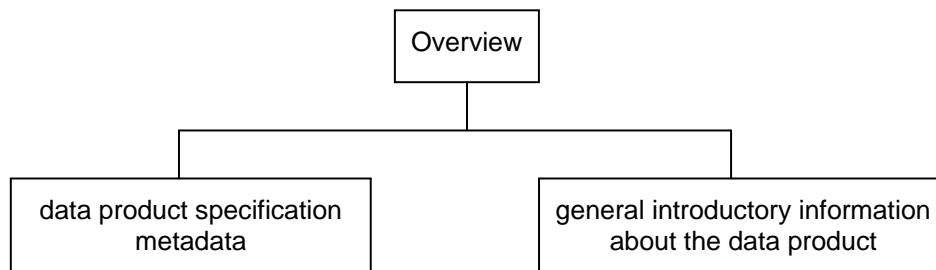


Figure 11-1 Content of the Overview Section

The Overview shall include the following parts:

- a) information about the creation of the data product specification;

NOTE This shall include the title, a reference date, the responsible party and the language. Information about the maintenance regime for the product specification should also be included.

- b) terms and definitions;
- c) abbreviations;
- d) acronyms for the name of the data product;

EXAMPLE AML Additional Military Layer

- e) an informal description of the data product.

The information shall contain general information about the data product which may include the following aspects shown in Table 1.

Item Name	Description	Multiplicity	type
title	Official designation of the data product	1	CharacterString
abstract	Informal description of the data product	1	CharacterString
acronym	Any acronyms for the title of the data product	0..*	CharacterString
content	Textual description of the content of any dataset which conform to the specification	1	CharacterString
spatialExtent	Description of the spatial extent covered by the data product	1	EX_Extent (ISO 19115)
temporalExtent	Description of the temporal extent covered by the data product	0..1	EX_Extent (ISO 19115)
specificPurpose	Specific purpose for which the data shall be or has been collected	1	CharacterString

**Table 1-11— Informal Description of the Data Product**

The data product specification metadata shall provide information to uniquely identify the data product specification as well as information about the creation and maintenance of the data product specification. The maintenance description may indicate regular updates, or give contact details for reporting issues which need correction. The data product specification metadata shall include the following items in Table 2 [extension to ISO 19131]:

Item Name	Description	Multiplicity	Type
title	Title of the data product specification	1	CharacterString
version	Version of the data product specification	1	CharacterString
date	Date the product specification was created / last updated	1	Date
language	Language(s) of the data product specification, e.g. translations	1..*	CharacterString
classification	Security classification code on the data product specification	0..1	MD_ClassificationCode (ISO 19115)
contact	Party responsible for the data product specification	1	CI_ResponsibleParty (ISO 19115)
URL	Online-address where the resource is downloadable	0..1	URL
identifier	Persistent unique identifier for a published version of the product specification <sup>1</sup> .	1	CharacterString
maintenance	Description of the maintenance regime for the product specification.	1	MD_MaintenanceInformation (ISO 19115)

**Table 11-2— Data product specification metadata**

## 11-5 Specification scopes

Some parts of a product specification may apply to the whole product whereas other parts of the product specification may apply to parts of the product. Coordinate reference system will generally apply to the complete product; whereas maintenance regimes may be different for navigational features and contextual features. If a specification is homogeneous across the whole data product it is only necessary to define a general scope (root scope), to which each section of the data product specification applies. The data product specification may specify a partitioning of the data content of the product on the basis of one or more criteria. Such partitioning may be different for different parts of the data product specification. Each such

<sup>1</sup> This is referenced from the discovery metadata of products which conform to the Product Specification

part of the data content shall be described by a specification scope that may inherit or override the general scope specification.

In principle, any or all of the remaining sections of the product specification may have variants which apply to the scopes within the product. Each variant must identify the scope(s) to which it applies.

**EXAMPLE** Data products to support navigation often contain two sets of feature types: those that provide navigation information that changes rapidly and is essential for safety of navigation, and those that provide background reference information. Maintenance and delivery information would be partitioned on the basis of these groupings; reference system information would not.

This section is only used where different parts of the product (e.g. by theme or geographical extent) have different specifications. For example, some aspects of the specification may be specific to bathymetry, or to non-tidal waters. If this is the case for the product being specified, this section defines the various “scopes” within the overall product specification, and how they should be identified in the datasets.

Depending on the type of data product specification the scope may include items in Table 3:

Item Name	Description	Multiplicity	type
scopeIdentification	Specific identification of the scope	1	CharacterString
level	Hierarchical level of the data specified by the scope	0..1	MD_ScopeCode (ISO19115)
levelName	Name of the hierarchy level	0..1	CharacterString
levelDescription	Detailed description about the level of the data specified by the scope	0..1	CharacterString
coverage	Subtype of a feature that represents real world phenomena as a set of attributes	0..1	CharacterString
extent	Spatial, vertical and temporal extent of the data	0..1	EX_Extent (ISO 19115)

**Table 11-3— Specification Scope Information**

## 11-6 Data product identification

This section describes how to identify data sets that conform to the specification. The information identifying the data product may include the following items in Table 4. [adopted from ISO 19131]:

Item Name	Description	Multiplicity	type
title	The title of the data product	1	CharacterString
alternateTitle	Short name or other name by which the data product is known	0..1	CharacterString
abstract	Brief narrative summary of the content of the data product	1	CharacterString
topicCategory	The main theme(s) of the data product	0..*	MD_TopicCategoryCode (ISO 19115)
geographicDescription	Description of the geographic area covered by the data product using identifiers	1	EX_GeographicDescription (ISO 19115)

Item Name	Description	Multiplicity	type
spatialResolution	Factor which provides a general understanding of the density of spatial data in the data product	1	MD_Resolution (ISO 19115)
purpose	Summary of the intention with which the data product is developed	1	CharacterString
language	Language(s) of the dataset. If language is not applicable, e.g. for raster data, use "not applicable" as value for the element	1..*	CharacterString (ISO 639-2)
classification	Security classification code on the data product	0..1	MD_ClassificationCode (ISO 19115)
spatialRepresentationType	Form of the spatial representation	0..1	MD_SpatialRepresentationTypeCode (ISO 19115)
pointOfContact	Identification of, and means of communication with, person(s) and organization(s) associated with the data	0..*	CI_ResponsibleParty (ISO 19115)
useLimitation	Limitation affecting the fitness for use of the data product	0..1	CharacterString

Table 11-4— Identification Information

## 11-7 Data content and structure

This profile mandates different requirements for data product specifications whether the data is feature- or coverage-based or imagery data. The product specification shall include this information for each identified scope.

### 11-7.1 Feature-based data

The content information of a feature-based data product is described in terms of a general feature model and a feature catalogue [adopted from S-100 Part 2 and S-100 Part 4].

The data product specification shall contain an application schema. For all data product specifications in the realm of S-100, the application schema shall be expressed in UML. All other rules of S-100 Part 2 concerning the creation of the general feature model and especially conformance to ISO 19109:2005 apply as well. If the application schema is a separate document, then the product specification shall include a narrative summary. The product specification shall describe any fixed roles or other restrictions or conventions for default roles. If unique role names are required, it may also define conventions for generating these unique names.

The data product specification shall include a feature catalogue, which provides a full description of each feature type including attributes, attribute values and relationships in the data product. The feature catalogue shall be realized in accordance with S-100 Part 5. The feature catalogue shall be available in both 'machine readable' (e.g. XML based on the S-100 Feature Catalogue XSD) and 'human readable' (e.g. textual derived by XSLT from the XML) forms.

All the feature types, their attributes and attribute value domains, and the association types between feature types expressed in the application schema shall be described in a feature catalogue.



The Product Specification for feature-based scopes shall include the elements in Table 5.

Item Name	Description	Multiplicity	type
applicationSchema	The application schema	1	DPS_ApplicationSchema
featureCatalogue	The feature catalogue	1	FC_FeatureCatalogue

**Table 11-5 — Elements of Feature-based data**

### 11-7.2 Coverage-based and imagery data

The content information of a coverage-based data product (including imagery data product) shall be described in accordance with S-100 Part 7. The content information shall be described in the following manner:

A data product specification shall identify each coverage type and each image type that is included within the specification scope and shall provide a narrative description for each. Accordingly, the following components shall be identified to describe a coverage or an image (Table 6):

Item Name	Description	Multiplicity	type
coverageID	Unique identifier of coverage	1	CharacterString
coverageDescription	Technical description of the coverage	1	CharacterString
coverageType	Type of the coverage	1	CharacterString
specification	Additional information	1	CV_Coverage (ISO 19123)

**Table 11-6— Coverage-based and imagery data**

### 11-7.3 Coordinate Reference Systems

The data product specification shall include information that defines the reference systems used in the data product. The spatial reference system used shall be a coordinate reference system (CRS) in conformance with S-100 Part 5 CRS Component. The application schema will show how CRS references are carried in the data sets; this may be by reference to a register of CRS parameters, such as the EPSG Geodetic Parameter Dataset.

A product specification may express coordinate operation parameters for operations between particular CRSs. These parameters shall be recorded as described in S-100 Part 5.

Item Name	Description	Multiplicity	type
spatialReferenceSystem	Reference system identifier(s) of spatial reference system used, e.g. different UTM zones can be considered as different reference systems	1..*	SC_CRS (S-100 Part 5)

**Table 11-7— Reference system identification**

### 11-7.4 Object identifiers

The specification of persistent global identifiers for feature and information objects is strongly recommended. Identifiers need not be defined where the physical realities dictate otherwise or it is known that a reference to the object will not be needed, even from an as-yet-unknown external dataset conforming to another product specification. For example, identifiers need not be defined for cartographic objects.

One way to implement global identifiers is by defining a namespace and a persistent unique local identifier for individual feature or information types. The global identifier can be

constructed by combining the namespace with the local identifier. Local identifiers should be unique within the namespace for the lifetime of the feature or information object.

The local identifier must be an attribute of feature and information data objects whenever it is defined. The full persistent global identifier need not be a data object attribute if the namespace portion can be computed from metadata.

Namespaces may be specified by construction, e.g., a rule describing how to construct a namespace from available metadata. Specification writers shall specify how global identifiers are to be constructed from namespace and local identifiers. It is recommended that the resulting global identifier be a "HTTP URI" (i.e., a URL) or a URN. IETF documents RFC 3986 and RFC 2141 describe the appropriate semantics and structure.

Specification writers should note that location-based identifiers may not be sufficient to disambiguate data objects, because (for example) two agencies might issue AtoNs in the same area, for example physical buoys marking a channel and a virtual AtoN marking section of the channel with low air draft. Updating and normalizing the data in this case must take into consideration that the two items have similar characteristics (location, aids to navigation, etc), but are different items. Therefore a location based identifier is likely not enough to enable a link between data.

## 11-8 Data Quality

The data product specification shall identify the data quality requirements for each scope within the data product in accordance with S-100 Part 3. For every data quality scope it is necessary to list all the data quality elements and data quality sub-elements defined in S-100 Part 3, even if only to state that a specific data quality element or data quality sub-element is not applicable for this data quality scope.

Each product specification shall describe the data quality requirements. One aspect is the "data quality overview element" which should allow a user to decide whether this dataset is the one they want. The other aspect is the metadata allowed for specific feature collections, features and attributes within the dataset.

The data quality overview element should include at least the intended purpose and statement of quality or lineage. Other data quality elements cover: completeness, logical consistency, positional accuracy, temporal accuracy, thematic accuracy, and anything specifically required for the product being specified.

The product specification should comment on which of these are to be used and how, including a description of (or reference to) conformance tests. For example, should data only be published if it passes a particular test, or is it allowable to publish the data with a quality statement which indicates non-conformance? The product specification shall describe how each quality element is to be populated, for example, stating the mechanism to reference the quality evaluation procedure, and allowable values for the quality results.

The application schema shall indicate how the data quality elements will be related to the data items, for example whether a particular dataset should have homogeneous quality, or whether quality elements can be related to feature collections, individual feature objects or attributes.

Finally, the encoding description (clause 15) shall indicate how the quality elements will be encoded.

## 11-9 Data capture and classification

The data product specification shall provide information on how the data is to be captured. This should be as detailed and specific as necessary. The product specification shall include this information for each identified scope.

The product specification includes the collection criteria for mapping real world objects to the conceptual objects of the dataset. Data products can carry information about their data sources (metadata lineage elements); the product specification and application schema will show whether this is expected, and how it is to be done.

Any organization performing data capture for the data product defined by the data product specification shall provide references to any more detailed encoding guide used in addition to that indicated in the product specification for the capturing process.

NOTE A data capture and classification guide is an important part of a data product specification that has to be written before a capturing process can start.

Item Name	Description	Multiplicity	type
dataSource	Identification of the kinds of data sources usable to product datasets compliant with the considering specification	0..*	CharacterString
productionProcess	Link to a textual description of the production process (including encoding guide) applicable to the datasets compliant with the considering specification	0..*	CharacterString (URL)

**Table 11-8 — Data capture information**

## 11-10 Data Maintenance

The data product specification shall provide information on how the data is maintained. It should describe the principles and criteria applied in maintenance decisions, as well as the expected frequency of updates. The product specification shall include this information for each identified scope.

Maintenance information shall also provide procedures regarding how known errors in the data shall be handled. Any organisation performing data maintenance for the data product defined by the data product specification shall provide a reference to the detailed maintenance guide used for the maintenance process. (See also Metadata / Maintenance Information). Information about maintaining the data product specification itself is included in the Overview.

Item Name	Description	Multiplicity	type
maintenanceAndUpdateFrequency	Frequency with which changes and additions are made to the data product (per update scope)	1..*	MD_MaintenanceInformation (ISO 19115)
dataSource	Identification of the kinds of data sources usable to produce datasets	1..*	LI_Source (ISO 19115)
productionProcess	Textual description of the production process applicable to the datasets (per scope or data source)	1..*	LI_ProcessStep (ISO 19115)

**Table 11-9— Maintenance information**

## 11-11 Portrayal

The data product specification may provide information on how the data is to be presented as graphic output, e.g. as a plot or as an image. This is an optional section; however it is strongly recommended that it is included where a product specification defines an IHO navigational product. Where included, this shall take the form of a reference to a portrayal library that

contains a set of portrayal rules and a set of portrayal specifications (Table 10). The product specification shall include this information for each identified scope.

Classes and attributes required to support portrayal for a particular product need to be registered in a feature catalog dictionary and the feature catalogue for that product specification. Examples could be cartographic object classes, scale maximum / minimum attributes, attributes which suggest layout for textual information (e.g. \$TINTS, \$JUSTH).

The portrayal library shall be defined in accordance with S-100 Part 9.

Item Name	Description	Multiplicity	type
portrayalLibraryCitation	Bibliographic reference to the portrayal library	0..1	CI_Citation (ISO 19115)

**Table 11-10— Portrayal Information**

## 11-12 Data Product format (encoding)

The data product specification shall define the format (encoding) in which each scope within the data product is delivered.

This section includes a description of file structures and format. The file structure (encoding) could be specified completely here, or by reference to a separate profile or standard. For example, S-100 gives guidance on GML (ISO 19136) encoding; a given product would have a specific GML application schema, expressed in one or more XML Schema Definition Language files. Specialized products may use other encodings, for example S-100 contains a profile of ISO 8211 binary encoding.

Item Name	Description	Multiplicity	type
formatName	Name of the data format	1..*	CharacterString
version	Version of the format (date, number, etc.)	0..1	CharacterString
characterSet	Character coding standard used for the dataset (western European requirement, Greek, Turkish, Cyrillic)	1	MD_CharacterSetCode (ISO 19115)
specification	Name of a subset, profile, or product specification of the format	0..1	CharacterString
fileStructure	Structure of delivery file	0..1	CharacterString

**Table 11-11 — Data format information**

## 11-13 Data product delivery

The data product specification may define the delivery medium for each identified scope. This is an optional section. If a data product can be delivered in different formats then the appropriate information for each shall be given. Data product delivery and medium information are specified in Table 12.

Item Name	Description	Multiplicity	type
unitsOfDelivery	Description of the units of delivery (e.g. tiles, geographic areas)	0..1	CharacterString
transferSize	Estimated size of a unit in the specified format, expressed in Mbytes	1	>0
mediumName	Name of the data medium	1	Free text
otherDeliveryInformation	Other information about the delivery	1	Free text

**Table 11-12 — Delivery Medium Information**

## 11-14 Additional information

This section of the data product specification is optional and may include any other aspects of the data product not provided elsewhere in this specification. Such aspects may include recommended training, creating or using the product, or details of related products. If this information only applies to a part of the data product, then the scope for this must be clearly identified (Table 13).

Item Name	Description	Multiplicity	type
additionalInformation	Any additional information to describe the data product	0..1	CharacterString

**Table 11-13 — Additional information**

## 11-15 Metadata

The core metadata elements as defined in ISO 19115 and S-100 Part 3 (Metadata Profile) shall be included with the data product. Discovery and Quality metadata shall be structured as per Appendixes 1 & 2 of S-100 Part 3, respectively. Any additional metadata items required for a particular product specification shall be documented in the data product specification. These should be defined using ISO 19115 and ISO 19139, with extensions or restrictions if required. The application schema shall show how metadata is carried in the datasets. This information shall be specified for each identified scope.

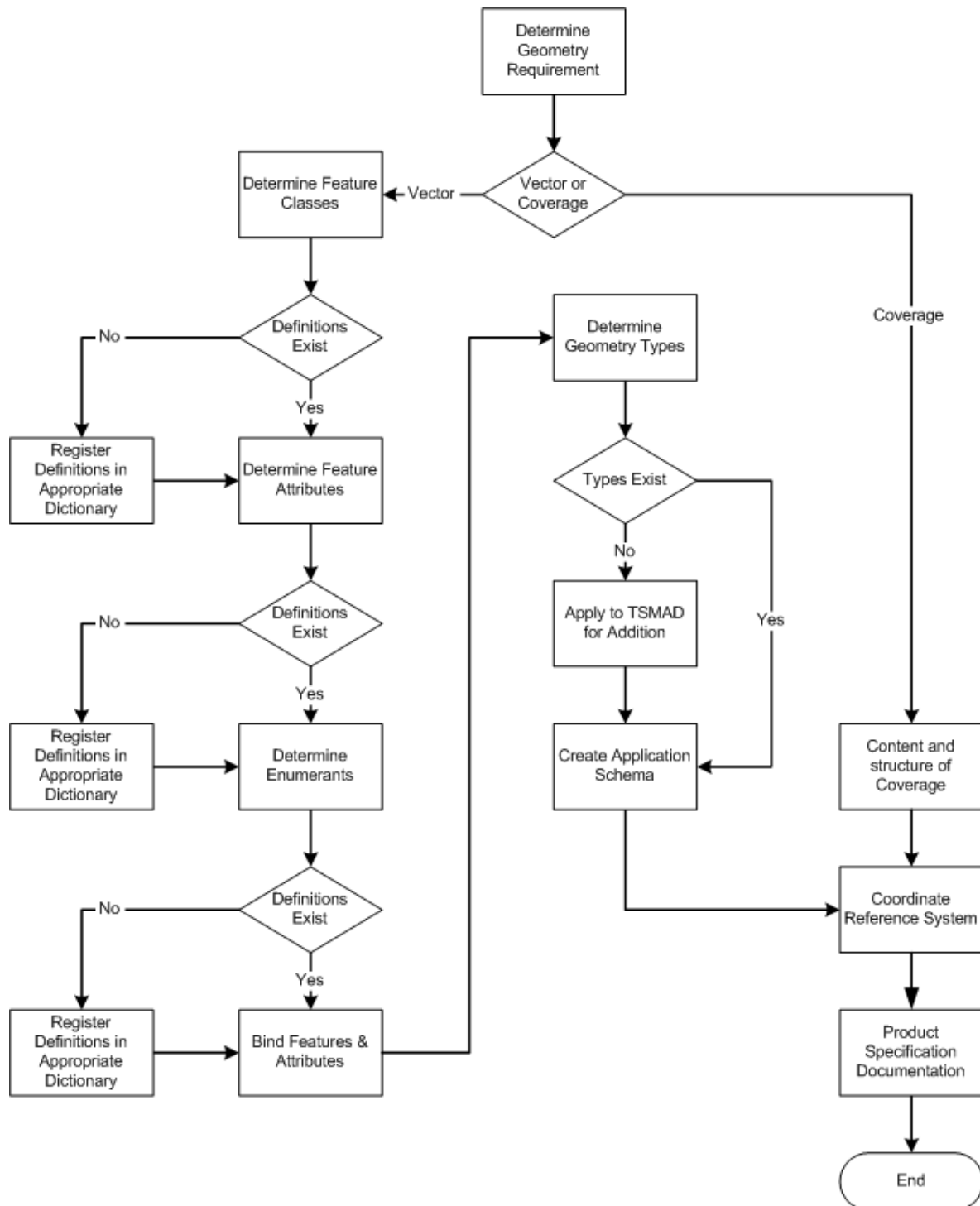
## Appendix 11-A (informative)

### A-1 Creating an S-100 product specification

#### A-1.1 Introduction

A data product specification is a precise technical description which characterises a geospatial data product. It includes general information for data identification as well as information for data content and structure, reference system, data quality aspects, data capture, maintenance, delivery and metadata.

The process described in this Appendix should be applied to each specification scope identified for the product. For example, if the product will contain a mixture of vector (feature) and coverage data, then the product specification would identify at least two scopes, and the process would be repeated for each scope. If the product contains more than one scope with the same geometry requirement (e.g. two scopes with vector geometry but different application schemas, or different maintenance regimes), then the process could still be followed twice, taking the same route.



**Figure 11-A.1 – Product specification process**

The main reason for creating a data product specification is to define the characteristics of a newly developed data product.

### A-1.2 General approach

The general approach to creating an S-100 Based product specification is shown in the process flow diagram in Figure 11-A.1. Further information on the processes is given in the following sections.



### **A-1.2.1 Determine geometry requirement**

The first step is to determine whether the scope will be feature based (i.e. use vector geometry) or coverage-based. Certain aspects of a product specification apply only to feature-based data and certain aspects apply only to coverage-based data. A product specification may include both feature-based and coverage-based data, by using specification scopes.

### **A-1.3 Feature-based product**

#### **A-1.3.1 Determine feature attributes**

Determine which feature attributes are required in the product. Seek definitions in existing authoritative feature data dictionaries. If required definitions do not exist then define new feature attributes.

#### **A-1.3.2 Determine enumerates**

Determine which enumerates are required in the product. Seek definitions in existing authoritative feature data dictionaries. If required definitions do not exist then define new enumerates.

#### **A-1.3.3 Register definitions in appropriate dictionary**

If new definitions are required then seek to register them in the most appropriate feature concept dictionary. The IHO will hold one such dictionary. The S-100 Feature Catalogue component does allow for feature or attribute types to be defined locally, if it is not possible to register them in an external dictionary.

#### **A-1.3.4 Bind features and attributes**

Features and attributes that are defined in a feature concept dictionary shall be bound in a feature catalogue.

#### **A-1.3.5 Determine geometry types**

Determine which geometry types are required in the product. S-100 includes definitions of 1D and 2D geometry types. If a geometry type is required that is not specified in S-100 Part 7 Spatial Component, then apply to TSMAD for it to be added to the framework.

#### **A-1.3.6 Create application schema**

It is possible to express an application schema in two different ways:

- 1) Using a conceptual schema language (a logical model)
- 2) Using an encoding specific language (a physical model)

**EXAMPLE** An example of a conceptual schema language is the UML. An example of an encoding specific language is XML Schema Definition Language.

An S-100 application schema may be expressed using the UML. The resulting model shall be included in the Product Specification so that the logical organisation of the data can be visualised easily. This will be particularly helpful where features have complex structures or relationships. An introduction to UML is included in the S-100 Main Document.

In some cases it is possible to generate the physical application schema automatically from the logical application schema.

**EXAMPLE** GML is an XML grammar for encoding geographic information. GML application schemas are written using XML Schema Definition Language which is itself a form of XML. Specific rules for designing GML application schemas using UML Class Diagrams are presented in ISO 19136 (the ISO/TC 211 standard for GML). The UML has a standard XML encoding that can be used for interchange of UML models between UML packages. Therefore, if the ISO 19136 rules for designing GML application schemas using UML are adhered to it is possible to export the resulting UML model as XML and to transform the resulting XML to the XML encoding of a GML application schema. The transformation between the UML XML and the GML application schema XML may be undertaken with an XML Stylesheet. Tools have been created that accomplish this task.

Physical encoding mechanisms may define means by which the physical application schema can be used to validate data instances that claim conformance with the application schema in an automatic way.

**EXAMPLE** GML schemas can be used for a certain amount of dataset validation. The feature and attribute definitions, referenced from the dictionaries, can be presented to the users. GML application schemas are written in XML Schema Definition Language. This is capable of expressing simple constraints, e.g. minimum and maximum values, character patterns. It is not capable of directly expressing constraints which involve more than one property type (e.g. "if there is more than one value of 'colour', 'colour pattern' must be set"). If these are included in the Application Schema, perhaps in a formal language such as Object Constraint Language, the ISO 19136 rules ignore them. Thus the GML schema associated with a given product can only be used for a limited validation.

#### **A-1.4 Coverage based product**

##### **A-1.4.1 Content and structure of the coverage**

The content and structure of a coverage-based product shall be described in terms defined by ISO 19123.

##### **A-1.5 Coordinate Reference System**

Determine the appropriate CRS for the data product. More than one CRS may be specified. If necessary, define coordinate operation methods and parameters that shall be used in conjunction with the data product.

## Appendix 11-B (informative)

### B-1 Example Product Specification

#### B-1.1 Overview

##### B-1.1.1 Product specification metadata

Title	Tide Prediction Information Product Specification	
Version	1.0	
Date	Created: 2008-01-18	
Language	English	
Classification	Unclassified	
Contact	Organisation Name	Data Product Owner
	Role	Owner
Identifier	IHO:S100:PSExample1	
Maintenance	Every five years	

##### B-1.1.2 Product description

Name	Tide Prediction Information	
Abstract	Encodes information and parameters for use in making tide predictions	
Content	A conformant dataset may contain features associated with the prediction of tides. The specific content is defined by the Feature Catalogue and the Application Schema.	
Spatial Extent	Description	Global, marine areas only
	East Bounding Longitude	180
	West Bounding Longitude	-180
	North Bounding Latitude	90
	South Bounding Latitude	-90
Specific Purpose	The data shall be collected for the purpose of tide prediction.	

##### B-1.1.3 Specification scope

This product specification defines only one general scope which applies to all its sections.

Scope Identification	GeneralScope
Level Name	General Scope

### B-1.1.4 Data product identification

Title		Tide Prediction Information
Abstract		Encodes information and parameters for use in making tide predictions
Geographic Description	Description	Global, marine areas only
	East Bounding Longitude	180
	West Bounding Longitude	-180
	North Bounding Latitude	90
	South Bounding Latitude	-90
Spatial Resolution	Equivalent Scale	10000
Purpose		The data shall be collected for the purpose of tide prediction.
Language		Not applicable

Data Product Identification Scope: GeneralScope

### B-1.2 Data content and structure

#### B-1.2.1 Introduction

TPI is a feature-based product. This section contains a feature catalogue and an application schema which is expressed in UML.

#### B-1.2.2 Feature Catalogue

**Name:** Tide Prediction Information Feature Catalogue  
**Scope:** Catalogue containing features associated with the prediction of tides.  
**Field of application:** Marine navigation  
**Version Number:** 1.0  
**Version Date:** May 2009  
**Producer:** International Hydrographic Organization  
**Functional Language:** English

#### Feature Type

**Name:** Tide Prediction  
**Definition:** Method for calculating tidal motion.  
**CamelCase:** TidePrediction  
**Remarks:** -  
**Alias:** -

#### Feature Attributes

**Name:** Object Name  
**Attribute Type:** Simple  
**Definition:** The individual name of an object.  
**CamelCase:** objectName  
**Cardinality:** 0..1

**Data Type:** text

**Name:** National Object Name

**Attribute Type:** Simple

**Definition:** The individual name of an object in the national Language.

**CamelCase:** nationalObjectName

**Cardinality:** 0..1

**Data Type:** text

**Name:** Status

**Attribute Type:** Simple

**Definition:** The geometric primitive of the associated feature

**camelCase:** status

**Cardinality:** 1

**Data Type:** Enumeration

**Values:**

- 1: Permanent
- 2: Occasional
- 3: Recommended
- 4: Not in use
- 5: Periodic/intermittent
- 6: Reserved

**Name:** Method of Tidal Prediction

**Attribute Type:** Simple

**Definition:** The technique employed to calculate tidal predictions

**camelCase:** methodOfTidalPrediction

**Cardinality:** 1

**Data Type:** Enumeration

**Values:**

- 1: Simplified harmonic
- 2: Full harmonic
- 3: Time and height difference

#### Feature Type

**Name:** Tide Harmonic Prediction

**Definition:**

**camelCase:** TideHarmonicPrediction

**Remarks:** -

**Alias:** -

#### Feature Attributes

**Name:** Value Of Harmonic Constituents

**Attribute type:** Complex

**Definition:**

**camelCase:** valueOfHarmonicConstituents

**Cardinality:** 1

**Data Type:** Harmonic Constituent

**Name:** Harmonic Constituent

**Attribute type:** Complex  
**Definition:** One of the harmonic elements in a mathematical expression of the tide- producing force, and in corresponding formulae for the tide or tidal stream. Each constituent represents a periodic change of relative position of the Earth, Sun and Moon.  
**CamelCase:** harmonicConstituent  
**Cardinality:** 1..\*

#### Sub Attributes

**Name:** CategoryOfHarmonicConstituents  
**Attribute Type:** Simple  
**Data Type:** Enumeration  
**Values:**  
1: M2  
2: S2  
3:MM

**Name:** Constituent Amplitude  
**Definition:** The amplitude of a tidal constituent for a given place in metres  
**Attribute Type:** Simple  
**Data Type:** Real

**Name:** Constituent Phase  
**Definition:** The phase lag of a tidal constituent at a particular place in degrees  
**Attribute Type:** Simple  
**Data Type:** Real

#### Feature Type

**Name:** Tide Non Harmonic Prediction  
**Definition:** method of tidal prediction made by applying the times of the moon's transits to the mean height of the tide systems of differences to take account of average conditions and various inequalities due to changes in the phase of the moon, declination and parallax of the moon and sun.  
**camelCase:** TideNonHarmonicPrediction  
**Remarks:** -  
**Alias:** -

**Name:** English Chart Note  
**Definition:** Textual information calling special attention to some fact.  
**CamelCase:** EnglishChartNote  
**Remarks:** -  
**Alias:** -

**Name:** Reference Station  
**Definition:** Station at which the tidal observations were made.  
**CamelCase:** ReferenceStation  
**Remarks:** -  
**Alias:** -

### B-1.2.3 Application Schema

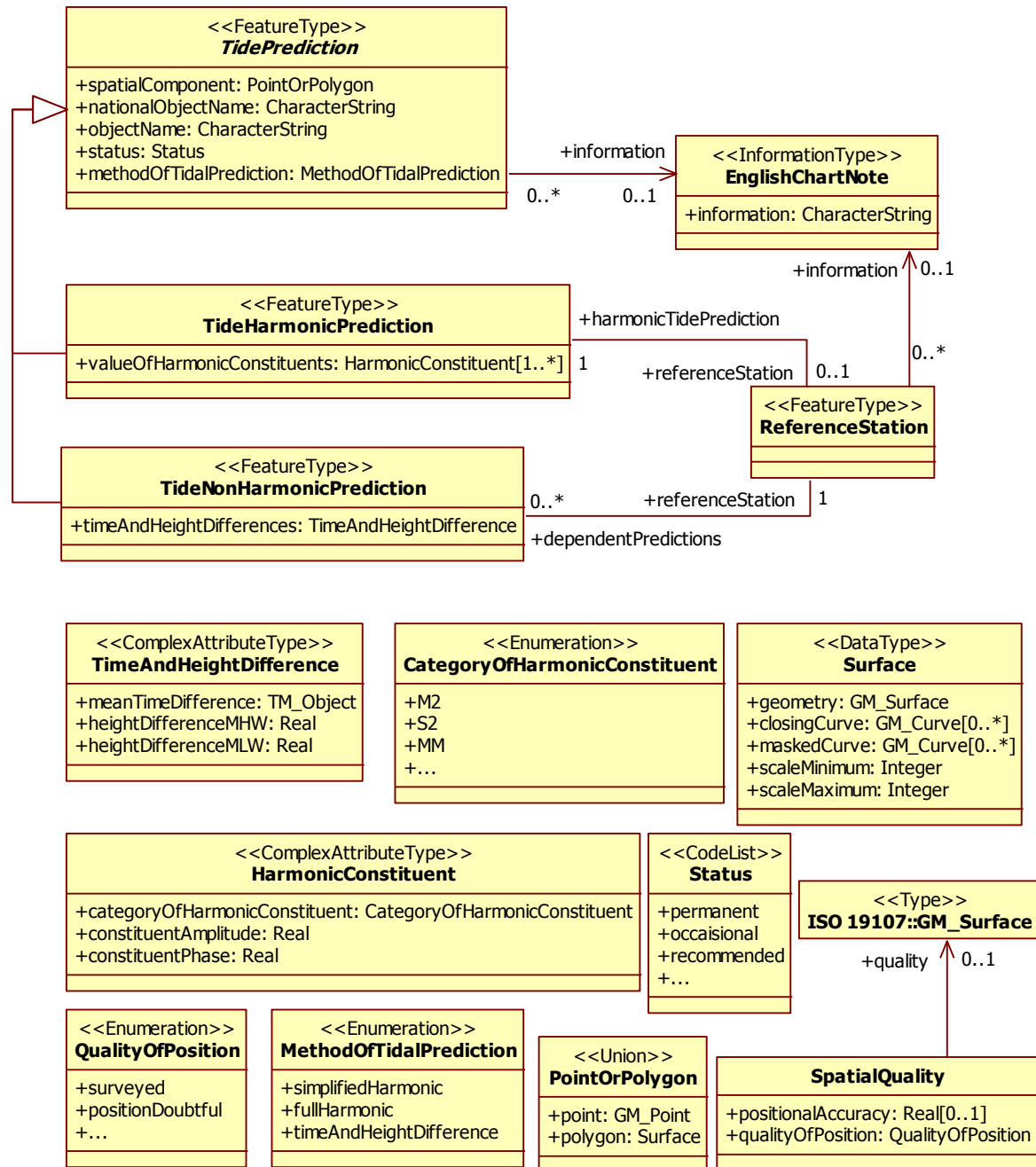


Figure 1-B.1 – Application schema

### B-1.3 Data Content and Structure Scope: GeneralScope

#### B-1.4 Coordinate Reference System

Geodetic Coordinate Reference System		
name	code	WGS 84
scope		Horizontal component of the 3D geodetic CRS used by the GPS satellite system.
Geodetic Datum		
scope		Satellite navigation.
Ellipsoid	semiMajorAxis	6378137m
	inverseFlattening	298.257223563
primeMeridian	greenwichLongitude	0°
Ellipsoidal Coordinate System		
Axis 1		
name	code	Geodetic latitude
axisSymbol		Lat
axisDirection		north
unitOfMeasure		angle
Axis 2		
name	code	Geodetic longitude
axisSymbol		Long
axisDirection		east
unitOfMeasure		angle

Coordinate Reference System Scope: GeneralScope

#### B-1.5 Data Quality

Data Quality Scope: GeneralScope

#### B-1.6 Data Capture

##### B-1.6.1 Data source

Tidal predictions are based on a proprietary mathematical model

##### B-1.6.2 Production Process

A data set conforming to this product specification shall cover an extent of one degree by one degree. Features with surface geometry that cross the edge of product cells shall be split and their geometry shall be specified in the following way, using the class Surface:

Geometry	The polygon geometry specified as the ISO 19107 type GM_Surface
Closing Curve	The segment of the edge of the polygon geometry that coincides with the



	edge of the cell specified as the ISO 19107 type GM_Curve
Masked Curve	The segment of the edge of the polygon geometry that does not coincide with the edge of the cell specified as the ISO 19107 type GM_Curve

Data Capture Scope: GeneralScope

### B-1.7 Data Maintenance

Data are updated as deemed necessary.

Data Maintenance Scope: GeneralScope

### B-1.8 Data Product Format

#### B-1.8.1 Delivery format

Format name	Geography Mark-up Language
Version	3.1.1
Specification	Geography Mark-up Language – GML – 3.0, OpenGIS® Implementation Specification, 7 February 2004, OGC Document Number 03-105r1
Language	English
Character Set	utf8

### B-1.9 Data Product Delivery

#### B-1.9.1 Delivery medium

Medium Name	Compact Disc (CD)
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Data Product Delivery Scope: GeneralScope

### B-1.10 Additional Information

Not applicable

### B-1.11 Metadata

Not Applicable

## Appendix 11-C (Informative) Guidance on Codelists

### C-1 Introduction to Codelists

Product specifications should balance all relevant considerations, e.g., implementation costs, application operational environment, cross-domain reuse, and reduction of maintenance and distribution efforts, when deciding which approach to use for any particular attribute.

### C-2 Modelling

When deciding between using a codelist and enumeration, consider the completeness, stability, source, reuse, and application dependencies of the list of values.

- If the set of allowed values is fixed and reasonably short (say, fewer than 20 values?), an enumeration must be used.
- If the list is fixed but long, an enumeration is preferred but a “dictionary model” codelist may be used.
- If only the likely values of an enumeration are known, or the list may be extended by data producers or the user community, a codelist must be used. Whether the “dictionary” or “open” form is preferable depends on who might add values – if it is maintained by an organization, the dictionary form is preferable, if user communities or data producers may add values, the “open” form is preferable.
- If the allowed values change frequently and the list should be updated without major revisions of the product specification, a codelist may be used. The “dictionary” form may be preferable under these circumstances.
- If application logic or portrayal rules depend on values, an enumeration is preferred but a codelist may be used if the logic/rules can be written to cover all possible values (e.g., using wildcards or defaults), or otherwise allow graceful recovery from unanticipated values.
- Collections which have internal structure (e.g., types and subtypes of vessels) should be modelled as “dictionary” codelists, pending discussion of the matter by ISO TC211.

#### C-2.1 Hierarchies of codelists

A code list may also be used as a super-type for more specific code lists. The vocabulary of the super-type is the union of the vocabularies of its sub-types<sup>2</sup>. If additional values are permitted the super-type must have tag *extensible=true*, otherwise it must have *extensible=false*. Practically, this allows vocabularies developed by different domain expert groups or organizations to be merged.

### C-3 Codelists maintained by external organizations

If there is an existing well-established codelist maintained by a responsible source, it can be referenced in an application schema. The code list should meet the following requirements<sup>3</sup>:

- It must be managed by a responsible source – an official national or international standards body, long-established user community, group, or consortium.
- The codelist and its values must be identified by persistent HTTP URIs.
- The list should be well-maintained i.e. all its values must remain available forever, even if they have been deprecated, retired or superseded.
- The list should be in a dictionary language accepted for use in S-10x product specifications.

<sup>2</sup> Note that the super-type cannot augment the union set with additional definitions. This conforms to the INSPIRE usage but may be worth reconsidered if an argument for such augmentation is made by OEMs, TSMAD, or SNPWG.

<sup>3</sup> Adapted from INSPIRE guidelines.

The IHO may be requested to arrange for the translation, reproduction, and maintenance of codelists meeting only some of the above requirements. Note that this may necessitate a discussion between the IHO and the source.

## **C-4 Data formats of codelist typed attributes**

The codelist model in S-100 is designed to be flexible by decoupling application schema from data format to some extent. Data formats may use “code list extractions” created by extracting codes or values from a codelist dictionary and treat them as ordinary enumerations. The effect is to allow data formats to use either an external dictionary or ordinary enumerations. For example, an XML data format might convert an *ISO3166CountryCodes* codelist maintained by IHO into an XML Schema type:

```
<xs:simpleType name="ISO3166CountryCodesType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="EN"/>
    <xs:enumeration value="FR"/>
    ... other country codes ...
```

As far as implementations using that schema are concerned, it is indistinguishable from an ordinary enumeration. The decision as to which alternative(s) to use in any particular product specification should depend on the circumstances of the data product and its use environment. The decision should be made by the product specification authors when developing the data format. Obviously allowing different data formats to use different representations introduces additional maintenance requirements relating to some data formats, these would be limited to the formats which use “closed” representations (i.e., convert the codelist to an ordinary enumeration).

### **C-4.1 GML and other XML data formats**

Enumeration with pattern: The data format in XML schemas must conform to ISO 19136 E.2.4.9, i.e., a union of an enumeration and a pattern of the form “other: lw{2,}”.

Examples of use (assuming a codelist which explicitly lists “Norwegian” but not Nynorsk and Bokmål):

```
<language>nor</language>      <!-- Norwegian is an explicitly
enumerated value -->
<language>other: nno</language>  <!-- Norwegian Nynorsk is not an
enumerated value -->
```

External Dictionary: The data format in XML schemas must be the XML Schema built-in types *anyURI*. The use of spaces is discouraged.

Example:

In XML schema: Type definition: `<xs:simpleType name="namedSeaType" type="xs:anyURI">` and later (in feature definition): `<xs:element name="namedSea" type="namedSeaType"/>`

In dataset: `<namedSea xlink:href="http://registry.iho.int/cl/s23/1953/1"/>`

### **C-4.2 ISO 8211 encodings**

Enumeration with pattern: To accommodate producer-defined values (“other: xyz”) this can be encoded either as a “text” type (character string) or as a complex attribute with an integer sub-attribute (for the listed allowed values) and a text sub-attribute (the “other:...” values).

External Dictionary: This can be encoded in two ways:

1. A URI data type with value a URI constructed by combining the URI for the vocabulary (dictionary) and the item code. E.g., `http://registry.iho.int/codelist/s23/1953/1` for the Baltic Sea (item 1 in the 1953 edition of IHO publication S23 – Limits of Oceans and Seas).
2. A complex attribute with two sub-attributes: Vocabulary location (URI) and item code (text). To use the same example: sub-attributes are `vocabulary=``http://registry.iho.int/codelist/s23/1953/` and `itemCode=1`.

The first method is recommended as it reduces data complexity.

### **C-5 Dictionary formats**

Use of GML dictionary or SKOS format is recommended. Other formats may be considered under compelling circumstances or after the development of standards in ISO or elsewhere.