

# **S-100 – Annex B**

## **Release Notes**

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## ANNEX B – RELEASE NOTES

### B-1 Release notes for Edition 4.0.0

Clause numbers: Wherever there is no explicit indication of the edition number, clause numbers refer to Edition 4.0.0.

#### B-1.1 Summary of revisions

- 1) The description of the *Time* datatype has been clarified. (**Part 1.**)
- 2) Added Maritime Resource Names (MRN). (**Parts 3, 11**)
- 3) The new ISO standard for metadata (ISO 19115-1:2014 + Amdt. 1:2018) has been introduced in place of the older ISO standard for metadata (ISO 19115:2003 + Correction 1:2006). A corresponding new ISO XML implementation specification (ISO 19115-3) has also been published. The new ISO 19115-3 specification reorganized ISO namespaces in addition to revising the XML types updated by ISO 19115-1. This new implementation specification has resulted in changes to the ISO elements and types that are included in S-100 metadata, S-100 exchange catalogue and discovery metadata, S-100 data types related to the ISO types, and to the S-100 feature catalogue schema. The feature catalogue schema has a new type for the *producer* header element and additional values for security classifications defined in ISO 19115-1. (**Parts 4a, 5.**)
- 4) Revisions to metadata agreed by the IHO S-100 working group have been incorporated. These changes include new metadata attributes and revisions to the data types and multiplicity of certain existing elements. Additional attributes, in particular vertical and sounding datum, can now be omitted if there is no vertical geographic data (e.g., depth, heights, elevation, etc) encoded in the data product. (**Part 4a.**)
- 5) The optional metadata attributes *issueTime* and *epoch* (of horizontal datum) have been added to metadata for harmonization with the metadata in Part 10c (HDF5 encoding) and product specifications under development. (**Part 4a.**)
- 6) Inapplicable or unknown mandatory metadata elements may now be empty (“nilled”), with a reason for nilling them indicated. (**Part 4a.**)
- 7) The ISO model of metadata for services has been added (**Part 4a.**)
- 8) Provisional revisions have been made in the S-100 discovery metadata classes to accommodate digital signatures, data protection, and authentication as described in the latest available draft of the S-100 digital signature, data protection, and authentication specification. (**Part 4a.**) A provisional XML schema for permit files is also included in the Edition 4.0.0 schema distribution. These items are provisional due to the likelihood of changes still to come.
- 9) The feature catalogue model and XML schema have been amended to remove circle/arc by centre points as spatial primitive types. (**Part 5.**)
- 10) The feature catalogue model and XML schema have been updated to harmonize with ISO 19115-1 by updating the *producer* header attribute and the list of allowed classification codes.
- 11) The spatial schema has been extended to include new spline curve geometry types. (**Part 7.**)
- 12) Portrayal has been extended by adding LUA portrayal and scripting. Minor corrections to XSLT portrayal have been made. (**Parts 9, 9a, 13.**)
- 13) The ISO 8211 data format has been extended to provide for encoding spline curve geometry. (**Part 10a.**)
- 14) The GML data format has been extended to provide for encoding spline curve geometry and allow points in curve segments to reference point spatial objects encoded elsewhere in the dataset. Supplementary information for product specification authors and developers of application and production tools has also been added. (**Part 10b.**)
- 15) The HDF5 data format specification has been extended with a common structure designed to be used for all S-100 HDF5 datasets. Supplementary information for product specification authors and developers of application and production tools has also been added. (**Part 10c.**)
- 16) A framework for online data exchange has been added. (**Part 14.**)
- 17) A specification for data protection and authentication has been added. (**Part 15.**)
- 18) Sundry editorial corrections and updates of references (particularly updating ISO 19115 citations to ISO 19115-1) have been made. These changes are not considered to be technically significant. (**Multiple Parts.**)
- 19) A recent UML model of ISO 191xx (about June 11, 2018) has replaced the 2011 model. S-100 figures referencing diagrams and classes from the old model have been updated where this resulted in a change in the model elements’ relationships, classes, or packages. These

changes have not significantly changed the semantics of the affected diagrams. (**Parts 3, 4a, 4b, 8.**)

20) The Portrayal Register model has been updated (**Part 2b**).

## B-2 Detailed change notes

Details about the changes in each Part are provided in the following subsections.

### B-2.1 Part 0 – Overview

- 1) Clause **0-4**: Updated to describe the new Parts 9a, 13, 14, and 15.
- 2) **Multiple clauses**: Editorial updates to replace ISO 19115 references with ISO 19115-1 to harmonize with Part 4a transition to 19115-1.

### B-2.2 Part 1 – Conceptual Schema Language

- 1) Clause **1-4.5.2** (Primitive types) : The description of the *Time* datatype has been clarified in regards to format of local time versus time zones and UTC.

### B-2.3 Part 2 – Management of IHO Geospatial Information Registers

There are no changes<sup>1</sup> to Part 2 in Edition 4.0.0.

### B-2.4 Part 2a – Feature Concept Dictionary Registers

There are no substantive changes<sup>1</sup> to Part 2a in Edition 4.0.0.

### B-2.5 Part 2b – Portrayal Register

- 1) **Multiple clauses**: The model describing information contained in the portrayal register has been updated and a model of portrayal register management added. Definitions and other information items omitted from the documentation tables in Part 2b in Edition 3.0.0 have been added.

### B-2.6 Part 3 – General Feature Model and Rules for Application Schema

- 1) **Multiple clauses**: Editorial updates replacing references to ISO 19115 with 19115-1, 19115-2, or both, to harmonize with Parts 4a & 4b transition to 19115-1 and 19115-2.
- 2) Clauses **3-7.2 & 3-7.3**: Figures 3-4 & 3-5 (Template application schemas for quadrilateral grid and Riemann grid coverages respectively) have been updated to conform the relationships to the same diagrams in ISO 19129 (from which these figures are taken), without change to the semantics.
- 3) Clauses **3-7.2 & 3-7.3**: Association relationship between coverage feature class and metadata class in Figures 3-4 & 3-5 changed to a dependency relationship, to harmonize with the treatment of metadata in the new portions of Part 10c (HDF5 Encoding).
- 4) Clause **3-7.4**: Figure 3-6 (Feature oriented discrete coverage) updated to conform to the ISO model, which does not have a connector between CV\_DiscretePointCoverage and CV\_GridPointValuePair or CV\_GridValuesMatrix as was depicted in the 3.0.0 figure. The new paragraph 2 is added in the text of this clause to explain the new figure.
- 5) Clause **3-10**: New clause on Maritime Resource Name added

### B-2.7 Part 4a – Metadata

#### B-2.7.1 Content

- 1) **General**: This Part has been updated to introduce the revised ISO metadata standard 19115-1:2014 (+ Amdt. 1:2018) in place of ISO 19115:2003 (+ Cor. 1:2006), which has been withdrawn by the ISO. The XML implementation of 19115:2003 metadata was ISO 19139:2007. While 19139:2007 has not yet been formally withdrawn by ISO, a new XML implementation corresponding to 19115-1 has been published as ISO 19115-3.
- 2) **Multiple clauses**: Editorial updates to replace ISO 19115 references with ISO 19115-1, 19115-2, or both, and replace ISO 19139 references with ISO 19115-3. ISO 19115 (2003, as revised and corrected, the metadata standard in S-100 Edition 3.0.0 and earlier editions) and replaced with ISO 19115-1.

<sup>1</sup> These parts will need some changes once the GI Registry and S-99 stabilize.

- 3) **Multiple clauses:** Terminological changes conforming to changes made by ISO 19115-1; e.g., “community profile” for “subset,” “metadata class” for “metadata entity,” “recommended metadata” for “core metadata,” “resource scope” for “hierarchy level” (when indicating whether the subject is a dataset, series, etc),
- 4) Clause **4a-5.1:** Changed language about “geographic extent identifiers”, since this matter has not yet been addressed and the “S-100 Metadata encoding guide” referenced in the footnote does not yet exist. Clause now mentions “identifier codelists” (which have not yet been defined, but would be consistent with the treatment of codelists in ISO 19115-3 and used in the metadata schemas).
- 5) **Multiple clauses:** Attributes renamed or datatypes changed to conform to ISO 19115-1 changes to ISO 19115 attributes:
  - a. Metadata attribute *fileIdentifier* replaced by *metadataIdentifier*. Conforming to the treatment of *fileIdentifier* in Edition 3.0.0, its replacement *metadataIdentifier* is made mandatory in S-100 Edition 4.0.0
  - b. Metadata attribute *parentIdentifier* replaced by *parentMetadata*.
  - c. References to attribute *hierarchyLevel* replaced by *resourceType*.
  - d. Metadata attributes *language* and *characterSet* are now attributes of the class *PT\_Locale* (*language* and *characterEncoding* respectively).
  - e. Character encoding type references UTF-8 instead of ISO 19646-1.
  - f. Metadata attribute *dateStamp* replaced by *dateInfo* (type *CI\_Date*).
  - g. Identifiers use the 19115-1 *MD\_Identifier* class, and indicate the identifier by value defined in a code space and encoded in the *MD\_Identifier.code* attribute.
- 6) **Multiple clauses:** Structural changes to metadata to conform to ISO 19115-1 changes to 19115 structure:
  - a. ISO 19115 class *CI\_ResponsibleParty* replaced by 19115-1 class *CI\_Responsibility*.
  - b. Attributes for resource scope name (mandatory – default “dataset”) and description (free text – optional) added to minimum metadata (Table **4a-1**).
  - c. Locale is indicated by *defaultLocale* and *otherLocale* attributes, both of type *PT\_Locale*, which allows encoding of language, character set, and country using the codes defined in the corresponding ISO standards.
- 7) Clause **4a-1:** Editorial change deleting a sentence in the third paragraph of this clause that repeats a sentence at the end of the first paragraph.
- 8) Clause **4a-2.2:** New clause drawing attention to ISO’s plans for continued availability of the UML models from ISO 19115:2003/Cor 1:2006 and ISO statement that backward compatibility is to be provided using a transformation service.
- 9) Clause **4a-5.2:** Requirement added in paragraph 2 for extensions to metadata to conform to ISO 19115-1 rules, as described in the new Appendix 4a-E.
- 10) Clause **4a-5.4: Table 4a-1** (Minimum metadata for geographic datasets and other resources) updated to conform metadata names, classes, and types to ISO 19115-1. Tables defining the new 19115-1 classes *CI\_Individual* and *CI\_Organisation* added. These classes are used in the *CI\_Responsibility* class.
- 11) Clause **4a-5.5:** Table **4a-4** (Recommended metadata for geographic datasets): The Edition 3.0.0 table 4a-2 (Core metadata for geographic datasets) has been renumbered Table 4a-4 in Edition 4.0.0, retitled to use 19115-1 terminology, and updated to conform metadata names, classes, and types to ISO 19115-1.
- 12) Clause **4a-5.5.** Mandatory metadata attributes are made nillable. If a mandatory metadata attribute is inapplicable or unknown, it may be encoded in the XML metadata file as an element with no content but with a *nilReason* attribute whose value is the reason code for not encoding the attribute. The allowed reason codes are: *inapplicable*, *template*, *missing*, *unknown*, *withheld*.
- 13) Clause **4a-5.6.5:** The information required for describing metadata extensions has been updated to conform to changes made by ISO 9115-1.
- 14) Clause **4a-5.7:** New clause describing metadata for services. Intended for the extension of S-100 in Edition 4.0.0 to cover service-based modes of information exchange as well as transfer-set exchange. This clause is the service-mode counterpart of clause 4a-5.5 which describes metadata for datasets.
- 15) **Appendix 4a-A, Figure 4a-A-1:** Diagram re-titled, class *DQ\_Information* referenced to ISO 19157, and *LI\_Lineage* added to figure (all according to changes introduced in ISO 19115-1).
- 16) **Appendix 4a-A:** New **Figure 4a-A-2** (Service metadata information classes) depicting the identification information for services. ISO 19115-1 service identification information (class *SV\_ServiceIdentification*) is an extension of the abstract class *MD\_Identifier* that adds attributes specific to descriptions of services. S-100 defines an extension of this class that

restricts the service type to names of maritime services, from a list of services that is expected to be defined later jointly with other stakeholders.

- 17) **Appendix 4a-D, Figure 4a-D-1** (Realization of exchange set classes) has been updated to use the generalization of datasets as resources (*DS\_Dataset* and *DS\_Resource*) introduced in 19115-3. In addition, ISO 19115 and 19139 references were updated to ISO 19115-1 and 19115-3.
- 18) **Appendix 4a-D, Figure 4a-D-3 (S-100 Exchange set)** has been updated to make the presence of datasets in an exchange set optional. This change allows exchange sets containing only a feature or portrayal catalogue(s).
- 19) **Appendix 4a-D, Figure 4a-D-4** (Dataset discovery metadata) and following tables:
  - a. **S100\_DatasetDiscoveryMetadata:**
    - i. *protectionScheme* - type is now an enumeration, *S100\_ProtectionScheme*.
    - ii. *digitalSignature* - deleted as redundant
    - iii. *digitalSignatureReference* - type is now an enumeration, *S100\_DigitalSignature*.
    - iv. *classification* – four new values added to the allowed values list, since ISO 19115-1 added them to the *MD\_ClassificationCode* codelist.
    - v. Attributes *purpose*, *specificUsage*, *editionNumber*, *verticalDatum*, *soundingDatum*, and *dataCoverage* made optional, since they are not applicable to all data products. Product specifications should restrict discovery metadata to make them mandatory if appropriate.
    - vi. *producingAgency* - type changed to *CI\_Responsibility* in accordance with ISO 11115-1 replacement of *CI\_ResponsibleParty*.
    - vii. Optional attribute *issueTime* added for harmonisation with the revisions to Part 10c. This attribute can be used to indicate the time of day when the dataset is issued, for data products in which the time of day is significant (e.g., if more than one dataset with the same coverage is issued in a day, such as meteorological data).
    - viii. Optional attribute *epoch* added for harmonisation with revisions to Part 10c. This attribute is intended for indications of the epoch of the geodetic datum used by the coordinate reference system.
    - ix. Attributes *defaultLocale* (mandatory) and *otherLocale* (optional) added to describe the language and character encoding of datasets, as used in ISO 19115-1 and S-100 minimum metadata. Both are of type *PT\_Locale*.
    - x. Attributes *metadataFileIdentifier*, *metadataDateStamp*, *metadataPointOfContact*, and *metadataLanguage* were added to describe the metadata resource itself, as approved by the S-100 working group.
  - b. **S100\_SupportFileDiscoveryMetadata:**
    - i. *digitalSignatureReference* – type changed from character string to enumeration *S100\_DigitalSignature*.
    - ii. *defaultLocale* (type *PT\_Locale*) – optional attribute added to describe character set and language of the support file.
  - c. **S100\_CatalogueMetadata:**
    - i. *digitalSignatureReference* – made mandatory and type changed from character string to *S100\_DigitalSignature*. Feature, portrayal, and interoperability catalogues must be signed.
    - ii. *digitalSignatureValue* – made mandatory.
  - d. **S100\_SupportFileFormat** (enumeration): “LUA” added to support delivery of Lua script files as part of an exchange. Edition 4.0.0 added support for Lua in portrayal.
  - e. **S100\_DataFormat** (enumeration):
    - i. “ISO/IEC 8211 ASCII” removed from this enumeration and “ISO/IEC 8211 Binary” simplified to “ISO/IEC 8211.”
    - ii. “other” replaced by “undefined,” defined to mean the format is defined in the product specification.
  - f. **S100\_ProductSpecification:** Mandatory integer attribute *number* added in order to allow unambiguous specification of S-100 product types.
  - g. **S100\_CatalogueScope** (enumeration): “interoperabilityCatalogue” added to support interoperability catalogue files, which are described in a separate specification (S-98).
  - h. Aggregation associations are now shown in **Figure 4a-D-4** – Edition 3.0.0 includes the aggregations in Figures 4a-D-2 and 4a-D-3 but they were suppressed in Figure 4a-D-4.
  - i. Miscellaneous editorial updates – sundry missing tables and multiplicities were added; aggregation roles from 4a-D-2 and 4a-D-3 were added (with definitions) in the relevant

classes; definitions for attributes or enumeration members were added or corrected; the error in the class name in table S100\_SupportFileFormat was corrected; “Enumeration” replaced the misleading “Class” in the enumeration tables.

- j. S100\_ExchangeCatalogue: Attribute *algorithmMethod*, intended for specifying the compression/archiving method, has been removed. This attribute is not needed in Edition 4.0.0 because only a single method is permitted in Part 15.
- 20) New table documenting the **S100\_SV\_ServicelDentification** class (from Figure 4a-A-2). Note there is not an equivalent diagram to Figure 4a-D-4 for services, because alignment of the standard ISO model of service metadata with Part 14 is undetermined at this time.
- 21) The new **Appendix 4a-E** (Metadata Extensions) has been added. This appendix is an adaptation of the Metadata extension rules provided in Annex C of ISO 19115-1:2014. These rules are meant to be used as a common rule set for how to extend S-100 metadata, and aim to create a common process that gives predictability for implementers.
- 22) **Support for digital signatures:** The type of the *digitalSignatureValue* attribute has been changed from character string to the class **S100\_DigitalSignatureValue** in order to allow the catalogue to contain digital signatures. The structure of digital signatures is defined in Part 15.
- 23) **Support for enumerations of algorithms:** The enumerations **S100\_DigitalSignature** and **S100\_ProtectionMethod** each have a single listed value as specified in Part 15.

### B-2.7.2 Exchange catalogue schema

The exchange catalogue schema has been updated to:

- 1) Update the exchange set structure and element/attribute XML types to conform to the changes to Figure 4a-D-4 described in B-2.7.1 items (19), (22), and (23)
- 2) Replace use of the ISO 19139 XML schemas with ISO 19115-3 XML schemas. The main consequences are a reorganisation of namespaces, changes to the structure of producer and contact identification (due to replacement of *CI\_ResponsibleParty* from ISO 19115 and ISO19139 by *CI\_Responsibility* from ISO 19115-1 and 19115-3) and language/character set description (due to the introduction of *PT\_Locale*).
- 3) Schematron files for exchange catalogue and ISO 19115 metadata updated for replacement of ISO 19139 types and namespaces with ISO 19115-3 types and namespaces.
- 4) File containing language code and character set codes added to schema distribution. This file supplements the ISO TC211 codelists file (March 2018 snapshot), which does not contain codelists for *MD\_LanguageCode* and *MD\_CharacterSetCode*.

### B-2.8 Part 4b – Metadata for Imagery and Gridded Data

- 1) Sundry editorial updates to replace ISO 19115 and ISO 19139 references and citations with ISO 19115-1 and 19115-3 respectively.
- 2) Figure 4b-1 (Metadata packages) updated to replace obsolete depictions of ISO 19115 packages with updated packages from ISO 19115-1 and related ISO standards.

### B-2.9 Part 4c – Metadata – Data Quality

There are no changes to Part 4c in Edition 4.0.0.

### B-2.10 Part 5 – Feature Catalogue

#### B-2.10.1 Part 5 Content

- 1) **Appendix 5-A, Figure 5-A-1** (Feature catalogue UML model) and following tables:
  - a. **S100\_FC\_SpatialPrimitiveType** (enumeration): *arcByCenterPoint* and *circleByCenterPoint* removed from this enumeration.
  - b. **MD\_ClassificationCode** (ISO 19115-1 codelist): Four new values added to classification codes (ISO 19115-1 added the new values).
  - c. **S100\_FC\_FeatureCatalogue:** Type of attribute producer changed from *CI\_ResponsibleParty* to *CI\_Responsibility* (ISO 19115-1 replaced the former with the latter).
- 2) **Table 5-A-8** (S100\_FC\_FeatureType): Editorial corrections to datatype for attribute *featureUseType*.

### B-2.10.2 Feature catalogue schema

- 1) XML types for *S100\_FC\_SpatialPrimitiveType* and *S100\_FC\_FeatureCatalogue* updated in accordance with item (1) in B-2.10.1.
- 2) The S-100 “profile” defined for the feature catalogue contains updated XML types for *CI\_Citation* and *CI\_Responsibility* and their associated types. The updated types correspond to the specifications in ISO 19115-1 and 19115-3. In Edition 3.0.0 they corresponded to the predecessor ISO standards, ISO 19115 and 19139.
- 3) Internal tests were added to check for the existence of feature and information codes named in the subType/superType fields for feature and information types.

### B-2.11 Part 6 – Coordinate Reference Systems

There are no changes to Part 6 in Edition 4.0.0.

### B-2.12 Part 7 – Spatial Schema

This Part was extended to add **new classes for spline geometry**. Since there are deficiencies in the ISO 19107:2003 model, and a new version of ISO 19107 is at advanced stage of development, the approach bridges the existing S-100 model with the anticipated model for the new edition of ISO 19107. Since the new edition of ISO 19107 has not been finalized and published by ISO, it is still subject to change and is not treated as a normative reference in S-100 Edition 4.0.0.

- 1) **Clause 7-4.1.1:** Added the new spline types and new sub-**clause 7-4.1.1.1** explaining the approach to adding splines to the existing S-100 spatial model and the relationship between spline classes in S-100 Part 7 and ISO 19107 classes.
- 2) Sundry updates to **clause 7-1** (Scope) to expand scope to include spline geometry.
- 3) **Clause 7-3** (References): Updated references to ISO standards.
- 4) **Clause 7-1** (Figure 7-1) revised to use package names from up-to-date S-100 and ISO UML models.
- 5) **Clause 7-4.2, Figure 7-3:** Classes modelling spline geometry added to figure.
- 6) **Clause 7-4.2.1** (Curve interpolation): Interpolation types for splines and blended parabolic curve fitting added. The three interpolations for splines (polynomialSpline, bezierSpline, and bSpline) are traditional spline types; the fourth (blendedParabolic) is a curve fitting method used in some NOAA weather information products and considered necessary for certain S-100-based data products.
- 7) **Clause 7-4.2.2** (GM\_CurveSegment): New sub-clause 7-4.2.2.2 describing the semantics of blended parabolic interpolation.
- 8) **Clause 7-4.2.6** (GM\_Curve): Clarification added to sub-clause 7-4.2.6.1 stating that product specifications may restrict curve interpolation types.
- 9) **Clauses 7-4.2.22 – 7-4.2.26:** New clauses describing the new classes for splines and related concepts – generic splines, polynomial splines, knots, and vector.

### B-2.13 Part 8 – Imagery and Gridded Data

- 1) **Multiple clauses:** References to ISO 19115 and 19139 standards, classes, and concepts replaced with the corresponding items from the new ISO metadata standards 19115-1 and 19115-3. Sundry appearances of old S-100 version packages and classes replaced with their Edition 4.0.0 packages/classes without changes to semantics.
- 2) **Clause 8-6.3, Figure 8-18:** The has/describes roles were reversed and have been corrected.
- 3) **Clause 8-7.1.1, Figure 8-20:** The GM\_Point>DirectPosition dependency is not in the ISO 19107 model, so the S-100 model is used to conform to Edition 3.0.0 without changing the ISO model.
- 4) **Figures 8-28 and 8-29:** Updated to conform the relationships to the same diagrams in ISO standards (ISO 19123 and ISO 19129).
- 5) **Appendix 8-E (Edition 3.0.0) - Portrayal of Imagery and Gridded Data:** This appendix has been removed from Edition 4.0.0. This Appendix was designated “informative” in Edition 3.0.0 and the content is mainly general information. It has been removed from Edition 4.0.0 in anticipation of proposals for the simplification of the colour encoding in the portrayal catalogue.
- 6) **Appendix 8-E, Figure 8-E-1:** This was Appendix 8-F in Edition 3.0.0. CV\_GridValuesMatrix has been removed. This is a result of using a more up-to-date ISO model of ISO 191xx classes and relationships. This figure is now more accurate and conforms to ISO 19123 relationships, which S-100 cannot change.



## B-2.14 Part 9 – Portrayal

### B-2.14.1 Content

- 1) **Multiple clauses:** Editorial changes replacing phrasing about “XSLT rules” with “rules” since rule files can now be either XSLT or Lua.
- 2) Clause **9-11.1.5:** Added explicit direction for ordering of drawing instructions with equivalent display priority.
- 3) Clause **9-13.3.24:** Add “Lua” to *FileFormat* enumeration since Lua script files as part of the portrayal catalogue.
- 4) Clauses **9-11.2, 9-11.2.14, 9-12.2, 9-12.2.8:** Added attribute *rotationCRS* to *AugmentedRay* in clause **9-11.2** (Drawing Instruction package) and to *Sector* in clause **9-12.2** (GraphicsBase package). In edition 3.0.0 the XSLT augmented drawing instructions *AugmentedRay*, *AugmentedPath:ArcByRadius*, and *AugmentedPath:Annulus* do not allow for proper portrayal with a rotated chart. Only one CRS is available for all elements of each augmented drawing instruction. In order to render correctly with a rotated chart the direction and length need separate CRSs. This revision adds a rotation CRS which can be used by each of the indicated drawing instructions.

### B-2.14.2 XML Schemas

- 1) The symbol definition XML schema (**clause 9-A-2**) and presentation schema (**clause 9-A-3**) are updated<sup>2</sup> in accordance with item 4) in B-2.14.1 to add attribute *rotationCRS*.

## B-2.15 Part 9a – Portrayal (Lua)

This Part is entirely new in Edition 4.0.0. This part defines the additions and changes to S-100 Part 9 necessary to implement portrayal using the scripting mechanism defined in S-100 Part 13. Products which specify use of a portrayal catalogue as described in this part must also require implementation of S-100 Part 13.

## B-2.16 Part 10a – ISO/IEC 8211 Encoding

- 1) Clause **10a-5.5.1:** The list of topic categories has been extended by adding “disaster,” which was added to the ISO MD\_TopicCategoryCode codelist in ISO 19115-1.
- 2) Clauses **10a-4.5.10.10, 10a-4.5.11, 10a-5.7.5, 10a-5.7.6:** New clauses describing new record types used for representing spline geometry.
- 3) Clause **10a-5.7** (Curve record): Descriptions of the new interpolation types for describing spline and blended parabolic interpolations (clause **10a-5.7.1**) and extensions to the curve record structure (**10a-5.7.2**) have been added. The codes for the new spline and parabolic blending interpolations have been added in the curve segment header field description (**10a-5.7.2.4**).

## B-2.17 Part 10b – GML Encoding

### B-2.17.1 Content

- 1) Clause **10b-8.5.2** (Curve interpolation): Descriptions for the spline and blended parabolic interpolation types have been added.
- 2) Clause **10b-8.7** (Compliance levels): The definition of compliance level 2 extended to include spline and blended parabolic interpolation geometry.
- 3) Clause **10b-9.6** (Dataset general information): Tables documenting the dataset identification header and structure elements have been added in sub-clauses 10b-9.6.1 (Dataset identification information) and 10b-9.6.2 (Dataset structure information).
- 4) Clause **10b-14** (Conventions for S-100 GML formats): New clause describing encoding conventions for developers of GML application schemas for product specifications.
- 5) Clause **10b-15** (Processing of GML datasets): New clause containing hints for developers of applications for processing GML datasets conforming to the S-100 GML profile.

### B-2.17.2 S-100 GML profile – XML schemas

- 1) XML types for the new spline and blended parabolic curve segments have been defined.
- 2) The XML type *LineStringSegmentType* was updated to conform to the *LineStringSegmentType* defined in GML 3.2.1. The GML type allows for a point that may be referenced from other

<sup>2</sup> Preexisting issues: Example files „result.xml“ and „S101Data.xml fail schema validation.

geometry elements or reference another point defined outside of this curve (reuse of existing points), as in the ISO 8211 encoding.

- 3) The curve interpolation types *bezierSpline*, *bSpline*, *loxodromic*, and *blendedParabolic* have been added and *clothoid* has been removed.

## **B-2.18 Part 10c – HDF5 Encoding**

- 1) Clauses **10c-1** (Scope), **10c-5.1.3** (Dataset), **10c-5.1.5** (Datatype), **10c-5.1.6** (Attribute): Miscellaneous clarifications, generally to distinguish HDF5 terms from S-100 terms.
- 2) Clause **10c-2** (References): Now divided into normative and informative references; ISO 8601 and 19123 added to normative references; informative references provided for certain techniques in the representation and processing of gridded data.
- 3) Clause **10c-5.2** (HDF5 Library and processing model): Material specific to HDF5 application libraries has been removed. This material can be found in the HDF5 library documentation.
- 4) Clause **10c-5.2.3** (Prohibited HDF5 constructs): Provides that constructs which cannot be processed using the standard libraries of the HDF5 release specified in this Part must not be used. This is intended to facilitate reusable implementation for different S-100 product specifications.
- 5) Clauses **10c-6** (S-100 profile of HDF5) **through 10c-10** (Common enumerations): New clauses defining a common structure for S-100 HDF5 files (i.e., S-100 datasets encoded in HDF5).
- 6) Clauses **10c-11** (Support files) **through 10c-15** (Updates): Related rules, guidelines, and information, relevant to HDF5 exchange sets but not directly about the structure of HDF files.
- 7) Clause **10c-16** (Summary of data model for HDF5 datasets): Elaboration of structural model of HDF5 files.
- 8) Clause **10c-17** (Rules for product specification developers): Rules for developers of product specification that use an S-100 HDF5 data format.
- 9) Clause **10c-18** (Implementation guidance): Guidance for application and production software developers.

## **B-2.19 Part 11 – Product Specifications**

- 1) **11-7.4** Amend section to recommend MRN concept as preferred method of creating unique identifiers.
- 2) **Appendix 11-d** (Product specification template): The template has been updated to change references to ISO 19115 to ISO 19115-1, add the new classification codes introduced by ISO 19115-1, and update the exchange catalogue documentation tables according to Edition 4.0.0 revisions in Part 4a.
- 3) **Appendix 11-e** (Guidance on Unique Identifiers): New annex on MRN.

## **B-2.20 Part 12 – S-100 Maintenance Procedures**

There are no changes to Part 12 in Edition 4.0.0.

## **B-2.21 Part 13 – Scripting**

This part is entirely new in Edition 4.0.0. This part defines a standard mechanism for including scripting support in S-100 based products. Scripting provides for processing of S-100 based datasets via script files written in the Lua programming language.

## **B-2.22 Part 14 – Online communication framework**

This part is entirely new in Edition 4.0.0. This part describes the components and processes needed to specify an online exchange of information.

## **B-2.23 Part 15 – Data Protection Scheme**

### **B-2.23.1 Content**

This Part is entirely new in Edition 4.0.0. This part specifies the mechanisms, structures and content required for the implementation of copy protections and/or authentication methods by S-100 product specifications. It defines standardised methods and algorithms for the encryption of file based components of datasets as well as feature and portrayal catalogues. Algorithms and methods for the production of digital signatures are defined as well as the surrounding infrastructure required for key management and identity assurance within the IHO Data Protection Scheme.

### **B-2.23.2 Schema**

An initial draft of the XML schema for permits file is included in the Edition 4.0.0 schemas.

### **B-2.24 Annex A – Terms and definitions**

Terms and definitions pertaining to scripting and online data exchange have been added.