S-98

Annex A

S-100 ECDIS Data Constraints

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Document History

Changes to this Annex are coordinated by the IHO S-100 Working Group.

New editions will be made available via the IHO web site.

Version Number	Date	Approved By	Purpose
2.5.2	January 2026		Initial version of DC Annex for WG review
3.0.0	March 2026	J Pritchard	Updates following comment adjudication meetings and TSM meeting. Version for HSSC.
3.0.0	October 2026		Published S-98 Annex A Edition 3.0.0.

1 Overview

This Annex reproduces and expands selected content from the main S-98 specification, focusing on clauses which apply not to ECDIS implementers, but to data producers. These clauses inform data producers on restrictions on data in order for it to be compatible with S-100 ECDIS which conform to S-98.

This annex does not define any extra requirements for S-100 ECDIS manufacturers over those defined in S-98 itself.

This annex presents data constraints in order for data to be used on S-100 ECDIS. To enforce data constraints a combination of DCEG and Validation tests should be used.

1.1 Scope

This Annex is intended for S-100 data producers and those involved in the management of the IHO infrastructure supporting S-100 ECDIS implementation and operation. The constraints documented here support the production of datasets which are to be used on S-100 ECDIS.

NOTE: "**S-100**" in this document and its Parts, Annexes, or Appendices means S-100 Edition 5.2.0 (any clarification).

1.2 Terms, definitions and abbreviations

1.2.1 Terms and Definitions

1.2.2 Abbreviations

AIS	Automatic Identification System
CRS	Coordinate Reference System
DCEG	Data Classification and Encoding Guide
ECDIS	Electronic Chart Display and Information System
ENC	Electronic Navigational Chart
EPSG	European Petroleum Survey Group
FC	Feature Catalogue
IEC	International Electrotechnical Commission
IHO	International Hydrographic Organization
IMO	International Maritime Organization
ISO	International Organization for Standardization
GFM	General Feature Model
OEM	Original Equipment Manufacturer
OGC	Open Geospatial Consortium
PC	Portrayal Catalogue
PS	Product Specification
SOLAS	Safety of Life at Sea (Convention)
UI	User Interface
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
XML	eXtensible Markup Language

XSD XML Schema Definition (a format for formally describing the elements in an XML document)

XSL eXtensible Stylesheet Language

XSLT XSL Transformations

1.3 How to use this Annex

This Annex contains a set of ECDIS data constraints. These are not intended for S-100 ECDIS implementers, nor do they constitute requirements for S-100 ECDIS. They consist of mandatory requirements for data which is intended for use on S-100 ECDIS and are thus pre-requisites for correct operation of such systems.

Future clarifications and revisions of this Annex will enhance the data encoding and production guidance for producers contained here, and such enhancements will not be added to the main S-98 document.

2 Provision of S-100 Schemas and Supporting files

IHO provide XML Schemas to support S-100 development, and XML feature and portrayal catalogues for each product specification supported by S-100 ECDIS. These are all provided through the IHO GI Registry.

It is vital that feature and portrayal catalogues are correct, conformant to S-100 schemas and pass all S-158 validation checks.

3 GML Coverage formats in exchange set catalogues

3.1 Introduction

GML is used as an integral part of S-100 Part 17, specifically in the XML elements defined by the Exchange Catalogue Schema. For the purpose of representing coverage objects in CATALOG.XML, however only a very small number of possibilities are required. Implementers benefit from a tighter standardization through a reduction of the CATALOG.XML coverage polygons.

3.2 Specification

In order to simplify the job of S-100 implementers for CATALOG.XML the only requirement is for a representation which encodes a simple, connected polygon with a single exterior and 0 or more holes.

Such polygons will be implemented using the GML vocabulary implemented in the included S-100 schemas as follows:

```
<S100XC:boundingPolygon>
     <gex:polygon>
         <gml:Polygon gml:id="DC1">
             <gml:exterior>
                 <gml:LinearRing>
                     <gml:posList srsName="http://www.opengis.net/def/crs/EPSG/0/4326">0.0
0.0 1.0 0.0 1.1 1.1 0.0 1.0 0.0 0.0</gml:posList>
                 </gml:LinearRing>
             </gml:exterior>
             <gml:interior>
                 <gml:LinearRing>
                     <gml:posList srsName="http://www.opengis.net/def/crs/EPSG/0/4326">0.25
0.25 0.75 0.25 0.75 0.75 0.25 0.75 0.25 0.25</gml:posList>
                 </gml:LinearRing>
             </gml:interior>
           </gml:Polygon>
       </gex:polygon>
</S100XC:boundingPolygon>
```

This implements bounding Polygons restricted to a single GML Polygon (with a gml:id with an SRS defined in each of the posList coordinates of http://www.opengis.net/def/crs/EPSG/0/4326) with a single exterior element and optional (i.e. 0 or more) interior elements. Each exterior or optional interior is a Linear Ring with >=4 coordinate pairs expressed as a single space separated posList (with no leading or trailing spaces), with the first and last coordinate pair being identical, i.e. the Linear Ring is closed. For example:

```
<gml:posList srsName="http://www.opengis.net/def/crs/EPSG/0/4326"><gml:posList
srsName="http://www.opengis.net/def/crs/EPSG/0/4326">44.4736122 -63.6849136
44.7395111 -63.6849136 44.7395111 -63.4249994 44.4736122 -63.4249994 44.4736122 -
63.6849136</gml:posList>
</gml:posList>
```

Coordinate order is always as per http://www.opengis.net/def/crs/EPSG/0/4326, latitude followed by longitude.

No further stipulations are required as geometry must also conform to the S-100 geometry model and be conformant with the XML Schema for exchange catalogues.

4 GML geometry definitions

In order to provide a simplified vocabulary of GML format geometry to S-100 ECDIS implementations restrictions are specified in this section for datasets encoded for ECDIS. These restrictions reduce the number of different S-100 and GML elements used to specify S-100 geometry. S-100 ECDIS are only required to support these restricted forms of geometry (supported by test data in S-164), and datasets using other geometric forms is not guaranteed to be portrayed correctly.

GML Schemas **must** use the following elements to specify geometry:

1. S100:pointProperty
2. S100:curveProperty
3. S100:surfaceProperty

to represent either Point, Curve or Surface geometry.

The only allowable methods for representing geometry in an S-100 ECDIS GML dataset are as follows:

1. Geometry by reference. This is done by specifying a series of geometry elements between the dataset identification element and the members element of the GML dataset. The geometry is then referenced with an xlink:href = “[geometry reference]” element in the geometry element of each feature, according to the following rules
    a. Point `<S100:pointProperty xlink:href="[Point Reference]">`
    b. Curve`<S100:curveProperty xlink:href="[Curve Reference]">`
    c. Surface`<S100:surfaceProperty xlink:href="[Surface Reference]">`
    Geometry by reference may only be specified using the same structures defined in the inline geometry in the next section.
2. Inline Geometry where geometry is specified in geometry elements with the feature. The following geometry types are possible (described in the next clause).
    a. Point
    b. Curve
    c. Surface

These two methods may be mixed in a dataset, i.e. a dataset may contain a mixture of geometry by reference and inline geometry.

4.1 Geometry Specifications

The only allowable geometry elements are defined in this section. This restricts how pointProperty, curveProperty and surfaceProperty are defined, and how CRS and positions are defined within those elements.

4.2 Referenced Geometry definitions

4.2.1 Point Definition

Points are restricted to a single S-100 Point (with a unique gml:id with an SRS defined in the pos element equal to http://www.opengis.net/def/crs/EPSG/0/4326). Points have a single pos element only with no leading or trailing whitespace or newlines..

Coordinate order is always as per http://www.opengis.net/def/crs/EPSG/0/4326, latitude followed by longitude.

```
  <S100:Point gml:id="P4">
    <gml:pos srsName="http://www.opengis.net/def/crs/EPSG/0/4326 >44.6374842 -
63.5398854</gml:pos>
  </S100:Point>
```

4.2.2 Curve Definitions

Curves are restricted to a sequence of S-100 Curves (each with a unique gml:id with an SRS defined in the posList element of http://www.opengis.net/def/crs/EPSG/0/4326). Each S-100 Curve is expressed as a either

- A single LineStringSegment with >=2 coordinate pairs expressed as a single space separated posList element with no leading or trailing whitespace or newlines.
- A single arc by centre point, formatted as below
- A single circle by centre point, formatted as below

Where a curve is expressed as >1 S-100 Curves, the end point of each curve must equal the starting point of the next curve in the sequence (except for the last curve in the sequence)

For all curves, coordinate order is always as per http://www.opengis.net/def/crs/EPSG/0/4326, latitude followed by longitude.

```
  <S100:Curve gml:id="C1">
    <gml:segments>
      <gml:LineStringSegment>
        <gml:posList srsName="http://www.opengis.net/def/crs/EPSG/0/4326”>44.6082209 -
63.5624050 44.6128528 -63.5531755 44.6242519 -63.53563 44.6243644 -63.5356044 44.6248663 -
63.5355775 44.6249761 -63.5355365</gml:posList>
      </gml:LineStringSegment>
    </gml:segments>
  </S100:Curve>
```

The use of Arc by centre point and Circle by centre point are permitted as curve segments. These are formatted as in the examples below. Here the gml:id must be unique and the unit of measurement restricted to metres (“m” for the radius) and all angles measured in 0-360 degrees. The S-100 GML Schemas contain documentation on the use of these curves.

```
  <S100:Curve gml:id="C2">
    <gml:segments>
      <S100:S100_ArcByCenterPoint>
        <gml:pos srsName="http://www.opengis.net/def/crs/EPSG/0/4326”>10.4 56.2</gml:pos>
        <S100:radius uom="m">10</S100:radius>
        <S100:startAngle>35.4</S100:startAngle>
        <S100:angularDistance>25.4</S100:angularDistance>
      </S100:S100_ArcByCenterPoint>
    </gml:segments>
  </S100:Curve>

  <S100:Curve gml:id="C3">
```

```
    <gml:segments>
      <S100:S100_CircleByCenterPoint>
        <gml:pos srsName="http://www.opengis.net/def/crs/EPSG/0/4326”>10.4 56.2</gml:pos>
        <S100:radius uom="m">10</S100:radius>
        <S100:startAngle>25</S100:startAngle>
        <S100:angularDistance>360.0</S100:angularDistance>
      </S100:S100_CircleByCenterPoint>
    </gml:segments>
  </S100:Curve>
```

4.2.3 Surface Definition

Surfaces are restricted to a single S-100 Surface (with a unique gml:id with an SRS defined in each of the posList coordinates of http://www.opengis.net/def/crs/EPSG/0/4326). The surface is made up of a single PolygonPatch with a single exterior element and optional (i.e. 0 or more) interior elements. Each exterior or optional interior is a Linear Ring with >=4 coordinate pairs expressed as a single space separated posList, with no leading or trailing whitespace or newlines, and with the first and last coordinate pair being identical, i.e. the Linear Ring is closed.

Coordinate order is always as per http://www.opengis.net/def/crs/EPSG/0/4326, latitude followed by longitude.

```
      <S100:Surface gml:id=”SID1”>
         <gml:patches>
            <gml:PolygonPatch>
               <gml:exterior>
                  <gml:LinearRing>
                     <gml:posList srsName="http://www.opengis.net/def/crs/EPSG/0/4326”> -
32.5074613 60.9869316 -32.5073961 60.9907965 -32.5101102 60.9906445 -32.5101320 60.9868882
-32.5074613 60.9869316</gml:posList>
                  </gml:LinearRing>
               </gml:exterior>
            </gml:PolygonPatch>
         </gml:patches>
      </S100:Surface>
```

4.2.4 Referencing Geometry from feature geometry

Referenced geometry is referenced from the individual feature geometry elements as standard GML references, as defined by the GML Schemas. For example, the referenced geometry defined in the previous subsection is referenced using the following elements (here the “*SXXX*” is the product specification-specific namespace prefix):

```
      <SXXX:geometry>
        <S100:pointProperty xlink:href="P4"/>
      </SXXX:geometry>

      <SXXX:geometry>
        <S100:curveProperty xlink:href="C1"/>
      </SXXX:geometry>

      <SXXX:geometry>
        <S100:surfaceProperty xlink:href="DataCoverage.1.S"/>
      </SXXX:geometry>
```

4.3 Inline definitions

Inline geometry follows the same structure as the referenced geometry definitions. Each point, curve or surface (defined as in the previous section) are wrapped by the appropriate property element, pointProperty, curveProperty and surfaceProperty for S-100 point, curve and surface primitives respectively and included in the geometry element of the required feature.

These are shown in the following inline definition examples.

4.3.1 Allowed Point Structure [inline geometry]

```
  <S100:pointProperty>
      <S100:Point gml:id=”P1Ex1”>
          <gml:pos srsName="http://www.opengis.net/def/crs/EPSG/0/4326”>-32.5074613
60.9869316</gml:pos>
      </S100:Point>
  </S100:pointProperty>
```

4.3.2 Allowed Curve Structure [inline geometry]

```
 <S100:curveProperty>
     <S100:Curve gml:id=”C1Ex1”>
        <gml:segments>
            <gml:LineStringSegment>
               <gml:posList srsName="http://www.opengis.net/def/crs/EPSG/0/4326”>-
 32.5074613 60.9869316 -32.5073961 60.9907965 -32.5101102 60.9906445 -
 32.5101320</gml:posList>
            </gml:LineStringSegment>
       </gml:segments>
    </S100:Curve>
 </S100:curveProperty>
```

4.3.3 Allowed Polygon GML Structure [inline geometry]

```
<S124:geometry>
   <S100:surfaceProperty>
      <S100:Surface gml:id=”SID1”>
         <gml:patches>
            <gml:PolygonPatch>
               <gml:exterior>
                  <gml:LinearRing>
                     <gml:posList
srsName="http://www.opengis.net/def/crs/EPSG/0/4326”> -32.5074613 60.9869316 -
32.5073961 60.9907965 -32.5101102 60.9906445 -32.5101320 60.9868882 -32.5074613
60.9869316</gml:posList>
                  </gml:LinearRing>
               </gml:exterior>
            </gml:PolygonPatch>
         </gml:patches>
      </S100:Surface>
   </S100:surfaceProperty>
</S124:geometry>
```

5 Enhanced Safety Contour and Water Level Adjustment data requirements, datums, validation, safety

5.1 Enhanced Safety Contour data constraints

1. Portrayal of S-102 data and application of ESC must be restricted by minimum and maximum display scale values contained in the exchange catalogue as specified in the S-98 Main document, Section 11.2.
2. Coverage – S-102 data is not expected to overlap, but in case of an overlap of greater than one grid cell[1] the ECDIS must indicate an overlap by the text “OVERLAP” and the user will have the ability to select which producer in the overlapped area has priority and will be selected for processing safety contour. An alternative mechanism for selecting which producer in the overlapped area has priority may also be implemented by the ECDIS:
    a. Overlaps are strictly defined as those between grid cells containing data, as opposed to grid cells with no-data (fill) values. Datasets may contain overlapping grid cells, and different datasets may overlap, most commonly at national borders, but also in areas where there are multiple vertical datums within a single dataset.
3. No complex interpolation is calculated between points in the S-102 grid. Nearest neighbour is used to define the depth in each S-102 point's neighbourhood (that is, the same depth everywhere within the grid square), regardless of any interpolationType defined for the S-102 dataset (S-100 Part 8, clause 8-7.1.4), as illustrated by Figures D-1-2 and D-1-3:

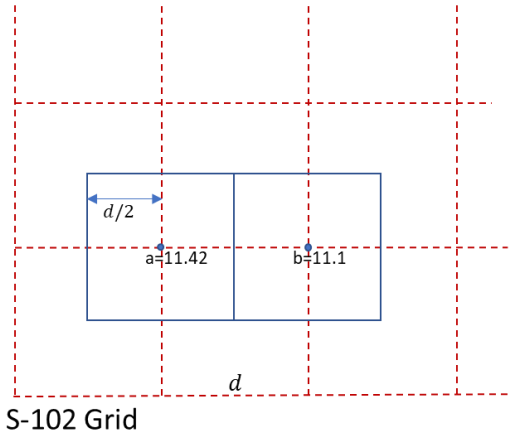


Figure D-1-2 - The extents of the S-102 points overlaid on the S-102 grid (grid spacing = ‘d’)

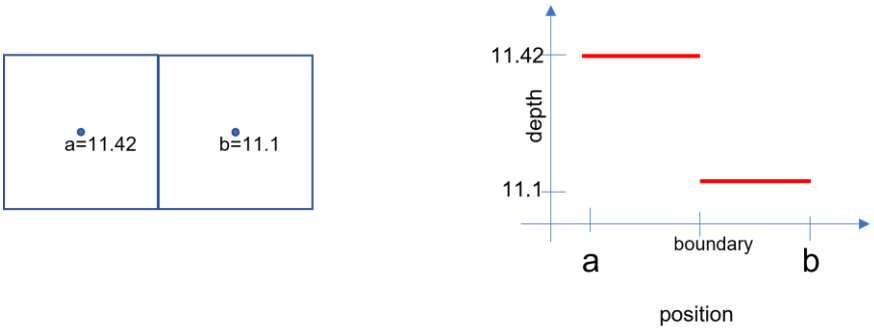


Figure D-1-3 - Extents of each S-102 points showing nearest neighbour interpolation (S-100 Part 8-7.1.4)

4. Only rectangular grids for S-102 are allowed. The method outlined may be extended to other grids; for example, triangular grids in the future.
5. Enhanced Safety Contour will only be provided in areas where the Sounding Datum of suppressed S-101 features is the same as the vertical datum of the S-102 Coverage.

[1] In the case of a difference in resolution the maximum overlap is the size of the larger of the overlapping grid cell.

6. When the Uncertainty selector is enabled the vertical uncertainty information will be taken into account when extracting depth data from S-102 datasets.

5.2 Water Level Adjustment data constraints

1. Coverage – As for S-102 data, S-104 datasets are not expected to spatially overlap within the same scale range, but in case of an overlap of greater than one grid cell[2] the approach must be same as for overlapping S-102 data.
2. As with S-102, each S-104 point is assigned a rectangular extent with nearest neighbour interpolation.
3. As with S-102, each S-104 value used in calculations must additionally take into account the vertical uncertainty values contained within the dataset when the Uncertainty selector is enabled.
4. WLA must not be applied unless the S-102 and S-104 features are on the same vertical datum. If the S-102 and S-104 features are not on the same vertical datum then an indication “Incompatible vertical datums” must be given to the user.

6 Digital Signature Certificate Information

IMO Performance Standards (MSC.530(106)/Rev.1 section 1.5) states that ECDIS should enable the mariner to execute all route planning, route monitoring, and positioning and sections 3.3-3.4 mean that the ENDS and System Database may contain information from nautical publications as well as ENCs.

The official status of data delivered to the ECDIS is defined by the value of a role. This is encoded in the ST field of the X.509 certificate referenced in the mandatory digital signature accompanying content in the exchange set catalogue. Digital signatures are mandatory for any data imported into the ECDIS, whether official or not. The mandatory fields within every authenticating certificate are defined as:

- **C** (Country) = ISO Country Code of state making request
- **ST** (State or Province) = A code reflecting the role of the signing entity (below)
- **O** (Organisation) = member state organisation name (text) or other organisation name
- **CN** (Common Name) = IHO data producer code integer and alpha code (as part of a colon separated MRN), e.g. **urn:mrn:iho:00AA:01810** or **urn:mrn:iho:GB00:00540**. For digitally signed datasets, the CN data producer integer and alpha code elements in the MRN of at least one of the authenticating certificates must match those contained in the dataset and its CATALOG.XML entry.

For ECDIS, the ST code holding the role determines whether a dataset or supporting resource is non official or official. The following codes are supported by the IHO data protection scheme:

- For S-100 datasets or supporting resources the following roles define official data.
    - **DATA_PRODUCER** Data Producers – producing data content for live navigation under SOLAS. This data is “official”
    - **DATA_AGGREGATOR** RENCs/Aggregators – validate, distribute and (sometimes) digitally sign data on behalf of their members. These organisations do not create data content, except for generation of S-128 datasets but can sign data as “official”
- S-128 datasets used for ECDIS Update Status reports. These datasets may also be authenticated by:
    - **AGGREGATOR** S-128 producers – aggregate data together for the purposes of running a service for end users. They create and digitally sign S-128 datasets which support their service offering and the production of update status reports
- Catalogues
    - **SCHEME_ADMINISTRATOR** The Scheme Administrator, the IHO. Only digitally signed catalogues with a certificate authenticated by the scheme administrator may be loaded onto the ECDIS.

[2] In the case of a difference in resolution the maximum overlap is the size of the larger of the overlapping grid cell.

ST field values using the role **OTHER_DATA_PRODUCER** (or any other value not included in the list above, or those not conforming to the CN MRN format above) represent data or catalogue content which is non official.

7 Datasets and Support Files on ECDIS

Exchange sets delivered to ECDIS must only contain

- S-100 datasets, any required dataset support files, S-100 catalogues (feature and portrayal catalogues)
- language packs, referred to as “system support files”.

As defined in S-100 Part 17, each dataset support file references one or more datasets which contain a reference to it. Language packs (S-100 Part 18) reference the feature catalogue they refer to.

- All dataset support files except the graphic formats must use UTF-8 encoding.
- System support files (feature and portrayal catalogues, and language packs) are in XML format.

7.1 Management of automatic updates to Dataset Support files

Dataset names in S-100 are unique (S-100 Part 17). Dataset support files are referenced to one or more datasets in the exchange catalogue metadata. This allows dataset support files to be shared between multiple datasets.

The ECDIS supports the management of dataset support files. As with datasets, dataset support files are managed using the Exchange Set metadata field S100_SupportFileRevisionStatus. This field defines whether a dataset support file included in an exchange set is new, a replacement or should be deleted. The behaviour of each value of S100_SupportFileRevisionStatus is described below:

- *new* – A new dataset support file to be installed on the system
- *replacement* – a replacement for an existing dataset support file with the same name.
- *deletion* – deletion of the dataset support file with the given name (subject to the guidance in this section)

When a feature pointing to a text, picture or application file is deleted or updated so that it no longer references the dataset support file, the ECDIS checks to see whether any other feature references the same dataset support file, before that dataset support file is deleted.

Similarly, when a dataset support file is marked for deletion by a CATALOG.XML entry then the ECDIS checks that the support file is not used by any other datasets prior to deletion.

7.2 Management of datasets on ECDIS

7.2.1 S100_Purpose and Cancellations

The method for detecting whether a dataset is a New dataset/edition, re-issue, cancellation, or update is contained in the Exchange Set metadata field S100_Purpose.

The behaviour of each is described below; note that individual Product Specifications may not implement all types of dataset state. All datasets include an issue date, and optionally an edition and update number.

These are the only states for S100_Purpose which are required to be implemented by S-100 ECDIS.

- New dataset – install new dataset and any included updates and record for tracking purposes.
- New Edition – replace numbered old Edition and its updates with the New Edition dataset
- Update – apply the numbered update and retain for tracking purposes. See S-98 Main Document 19.4. Where updates cannot be applied a permanent indication “Chart information not up to date” must be available in the chart display area when such a chart is in use (either displayed on chart area or used as largest scale available for chart related alerts and indications). This is also referenced by the ECDIS Update Status Report, Appendix C.

- Re-issue - replace the original datasets and its updates up to the date of the issue with the reissued dataset. Retention of the old issue should be as specified in the Product Specification. After a re-issue, subsequent updates may be incorporated from this reissue or from the original data kept continuously updated.
- Cancellation – cancellations are achieved either by the application of a cancellation update, or by the use of a fileless cancellation mechanism. The ECDIS must delete the cancelled dataset and any updates as specified in S-100 17-4.4.1
- Fileless Cancellation of datasets is achieved by the receipt of a dataset discovery metadata entry with no accompanying datafile but with a digital signature matching the original Data Producer signature, and the S100Purpose set to “cancellation”. Additionally a cancellation signature, a signature of the original Data producer signature must be present and valid.

8 Gridded Data Formats and Projections

8.1 S-102, S-104 and S-111

Coverage and time series features are encoded in the HDF5 format (see S-100 Part 10c). S-100 provides for the following types of coverage and time series data:

- Gridded data with different types of spatial grid coverages;
- Data at a set of discrete fixed points;
- Data at a set of moving platforms;
- Time series data at a set of fixed points.

For S-102 and S-104 datasets, ECDIS must support gridded data in DCF 2 format only (noting the one exception that S-102 *QualityOfBathymetryCoverage* group uses DCF 9). For S-111 datasets, ECDIS must support gridded data in DCF 2 or DCF 3 format only

Gridded data will specify either continuous or discrete interpolation (no interpolation between points) between grid points. Data for discrete fixed points, moving platform and time series at fixed points is intrinsically discrete.

8.2 Support for Projected Data

ECDIS supports the import of data products using unprojected geographic latitude and longitude values. Additionally, ECDIS supports the import of S-102 and S-104 data products using coordinates which are projected using either UTM or UPS projections. Formulas for conversion of such coordinates back to unprojected latitude and longitude values are contained in appendix H of S-98.

9 Compatibility of different feature and Portrayal catalogues, and edition numbers

The versioning of Feature and Portrayal catalogues follows the same rules as S-100, which uses a three-part version number (*Edition.Revision.Clarification*). The significance of each component is summarised below:

- Edition: New Editions introduce significant changes, such as the ability to support new functions or applications; or the introduction of new constructs or data types. New Editions are indicated by incrementing the *Edition* component of the version number and resetting the other components to 0.
- Revision: Revisions introduce substantive semantic changes. New Revisions are indicated by incrementing the *Revision* component of the version number and resetting the *Clarification* component to 0.
- Clarification: Clarifications are non-substantive changes. Typically, Clarifications remove ambiguity; correct grammatical and spelling errors; amend or update cross references; and/or insert improved graphics, spelling, punctuation and grammar. Clarifications must not cause any substantive semantic changes. Changes in a Clarification are minor and ensure backward

compatibility with the previous versions within the same Edition. Clarifications are indicated by incrementing the Clarification component of the version number.

Type of Change	Example	DPS	FC	PC
Major Change including an S-100 version change	New Concept in S-100, used in S-101	✖.0.0	✖.0.0	✖.0.0
New content	Attribute value / Feature added or removed	A.✖.0	A.✖.0	A.✖.0
FC correction, no content or portrayal impact	Clarification of definition	A.B.-	A.B.✖	A.B.-

Each dataset has a product specification edition number contained within it. These are located as follows:

1. ISO8211 datasets (S-100 Part 10a). The “PRED” field of the DSID record in the dataset.
2. GML Datasets (S-100 Part 10b). The “ProductEdition” element of the DatasetIdentification element in the GML dataset header.
3. HDF5 datasets (S-100 Part 10c) – Root Group “Product Specification” metadata value, S-100 Part 10c

And have the following common format:

INT.IHO.[S-XXX].A.B[.C] where:

S-XXX is the IHO product specification, for example S-101, S-102 etc..

A.B and, optionally encoded, **.C** are the Edition, Revision and clarification numbers as above.

For example, for an S-101 ENC dataset conforming to feature catalogue 1.4.1 the DSID PRED field contains:

INT.IHO.S-101.1.4.1 or INT.IHO.S-101.1.4

Catalogues are identified by the following XML elements

- Feature Catalogue: S100XC: **productid** and S100XC:**versionNumber**
- Portrayal Catalogue: **productid** and **version** attributes of the PortrayalCatalogue root element of the portrayal_catalogue.xml contained in the root level of the compressed portrayal catalogue archive.

9.1 Portrayal and Feature Catalogue compatibility

1. Compatible datasets have identical Edition and Revision numbers.
2. Portrayal Catalogues compatible with Feature catalogues also have identical Edition and Revision Numbers.
3. Editions with different clarification numbers but identical Edition and Revision numbers are all compatible.
4. So, it must always be possible to process[3] datasets conforming to a Clarification with the Feature and Portrayal Catalogues for an earlier Clarification within the same Edition and Revision.

[3] In this context “process” means import/load, portray and query on the ECDIS. The key concept here is that datasets conforming to a clarification are fully compatible with both earlier and later clarifications of the product specification from the ECDIS operational perspective.

9.2 Construction of Feature and Portrayal Catalogues

As stated in Section 2 IHO produces a set of operational, normative Feature and Portrayal Catalogues for each product specification listed in S-98.

The Portrayal Catalogue for a product contains the set of parameters which are used in the portrayal processing for that product. This set may be different for different products. Context parameters are used for passing portrayal-related configuration information and user settings to portrayal processing, and the values of context parameters may therefore be changed by user functions, including those defined in the IMO Performance Standard, or manufacturers' custom user functions.

In order to be able to use the official Portrayal Catalogue for a data product, manufacturers must implement all the context parameters listed in the Portrayal Catalogue.

Context parameters may be added or removed by updates to the Portrayal Catalogue. Context parameters which cannot be automatically associated with ECDIS display functions or user interface features must be exposed to the Mariner for use.

Context Parameters representing mandatory IMO Performance Standard functionality will not be removed, edited or renamed by portrayal catalogue updates. The set of context parameters exposed to the Mariner is thus the superset of all those defined by the portrayal catalogues in use.

10 ECDIS Dual Fuel Mode

10.1 Concurrent applicability of S-52 and S-57

Dual-fuel capable systems must continue to use the principles defined in S-57 and S-52 for the presentation of chart data that conforms to S-57 instead of S-101. The principles of S-101 and this specification must be concurrently applied where S-101 data is displayed.

This includes the case where one part of the chart window has S-101 data as the chart layer and another has S-57 data as the chart layer – S-57/S-52 applies to the portion where S-57 data is the chart layer and S-101 and this specification apply where S-101 data is the chart layer.

There is no requirement on S-100 ECDIS to prioritise the loading or portrayal of S-101 ENCs over S-57. An S-57 ENC which overlaps an S-101 ENC, where the compilation scale (or M_CSCL values) lie between the *optimumDisplayScale* and *minimumDisplayScale* may be treated as an overlap as described in clause 11.1.

11 Data Overlaps

11.1 Overlaps and gaps in ENC coverage

There may be cases where ENCs in the same scale range overlap. Such may be the case at agreed adjoining producer data limits, where, if it is difficult to achieve a perfect join, an overlapping buffer zone of up to 5 metres may be used.

11.2 Overlaps and gaps in other S-100 datasets

Overlaps between S-102 and S-104 data is dealt with in Section 5.

12 Exchange Set metadata

Data is only delivered to the S-100 ECDIS as exchange sets. There is no requirement for S-100 ECDIS to import or load datasets which are not contained in a conformant exchange set. In particular all datasets must have a valid digital signature to be conformant.

S-101 Scale boundaries must be included in datasets in order for the dataset loading and rendering algorithms to be correctly executed. These must also match those values contained in the CATALOG.XML. The scale boundary is the range of scales for which the dataset is intended for use. They are defined by the attributes *minimumDisplayScale* and *optimumDisplayScale*. The attribute

maximumDisplayScale should also be defined. This defines the boundary at which data is defined to be "grossly overscaled". All datasets within exchange sets must define *minimumDisplayScale*, *optimumDisplayScale* and *maximumDisplayScale*.

NotForNavigation may be included in CATALOG.XML but is ignored by S100 ECDIS. If it is required to indicate data for testing purposes then a specific Producer code should be used. Dataset Titles may also be used to indicate this for product specifications supporting titles.

Catalogues may be delivered to the ECDIS within exchange sets but, as stated in Section 6 they must only be signed by the Scheme Administrator using the scheme administrator MRN. The mechanism by which the ECDIS installs such catalogues is determined by the OEM and may not be direct import.

13 Scales in S-100 data

13.1 Elements related to ENC data and display scales

ENC Features are contained within DataCoverage features and aggregated into datasets. Each DataCoverage feature contains attributes *optimumDisplayScale*, *minimumDisplayScale* and *maximumDisplayScale*. The algorithm which must be used for the selection and rendering of ENC features is contained in S-98 Appendix E – Dataset Loading and Display (Rendering) Algorithms.

13.2 ENC scale

The term "scale" is used to describe either:

- Display Scale, or (equivalently) Mariner Selected Viewing Scale (MSVS)
- The scale of the source data used to compile the ENC.
- Data Scale (the values used for the DataCoverage attributes *minimumDisplayScale*, *maximumDisplayScale*, *optimumDisplayScale*. This may not be the same as the scale of the source data used to compile the ENC. These values define the range of scales at which ENC coverage is intended to be displayed.

The S-101 ENC values used for the Data Scale attributes *minimumDisplayScale* and *optimumDisplayScale* are fixed, and taken from the table below:

Scale
NULL
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

14 HDF5 Data

Coverage and time series features are encoded in the HDF5 format (see S-100 Part 10c).

S-100 provides for the following types of coverage and time series data:

- Gridded data with different types of spatial grid coverages;
- Data at a set of discrete fixed points;
- Data at a set of moving platforms;
- Time series data at a set of fixed points.

For S-102 and S-104 datasets, ECDIS supports gridded data in DCF 2 format only. For S-111 datasets, ECDIS supports gridded data in DCF 2 or DCF 3 format only Gridded data will specify either continuous or discrete interpolation (no interpolation between points) between grid points. Data for discrete fixed points, moving platform and time series at fixed points is intrinsically discrete

S-101, S-104 and S-102 Horizontal Datums must be the same in areas of overlapping coverage.

S-101, S-102 and S-104 Vertical Datums must be the same in areas of overlapping coverage.

All depth measurements must be positive down.