**S-98 - Annex B**

**(Informative)**

**VALIDATION CHECKS**

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# Introduction

This Annex defines validation checks for developers of S-98 Inteoperability Catalogues. The checks can be administered at any time during the production phase. They can also be applied downstream in the distribution and end user systems to test the conformance of an Interoperability Catalogue to the rules specified in S-100 Part 16 and S-98.

This Annex also defines tests for validating the operation of an Interoperability Catalogue on the data products to which it applies. As with the conformance checks, they can be applied by developers of Interoperability Catalogues or downstream in the distribution and end user systems.

The checks are based on the data quality measures and elements described in “S-98 – Main” (Clause 6) and Parts A/B/C/D (Clause 4 in each).

# References

S-58 IHO Publication S-58, ENC Validation Checks, Edition 6.1.0, September 2018.

S97C IHO S-97 Part C IHO data quality checklist Edition 1.0.0, [Draft, March 2019].

S-100 IHO S-100 Universal hydrographic data model. Edition 5.0.0, [TBD].

# Check classification

Checks are classified as critical, error, or warnings as described in Table B-1.

Table B-1 - Classification of checks

|  |  |  |
| --- | --- | --- |
| C | Critical Error | An error which would make a dataset unusable in ECDIS through not loading or causing an ECDIS to crash or presenting data which is unsafe for navigation. |
| E | Error | An error which may degrade the quality of the dataset through appearance or usability but which will not pose a significant danger when used to support navigation. |
| W | Warning | An error which may be duplication or an inconsistency which will not noticeably degrade the usability of a dataset in ECDIS. |

Checks are also categorized according to their scopes (see Clause 6 in “S-98 – Main”), as follows:

* Checks which apply to the Interoperability Catalogue itself are categorized as “IC” checks.
* Checks which apply to the output of interoperability operations in the interoperability catalogue are categorized as interoperability output (“OP”) checks.

# Check application

Checks do not apply to dataset terminations or cancellations, except where the check description explicitly states it applies in case of a termination or cancellation.

The catalogue checks apply to each Interoperability Catalogue file, which is considered a in the S-100 sense of “dataset”.

There being no update format defined in S-98 Edition 1.0.x, checks are not designated as applying to “base” or “update” datasets.

# Check syntax and operations

## Check syntax

In order to ensure that checks can be interpreted clearly and consistently a defined syntax has been used for the reworded checks wherever possible. Each check is a statement which generates a Critical Error, Error or Warning if the expression returns ‘true’.



Figure V-1 - Check syntax example

In the example in Figure V-1 the check would return true and give an error if skin of the earth features generated by different hybridization rules overlap.

## Comparison and Logical Operators

The following comparison and logical operators are used:

* Equal
* Not equal
* Less than
* Less than or equal to
* Greater than
* Greater than or equal to
* AND
* OR (inclusive OR)

## Spatial Operators

Within this document the spatial operators (EQUALS, DISJOINT, TOUCHES, WITHIN, OVERLAPS, CROSSES, INTERSECTS, CONTAINS, and COINCIDENT), based on those laid out in the ISO standard 19125-1, are used to describe spatial relationships tested within the checks.

For all spatial operators a default tolerance should be applied in validation software which is equivalent to 1 pixel on an ECDIS of the lowest acceptable resolution according to the performance standards at the minimum display scale of the S-101 dataset involved in the test.

## Values

The following terms are used for types of values:

* Present – An attribute is present and has been populated with:
	+ a value (for attributes not derived from XML string type), or
	+ the empty string (for attributes derived from the XML string type), or
	+ empty content, and is nilled as specified in the W3C XML specification.
* Null – An attribute is present and has no content or is nilled as specified in the XML specification.
* notNull – The attribute is present and has been populated with a value.

## Statements

The checks must be structured using the following statements:

* If – A conditional statement which determines whether a further statement should be executed.
* For – Repeat a statement until a statement is met (evaluates to “true”). For the purposes of the checks the statement being met generates the error or warning specified.

# Geometry and spatial operators: Terms and definitions

The terms and definitons of geometry and spatial operators are as described in S-58 Clause 2.

# Validation checks

This draft contains only selected checks to demonstrate the concept. In the tables that follow:

* IC means Interoperability Catalogue or “IC scope” depending on context
* FC means Feature Catalogue
* PC means Portrayal Catalogue
* name1.name2 means XML content element “name2” in element “name1”. In the application schema, “name1” will be a class and “name2” will be an attribute or role.

## Checks applicable to Interoperability Catalogues (IC scope)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Quality measure** | **Check no.** | **Check description** | **Check Message** | **Check solution** | **Conformity**(X-N.n means clause N.n in Part X) | **Cat.** |
| ***Checks for interoperability catalogues of all levels*** |
| Completeness / omission | X0001 | IF there is no file 098CCCCDICTIONARY.XML in the exchange set | Dictionary file with list of products must be included | Add products dictionary file | Main-4.1.1; Main-11 | C |
|  | X0002 |  |  |  |  |  |
| ***Checks for Level 1 interoperability catalogues*** |
| Completeness / omission | A0001 | IF the value of attribute S100\_‌IC\_‌Interoperability‌Catalogue.interope‌‌rability‌Level is not 1 | Interoperability level must be 1 in Level 1 catalogues | Correct interoperability level attribute | A-3.3, item 4 | C |
|  |  |  |  |  |  |  |
| ***Checks for Level 2 interoperability catalogues*** |
|  |  |  |  |  |  |  |
| ***Checks for Level 3 interoperability catalogues*** |
| Completeness / omission | C… | If the IC contains an S100\_IC\_HybridFeature element with outputproduct=HYBRID but there is no hybrid FC in the exchange set | Hybrid FC is missing | Add Hybrid FC | Logical consistency | C |
|  |  |  |  |  |  |  |
| ***Checks for Level 4 interoperability catalogues*** |
|  |  |  |  |  |  |  |

## Checks for interoperability processing output (OP scope)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Quality measure** | **Check no.** | **Check description** | **Check Message** | **Check solution** | **Conformity** | **Cat.** |
| ***Checks for interoperability catalogues of all levels*** |
|  |  |  |  |  |  |  |
| ***Checks for Level 1 interoperability catalogues*** |
|  |  |  |  |  |  |  |
| ***Checks for Level 2 interoperability catalogues*** |
|  |  |  |  |  |  |  |
| ***Checks for Level 3 interoperability catalogues*** |
|  |  |  |  |  |  |  |
| ***Checks for Level 4 interoperability catalogues*** |
| Logical Consistency / Conceptual Consistency | D2001 | For each DepthArea, DredgedArea, LandArea, DockArea, LockBasin, UnsurveyedArea feature of geometric primitive area that is generated by an S100\_HybridFeature rule AND OVERLAPS or is WITHIN another DepthArea, DredgedArea, LandArea, DockArea, LockBasin, UnsurveyedArea of geometric primitive area produced by a S100\_HybridFeatureRule. | Skin of the earth features overlap. | Adapt selection criteria or tolerance to ensure features do not overlap. | D-4.2 (Qual. elem. D4) | E |
|  |  |  |  |  |  |  |