

INTERNATIONAL HYDROGRAPHIC ORGANIZATION



ENC VALIDATION CHECKS

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1. INTRODUCTION

This document was previously Appendix B1, Annex C of S-57 Edition 3.1. It specifies the minimum checks that ~~at a minimum,~~ producers of ENC validation tools should include in their validation software. This software must be used by hydrographic offices to help ensure that their ENC data are compliant with the S-57, Appendix B1 ENC Product Specification. The checklist has been compiled for the IHO from lists of checks provided by a number of hHydrographic offices and software companies. The document will be maintained by means of new editions. ~~In order to assist software developers, those checks that have been removed from all previous editions of S-58 have been retained in Edition 5.0.0 as struck-out text strings.~~ The document provides checks for individual ENC cells however additional checks applicable to ENC Exchange Sets are included in part 2.3.

1.1 Document Layout

The validation checks are laid out as follows;

USE OF THE OBJECT CATALOGUE FOR ENC					
Appendix B.1.					
Annex A					
1500	For each object of type LNDARE which overlaps an object of type CBLARE or an object of type SBDARE.	SBDARE or CBLARE sit on a LNDARE object.	Amend CBLARE or SBDARE objects these objects should not sit on land.	Logical consistency	W
1504	For each object of type M_HDAT.	M_HDAT object present.	Remove M_HDAT object.	2.1.1	E
1502	For each object where the attribute HORDAT is present.	HORDAT used on an object.	Remove HORDAT.	2.1.1	E
1503	For each object not of type M_VDAT and M_SDAT where VERDAT is <u>not Null</u> AND none of the following are <u>not Null</u> ELEVAT, HEIGHT, VERCCL, VERCLR, VERCOP or VERCSA.	Value of VERDAT without corresponding vertical distance value.	Remove VERDAT or populate vertical distance attribute.	2.1.2	W

2.4 Checks relating to Use of the Object Catalogue for ENC					
No.	Check description	Check message	Check solution	Conformity to:	Cat
1500	For each LNDARE feature object of geometric primitive area which <u>OVERLAPS a CBLARE OR SBDARE feature object of geometric primitive area.</u>	SBDARE or CBLARE overlaps a LNDARE object.	Ensure CBLARE or SBDARE objects do not overlap LNDARE objects	Logical consistency	W
1504	<u>Check removed.</u>				
1502	For each spatial object where the attribute HORDAT is Present	HORDAT used in a spatial object.	Remove HORDAT.	2.1.1	E

Columns are as follows

1. Check number (~~in order to retain the existing numbering system checks restructured in S-58 edition 5.0.0 have been given suffixes a,b,c etc~~)
2. Check description written in a defined syntax (wherever feasible) ~~syntax as~~ defined in this document (1.43).
3. Check message to provide the user with meaningful information.
4. Check solution, suggested action to rectify a warning or error.
5. Conformity to, reference to the relevant location within the UOC or PS
6. Check classification - Critical Error (C), Error (E), Warning (W) (see 1.2)

1.2 Check Classification

The check classification is intended to ensure that published ENC data is free of errors which would affect the use of an the ENC in ECDIS. ~~are not included in published ENC data.~~In

some cases it has been necessary to diverge from the strength of wording used in the S-57 ENC Product Specification or the Use of the Object Catalogue for ENC. In such cases the user-impact on the user has been the overriding factor for consideration. The classifications have the following meanings;

C	Critical Error	An error which would make an ENC unusable in ECDIS through not loading or causing an ECDIS to crash or presenting data upon which is unsafe for navigation.
E	Error	An error which may degrade the quality of the ENC 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 and inconsistency which will not noticeably degrade the usability of an ENC in ECDIS.

At a minimum validation software must group validation reports using these categories. They may also support sub-grouping of related checks such as those relating to geometric validity or attribute consistency. Software may allow checks of type error or warning to be deselected completely or by such categories.

1.3 Minimum Check Standard

S-57 Supplement 3 specifies that ENC data must meet the minimum validation requirements defined in this standard. At the time of publication of S-58 5.01.0 no checks are mandatory.

The intention is that Critical Errors will become mandatory once software conforming to S-58 5.10.0 is available and in use by ENC producers. In order to support this transition a test dataset and a mechanism to certify that the validation tools reflect the current standard will be developed. The implementation date of mandatory checks for ENC producers will be announced in due course by IHO circular letter at least two months in advance of the implementation date.

~~The IHO will issue circular letters to identify when producers are able to meet the minimum check standard for new and updated ENC data. At that time a new version of S-58 will be published to specify that ENC data must not contain any Critical Errors. In order to support this transition a test dataset will be developed and a means to certify validation tools as reflecting the standard will be developed.~~

1.4 Guidelines on the 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 warning/error if the expression returns 'true'.

In the below example the ~~reworded-check~~ ~~(in blue text)~~ would return true and give an error for each BERTHS object which carries the attribute VERDAT;

No	Check description	Check Message	Check solution	Conformity to:	Cat
1571	Check that no BERTHS object contains the attribute VERDAT.	4.6.2			E
1571 1571	<u>For each BERTHS feature object where VERDAT is Present.</u> For each BERTHS object where VERDAT is present.	<u>Prohibited attribute VERDAT populated for a BERTHS object.</u> BERTHS object includes VERDAT.	<u>Remove value of VERDAT.</u> Remove values of VERACC or VERDAT.	<u>4.6.2</u> 4.6.2	<u>E</u> E

The elements of the syntax are defined as follows;

1.4.1 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)

1.4.2 Spatial Operators

Within this document the following 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.

They are described in annex A of this document.

For all spatial operators a default tolerance of 0.125mm at compilation scale should be applied in validation software.

1.4.3 Values

The following terms are used for types of values;

- Present – An attribute is present either with or without a value.
- Null – An attribute has a value of null (255)
- notNull – The attribute has been populated with a value.

1.4.4 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.

◆ Switch – test against a variable if this does not match move on to the next test

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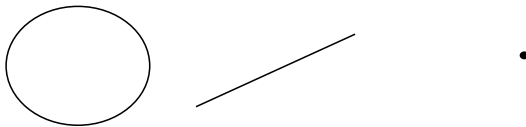
Examples

No	Check description	Check Message	Check solution	Conformity to:	Cat
1574	Check that no BERTHS object contains the attribute VERDAT.	4.6.2			E
1574	For each BERTHS object where VERDAT is present.	BERTHS object includes VERDAT.	Remove values of VERACC or VERDAT.	4.6.2	E

Annex A

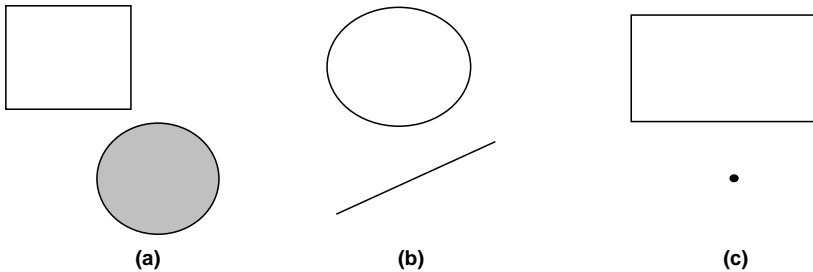
(In the diagrams within this annex LineString corresponds to the S-57 Line geometric primitive)

EQUALS – geometric object 1 is exactly equal to geometric object 2
The two geometries are the same.



Examples of the ~~Equals~~-**EQUALS** relationship

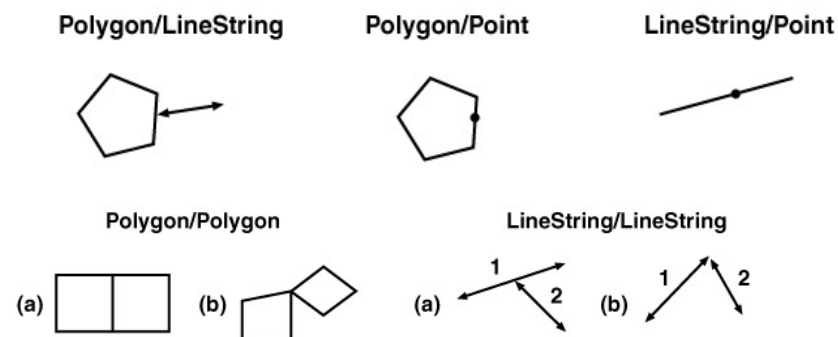
DISJOINT – the geometries of object 1 and geometric object 2 do not touch or overlap.



Examples of the ~~Disjoint~~-**DISJOINT** relationship

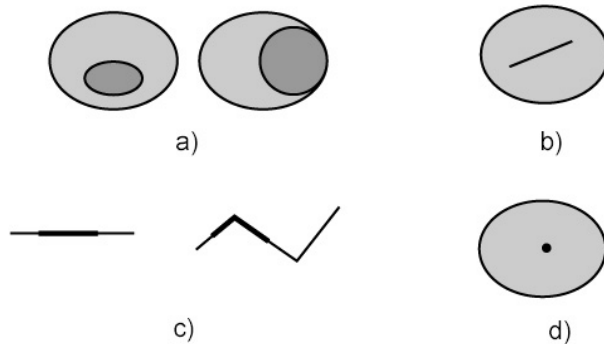
TOUCHES – geometric object 1 shares one or more component (node) with geometric object 2.

The two geometries have one or more common nodes.



Examples of the ~~Touches~~-**TOUCHES** relationship.

WITHIN –geometric 1 object is completely contained in geometric object 2

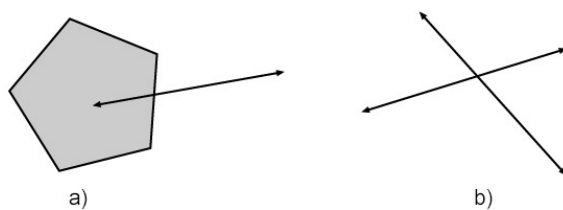


Examples of the **Within-WITHIN** relationship — Polygon/Polygon (a), Polygon/LineString (b), LineString/LineString (c), and Polygon/Point (d)

OVERLAPS - the intersection of geometric object 1 and geometric object 2 returns a value which is not the same as geometric object 1 or 2.
The geometries both cover a common line or area.



CROSSES -



INTERSECTS

The inverse of DISJOINT.
The two geometries cross or overlap.

CONTAINS

CONTAINS is identical in meaning to WITHIN.

COINCIDENT (not an ISO 19124 operator)

Two geometries share two or more consecutive nodes.

