

S-101 DATA CLASSIFICATION AND ENCODING GUIDE

FRAMEWORK AND DEVELOPMENT DOCUMENT

INTRODUCTION

The S-101 Data Classification and Encoding Guide is the reference document to be used for the consistent encoding of IHO compliant ENC's in the S-101 ENC Product Specification, which is a Product Specification developed in accordance with IHO Publication S-100 – IHO Universal Hydrographic Data Model.

FRAMEWORK

The format for the S-101 Data Classification and Encoding Guide is based on the Nautical Chart Manual (Volume 3) – Digital Specifications – Data Capture and Classification Guide (as amended at August 2009); produced by the US National Oceanographic and Atmospheric Administration (NOAA) in MS Word format. The NOAA document is a guide for the compilation of US ENC's based on the current IHO Transfer Standard for Digital Hydrographic Data (S-57 Edition 3.1.2). The Inland Electronic Navigational Chart Encoding Guide, produced and maintained by Inland ENC Harmonization Group, has also been used as a guide in the production of the S-101 Data Classification and Encoding Guide.

Reference Documents: A number of documents have been used in order to determine the best format, structure and presentation for the S-101 Data Classification and Encoding Guide. These include:

- S-57 ENC Product Specification;
- S-57 Use of the Object Catalogue for ENC;
- The Inland ENC Encoding Guide (Edition1, Version 3.1).

Procedure:

1. Copy of the Nautical Chart Manual (Volume 3) – Digital Specifications – Data Capture and Classification Guide in MS Word format obtained from NOAA August 2009.
2. Cover page, contents and overview section was initially derived from and formatted in accordance to the Draft S-101 ENC Product Specification as submitted to TSMAD18. The Document Control page was derived from and formatted in accordance to S-100 Edition 1.0.0.
3. The following documents were referenced in the development of the S-101 Data Classification and Encoding Guide and the Working Draft amended to comply with these documents as required:
 - S-32; On-line Hydrographic Dictionary (http://hd.iho.int/en/index.php/Main_Page)
 - S-57 Appendix A Chapter 1; Object Classes, Edition 3.1 (November 2000)
 - S-57 Appendix A Chapter 2; Attributes, Edition 3.1 (November 2000)
 - S-57 Appendix B.1; ENC Product Specification, Edition 2.0 (November 2000)
 - S-57 Appendix B.1 – Annex A; Use of the Object Catalogue for ENC (current Edition)
 - S-57 Supplement No. 2 (June 2009)
 - S-57 Maintenance Document (Cumulative) – Number 8 (March 2002)
 - S-58 Recommended ENC Validation Checks (current Edition)
 - DGIWG Feature data Dictionary (FDD) (<https://www.dgiwg.org/FAD/fdd/registers.jsp?register=DFDD>)
 - Australian Use of the Object Catalogue for ENC (AUOC2.1).
4. Within the Working Document, the relevant references to the above documents have been included in the Working Draft as comments for easy cross-referencing, where required.

5. The first principle used is that anything from the existing S-57 ENC Product Specification and the Use of the Object Catalogue that has not been incorporated in the Draft S-101 has been incorporated in the Data Classification and Encoding Guide. Additionally, as much of the S-57 Object and Attribute Catalogues as possible have also been included in the document. TSMAD will need to decide which information is not relevant or can be transferred to the main S-101 document. **Consideration must be given to the compiler, who may not be aware that they have to refer to other documents e.g. the Feature Catalogue or the S-101 main document, to find information relevant to their requirements** (e.g. the list of objects permitted for use in ENC and their geometric primitives, and the mandatory attributes table). Balanced against this is the consideration of not repeating information contained in other documents where possible.
6. The format of the Guide was initially retained as for the NOAA S-57 Data Capture and Classification Guide for ENC, i.e. in INT1 order. Following discussions by the DCEG Sub-WG post-TSMAD20, the format for each feature table entry in the document was amended to remove the detailed attribute descriptions from the tables to avoid excessive duplication. The detailed attribute descriptions were added as new Sections after the feature tables in the document. A descriptive example of the feature table format can be found at clause 2.6.
7. Terms and definitions (in the Overview Section of the document): Where possible, these have been taken from S-100, Annex A, V0.1 – Terminology (AA405404). At this draft stage, the terms and definitions included are examples only – the complete list of terms and definitions will need to be compiled at a later date.
8. Clauses/paragraphs/sentences/words that are considered to require more work, or further discussion by TSMAD or the DCEG Sub-Working Group, have been retained in the document in pink text.
9. Clauses/paragraphs/sentences/words that have not been derived from the S-57 ENC Product Specification, UOC or Object and Attribute Catalogues; have been derived from the AU UOC and other nation's encoding guides; or additional nautical cartographic guidelines derived from IHO S-4, have been inserted in the document in magenta text. The DCEG Sub-Working Group has essentially approved the addition of this text as part of the two Sub-Working Group reviews conducted so far.
10. Clauses/paragraphs/sentences/words that have been taken from IHO documents relating to ENCs other than the S-57 Product Specification, UOC and Object and Attribute Catalogues (e.g. S-58, MD8); or have are additions to the document resulting from DCEG Sub-WG discussions of proposals and review comments, have been inserted in the document in green text.
11. Within the individual feature clauses, all allowable attributes for the feature have been listed. For enumerated attributes, the allowable enumerate list (that may be a subset of the full list as defined in the IHO Registry (or S-57 Attribute Catalogue) is shown. These subsets have been based on S-58 Test 2000, but amendments have been made as part of the DCEG Sub-Working Group reviews. TSMAD will be required to review these enumerate lists as they relate to each feature for which the attribute is applicable, and confirm the bindings that have been suggested. [NOTE: This activity is fundamental to S-101 Feature Catalogue development.]
12. In the interests of keeping the size of the document to a minimum, no pictorial examples of real world, paper chart or ECDIS instances of features have been included in the draft document at this stage.
13. DCEG Sub-WG review (two reviews conducted to date, and three face-to-face meetings conducted) to evaluate review comments and additional proposals developed as a result of the reviews.
14. Full TSMAD review (**currently under way**).
15. DCEG Sub-WG evaluation and incorporation of TSMAD review comments, and evaluation of any outstanding proposals (**programmed for June 2013 prior to TSMAD26/DIPWG5**).
16. Preparation of final draft 0.0.1 of the document for approval of TSMAD.

17. TSMAD approval to release version 0.0.1 for S-101 Feature Catalogue and S-101 Test bed development.

Strength of Wording:

The terms “must”, “should” and “may” have been retained in the draft document as used in S-57 Appendix B.1 – Annex A.

Maintenance:

It has been determined that the DCEG will be maintained as part of the maintenance process for the main S-101 document, therefore the maintenance section of the DCEG contains a reference to the relevant clause of the S-101 main document only.

PROGRESS MADE AS AT TSMAD25 (JANUARY 2013):

1. Copy of the Nautical Chart Manual (Volume 3) – Digital Specifications – Data Capture and Classification Guide (as amended at August 2009); produced by the US National Oceanographic and Atmospheric Administration (NOAA) in MS Word format supplied on CD. Copy of the IEHG Inland ENC Encoding Guide (in pdf and database formats) obtained at TSMAD19. [October 2009].
2. Development of standard formatting guidelines – based on the draft S-101 Product Specification document (as at TSMAD19). This included criteria for clause Headings, paragraphs etc. [January 2010].
3. Drafting of Overview and General Sections of the document. Evaluation of the information contained in the introductory clauses of the NOAA Data Capture and Classification Guide for relevance to the IHO document. Text retained (in magenta) if considered relevant. Note that within this draft document, the “Objects permitted for ENC and their geometric primitives” and “Mandatory attributes” tables from the S-57 ENC Product Specification have been included at clauses 2.2 and 2.4.3. Feedback from ENC compilers at the AHO has indicated that these tables are an invaluable quick reference when compiling, therefore they have been included. [January/February 2010].
4. Determination of standard format for tables used for Feature classification and encoding guidance. [January 2010].
5. Evaluation of S-57 UOC, Object and Attribute Catalogues for information to be included in the tables. [January-March 2010].
6. Progression through the document to populate and standardise the individual S-101 Feature tables. Steps/decisions taken during table population included [January-March 2010]:
 - Determination of attributes to be included in the table. This was based on those attributes that best define the characteristics of the feature class in the real world (predominantly from the Attributes_A list on the S-57 Object Catalogue), and those enumerate values that are applicable to only that feature. It was also determined that the full list of (E) and (L) attributes would not always be included, as in many cases only a subset of the full list of enumerates that apply to an attribute would be relevant to an attribute as it is applied to a feature. For instance, while black may be considered a valid value for the attribute COLOUR for many features, it is not logical to allow black to be a value that can be populated for COLOUR for a LIGHTS feature. The determination of this binding is a main contributing factor to the development of the S-101 Feature Catalogue, and a quick evaluation on a feature by feature basis was done in the first pass development of the document.
 - Evaluation of the enumerate list for (E) and (L) attributes to determine the subset (where applicable) in relation to the binding of the attribute to the feature. As stated above, this was a rough first pass only and an interpretation from one individual. Within the draft, the full list of allowable enumerates (from S-57 and based on S-58 check 2000) was included, with those considered not applicable to the feature indicated in ~~pink-strike-through~~ text. Prohibited enumerate values were not included in the list.
 - Insertion of additional rows in the table to provide additional information on a selection of the attributes listed in the “S-101 Attribute” column. This information

was taken from the S-57 Attribute Catalogue. For (E) and (L) attributes, only those enumerates considered applicable to that feature were defined.

- Definitions: Throughout the document, instances of definitions of features, attributes and enumerates that have no authority listed were included in pink text. This included those definitions for which S-57 is attributed as the authority. TSMAD will need to determine whether other, authorised definitions should be substituted, suggestions made to the HDWG for new definitions to be included in the IHO On-line Hydrographic Dictionary, or the current unauthorised definition be retained. **NOTE:** This will have implications on registered features in the IHO Registry.
- Compilation of the additional ENC encoding guidance in the final row of each table. This information was taken predominantly from the S-57 UOC. The full attribute list for the feature was included in the attribute list, in the order (from S-57) Attributes_A, Attributes_B and Attributes_C (prohibited attributes were not been included in this list). Additional text and changed wording from that in the UOC was added in magenta text (e.g. substituting “feature” for “object”). Additional information included from other ENC-related documentation (e.g. derived from S-58 or taken from the S-57 Maintenance Document) was indicated in green text (note that, where possible, a reference has been included with magenta and green text as a comment in the document). Where possible on the first pass, this guidance was updated to include additional/amended guidance and specification from:
 - S-58 Recommended ENC Validation Checks;
 - S-57 Maintenance Document (MD8);
 - S-57 Internal Extensions list;
 - S-57 Supplement No. 2;
 - ENC Encoding Bulletins
- On completion of the geo feature tables, evaluation was done on the Object and Attribute Catalogues to determine what was missing. This included the Meta features, and spatial, meta and other attributes common to all features. These were then included in Sections 2 and 3 of the document.
- A second pass of the document was commenced. As at TSMAD20, this had progressed as far as clause 7.2. This second pass was focussed on the following:
 - Checking of format of the table;
 - Evaluation of definitions – where a non-authorised definition has been included (from S-57), an alternate, authorised definition was investigated. The first source of investigation was the IHO On-line Hydrographic Dictionary. Existing definitions authorised as sourced from S-32 were checked for correctness (definition and S-32 reference) against S-32. An alternate source of investigation was the DGIWG FDD. This was done in the interests of harmonisation between the IHO and DGIWG Registries. TSMAD will need to determine whether this is an appropriate way to go (note that in some cases this may result in proposals for changes to hydrographic-relevant definitions in the DGIWG FDD). Note that not all definitions were authorised. Alternate authorised definitions were indicated in the document in green text. Unauthorised definitions were retained in pink text.
 - Check that all information from the S-57 UOC had been included;
 - Check that INT1 and S-4 references are correct. Where a reference(s) has been amended, this is indicated in green text;
 - Check that guidance not previously included was included in the document in relation to equivalent S-58 Checks. Such guidance, where incorporated, has been included in green text;
 - Check S-57 MD8 to ensure that clarifications and corrections relevant to features, attributes and enumerates were included. Where additional/changed text is required, this was indicated in green text;

- Check the S-57 Internal Extensions List that all extensions relevant to features, attributes and enumerates were included. Where additional/changed text was required, this was indicated in **green text**;
 - Check IHO S-65 for any additional guidance that should be included in the document (e.g. SCAMIN consistency guidelines);
 - Check IHO S-4 for fundamental cartographic guidance to the compiler relevant to the feature (AU Action from TSMAD18). Where considered necessary, such guidance was included in the document in **magenta text**.
 - In line with the above, the document “Issues to Raise with TSMAD and Other Fora” has been developed incrementally as a “work in progress” to (hopefully) capture the issues that need to be discussed further by the DCEG Sub-Working Group or the full TSMAD. This has been treated as a “live” document throughout the development process so far, with additional entries inserted, as identified, as development progresses; and decisions made against issues recorded as they are discussed and resolved.
7. A first draft of the DCEG was prepared for TSMAD20, and included in the agenda as an INF paper:
TSMAD20/DIPWG2-INF1_Draft_S-101_Data_Classification_and_Encoding_Guide
The document was discussed briefly, and a number of Actions from the meeting required changes to be made to the document. [May 2010].
 8. A new draft of the document was prepared for TSMAD21. This draft included the rationalisation of the attribute descriptions out of the features tables into separate Sections (Sections 22 (Feature Attributes) and 23 (Meta and Spatial Attributes)). Actions from TSMAD20 applied and further progress made on consolidating definitions. The new draft was submitted to TSMAD21 as Paper TSMAD21-04.14A_S101_EncGuide. During the TSMAD21 meeting a start was made to address the issues raised in the “Issues to Raise with TSMAD and Other Fora” document, which was submitted to the meeting as an Annex to Paper TSMAD21-05.14A_S101_EncGuideRep. Decisions made at TSMAD21 were recorded in the “Issues to Raise with TSMAD and Other Fora” document. [November/December 2010].
 9. Post-TSMAD22, a Data Classification and Encoding Guide Sub-Working Group (DCEG Sub-WG) was formed to progress the development of the document and conduct the first review of the draft. The Sub-WG would conduct the majority of its business by correspondence, and meet if the opportunity arises prior to future TSMAD meetings. The Sub-WG is co-chaired by T. Richardson (UK) and Julia Powell (US). [June 2011].
 10. First DCEG Sub-WG review. The review commenced with the whole Sub-WG reviewing the same sub-sections of the document (Introduction, Meta features and Positions, Distances, Directions, Compass) to provide a baseline for review of the entire document. Full review of the document was conducted by assigning a Section of the document to each member of the Sub-WG. [August-December 2011].
 11. The first meeting of the DCEG Sub-WG was held in Wollongong, Australia immediately preceding TSMAD23. This three day meeting was convened to adjudicate on the consolidated list of comments from the first review of the document, and evaluate and discuss proposals submitted by members of the Sub-WG as a result of the review. A major outcome of the review was the re-formatting of the feature table entries to allow for an additional column to be added which shows the multiplicity for the feature. The meeting managed to discuss the majority of submitted proposals and about 60% of the consolidated review comments. A report of the progress of the Sub-WG was provided to the TSMAD23 meeting (Agenda TSMAD23-4.4). Decisions made by TSMAD as required. [January 2012].
 12. Application of changes to the DCEG resulting from the first review by the Sub-WG and decisions made at TSMAD23. Major changes included new modelling for lights and bridges, and a new concept for data coverage to incorporate varying maximum display scale data in a single ENC dataset. Features Sections of the document re-formatted in accordance with the revised table format, and multiplicities for attributes

added. Re-modelling of features to incorporate complex attributes commenced and examples added to the document. Document updated for S-57 UOC Edition 3.0.0. Parallel to this, a small group was conducting a review of the introductory Section and amending this Section as required (a new draft of the introduction Section was added to the draft DCEG prior to the second DCEG Sub-WG meeting). Additionally, Sub-WG members were requested to develop proposals for issues discussed by the Sub-WG or TSMAD based on an approved proposals template. [January-April 2012].

13. The second meeting of the DCEG Sub-WG was held at the IHB immediately preceding TSMAD24/DIPWG4. This three day meeting completed the discussions on comments from the first review of the document; discussed additional proposals received; and evaluated the progress made in regard to incorporating those decisions made at the first Sub-WG meeting and TSMAD23. A report of the progress of the Sub-WG was provided to the TSMAD24/DIPWG4 meeting (Agenda TSMAD24/DIPWG4-10.7). Decisions made by TSMAD as required. [May 2012].
14. Application of changes to the DCEG resulting from the second Sub-WG meeting and discussions at TSMAD24/DIPWG4. Implementation of proposals as agreed by the Sub-WG. Further implementation of complex attributes, and addition of a new Complex Attributes Section to describe these attributes. [June-August 2012].
15. Second DCEG Sub-WG review of the document. Sub-WG members were asked to review the entire document individually, rather than review a section of the document only as in the previous review. [August-October 2012].
16. Sub-WG discussion by correspondence regarding the consolidated comments from the second review of the document. Incorporation of decisions into the draft document in preparation for submission to TSMAD25. [November 2012 – January 2013].
17. The third meeting of the DCEG Sub-WG was held in Tokyo, Japan immediately preceding TSMAD25. This one day meeting further discussed the comments from the second Sub-WG review that could not be resolved by correspondence. A report of the progress of the Sub-WG was provided to the TSMAD25 meeting (Agenda TSMAD25-4.4.2). Decisions made by TSMAD as required. [January 2013].
18. Incorporation of decisions made at the third Sub-WG meeting; decisions made at TSMAD25; general “cleaning up” the document; and generation of draft DCEG for full TSMAD review. [February 2013].
19. Full TSMAD review (ongoing). [March/April 2013].

TASKS TO BE COMPLETED POST-TSMAD25:

1. Consolidate and discuss first pass review TSMAD comments (scheduled for June 2013 prior to TSMAD26/DIPWG5).
2. Outstanding from TSMAD22 discussions – add general guidance to the DCEG in regard to masking lines.
3. Guidance required on text positioning (TSMAD23, TSMAD25).
4. Revised modelling and encoding guidance for indicating the quality of bathymetric data in ENC's to be incorporated (DQWG).
5. Revised modelling for restricted areas and ATBA (TSMAD24/DIPWG4, TSMAD25).
6. New modelling for Virtual AIS Aids to Navigation.
7. Incorporate fully the recommendations and decisions related to modelling and encoding resulting from S-52 CSP review (TSMAD24/DIPWG4, TSMAD25).
8. Incorporate revised modelling for date ranges (TSMAD24/DIPWG4, TSMAD25).
9. Full DCEG Sub-WG review of Introductory Section.
10. Full DCEG Sub-WG review of Attributes and ENC Maintenance Sections.
11. Consolidation of definitions throughout the document.
12. Check that there is no duplicated specification in the S-101 main document and the DCEG.
13. Amend guidance for information and collection features throughout the document to standardise and conform to S-101 structures for information/collection features.

14. Review, standardise, add and replace (where necessary) diagrams throughout the document.
15. Insert images – real-world examples (where possible); INT1 example(s) and ECDIS symbol example(s).
16. Preparation and distribution of final draft of DCEG for full TSMAD review. Consolidate and adjudicate responses.
17. Preparation of draft DCEG 0.0.1 for approval and use.
18. Determine how the IHO would like the document to be managed (MS Word, In-design, database, XML?) and published i.e. existing format; web-based (html?); both?
19. On completion of the document, go for a couple of quiet beers to celebrate.

DOCUMENT STANDARD PROPERTIES

TEXT STYLES:

All text is in the Ariel font

Major Headings:	Heading 1 (12 pt)	Spacing: 12 pt before / 12 pt after (at 12 pt)
Major sub-headings:	Heading 2 (11 pt)	Spacing: 3 pt before / 12 pt after (at 12 pt)
Minor sub-headings 1:	Heading 3 (10 pt)	Spacing: 3 pt before / 12 pt after (at 12 pt)
Minor sub-headings 2:	Heading 4 (10 pt)	Spacing: 3 pt before / 12 pt after (at 12 pt)
Body text:	10 pt block justified (Single)	Spacing: 0 pt before / 6 or 12 pt after

STANDARDISATION OF TERMS/SYNTAX:

- Units of measure: Full term has been used i.e. "metre" instead of "m".