HSSC7-05.6E

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Paper for Consideration by HSSC7

S-11 PART A

NSEHWG/WENDWG/NCWG Draft Document and Comments from Chile

Submitted by:	Chair NCWG
Executive Summary:	A draft of S-11 Part A has been prepared to include guidelines for preparation & maintenance of small / medium scale ENC schemes. However Chile has raised some concerns over the inclusion of these guidelines in association with the concept of the INT (paper) chart scheme.
Related Documents:	S-11 Part B NCWG1 Record of Meeting NCWG Letter 06/2015 IHO CL 51/2015
Related Projects:	INToGIS.

Introduction / Background

1. The CSPCWG/NCWG was tasked by the HSSC in 2009 to review S-11 Part A – Guidance for the Preparation and Maintenance of International Chart Schemes, in order to incorporate guidelines for the preparation and maintenance of small and medium scale ENC schemes. This task is included as item B.3 of the NCWG Work Plan, with a forecast end date of 2017. Due to a lack of resources and experience (at the time) of CSPCWG members in ENC scheming and production, the North Sea ENC Harmonization Working Group (NSEHWG) agreed to prepare an initial draft, with engagement of the WENDWG, for consideration of the CSPCWG/NCWG.
2. The resultant draft document (Preface and substantive textual component only), as reviewed and revised by the NCWG, has subsequently been prepared for consideration of the HSSC. However, in response to a request by the IHB for feedback on the draft from Regional INT Chart Coordinators/ICCWG, Chile has identified what it considers to be some concerns over the draft. The NCWG Executive believes that these concerns may have merit, and considers that the opinion and further guidance from the HSSC is required before moving forward.

Analysis/Discussion

3. A draft of the revised S-11 Part A Preface and substantive textual component, as prepared by the NSEHWG in consultation with the WENDWG, was submitted to the NCWG in April 2015. Unfortunately this draft was submitted too late for full consideration of the NCWG at its first meeting (27-30 April 2015), however it was decided that a full review of the draft by the NCWG Executive would be conducted before consideration of the full Working Group (Action NCWG1-47 refers). On completion of this review, the revised draft was submitted for review of the full NCWG membership via NCWG Letter 06/2015.
4. In parallel the review of the draft by the NCWG, it was agreed that the draft was to be circulated to Regional INT Chart Coordinators/ICCWG for comment (Action NCWG1-48 refers). Additionally, it was also agreed that the review of S-11 Part A provided an opportunity for updating its Annexes (Action NCWG1-48 and IHO Letter 51/2015 refers).
5. The resultant draft document (Preface and substantive textual component only), incorporating feedback from the NCWG and Regional INT Chart Coordinators/ICCWG, is included at Annexes A (red line changes from S-

11 Part A Edition 2.0.5 – May 2012) and B (clean version) below. However, a substantive response to the request for feedback from Regional INT Chart Coordinators/ICCWG was received from Chile, which raises some concerns over the draft. This full response is included at Annex C below; a summary of the main concerns as raised by Chile are as follows:

- Consideration that guidelines for the preparation of (paper) INT chart schemes and ENC schemes are the same or similar is an error;
- In light of this, combining (paper) INT chart scheming guidance and ENC scheming guidance in the same document is potentially confusing, and as such guidance for the preparation and maintenance of ENC schemes should be a stand-alone guide;
- The concept of the INT chart as it has been applied to paper charts does not apply to ENCs, and as such an ENC is not an "international chart".

6. On discussion of this response between the NCWG Executive and the IHB, it was agreed that opinion and further guidance should be sought from the HSSC. The main topics for these discussions as a result of the feedback from Chile are:
   - Consideration of the inclusion of the guidance for the preparation and maintenance of ENC schemes as a separate section of S-11 – this was suggested early on in the development of this guidance but was not done as it was considered that there would be too much duplication between Parts; and
   - Application of the "INT chart" concept to "small scale" ENC (given the definition of "chart") – this could possibly be considered for the Navigation Purpose 1 and 2 usages, with the thought being that this may provide a solution to the issue of overlapping ENC within the same Navigational Purpose.
7. In addition, it has been pointed out the pending introduction of the INToGIS online service, which may have implications on the future of the Annexes to S-11 Part A and S-11 Part B. These implications need to be resolved, and a possible transition period identified for the withdrawal of the Part A Annexes and Part B, which will impact on the references to these documents in S-11 Part A.

Conclusions

8. While the NSEHWG and WENDWG are to be commended on their work in incorporating guidance for the preparation and maintenance of ENC schemes into a revised draft of S-11 Part A, there have been some valid concerns raised by Chile that require further consideration. The NCWG therefore requests the advice and guidance of the HSSC on a way forward.
9. Further consideration of the HSSC is required in regard to the impact of the INToGIS online service on the Annexes to S-11 Part A and S-11 Part B.

Recommendations

10. To consider the draft S-11 Part A (Preface and substantive textual component) at Annex B, taking into account the comments from Chile included at Annex C and summarised in paragraph 5 above.
11. Based on this consideration, to discuss and identify the way forward for the NCWG in completing the revision of S-11 Part A, taking into account the discussions summarised at paragraph 6 above.
12. To consider the impact of the INToGIS online service on the S-11 Part A Annexes and S-11 Part B.

Justification and Impacts

13. To provide guidance to Regional INT Chart Coordinators/ICCWG and chart producers for a consistent approach to the preparation and maintenance of ENC schemes.

Action Required of HSSC

14. HSSC5 is invited to:

    - **Note** the contribution of the NSEHWG and WENDWG in the preparation of the revised S-11 Part A incorporating guidance for the preparation and maintenance of ENC schemes.
    - **Discuss** the comments on the draft S-11 Part A submitted by Chile.
    - **Advise** the NCWG on the way forward in completing the review of S-11 Part A.

- **Discuss** the impact of the introduction of the INToGIS online service on the S-11 Part A Annexes and S-11 Part B.

Annexes:

A. Draft revision of S-11 Part A (red line)

B. Draft revision of S-11 Part A (clean)

C. Draft revision of S-11 Part A – comments from Chile

ANNEX A

Draft revision of S-11 Part A showing changes

PREFACE

1. The International Hydrographic Organization (IHO) was formed in 1921 as the result of a desire for greater standardization of nautical charts and associated publications and consequently for greater safety of mariners. It was felt that this standardization could be achieved in such a way that language and symbol differences would be minimized and that a chart produced by one country would be perfectly comprehensible to a navigator from another country.

2. Although measures have been taken since the formation of the IHO ~~International Hydrographic Bureau (IHB) in 1921~~ to develop standards to be followed nationally when producing charts and publications, it was not until 1967 that the concept of an international (INT) chart was proposed. It was felt that, instead of several different Hydrographic Offices each producing different charts of the same ocean area, often with differing data, scales and limits, it would be both more economic and safer if one Hydrographic Office would compile and produce an original chart to internationally agreed specifications. ~~and that~~ Other Hydrographic Offices would then be able to print the chart, using the basic reproductive material provided by the original producer nation but substituting their own language, if they wished.

3. The first step was to agree on the standardization of the format and symbols to be used on international charts. The 1967 International Hydrographic Conference (IHC) established a Commission which~~,~~ - working by correspondence - developed the "Chart Specifications of the IHO" which were adopted at the 1982 IHC ~~International Hydrographic Conference~~. These Specifications are now contained in ~~published as~~ IHO Publication S-4. They are applicable to all INT Charts and recommended also for all national chart series.

4. It was also necessary to develop an agreed scheme, at agreed scales, to provide world-wide coverage. A system of two series of small scale paper charts at scales of 1:10 million (19 charts) and 1:3,5 million (60 charts) was agreed. The two series were published during a 15 year period starting in 1972. This provided international shipping with uniform modern chart coverage for all ocean passages. Specifications for these small scale INT charts are contained in S-4 Part C.

5. In 1982, the success of the small-scale INT Chart Series led to consideration of extending the concept to include charts at medium and large scales. Following the IHC ~~International Hydrographic Conference~~ of that year, the North Sea Hydrographic Commission began to assess the problem by conducting ~~making~~ a pilot study of the North Sea. Once again the IHO Member States involved had to agree to a paper chart scheme that would satisfy the needs of international shipping for that area. It was agreed that this would include medium scale charts of coastal and sea areas at scales between 1:150 000 and 1:1,5 million, and approach and harbour charts at scales greater than 1:150 000. Agreement was also ~~had been~~ reached that the maximum paper size should be defined as being A0 (1189 x 841 mm). Specifications for these medium and large scale INT charts are contained in S-4 Part B.

6. Following the study of INT Charts at medium and large scales for the North Sea, Regional Chart Committees or Groups were established, within the relevant Regional Hydrographic Commissions (RHC), for a number of other regions around the world. Their task was ~~being~~ to develop and maintain chart schemes of paper nautical charts for their regions, leading eventually to a full ~~total~~ world coverage of INT Charts at medium and large scales for ~~all of~~ the world's main shipping routes, ports and port approaches. This coverage may be complemented by large scale national charts for navigation by mariners requiring a more detailed knowledge of a country's waters. INT Charting regions were thus set up, covering the world's oceans.

7. ~~With the~~ Increased production of Electronic Navigational Charts (ENC) ~~(Electronic Navigational Charts),~~ has driven the need for similar principles to those already applying for paper nautical charts, in respect of coordinated scheme development, production and maintenance~~, was identified~~. This created the concept of International Charting Coordination Working Groups (ICCWG) which ~~will~~, on a regional basis, collaborate and coordinate activities in respect of both paper and electronic charts. In the production of small scale ocean coverage ENCs, the two series of INT paper charts at scales of 1:10 million and 1:3,5 million have been replicated. However, in general, there are inherent constraints in design and content of ENCs to replicate just the equivalent scale paper chart, which require consideration of ICCWGs.

8. Guidance for the Preparation and Maintenance of both International (INT) paper chart and small and medium scale ENC schemes ~~and generic Terms of Reference for ICCWG are~~ is contained in Part A of S-11. Generic Terms of Reference for ICCWG are included as Annex X. ~~The guidance refers to paper nautical charts only, pending development of equivalent guidelines for the preparation and maintenance of small and medium scale ENC schemes.~~

9. The current status of INT paper nautical chart~~ing~~ development and production, at all scales and in all regions, is presented in Part B of S-11.

1. INTRODUCTION

1.1 **Regional Hydrographic Commissions** (RHC), the creation of which was encouraged ~~by the IHB~~ under IHO ~~Administrative Resolution T1.3~~ Programme 3, Resolution 2/1997 (as amended), bring together those Member States having common regional interests in ~~problems of~~ nautical charting[1], research or data collection, so that cooperative solutions to these problems may be reached. Regional Charting Groups ~~(RCG)~~ or Committees, later re-titled **International Charting Coordination Working Groups** (ICCWG), may also exist. These were set up following Decision 26 of the XII IHC in 1982 with "a primary objective of developing integrated schemes of International (INT) charts for the areas concerned." They consist of any Member State~~s~~ with an interest in the charting of a particular region. The ~~Chairman~~ coordinator of such a group is referred to as the **Regional Coordinator**, who advises and reports to the relevant RHC (see Annex X 3.10).

1.2 **The ~~Chart Standardization and Paper Chart~~ Nautical Cartography Working Group** (~~CSP~~NCWG) (formerly the Chart Standardization ~~Committee~~ and Paper Chart Working Group (CSPCWG)) has a range of duties in the charting field, as set out in IHO ~~Technical~~ Resolutions ~~(TR) B5.4, B5.6~~ 2/1982 (as amended) and ~~K2.11~~ 11/2002 (as amended). In particular, it has an on-going consultative role ~~(TR B5.4)~~ to:

- Advise the International Hydrographic Bureau (IHB), as appropriate, ~~on~~ in the setting up of RHCs and ICCWGs in order to ~~develop integrated schemes~~ accelerate the production of large and medium scale International ~~(INT)~~ charts, ~~at medium and large scales~~ with priority being given to large scales; and~~. Under TR B5.4, it also has the responsibility to~~
- Offer advice on ~~the construction of INT~~ chart schemes and cartographic work of such Commissions or Groups, in order to ensure homogeneity. ~~This role of the CSPCWG is purely consultative.~~

1.3 ~~This~~ The ~~basic~~ guidance for application to INT paper charts~~, which~~ was ~~has been~~ prepared by the Chairman and Secretary of the CSPCWG.~~,~~ It draws upon, and superseded, that contained in former IHO Publication SP-48. It is intended to be used as an aide-memoire and should be used in conjunction with the Regulations of the IHO for International (INT) Charts in IHO Publication S-4~~,~~ Part A, and the Specifications of the IHO for ~~International~~ INT Charts in S-4 Parts B & C.

1.4 ~~This guidance refers to paper nautical charts only, pending development of equivalent~~ The **Hydrographic Services and Standards Committee** (HSSC) tasked the CSPCWG to extend the guidance developed for INT charts to include guidelines for the development and maintenance of small and medium scale ENC schemes. This extended guidance was prepared by the **North Sea ENC Harmonisation Working Group** (NSEHWG), under the direction of its Chairman and Secretary (2013), building on earlier work by the **Worldwide Electronic Navigational Chart Database** (WEND) Committee, and to fulfil parts of the requirements of Resolution 1/1997 (as amended). It should be used in conjunction with IHO Publication S-57 and its Appendices, as well as S-4.

2. OBJECTIVE AND CONCEPT

2.1 The overall objective for International ~~INT~~ charts differs from that for **national charts,** which must permit the safe navigation of **all** classes of vessels throughout their coastal waters~~,~~. This includes ~~including~~ major ports visited by the largest vessels and minor arms of the sea which are of purely local interest. national charts must also satisfy the requirement for an information source on behalf of a variety of national users other than navigators. The combined effect of these two requirements has caused national chart series to cover national waters in great detail. Very large scale charts may be used for port plans, and there are usually at least two continuous coastal paper chart series, one on a relatively large-scale, the other slightly smaller.

2.2 For **INT paper charts,** the overall objective is the creation of a compact set of medium and large scale charts that are specifically designed for planning, landfall and coastal navigation and access to ports used by ships engaged in international trade. Their content will, therefore, differ from that of national charts. A careful selection of detail on INT paper charts will allow updates to be restricted to items which are essential for international shipping, thus keeping the maintenance of the series ~~to~~ manageable ~~proportions~~. ~~Conceived for the needs of the international mariner, International~~

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1 Nautical chart: A chart specifically designed to meet the requirements of marine navigation, showing depths of water, nature of bottom, elevations, configuration and characteristics of coast, dangers and aids to navigation. May be a paper chart, electronic navigational chart (ENC) or a raster navigational chart (RNC). Also called marine chart, hydrographic chart, or simply chart. [IHO Hydrographic Dictionary].

~~INT chart design will be uninhibited by national boundaries or political considerations. They will not attempt to fulfil the needs of local shipping nor act as national information sources.~~

~~2.4 It is recommended that, for the sake of economy, national charts series are designed so that selected charts can be used for the International chart series (see 3.3).~~

2.3 In using ENCs in an Electronic Chart Display and Information System (ECDIS), the burden on the user of updating and maintenance is not as significant compared to a paper chart folio. The objective of providing a folio of ENCs designed for planning, landfall and coastal navigation, nominally within (but not restricted to) the Navigation Purpose 1 and 2 ENC cell usage bands, should be considered in determining content and level of detail to be charted.

2.4 Conceived for the needs of the international mariner, International chart design will be uninhibited by national boundaries or political considerations. They will not attempt to fulfil the needs of local shipping nor act as national information sources. However, it is recommended that, for the sake of economy, national chart series are designed so that selected charts can be used for the International chart series (see 3.3.2).

2.5 In both chart formats, the content must be sufficiently complete and comprehensive to enable international mariners to navigate to their destination; there should be no need for them to use larger scale national charts.

2.6 The language must be English although other languages may be supplementary options within the chart.

3. PROCEDURE

3.1 **Port Selection**.

3.1.1 The ports to be covered by large (that is, berthing and harbour) scale and, where necessary, approach scale charts ~~plans~~ should be selected through consultation within the ICCWG ~~International Charting Coordination Working Group~~. It is important to establish the frequency of use of the ports by international shipping and their charting needs for navigation (plan, execute, monitor, modify) and compliance under SOLAS Chapter V. Statistical data for the volume of traffic at each port should be sought from the relevant authorities. This may include the net registered tonnage of ships arriving each year and the proportion of this tonnage under foreign flags. Where statistical data are not available, other approaches can be used, such as a study of the traffic of companies using a particular area, the number of charts sold or advice from the national authority.

3.1.2 In less developed areas, consideration can be given to including harbours because of their importance as regional centres or as the main port of an island or group of islands.

3.1.3 Other ports, ~~and~~ anchorages, offshore terminals and production areas may need charts designed to meet the individual navigational requirements of certain sectors of users, such as ~~to be included to satisfy~~ the needs of cruise liners. Particularly for such selections, the type of chart to be produced (paper, ENC or both formats) must be specified so as to satisfy users' needs.

3.1.4 This selection of ports forms the framework around which the chart scheme is built. The choice of ports must be kept under review in ~~the~~ light of new developments and the chart scheme adjusted accordingly.

3.2 **Shipping Routes**. The major routes along the coasts and in the approaches to ports that are used by international shipping should be identified. AIS data can be utilised in locating shipping movements. The inclusion and impact of routeing measures (both IMO-approved and national), vessel traffic services, pilotage and port operations management must also be considered. Where there is a good chance of obtaining a response, existing chart users and international commercial shipping companies should be consulted. In general, a better response will be obtained if users are asked to comment on options rather than to come up with solutions on their own.

3.3 **Comparison of Catalogues**.

3.3.1 All relevant IHO Member States' chart catalogues should be examined. The catalogues of other countries, in particular those providing extensive regional or world cover, are likely to give a

good ~~better~~ indication of the scales and numbers of charts likely to be appropriate for the international mariner ~~than that of the nation whose waters are being considered~~.

3.3.2 Ideally, ~~the~~ International ~~INT~~ chart limits and scales should conform to the corresponding charts, present or projected, in the local national series. Such charts, which may not always be the largest scale national charts, can then be modified, or prepared from the start, to full INT specifications, as required for all International charts. They can then often be published with a minimum of delay. It will not always be possible to simply select International ~~INT~~ charts from existing national series. Where new limits and scales are proposed for International ~~INT~~ charts, the member country should be encouraged to amend their national chart series to accommodate the International ~~INT~~ coverage, so that, for example, the smaller of the two national coastal series may be utilised for International charts.

3.4 **Scale**.

3.4.1 The choice of scales should depend upon the navigational requirements of international shipping and the need to provide a coherent and logical scheme of charts for a route or for port entry. Although the precise structure of the scheme may vary from area to area, reflecting different hydrographic and navigational requirements, ~~it will usually be possible~~ the Navigational Purpose of each chart should be clear. Navigational Purposes are derived from and defined in S-57 Appendix B.1 – ENC Product Specification; and a further theoretical link between scale and Navigational Purpose is defined within the ENC consistency recommendations in IHO Publication S-66 – Facts about Electronic Charts and Carriage Requirements. S-66 also provides a more detailed correlation between scale, Navigational Purpose and selectable radar range display scales. For ENCs it is important that, where possible, there be a regional commonality of scale across at least the Overview and General Navigational Purposes, noting that the suggested alignment of Navigational Purposes to scale ranges in S-66 is not mandatory.

3.4.2 The term 'compilation scale' is used differently in the context of paper and electronic charts. In paper chart construction, compilation scale is that of the final analogue (printed) chart which displays content statically as it is designed by the Hydrographic Office to be shown ('what you see is what you get'). In ENCs, compilation scale refers to the optimum scale at which the compiling Hydrographic Office intends the ENC data to be displayed for the Navigational Purpose, while recognising the user's ability to modify the actual scale at which the ENC is viewed in the ECDIS. While there is no requirement to do so, consideration should be given to aligning the compilation scales of International charts within at least the smaller scale Navigational Purposes for ENCs and corresponding paper charts, in order to simplify chart maintenance requirements and provide greater consistency of product portfolios to the end user.

3.4.3 The following are general parameters in order to identify the ~~following~~ Navigational Purposes for charts:

- **Berthing (ENC Navigational Purpose 6)**. Detailed data to aid berthing, at very large scales. It will often be appropriate to include these as inset plans on Harbour paper charts. For ENCs, the Berthing Navigational Purpose is recommended to have compilation scales larger than 1:4 000. Where the source data used to produce the ENC is of a scale larger than 1:4 000, then that source scale may be used as the compilation scale for the ENC.

- **Harbour (ENC Navigational Purpose 5)**. To ~~Generally at scales larger than 1: 30 000 these will~~ provide for port entry, and navigating within ports, harbours, anchorages, bays, rivers and canals. For paper charts, generally at scales larger than 1:30 000. Sometimes the largest scale equivalent national charts will be followed; sometimes the smaller of such scales will be adequate for the International series, since it is in harbour plans that the national information document role of nautical charts is most clearly seen. For ENCs, the Harbour Navigational Purpose is recommended to have compilation scales between 1:4 000 and 1:21 999. The available corresponding compilation scales for the Harbour scale band as related to standard selectable radar range display scales are 1:4 000, 1:8 000 and 1:12 000.

- **Approach (ENC Navigational Purpose 4)**. To provide ~~Generally at scales between 1:30 000 and 75 000~~ for navigating in the approaches to ports, in major channels or through intricate or congested waters. For paper charts, generally at scales between 1:30 000 and 1:75 000. Such areas may well contain complicated traffic routeing measures. Uncomplicated port approaches should not warrant the provision of separate approach charts; in such cases, the harbour paper charts should be

schemed with sufficient sea-room offshore to permit the safe transfer by the user from the appropriate chart of the coastal series. For ENCs, the Approach Navigational Purpose is recommended to have compilation scales between 1:22 000 and 1:89 999. The available corresponding compilation scales for the Approach scale band as related to standard selectable radar range display scales are 1:22 000 and 1:45 000.

- **Coastal (ENC Navigational Purpose 3)**. To provide for coastal navigation and coastal shipping routes. It is desirable, but not essential, that a continuous coastal series should have a uniform scale since this offers a number of advantages to: the navigator in being presented with a common display along a route and, for paper chart usage, in transferring fixes; the cartographer in compiling the overlaps of paper charts and in achieving 'horizontal consistency' along ENC cell boundaries; and the database manager in facilitating the creation of a seamless database for the Navigational Purpose. For paper charts, generally at scales between 1:75 000 and 350 000~~, for coastal navigation~~. Where a national paper chart series has~~ Many national series have~~ two continuous coverage coastal scales ~~series;~~, usually the smaller scale will be adequate for the needs of international shipping. ~~It is desirable, but not essential, that a continuous coastal series should have a uniform scale since this offers advantages to the navigator in transferring fixes; the cartographer in compiling the overlaps; and it may also facilitate the creation of a seamless database for Electronic Navigational Charts (ENCs).~~ For ENCs, the Coastal Navigational Purpose is recommended to have compilation scales between 1:90 000 and 1:349 999. The available corresponding compilation scales for the Coastal scale band as related to standard selectable radar range display scales are 1:90 000 and 1:180 000. In some areas, however, it may be desirable to have intermediate scales to meet the needs of a large volume of offshore traffic or to give overall cover to extensive offshore shoal areas or outlying island groups.

- **General (ENC Navigational Purpose 2).** To provide for landfall identification and non-oceanic route planning. For paper charts generally at scales between 1:350 000 and 1:2 000 000. For ENCs, the General Navigational Purpose is recommended to have compilation scales between 1:350 000 and 1:1 499 999. The available corresponding compilation scales for the General scale band as related to standard selectable radar range display scales are 1:350 000 and 1:700 000. ~~These medium scale charts are intended for landfall identification and non-oceanic route planning.~~

- **Overview (ENC Navigational Purpose 1).** To provide for route planning and ocean passage before progressing to 'General' for landfall purposes. For paper charts, generally scales at 1: 2 000 000 and smaller, ~~intended for route planning and ocean crossing. These will~~ normally ~~be~~ provided for by the two established series of small scale INT charts, details of which can be found in S-11 ~~(~~Part B~~)~~. For ENCs, the Overview Navigational Purpose is recommended to have compilation scales smaller than 1:1 499 999, based on the 1:3 500 000 small scale INT paper chart series to provide a seamless and consistent scale coverage. The available corresponding compilation scales for the Overview scale band as related to standard selectable radar range display scales are 1:1 500 000 and 1:3 000 000. Where the source data used to produce the ENC is of a scale smaller than 1:3 000 000, then that source scale may be used as the compilation scale for the ENC.

3.4.4 ~~Note:~~ It will not always be necessary to use all the above scale bands. ~~(~~For example, in uncomplicated areas an Approach chart will not usually be necessary where it is considered that a Coastal chart satisfies mariner requirements~~)~~. S-57 and S-66 provide guidance only for the assignment of ENC Navigational Purpose to compilation and standard selectable radar range scales – for International ENCs the best appropriate scale based on this guidance should be determined by the ICCWG. ~~Also, the scale bands above are those that are usually suitable for International charts;~~ For national chart series, the scale bands may also ~~well~~ be different. ~~(~~For example, the Coastal band may ~~well~~ include charts as large scale as 1:50 000 or as small scale as 1:150 000~~)~~. Other values may be used if agreed by the ICCWG.

3.4.5 If there is no conflict with other important criteria, the charting scale should not normally be larger than the available source material.

3.5 **Geodetic Datum and Projections~~ and mid-latitudes~~**. All ENCs must be referenced to WGS 84 Datum. INT paper charts should be referenced to WGS 84 Datum or equivalent and, where not, priority should be given to their re-positioning to WGS 84 Datum as a significant part of their modernisation (S-4, B-201 refers). The choice of projection for INT paper charts and in the case of Mercator projections, the mid-latitude, should be made in accordance with the INT Specifications, contained in S-4, B-203 and B-211.

3.6 **Dimensions**.

3.6.1 **INT paper charts**. Within the standards laid down in the INT Specifications (S-4, B-222) the regional preferences for the chart dimensions should be determined. The printing capabilities of **all** potential Producer and Printer Nations should be investigated, in order to determine both the preferred and maximum sizes to be used for charts in the regional scheme. Annex A lists potential Printer Nations while Annex B provides ~~gives~~ details of the use of A0 size paper.

3.6.2 **ENCs**. Cells must be rectangular, defined by 2 parallels of latitude and 2 meridians of longitude. However the area covered by data within a cell does not need to be rectangular. The geographic extent of the cell must be chosen by the ENC Producer to ensure that the resulting data set file contains no more than 5 Megabytes of data. Subject to this consideration, the cell size must not be too small in order to avoid the creation of an excessive number of cells.

3.7 **Coverage ~~Limits and overlaps~~**.

3.7.1 **INT paper chart limits and overlaps**. It is the detailed limits and the degree and arrangement of overlaps, which largely determine the quality of a scheme. In general, overlaps between INT paper charts should be sufficient to enable the mariner to safely transfer their ~~his~~ position from one chart to the next. They should be designed so that changing charts in an area of complicated navigation is avoided. Larger overlaps may sometimes be necessary where, for example, an important strait is covered on two charts to allow an adequate depiction of both approaches. Particular care is needed to ensure the provision of adequate overlaps with schemes in adjoining Regions. More specifically, the following should be considered:

~~3.7.2~~ • For schemes of **coastal charts**, ideally each major port should lie towards the centre of a sheet, allowing approach from all directions. This principle can, therefore, provide the starting point for the remainder of the sheet limits.

~~3.7.3~~ • The **area covered** by any chart should be a coherent unit where possible, for example: ~~e.g.~~ an ocean, a bay, a port approach, a strait. If the chart has an obvious title this condition is usually satisfied.

~~3.7.4~~ • Each chart should have **adequate sea room** and allow satisfactory transfer to adjoining charts and to the next larger or smaller scales. This is particularly important in any chart used for entering and leaving port.

~~3.7.5~~ • The **land area** shown should include the visual and radar horizons.

~~3.7.6~~ • **Overlaps** should include at least one good fixing point. They should be of such extent as to allow adequate time to transfer the course and ship's position, but not be so large as to create a need to duplicate ~~correction~~ updating unnecessarily. They need to avoid cutting off visual marks or radiobeacons near the edges of charts that might be used in position fixing. On coasts where there are many off-lying islands and shoals, overlaps need to be large enough to include visual transits of objects in line.

~~3.7.7~~ • The **objects that determine the heading of a vessel** should appear on the chart even if it means having ~~at the expense of~~ a large overlap.

~~3.7.8~~ • There should be room for the **chart title**, notes, scales etc, without obliterating important hydrographic detail, or reducing the effective overlap between charts.

~~3.7.9~~ • **Features** which should be within the chart's limits ~~if at all possible~~ and not just outside them are:

- Lights, radio aids, navigational buoys and beacons (especially landfall buoys on port approach sheets and beacons controlling transits in fairways).
- Pilot boarding stations, anchorages, radio reporting points.
- Prominent dangers, protruding coasts and offshore islands.
- Traffic separation schemes, dredged channels, recommended tracks etc. Features under this heading should not be split by chart limits, unless, like some separation schemes, they are extensive enough to cover several charts.
- Conspicuous or prominent features (natural or artificial) on the land, ~~e.g.~~ for example: radio masts, chimneys, hill summits.

~~3.7.10~~ • It is possible occasionally to meet the above requirements by **moving the limits** in one direction or another, changing the scale or the mid latitude in a Mercator scheme, or increasing the number of charts. The remaining possibilities are:

- To break the inner border and continue the work to the outer border (but preferably not beyond).
- To continue the work which cannot be included in situ, in an inset plan, if there is room for this (not normally appropriate for fixing marks).
- To design the chart in separate sections, for example to cover a North/South oriented channel.

~~3.7.11~~ • Charts with the longer side running east-west are in **'landscape' format**. They are convenient for use on chart plotting tables and are therefore the preferred format in scheming decisions.

3.7.2 **ENC coverage**. When scheming ENC cell limits, coverage may be based on 'equivalent' paper chart limits, a grid or a combination of both, preferably in differing Navigational Purposes. If possible a Producer should not mix a combination of grid and paper chart limits in the same Navigational Purpose.

- The **area covered** in a given Navigational Purpose must be split into cells in order to facilitate the efficient processing of ENC data in ECDIS.
- Each cell must be contained in a physically separate, **uniquely identified file** on the transfer medium, known as a data set file (S-57 Appendix B.1, clause 5.6.3 refers).
- The **ENC scheme** must take account of ENCs that are already produced.
- Where a cell's data content is **captured from paper charts**:
  - Selection of data should be based on the most appropriate paper chart (for example: scale, currency).
  - In some cases, data may be incomplete due to the paper chart's design (for example: placement of chart titles, scales etc) leading to the creation of 'no coverage areas'. Consideration should be given to compiling such areas from source, where data exists.
- When **edge matching** it is important for ENC Producers to use the same Coordinate Multiplication Factor (COMF). Producers should follow the IHO recommendations as defined in the ENC Product Specification to hold the ENC production systems at a resolution of 0.0000001 (10^{-7}) and the COMF value in the ENC cell header to 10000000 (10^{7}). It is also recommended to use the same Compilation Scale of Data (CSCL) in the ENC cell header for cells in the same Navigational Purpose; this helps to bring consistency at the boundary between two Producers.
- **Overlaps**. Overlapping ENCs must be avoided, wherever possible, to avoid duplication. Whilst cells with the same Navigational Purpose may overlap, data within cells in the same Navigational Purpose must not overlap. Therefore, in an area of overlap only one cell may contain data, and all other cells must have a meta object M_COVR with attribute CATCOV = 2 (no coverage available) covering the overlap area. This rule should apply even if several producers are involved; however, if it is difficult for technical reasons to achieve a perfect join at agreed adjoining national data limits, a 5 metre (on the ground) overlapping buffer zone may be used.
- **International boundaries.** When the maritime limits of national jurisdiction between two neighbouring countries are not established, or it is convenient to agree boundaries other than at established international boundaries, producing countries should define the cartographic boundaries for ENC production within a technical arrangement. These limits are for cartographic convenience in ENC production only and do not have any significance, legal effect or status regarding political or other jurisdictional boundaries. Features such as navigation lines, recommended tracks, etc. should have continuity across boundaries. Where agreed, such cartographic boundaries should be as simple as possible (for example a succession of straight segments and turning points, corresponding to meridians and parallels or paper chart limits). For technical reasons, diagonal lines should be avoided. When determining the boundaries of ENC coverage between adjoining States, it is important that a rigorous consultation process be initiated (refer to clause 3.10).
- A **data gap** between ENC cells designed to adjoin each other in the same Navigational Purpose must be avoided.

3.7.3 It is generally accepted that 87 degrees north is approximately the northern limit at which ENCs will perform adequately in an ECDIS; some ECDIS systems are limited in their ability to display ENCs for latitudes further north.

3.8 **Chart Numbering**.

3.8.1 **INT paper charts**. Blocks of approved INT paper chart numbers, sub-divided on a regional basis, have been allocated to major areas. These numbers are listed in S-4, part A-204, together with the principles by which the numbers are allocated within a region. There should preferably be a logical order to the allocated INT numbers (~~e.g.~~ for example, a series of charts numbered sequentially around a coast).

3.8.2 In some instances, these allocations will need to be agreed with the Coordinators of adjoining regions who may share the same block. It is possible, if necessary, to transfer blocks of numbers from one region to another, with the agreement of the relevant Regional Coordinators and the NCWG ~~CSPCWG~~ Chairman.

3.8.3 When a Producer replaces an existing INT ~~International~~ chart by a new INT ~~International~~ chart (~~i.e.~~ that is, one where the area covered has changed significantly) then a new INT number should be allocated by the Regional Coordinator. The old INT number should preferably not be re-used for at least five years.

3.8.4 **ENCs** must be named (numbered) according to the convention in S-57 Appendix B.1 - ENC Product Specification, clause 5.6.3. If an ENC cell is cancelled, the ENC cell name (number) must not be reused.

3.9 **Draft Schemes**.

3.9.1 A first draft of any new or amended International ~~the INT~~ chart scheme should be prepared. Indexes should be drawn on a large enough scale to show clearly where the proposed chart limits intersect coastline detail. These indexes should be accompanied by a list of chart numbers, together with the chart scales, geographical limits and, for paper charts, inner neat-line dimensions. Where proposed INT paper charts correspond to existing national paper charts, this should be indicated. In some complex cases, explanatory notes of how particular charts ~~sheets~~ were schemed should be included.

3.9.2 In order to enhance consistency such that ENCs appear seamless in an ECDIS, it is important to establish common ENC content standards (where open to interpretation) both within a national ENC scheme and between different Producers' data where they adjoin. This should be achieved in consultation with neighbouring producer HOs; and with all nations within a Regional Electronic Chart Coordinating Centre (RENC), ICCWG or RHC, as appropriate. Examples of some obvious features that affect the mariner's use of data in an ECDIS include the application of SCAMIN, routeing measures, critical information and depth contour intervals.

3.10 **Consultation**.

3.10.1 Cooperation and collaboration is important and essential to ensure the optimum outcome in the charts produced and the consistency of their content. Draft International ~~INT~~ chart schemes should be circulated for comment to the following, as appropriate:

- All members of the ICCWG ~~International Charting Coordination Working Group~~ and, where appropriate, members of the RHC ~~Regional Hydrographic Commission~~.
- The Coordinators of adjoining ICCWGs ~~International Charting Coordination Working Groups~~, if the scheme impacts on their region.
- Hydrographic Offices producing or printing charts in the region.
- RENCs.
- Technical Experts Working Groups (for example, a regional ENC Harmonisation Working Group).
- The Chairman of the NCWG ~~CSPCWG~~.
- The ~~International Hydrographic Bureau~~ IHB (IHO Secretariat).

3.10.2 ~~3.10.1~~ Comments received should be considered and discussed as necessary and the initial scheme should be refined accordingly ~~into a second draft version~~. It may be necessary to produce

further draft versions before final agreement is obtained. In general, the smaller the scale the more necessary it is to obtain a wide consensus. This consultation can generally be effected by correspondence. However, meetings of the ICCWG ~~International Charting Coordination Working Group~~ at significant points may ~~will~~ speed up the process. The final draft of the scheme should be submitted to the RHC for formal approval.

3.10.3 For minor changes to International chart schemes, see 3.12.

3.11 **Allocation of Producers**.

3.11.1 In most cases, the allocation of Producer Nations for International charts will be a fairly straightforward process. For most medium- and large-scale INT paper charts and ENCs, the Producer Nation will be the IHO Member State with responsibility for charting the waters covered by these charts. There will, however, be some exceptions for INT paper charts. (For further information, see S-4, A-203).

3.11.2 Where an INT paper chart covers the waters of more than one nation, a single Producer Nation should be agreed. Nations may collaborate in the production, the resulting chart carrying both nations' seals (crests). Examples of collaboration include:

- Two nations compiling sections of the chart to an agreed dividing line, such as the median line, with the producer nation joining the sections and producing the finished repromat~~;~~.
- One nation compiling the chart, the other nation completing quality control, repromat production and printing for both nations.

3.11.3 In such cases, the Producer Nation will usually be that nation which is responsible for the content and creation of the final chart.

3.11.4 ~~3.11.2~~ An agreed production schedule should be determined when the allocation of Producer Nations has been completed for all the proposed INT paper charts. This will facilitate the forward planning for the adoption of these charts by potential Printer Nations and will enable the ICCWG ~~International Charting Coordination Working Group~~ to monitor future progress. It would also be advisable, at this stage, to give consideration to the preparation of a Regional INT Chart Catalogue. This would ultimately provide the source data for S-11 ~~(~~Part B~~)~~. In reality, some nations may start production before the allocation is completed.

3.11.5 ~~3.11.3~~ Where a chart has been included in the INT scheme, but the national HO is unable to effect its production within an acceptable timescale, its production may be undertaken, with the agreement of the national HO concerned, by a potential Printer Nation. Similarly, responsibility for the production of an ENC can be delegated in whole or in part by a national HO to another HO, which then becomes the Producer Nation in that area until such time as the national HO develops the capacity to maintain the ENC.

3.11.6 In areas of national jurisdiction for which there is no recognised ENC Producer Nation, the ICCWG or RHC should determine the ENC Producer Nation. ENCs produced under such arrangements should be offered for transfer to the national HO of the coastal State in the event that the national HO subsequently develops the capacity to maintain the ENCs.

3.11.7 In **international waters**, the INT chart producer shall be assumed to be the producer of the corresponding ENCs.

3.12 **Review**. It will be necessary to keep all ~~these~~ International ~~INT~~ chart schemes under continuous review. Adjustments will be required in order to cater, for example, for: the expansion of existing ports~~;~~, the development of new ports~~;~~, changes to routeing measures; ~~and~~ the re-positioning of major navigational aids. The consultation process (Section 3.10) need not aim to finalise every detail of every INT paper chart or ENC in a ~~the~~ scheme. Once the general requirements, scales and limits have been agreed, it may be left to the designated Producer Nation to make the final detailed decisions. It will not normally be necessary to obtain the approval of the Coordinator of the ICCWG for a minor amendment to an individual chart. It can often take many years to finalise a regional International chart ~~INT~~ scheme and, in that time, national charts which are candidates for inclusion may themselves have been re-schemed, although the adequacy of the overall coverage will not have changed. However, for major changes to a chart, for partial re-scheming and for the addition or deletion of an INT paper chart or ENC, the ICCWG should be consulted, via the Regional Co~~-~~ordinator.

3.13 **Maintenance of S-11**. Any changes to scale, limits or numbering of INT paper ~~International~~ charts, which affect S-11 Part B ‘Catalogue of International Charts’, shall be notified to the IHB, who will update the Catalogue.

ANNEX B

Draft revision of S-11 Part A 'clean copy'

PREFACE

1. The International Hydrographic Organization (IHO) was formed in 1921 as the result of a desire for greater standardization of nautical charts and associated publications and consequently for greater safety of mariners. It was felt that this standardization could be achieved in such a way that language and symbol differences would be minimized and that a chart produced by one country would be perfectly comprehensible to a navigator from another country.

2. Although measures have been taken since the formation of the IHO to develop standards to be followed nationally when producing charts and publications, it was not until 1967 that the concept of an international (INT) chart was proposed. It was felt that, instead of several different Hydrographic Offices each producing different charts of the same ocean area, often with differing data, scales and limits, it would be both more economic and safer if one Hydrographic Office would compile and produce an original chart to internationally agreed specifications. Other Hydrographic Offices would then be able to print the chart, using the basic reproductive material provided by the original producer nation but substituting their own language, if they wished.

3. The first step was to agree on the standardization of the format and symbols to be used on international charts. The 1967 International Hydrographic Conference (IHC) established a Commission which - working by correspondence - developed the "Chart Specifications of the IHO" which were adopted at the 1982 IHC. These Specifications are now contained in IHO Publication S-4. They are applicable to all INT Charts and recommended also for all national chart series.

4. It was also necessary to develop an agreed scheme, at agreed scales, to provide world-wide coverage. A system of two series of small scale paper charts at scales of 1:10 million (19 charts) and 1:3,5 million (60 charts) was agreed. The two series were published during a 15 year period starting in 1972. This provided international shipping with uniform modern chart coverage for all ocean passages. Specifications for these small scale INT charts are contained in S-4 Part C.

5. In 1982, the success of the small-scale INT Chart Series led to consideration of extending the concept to include charts at medium and large scales. Following the IHC of that year, the North Sea Hydrographic Commission began to assess the problem by conducting a pilot study of the North Sea. Once again the IHO Member States involved had to agree to a paper chart scheme that would satisfy the needs of international shipping for that area. It was agreed that this would include medium scale charts of coastal and sea areas at scales between 1:150 000 and 1:1,5 million, and approach and harbour charts at scales greater than 1:150 000. Agreement was also reached that the maximum paper size should be defined as being A0 (1189 x 841 mm). Specifications for these medium and large scale INT charts are contained in S-4 Part B.

6. Following the study of INT Charts at medium and large scales for the North Sea, Regional Chart Committees or Groups were established, within the relevant Regional Hydrographic Commissions (RHC), for a number of other regions around the world. Their task was to develop and maintain chart schemes of paper nautical charts for their regions, leading eventually to a full world coverage of INT Charts at medium and large scales for the world's main shipping routes, ports and port approaches. This coverage may be complemented by large scale national charts for navigation by mariners requiring a more detailed knowledge of a country's waters. INT Charting regions were thus set up, covering the world's oceans.

7. Increased production of Electronic Navigational Charts (ENC) has driven the need for similar principles to those already applying for paper nautical charts, in respect of coordinated scheme development, production and maintenance. This created the concept of International Charting Coordination Working Groups (ICCWG) which, on a regional basis, collaborate and coordinate activities in respect of both paper and electronic charts. In the production of small scale ocean coverage ENCs, the two series of INT paper charts at scales of 1:10 million and 1:3,5 million have been replicated. However, in general, there are inherent constraints in design and content of ENCs to replicate just the equivalent scale paper chart, which require consideration of ICCWGs.

8. Guidance for the Preparation and Maintenance of both International (INT) paper chart and small and medium scale ENC schemes is contained in Part A of S-11. Generic Terms of Reference

for ICCWG are included as Annex X [X = Placeholder. To be amended when retention of current Annexes A and B is discussed at HSSC7.]

9. The current status of INT paper nautical chart development and production, at all scales and in all regions, is presented in Part B of S-11.

1 INTRODUCTION

1.1 **Regional Hydrographic Commissions** (RHC), the creation of which was encouraged under IHO Programme 3, Resolution 2/1997 (as amended), bring together those Member States having common regional interests in nautical charting[2] research or data collection, so that cooperative solutions to these problems may be reached. Regional Charting Groups or Committees, later re-titled **International Charting Coordination Working Groups** (ICCWG), may also exist. These were set up following Decision 26 of the XII IHC in 1982 with "a primary objective of developing integrated schemes of International (INT) charts for the areas concerned." They consist of any Member State with an interest in the charting of a particular region. The coordinator of such a group is referred to as the **Regional Coordinator**, who advises and reports to the relevant RHC (see Annex X).

1.2 **The Nautical Cartography Working Group** (NCWG) (formerly the Chart Standardization and Paper Chart Working Group (CSPCWG)) has a range of duties in the charting field, as set out in IHO Resolutions 2/1982 (as amended) and 11/2002 (as amended). In particular, it has an on-going consultative role to:

- Advise the International Hydrographic Bureau (IHB), as appropriate, in the setting up of RHCs and ICCWGs in order to accelerate the production of large and medium scale International charts, with priority being given to large scales; and
- Offer advice on chart schemes and cartographic work of such Commissions or Groups, in order to ensure homogeneity.

1.3 The guidance for application to INT paper charts was prepared by the Chairman and Secretary of the CSPCWG. It draws upon, and superseded, that contained in former IHO Publication SP-48. It is intended to be used as an aide-memoire and should be used in conjunction with the Regulations of the IHO for International (INT) Charts in IHO Publication S-4 Part A, and the Specifications of the IHO for INT Charts in S-4 Parts B & C.

1.4 The **Hydrographic Services and Standards Committee** (HSSC) tasked the CSPCWG to extend the guidance developed for INT charts to include guidelines for the development and maintenance of small and medium scale ENC schemes. This extended guidance was prepared by the **North Sea ENC Harmonisation Working Group** (NSEHWG), under the direction of its Chairman and Secretary (2013), building on earlier work by the **Worldwide Electronic Navigational Chart Database** (WEND) Committee, and to fulfil parts of the requirements of Resolution 1/1997 (as amended). It should be used in conjunction with IHO Publication S-57 and its Appendices, as well as S-4.

2 OBJECTIVE AND CONCEPT

2.1 The overall objective for International charts differs from that for **national charts,** which must permit the safe navigation of **all** classes of vessels throughout their coastal waters. This includes major ports visited by the largest vessels and minor arms of the sea which are of purely local interest. national charts must also satisfy the requirement for an information source on behalf of a variety of national users other than navigators. The combined effect of these two requirements has caused national chart series to cover national waters in great detail. Very large scale charts may be used for port plans, and there are usually at least two continuous coastal paper chart series, one on a relatively large-scale, the other slightly smaller.

2.2 For **INT paper charts,** the overall objective is the creation of a compact set of medium and large scale charts that are specifically designed for planning, landfall and coastal navigation and access to ports used by ships engaged in international trade. Their content will, therefore, differ from that of national charts. A careful selection of detail on INT paper charts will allow updates to be restricted to items which are essential for international shipping, thus keeping the maintenance of the series manageable.

2.3 In using ENCs in an Electronic Chart Display and Information System (ECDIS), the burden on the user of updating and maintenance is not as significant compared to a paper chart folio. The objective of providing a folio of ENCs designed for planning, landfall and coastal navigation, nominally within (but not restricted to) the Navigation Purpose 1 and 2 ENC cell usage bands, should be considered in determining content and level of detail to be charted.

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2 Nautical chart: A chart specifically designed to meet the requirements of marine navigation, showing depths of water, nature of bottom, elevations, configuration and characteristics of coast, dangers and aids to navigation. May be a paper chart, electronic navigational chart (ENC) or a raster navigational chart (RNC). Also called marine chart, hydrographic chart, or simply chart. [IHO Hydrographic Dictionary].

2.4 Conceived for the needs of the international mariner, International chart design will be uninhibited by national boundaries or political considerations. They will not attempt to fulfil the needs of local shipping nor act as national information sources. However, it is recommended that, for the sake of economy, national chart series are designed so that selected charts can be used for the International chart series (see 3.3.2).

2.5 In both chart formats, the content must be sufficiently complete and comprehensive to enable international mariners to navigate to their destination; there should be no need for them to use larger scale national charts.

2.6 The language must be English although other languages may be supplementary options within the chart.

3 PROCEDURE

3.1 **Port Selection**.

3.1.1 The ports to be covered by large (that is, berthing and harbour) scale and, where necessary, approach scale charts should be selected through consultation within the ICCWG. It is important to establish the frequency of use of the ports by international shipping and their charting needs for navigation (plan, execute, monitor, modify) and compliance under SOLAS Chapter V. Statistical data for the volume of traffic at each port should be sought from the relevant authorities. This may include the net registered tonnage of ships arriving each year and the proportion of this tonnage under foreign flags. Where statistical data are not available, other approaches can be used, such as a study of the traffic of companies using a particular area, the number of charts sold or advice from the national authority.

3.1.2 In less developed areas, consideration can be given to including harbours because of their importance as regional centres or as the main port of an island or group of islands.

3.1.3 Other ports, anchorages, offshore terminals and production areas may need charts designed to meet the individual navigational requirements of certain sectors of users, such as the needs of cruise liners. Particularly for such selections, the type of chart to be produced (paper, ENC or both formats) must be specified so as to satisfy users' needs.

3.1.4 This selection of ports forms the framework around which the chart scheme is built. The choice of ports must be kept under review in light of new developments and the chart scheme adjusted accordingly.

3.2 **Shipping Routes**. The major routes along the coasts and in the approaches to ports that are used by international shipping should be identified. AIS data can be utilised in locating shipping movements. The inclusion and impact of routeing measures (both IMO-approved and national), vessel traffic services, pilotage and port operations management must also be considered. Where there is a good chance of obtaining a response, existing chart users and international commercial shipping companies should be consulted. In general, a better response will be obtained if users are asked to comment on options rather than to come up with solutions on their own.

3.3 **Comparison of Catalogues**.

3.3.1 All relevant IHO Member States' chart catalogues should be examined. The catalogues of other countries, in particular those providing extensive regional or world cover, are likely to give a good indication of the scales and numbers of charts likely to be appropriate for the international mariner.

3.3.2 Ideally, International chart limits and scales should conform to the corresponding charts, present or projected, in the local national series. Such charts, which may not always be the largest scale national charts, can then be modified, or prepared from the start, to full INT specifications, as required for all International charts. They can then often be published with a minimum of delay. It will not always be possible to simply select International charts from existing national series. Where new limits and scales are proposed for International charts, the member country should be encouraged to amend their national chart series to accommodate the International coverage, so that, for example, the smaller of the two national coastal series may be utilised for International charts.

3.4 **Scale**.

3.4.1 The choice of scales should depend upon the navigational requirements of international shipping and the need to provide a coherent and logical scheme of charts for a route or for port entry. Although the precise structure of the scheme may vary from area to area, reflecting different hydrographic and navigational requirements, the Navigational Purpose of each chart should be clear. Navigational Purposes are derived from and defined in S-57 Appendix B.1 – ENC Product Specification; and a further theoretical link between scale and Navigational Purpose is defined within the ENC consistency recommendations in IHO Publication S-66 – Facts about Electronic Charts and Carriage Requirements. S-66 also provides a more detailed correlation between scale, Navigational Purpose and selectable radar range display scales. For ENCs it is important that, where possible, there be a regional commonality of scale across at least the Overview and General Navigational Purposes, noting that the suggested alignment of Navigational Purposes to scale ranges in S-66 is not mandatory.

3.4.2 The term 'compilation scale' is used differently in the context of paper and electronic charts. In paper chart construction, compilation scale is that of the final analogue (printed) chart which displays content statically as it is designed by the Hydrographic Office to be shown ('what you see is what you get'). In ENCs, compilation scale refers to the optimum scale at which the compiling Hydrographic Office intends the ENC data to be displayed for the Navigational Purpose, while recognising the user's ability to modify the actual scale at which the ENC is viewed in the ECDIS. While there is no requirement to do so, consideration should be given to aligning the compilation scales of International charts within at least the smaller scale Navigational Purposes for ENCs and corresponding paper charts, in order to simplify chart maintenance requirements and provide greater consistency of product portfolios to the end user.

3.4.3 The following are general parameters in order to identify the Navigational Purposes for charts:

- **Berthing (ENC Navigational Purpose 6)**. Detailed data to aid berthing, at very large scales. It will often be appropriate to include these as inset plans on Harbour paper charts. For ENCs, the Berthing Navigational Purpose is recommended to have compilation scales larger than 1:4 000. Where the source data used to produce the ENC is of a scale larger than 1:4 000, then that source scale may be used as the compilation scale for the ENC.

- **Harbour (ENC Navigational Purpose 5)**. To provide for port entry, and navigating within ports, harbours, anchorages, bays, rivers and canals. For paper charts, generally at scales larger than 1:30 000. Sometimes the largest scale equivalent national charts will be followed; sometimes the smaller of such scales will be adequate for the International series, since it is in harbour plans that the national information document role of nautical charts is most clearly seen. For ENCs, the Harbour Navigational Purpose is recommended to have compilation scales between 1:4 000 and 1:21 999. The available corresponding compilation scales for the Harbour scale band as related to standard selectable radar range display scales are 1:4 000, 1:8 000 and 1:12 000.

- **Approach (ENC Navigational Purpose 4)**. To provide for navigating in the approaches to ports, in major channels or through intricate or congested waters. For paper charts, generally at scales between 1:30 000 and 1:75 000. Such areas may well contain complicated traffic routeing measures. Uncomplicated port approaches should not warrant the provision of separate approach charts; in such cases, the harbour paper charts should be schemed with sufficient sea-room offshore to permit the safe transfer by the user from the appropriate chart of the coastal series. For ENCs, the Approach Navigational Purpose is recommended to have compilation scales between 1:22 000 and 1:89 999. The available corresponding compilation scales for the Approach scale band as related to standard selectable radar range display scales are 1:22 000 and 1:45 000.

- **Coastal (ENC Navigational Purpose 3)**. To provide for coastal navigation and coastal shipping routes. It is desirable, but not essential, that a continuous coastal series should have a uniform scale since this offers a number of advantages to: the navigator in being presented with a common display along a route and, for paper chart usage, in transferring fixes; the cartographer in compiling the overlaps of paper charts and in achieving 'horizontal consistency' along ENC cell boundaries; and the database manager in facilitating the creation of a seamless database for the Navigational Purpose. For paper charts, generally at scales between 1:75 000 and 350 000. Where a national paper chart series has two continuous coverage coastal scales, usually the smaller scale will be adequate for the needs of international shipping. For ENCs, the Coastal Navigational Purpose is recommended to have compilation scales between 1:90 000 and 1:349 999. The available

corresponding compilation scales for the Coastal scale band as related to standard selectable radar range display scales are 1:90 000 and 1:180 000. In some areas, however, it may be desirable to have intermediate scales to meet the needs of a large volume of offshore traffic or to give overall cover to extensive offshore shoal areas or outlying island groups.

- **General (ENC Navigational Purpose 2).** To provide for landfall identification and non-oceanic route planning. For paper charts generally at scales between 1:350 000 and 1:2 000 000. For ENCs, the General Navigational Purpose is recommended to have compilation scales between 1:350 000 and 1:1 499 999. The available corresponding compilation scales for the General scale band as related to standard selectable radar range display scales are 1:350 000 and 1:700 000.

- **Overview (ENC Navigational Purpose 1).** To provide for route planning and ocean passage before progressing to 'General' for landfall purposes. For paper charts, generally scales at 1: 2 000 000 and smaller, normally provided for by the two established series of small scale INT charts, details of which can be found in S-11 Part B. For ENCs, the Overview Navigational Purpose is recommended to have compilation scales smaller than 1:1 499 999, based on the 1:3 500 000 small scale INT paper chart series to provide a seamless and consistent scale coverage. The available corresponding compilation scales for the Overview scale band as related to standard selectable radar range display scales are 1:1 500 000 and 1:3 000 000. Where the source data used to produce the ENC is of a scale smaller than 1:3 000 000, then that source scale may be used as the compilation scale for the ENC.

3.4.4 It will not always be necessary to use all the above scale bands. For example, in uncomplicated areas an Approach chart will not usually be necessary where it is considered that a Coastal chart satisfies mariner requirements. S-57 and S-66 provide guidance only for the assignment of ENC Navigational Purpose to compilation and standard selectable radar range scales – for International ENCs the best appropriate scale based on this guidance should be determined by the ICCWG. For national chart series, the scale bands may also be different. For example, the Coastal band may include charts as large scale as 1:50 000 or as small scale as 1:150 000. Other values may be used if agreed by the ICCWG.

3.4.5 If there is no conflict with other important criteria, the charting scale should not normally be larger than the available source material.

3.5 **Geodetic Datum and Projections**. All ENCs must be referenced to WGS 84 Datum. INT paper charts should be referenced to WGS 84 Datum or equivalent and, where not, priority should be given to their re-positioning to WGS 84 Datum as a significant part of their modernisation (S-4, B-201 refers). The choice of projection for INT paper charts and in the case of Mercator projections, the mid-latitude, should be made in accordance with the INT Specifications, contained in S-4, B-203 and B-211.

3.6 **Dimensions**.

3.6.1 **INT paper charts**. Within the standards laid down in the INT Specifications (S-4, B-222) the regional preferences for the chart dimensions should be determined. The printing capabilities of **all** potential Producer and Printer Nations should be investigated, in order to determine both the preferred and maximum sizes to be used for charts in the regional scheme. Annex A lists potential Printer Nations while Annex B provides details of the use of A0 size paper.

3.6.2 **ENCs**. Cells must be rectangular, defined by 2 parallels of latitude and 2 meridians of longitude. However the area covered by data within a cell does not need to be rectangular. The geographic extent of the cell must be chosen by the ENC Producer to ensure that the resulting data set file contains no more than 5 Megabytes of data. Subject to this consideration, the cell size must not be too small in order to avoid the creation of an excessive number of cells.

3.7 **Coverage**.

3.7.1 **INT paper chart limits and overlaps**. It is the detailed limits and the degree and arrangement of overlaps, which largely determine the quality of a scheme. In general, overlaps between INT paper charts should be sufficient to enable the mariner to safely transfer their position from one chart to the next. They should be designed so that changing charts in an area of complicated navigation is

avoided. Larger overlaps may sometimes be necessary where, for example, an important strait is covered on two charts to allow an adequate depiction of both approaches. Particular care is needed to ensure the provision of adequate overlaps with schemes in adjoining Regions. More specifically, the following should be considered:

- For schemes of **coastal charts**, ideally each major port should lie towards the centre of a sheet, allowing approach from all directions. This principle can, therefore, provide the starting point for the remainder of the sheet limits.

- The **area covered** by any chart should be a coherent unit where possible, for example: an ocean, a bay, a port approach, a strait. If the chart has an obvious title this condition is usually satisfied.

- Each chart should have **adequate sea room** and allow satisfactory transfer to adjoining charts and to the next larger or smaller scales. This is particularly important in any chart used for entering and leaving port.

- The **land area** shown should include the visual and radar horizons.

- **Overlaps** should include at least one good fixing point. They should be of such extent as to allow adequate time to transfer the course and ship's position, but not be so large as to create a need to duplicate updating unnecessarily. They need to avoid cutting off visual marks or radiobeacons near the edges of charts that might be used in position fixing. On coasts where there are many off-lying islands and shoals, overlaps need to be large enough to include visual transits of objects in line.

- The **objects that determine the heading of a vessel** should appear on the chart even if it means having a large overlap.

- There should be room for the **chart title**, notes, scales etc, without obliterating important hydrographic detail, or reducing the effective overlap between charts.

- **Features** which should be within the chart's limits and not just outside them are:
    - Lights, radio aids, navigational buoys and beacons (especially landfall buoys on port approach sheets and beacons controlling transits in fairways).
    - Pilot boarding stations, anchorages, radio reporting points.
    - Prominent dangers, protruding coasts and offshore islands.
    - Traffic separation schemes, dredged channels, recommended tracks etc. Features under this heading should not be split by chart limits, unless, like some separation schemes, they are extensive enough to cover several charts.
    - Conspicuous or prominent features (natural or artificial) on the land, for example: radio masts, chimneys, hill summits.

- It is possible occasionally to meet the above requirements by **moving the limits** in one direction or another, changing the scale or the mid latitude in a Mercator scheme, or increasing the number of charts. The remaining possibilities are:
    - To break the inner border and continue the work to the outer border (but preferably not beyond).
    - To continue the work which cannot be included in situ, in an inset plan, if there is room for this (not normally appropriate for fixing marks).
    - To design the chart in separate sections, for example to cover a North/South oriented channel.

- Charts with the longer side running east-west are in **'landscape' format**. They are convenient for use on chart plotting tables and are therefore the preferred format in scheming decisions.

3.7.2 **ENC coverage**. When scheming ENC cell limits, coverage may be based on 'equivalent' paper chart limits, a grid or a combination of both, preferably in differing Navigational Purposes. If possible a Producer should not mix a combination of grid and paper chart limits in the same Navigational Purpose.

- The **area covered** in a given Navigational Purpose must be split into cells in order to facilitate the efficient processing of ENC data in ECDIS.

- Each cell must be contained in a physically separate, **uniquely identified file** on the transfer medium, known as a data set file (S-57 Appendix B.1, clause 5.6.3 refers).

- The **ENC scheme** must take account of ENCs that are already produced.

- Where a cell's data content is **captured from paper charts**:
  - Selection of data should be based on the most appropriate paper chart (for example: scale, currency).
  - In some cases, data may be incomplete due to the paper chart's design (for example: placement of chart titles, scales etc) leading to the creation of 'no coverage areas'. Consideration should be given to compiling such areas from source, where data exists.

- When **edge matching** it is important for ENC Producers to use the same Coordinate Multiplication Factor (COMF). Producers should follow the IHO recommendations as defined in the ENC Product Specification to hold the ENC production systems at a resolution of 0.0000001 (10^{-7}) and the COMF value in the ENC cell header to 10000000 (10^{7}). It is also recommended to use the same Compilation Scale of Data (CSCL) in the ENC cell header for cells in the same Navigational Purpose; this helps to bring consistency at the boundary between two Producers.

- **Overlaps**. Overlapping ENCs must be avoided, wherever possible, to avoid duplication. Whilst cells with the same Navigational Purpose may overlap, data within cells in the same Navigational Purpose must not overlap. Therefore, in an area of overlap only one cell may contain data, and all other cells must have a meta object M_COVR with attribute CATCOV = 2 (no coverage available) covering the overlap area. This rule should apply even if several producers are involved; however, if it is difficult for technical reasons to achieve a perfect join at agreed adjoining national data limits, a 5 metre (on the ground) overlapping buffer zone may be used.

- **International boundaries.** When the maritime limits of national jurisdiction between two neighbouring countries are not established, or it is convenient to agree boundaries other than at established international boundaries, producing countries should define the cartographic boundaries for ENC production within a technical arrangement. These limits are for cartographic convenience in ENC production only and do not have any significance, legal effect or status regarding political or other jurisdictional boundaries. Features such as navigation lines, recommended tracks, etc. should have continuity across boundaries. Where agreed, such cartographic boundaries should be as simple as possible (for example a succession of straight segments and turning points, corresponding to meridians and parallels or paper chart limits). For technical reasons, diagonal lines should be avoided. When determining the boundaries of ENC coverage between adjoining States, it is important that a rigorous consultation process be initiated (refer to clause 3.10).

- A **data gap** between ENC cells designed to adjoin each other in the same Navigational Purpose must be avoided.

3.7.3 It is generally accepted that 87 degrees north is approximately the northern limit at which ENCs will perform adequately in an ECDIS; some ECDIS systems are limited in their ability to display ENCs for latitudes further north.

3.8 **Chart Numbering**.

3.8.1 **INT paper charts**. Blocks of approved INT paper chart numbers, sub-divided on a regional basis, have been allocated to major areas. These numbers are listed in S-4, part A-204, together with the principles by which the numbers are allocated within a region. There should preferably be a logical order to the allocated INT numbers (for example, a series of charts numbered sequentially around a coast).

3.8.2 In some instances, these allocations will need to be agreed with the Coordinators of adjoining regions who may share the same block. It is possible, if necessary, to transfer blocks of numbers from one region to another, with the agreement of the relevant Regional Coordinators and the NCWG Chairman.

3.8.3 When a Producer replaces an existing INT chart by a new INT chart (that is, one where the area covered has changed significantly) then a new INT number should be allocated by the Regional Coordinator. The old INT number should preferably not be re-used for at least five years.

3.8.4 **ENCs** must be named (numbered) according to the convention in S-57 Appendix B.1 - ENC Product Specification, clause 5.6.3. If an ENC cell is cancelled, the ENC cell name (number) must not be reused.

3.9 **Draft Schemes**.

3.9.1 A first draft of any new or amended International chart scheme should be prepared. Indexes should be drawn on a large enough scale to show clearly where the proposed chart limits intersect coastline detail. These indexes should be accompanied by a list of chart numbers, together with the chart scales, geographical limits and, for paper charts, inner neat-line dimensions. Where proposed INT paper charts correspond to existing national paper charts, this should be indicated. In some complex cases, explanatory notes of how particular charts were schemed should be included.

3.9.2 In order to enhance consistency such that ENCs appear seamless in an ECDIS, it is important to establish common ENC content standards (where open to interpretation) both within a national ENC scheme and between different Producers' data where they adjoin. This should be achieved in consultation with neighbouring producer HOs; and with all nations within a Regional Electronic Chart Coordinating Centre (RENC), ICCWG or RHC, as appropriate. Examples of some obvious features that affect the mariner's use of data in an ECDIS include the application of SCAMIN, routeing measures, critical information and depth contour intervals.

3.10 **Consultation**.

3.10.1 Cooperation and collaboration is important and essential to ensure the optimum outcome in the charts produced and the consistency of their content. Draft International chart schemes should be circulated for comment to the following, as appropriate:

- All members of the ICCWG and, where appropriate, members of the RHC.
- The Coordinators of adjoining ICCWGs, if the scheme impacts on their region.
- Hydrographic Offices producing or printing charts in the region.
- RENCs.
- Technical Experts Working Groups (for example, a regional ENC Harmonisation Working Group).
- The Chairman of the NCWG.
- The IHB (IHO Secretariat).

3.10.2 Comments received should be considered and discussed as necessary and the initial scheme should be refined accordingly. It may be necessary to produce further draft versions before final agreement is obtained. In general, the smaller the scale the more necessary it is to obtain a wide consensus. This consultation can generally be effected by correspondence. However, meetings of the ICCWG at significant points may speed up the process. The final draft of the scheme should be submitted to the RHC for formal approval.

3.10.3 For minor changes to International chart schemes, see 3.12.

3.11 **Allocation of Producers**.

3.11.1 In most cases, the allocation of Producer Nations for International charts will be a fairly straightforward process. For most medium- and large-scale INT paper charts and ENCs, the Producer Nation will be the IHO Member State with responsibility for charting the waters covered by these charts. There will, however, be some exceptions for INT paper charts. (For further information, see S-4, A-203).

3.11.2 Where an INT paper chart covers the waters of more than one nation, a single Producer Nation should be agreed. Nations may collaborate in the production, the resulting chart carrying both nations' seals (crests). Examples of collaboration include:

- Two nations compiling sections of the chart to an agreed dividing line, such as the median line, with the producer nation joining the sections and producing the finished repromat.
- One nation compiling the chart, the other nation completing quality control, repromat production and printing for both nations.

3.11.3 In such cases, the Producer Nation will usually be that nation which is responsible for the content and creation of the final chart.

3.11.4 An agreed production schedule should be determined when the allocation of Producer Nations has been completed for all the proposed INT paper charts. This will facilitate the forward planning for the adoption of these charts by potential Printer Nations and will enable the ICCWG to monitor future progress. It would also be advisable, at this stage, to give consideration to the preparation of a

Regional INT Chart Catalogue. This would ultimately provide the source data for S-11 Part B. In reality, some nations may start production before the allocation is completed.

3.11.5 Where a chart has been included in the INT scheme, but the national HO is unable to effect its production within an acceptable timescale, its production may be undertaken, with the agreement of the national HO concerned, by a potential Printer Nation. Similarly, responsibility for the production of an ENC can be delegated in whole or in part by a national HO to another HO, which then becomes the Producer Nation in that area until such time as the national HO develops the capacity to maintain the ENC.

3.11.6 In areas of national jurisdiction for which there is no recognised ENC Producer Nation, the ICCWG or RHC should determine the ENC Producer Nation. ENCs produced under such arrangements should be offered for transfer to the national HO of the coastal State in the event that the national HO subsequently develops the capacity to maintain the ENCs.

3.11.7 In **international waters**, the INT chart producer shall be assumed to be the producer of the corresponding ENCs.

3.12 **Review**. It will be necessary to keep all International chart schemes under continuous review. Adjustments will be required in order to cater, for example, for: the expansion of existing ports; the development of new ports; changes to routeing measures; the re-positioning of major navigational aids. The consultation process (Section 3.10) need not aim to finalise every detail of every INT paper chart or ENC in a scheme. Once the general requirements, scales and limits have been agreed, it may be left to the designated Producer Nation to make the final detailed decisions. It will not normally be necessary to obtain the approval of the Coordinator of the ICCWG for a minor amendment to an individual chart. It can often take many years to finalise a regional International chart scheme and, in that time, national charts which are candidates for inclusion may themselves have been re-schemed, although the adequacy of the overall coverage will not have changed. However, for major changes to a chart, for partial re-scheming and for the addition or deletion of an INT paper chart or ENC, the ICCWG should be consulted, via the Regional Coordinator.

3.13 **Maintenance of S-11**. Any changes to scale, limits or numbering of INT paper charts, which affect S-11 Part B ‘Catalogue of International Charts’, shall be notified to the IHB, who will update the Catalogue.

ANNEX C

COMMENTS FROM CHILE IN RESPONSE TO IHB REQUEST TO RCG/ICCWG FOR FEEDBACK ON THE DRAFT S-11 PART A

Thanks for considering us as a potential contributor to the production of guidelines for the preparation and maintenance of ENC schemes.

Firstly we would like to offer a general comment, followed by some others more specific.

GENERAL COMMENT:
We thank it is an error to consider that guidelines for the preparation and maintenance of INT Charts schemes and ENC schemes are or should be similar. In our opinion we are dealing with two very different products the genesis of which are different and are ruled by different concepts. It is true that some common considerations do, apply to both, but conceptually both cannot be homologized, and in trying to do so, the guidelines become complex, difficult to follow and at the end of the day generate confusion. That is why we are of the opinion that separate guidelines should exist, probably under a new Part in S-11, which also, shall have a new title

The concept of INT Charts was proposed in 1967, aiming at avoiding several HOs producing different charts of the same area, with different data, scales and limits, understanding that it would be more economic and safer if just one HO be in charge of compiling and producing an original chart following international agreed standards. Then other HOs might wish to print the chart using original data provided by the producing nation. Certainly this concept is not applicable to ENCs and therefore there is a full justification to give them a different treatment.

OTHER COMMENTS

1. The Introduction of Part A says:

~~This guidance refers to paper nautical charts only, pending development of equivalent~~ **The Hydrographic Services and Standards Committee (HSSC) tasked the** NCWG to extend the guidance developed for INT charts to include guidelines for the development and maintenance of small and medium scale ENC schemes. **This extended guidance was prepared by the North Sea ENC Harmonisation Working Group (NSEHWG), under the direction of its Chairman and Secretary (2013), building on earlier work by the Worldwide Electronic Navigational Chart Database** (WEND) Committee, and to fulfil parts of the requirements of Resolution 1/1997 (as amended). **It should be used in conjunction with** IHO Publication S-57 and its Appendices, as well as S-4.

COMMENT:
We agree on the need to set guidelines for the preparation and maintenance of ENC schemes for small and medium scales, but as in essence the coverage consideration to be applied to INT Charts and ENC are too different. It seems much more appropriate to have different guidelines. As it was indicated in the general comment, by merging the guidelines, they become confusing. We should attempt to produce “Guidelines for the development and maintenance of small and medium scale ENC schemes”, on its own, without giving ENC the denomination of “international charts”, because they are not international charts and have not been defined as such by IHO.

2.- Paragraph 2.2 has a side comment that reads: Throughout this review I have tried to keep to a convention of using the term “International chart” for the generic (paper chart and ENC); and “INT (paper) chart” for paper charts and “ENC” for ENCs), which merits a strong objection.

Conceived for the needs of the international mariner, International chart design will be uninhibited by national boundaries or political considerations. They will not attempt to fulfil the needs of local shipping nor act as national information sources. However, it is recommended that, for the sake of economy, national charts series are designed so that selected charts can be used for the International chart series (see 3.3.2).

COMMENT:
We notice with great concern the adopted convention to consider under the umbrella of “International chart”, not just the well known INT Chart but also the ENC, generating a complex situation with connotations difficult to assess. We do not share the convention suggested/adopted and we do object such approach. An ENC is not an “International Chart”. The introduction of this surprising convention along the whole text is not acceptable and we request it to be withdrawn.

3.- Paragraph 2.5 reads:

In both chart formats the content must be sufficiently complete and comprehensive for use by the international mariner; the INT (paper) chart should not require reference to other National charts. The language must be English although other languages may be supplementary options within the chart.

COMMENT:
The objective of S-11 is to provide guidelines for the preparation and maintenance of schemes and should not refer to the content of the charts. Moreover we object the wording in its last sentence that makes mandatory the use of English, which should only be made as a recommendation.

4.- Paragraph 3.1.4. reads:
3.1.4 This selection of ports forms the framework around which the chart scheme is built. The choice of ports must be kept under review in ~~the~~ light of new developments and the chart scheme adjusted accordingly.

COMMENT:
The first sentence is a repetition of the same in paragraph 3.1.3

5.- Paragraph 3.11.6 reads:
In areas of national jurisdiction for which there is no recognised ENC Producer Nation, the ICCWG or RHC should determine the ENC Producer Nation. ENCs produced under such arrangements should be offered for transfer to the national HO of the coastal State in the event that the national HO subsequently develops the capacity to maintain the ENCs.

COMMENT:
It does not sound proper for the ICCWG or a RHC to determine the ENC Producer Nation for areas of national jurisdiction for which there is no recognized ENC Producer Nation without the consent of of the relevant coastal State. This consent must be a “must”.

We would like to reiterate that we strongly support the drafting of the “Guidelines for the Preparation and Maintenance of ENC schemes”, but as a stand-alone guide, not mixed with the guidelines for the INT Chart scheme.