

**CSPCWG11-10.1A**

**11<sup>th</sup> CSPCWG-1<sup>st</sup> NCWG MEETING  
Rostock, Germany 27-30 April 2015**

**Paper for Consideration by NCWG**

**Work item B3: Progress on drafting guidelines for ENC schemes**

<b>Submitted by:</b>	Secretary
<b>Executive Summary:</b>	CSPCWG Work Item B3: Develop guidelines for preparation & maintenance of small / medium scale ENC schemes was passed to the NSEHWG for drafting. This paper provides an update on progress.
<b>Related Documents:</b>	CSPCWG11-10.1A, WENDWG5-05C-INF1
<b>Related Projects:</b>	None

**Introduction / Background.**

In 2009 CHRIS20 tasked CSPCWG to develop guidelines for the preparation and maintenance of small / medium scale ENC schemes (CSPCWG5 Report Agenda item 10.1 refers). Little progress was made because of competing priorities and lack of relevant expertise within CSPCWG. Chair of CSPCWG asked the North Sea ENC Harmonisation Working Group (NSEHWG) to help. Originally, this was planned as a new section in S-11 Part A, but, at the suggestion of CSPCWG Chair, it was decided to combine it with the existing guidance for scheming INT charts (S-11 Part A) to avoid considerable duplication.

**Analysis / Discussion.**

A marked up draft and a 'clean' version of S-4 Part A as revised by the NSEHWG are included at Annexes A and B for information. (Note that the mark up does not show all the changes proposed to the current version of S-11 Part A, but are the latest changes to earlier drafts).

In addition of the updating of S-11 Part A to include guidelines for ENC schemes, revision of the document is also required to incorporate the change of name from the CSPCWG to the NCWG. The Working Group should further determine whether this is an opportunity to revise the Annexes to S-11 Part A, which were last revised in 2012 (and in some cases is based on information received from IHO Member States in 2004).

**Conclusions.**

Good progress is being made. NCWG will need to be satisfied that the needs of paper INT charts are still correct.

**Recommendations.**

1. NCWG Secretary to:
  - carefully review the document against the existing S-11 Part A to ensure that the guidance for scheming paper INT charts are still correct; and
  - update S-11 Part A to reflect the change of name from CSPCWG to NCWG;
2. NCWG to consider initiating the updating of the Annexes to S-11 Part A via a request to the IHB to initiate an IHO Circular Letter asking Member States to provide updated printer nation and paper chart format information.

**Justification and Impacts.**

The overall responsibility for this task is still with NCWG.

### **Action required of NCWG.**

The NCWG is invited to:

1. **Note** the progress made by the NSEHWG in including guidance for ENC scheming in S-11 Part A.
2. **Endorse** the recommendations above, and discuss the requirement to update the S-11 Part A Annexes.

<b>DOCUMENT CONTROL</b>			
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<b>Author:</b>	Paul Barrett	<b>Version</b>	Edition 3.0. <a href="#">0-1</a> Draft
<b>Title:</b>	S-11 Part A Guidance for the preparation and maintenance of International <a href="#">(INT)</a> Chart <a href="#">(INT)</a> and Electronic Navigational Chart (ENC) schemes.		
<b>Purpose:</b>	This paper incorporates guidelines for the preparation and maintenance of ENC schemes into the existing guidance for INT (paper) charts. This refers to CSPCWG Work Plan item B3 (as directed by HSSC).		



**GUIDANCE FOR THE PREPARATION  
AND MAINTENANCE OF  
INTERNATIONAL [\(INT\)](#) CHART [\(INT\)](#) AND ELECTRONIC  
NAVIGATIONAL CHART (ENC) SCHEMES**  
**S-11 PART A**

**Proposed amendments to S-11 Edition 2.0.5, May 2012**

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PREFACE

1. The International Hydrographic Organization was formed as the result of a desire for greater standardization of nautical charts and associated publications, and consequently for greater safety of mariners. To some degree this standardization has been achieved in paper charts in a way that language differences ~~would~~ are minimized and that a chart produced by one country is perfectly comprehensible to a navigator from another country. This work has now extended to cover ENCs. Small scale paper chart schemes at scales of 1:10 million and 1:3.5 million have already been produced, providing international shipping with uniform modern chart coverage for all ocean passages. The majority of these charts have now been converted to ENCs based on S-57. Special Publication S-57 is the IHO's [transfer-Transfer Standard Standard](#) for [digital-Digital hydrographic Hydrographic dataData](#). There are drawbacks in constraining the content of ENCs to replicate the paper chart equivalent. Constructing ENCs from source material utilising survey data, databases etc. should mean a more tailored product for the mariner.

2. In 1982, the success of the small-scale INT ~~Chart chart Series-series~~ led to consideration of extending the concept to include charts at medium and large scales. Following the International Hydrographic Conference ([IHC](#)) of that year, the North Sea Hydrographic Commission ([NSHC](#)) began to assess the problem by making a pilot study of the North Sea. Once again the Member States involved had to agree to a 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.

For ENCs, [in 1996](#), the Transfer Standard ~~and~~ Maintenance ~~and~~ Applications ~~and~~ Development Working Group ([TSMAD](#)) of the IHO ~~has~~ established ~~six~~ navigational purpose levels.

3. Following the study of INT ~~Charts-charts~~ at medium and large scales for the North Sea, Regional Chart Committees or Groups were established for a number of other regions around the world. Their task was to develop and maintain ~~c~~hart ~~S~~chemes of paper nautical charts for their regions, leading eventually to total world coverage of INT ~~c~~harts 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-National~~ charts for navigation by mariners requiring a more detailed knowledge of a country's waters. INT ~~Charting-charting~~ regions were thus set up, covering the world ocean.

4. Increased production of ENCs ([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. 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.

5. Guidance for the Preparation and Maintenance of ENC Schemes are contained in S-11.

6. With the production of [ENCs-Electronic Navigational Charts \(ENC\)](#), a need was identified to extend and apply similar principles to ENCs ~~to~~ ~~for~~ those already applied ~~edng~~ ~~for~~ ~~to~~ paper nautical charts, in respect of coordinated scheme development, production and maintenance. For ENCs, the IHO's ~~Transfer Standard and Maintenance Application and Development Working Group~~ ([TSMADWG](#)) established six navigational purpose levels. 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. All of these ENCs have now been produced, being converted from paper charts to ENCs based on S-57 ([IHO Transfer Standard for Digital Hydrographic Data](#)). However in general, there are drawbacks in constraining the design and content of ENCs to fully replicate the equivalent-scale paper chart. Further, the potential of constructing ENCs from source material (for example, utilising rich survey data contained in a database), may provide for an enhanced and more tailored ENC product for the mariner.

7. In order to provide for collaboration and coordination on a regional basis in respect of both international paper and electronic charts, the concept of [International Charting Coordination Working Groups \(ICCWG\)](#) was created. To support these ICCWG, Guidance for the Preparation and Maintenance of International Chart Schemes was developed. This guidance was then extended to incorporate similar principles to apply to ENC Schemes along with generic Terms of [reference Reference](#) for ICCWG. All these elements are contained in Part A of S-11.

8. The current status of INT charting development and production, at all scales and in all regions, is presented in S-11.<sup>7</sup>

## 1. INTRODUCTION

**1.1 Regional Hydrographic Commissions** (RHC), the creation of which was encouraged by the International Hydrographic Bureau (IHB) under IHO Administrative Resolution T1.3, bring together those Member States having common regional problems of charting, 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 INT charts for the areas concerned.” They consist of any Member States with an interest in the charting of a particular region. The Chairman of such a group is referred to as the **Regional Co-ordinator**.

**1.2 The Chart Standardization and Paper Chart Working Group** (CSPCWG) (formerly the Chart Standardization Committee (CSC)) has a range of duties in the charting field, as set out in IHO Technical Resolutions (TR) 2/1982 and 11/2002. It has an on-going role (TR 1/1982) to advise the IHB on the setting up of RHCs and ICCWGs to develop integrated schemes of International (INT) charts at medium and large-scales. Under TR 2/1982, it also has the responsibility to offer advice on the construction of INT chart schemes, in order to ensure homogeneityconsistency. This role of the CSPCWG is purely consultative.

**1.3** This guidance for application to International (paper) charts has been prepared by the Chairman and Secretary of the CSPCWG, draws upon, and supersedes, 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 S-4, Part A, and the Specifications of the IHO for International INT Charts in S-4<sub>1</sub>, Parts B & C.

**1.4 The Hydrographic Services and Standards Committee** (HSSC) tasked CSPCWG to extend the guidance developed for INT charts to include small and medium scale ENC schemes. This extended guidance was developed by the **North Sea (Hydrographic Commission's) 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 (K2.19). It should be used in conjunction with IHO publication S-57 and its appendices.

## 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.<sup>5</sup> This includes<sup>6</sup> 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-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 series, one on a relatively large-scale, the other slightly smaller.

**2.2** For **International-INT** 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-National** charts. A careful selection of detail on **International-(INT)** 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, 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.

**2.3** In using **ENCs** in an ECDIS, the burden on the user of updating and maintenance is not so significant compared to a paper chart folio. Further, noting that ECDIS is primarily targeted at the categories of shipping subject to SOLAS, most first generation **ENCs** have content firmly based on their equivalent-scale paper chart; this is usually to effect initial production and to maintain consistency in the updating of the producer's charts, both paper and ENC.

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

### 3 PROCEDURE

**3.1 Port Selection.** The ports to be covered by large- (i.e. berthing and harbour) scale and, where necessary, approach scale charts should be selected through consultation within the **International Charting Coordination Working Group****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-is** 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.

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.

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 to satisfy users' needs.

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.** All relevant IHO Member States' chart catalogues should be examined, including those in digital format for ENC coverage. 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.

Ideally, 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 nationalNational charts, can then be modified, or prepared from the start, to full INT specifications, as required for all InternationalINT charts. They can then often be published with a minimum of delay. It will not always be possible to simply select INT charts from existing national series. Where new limits and scales are proposed for INT charts, the member country should be encouraged to amend their nationalNational chart series to accommodate the INT coverage, so that, for example, the smaller of the two national coastal series may be utilised for InternationalINT 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 port entry. Although the precise structure of a chart 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 the ENC productProduct specification Specification within the IHO's consistency recommendations which further defines a link between scale and navigational purpose. S-57 provides a more detailed correlation between scale, navigational purpose and radar ranges. For ENCs it is important for there to be a regional commonality of scale.

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 chart which always displays its content as it is designed to be shown ('what you see is what you get'). In ENCs, compilation scale refers both to the primary source data and to pre-defined standard 'viewing' scales whilst recognising the user's ability to modify the actual scale that the ENC is portrayed in the ECDIS. For example, in constructing an ENC, the scale of a data source (e.g. a paper chart) may need to be 'rounded' to fit one of the defined ENC compilation scales, based on standard radar ranges for viewing (e.g. an ENC constructed from a 1:25 000 scale paper chart should have a compilation scale of 1:22 000 applied to it - in the 'Compilation scale of Data-data' CSCL subfield in the ENC header) in order to provide for an optimum viewing scale of the ENC in an ECDIS).

- **Berthing.** 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,

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~~the Berthing of this~~ navigational purpose ~~is~~ are specifically ~~at~~ defined as compilation scales larger than 1:4000. Where the source data used to produce the ENC is of a scale larger than 1:4000, then that source scale may be used as the compilation scale for the ENC.

- **Harbour.** 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~~ 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 ~~ENC~~s, the Harbour navigational purpose is defined as compilation scales between 1:4000 and 1:21 999. The available compilation or ‘viewing’ scales for this Harbour scale band are 1:12 000, 1:8000 and 1:4000.
- **Approach.** To provide for navigating in the approaches to ports, in major channels or through intricate or congested waters. Such areas may contain complicated traffic routeing measures. For paper charts, generally at scales between 1:30 000 and 1:75 000. 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 ~~ENC~~s, the Approach navigational purpose is defined as compilation scales between 1:22 000 and 1:89 999. The available compilation or ‘viewing’ scales for this Approach scale band are 1:45 000 and 1:22 000.
- **Coastal.** 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; the database manager in facilitating the creation of a seamless database. For paper charts, generally at scales between 1:75 000 and 1:350 000. 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 ~~ENC~~s, the Coastal navigational purpose is defined as compilation scales between 1:90 000 and 1:349 999. The available compilation or ‘viewing’ scale for this Coastal scale band is 1:180 000 and 1:~~22-90~~ 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.** 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 ~~ENC~~s, the General navigational purpose is defined as compilation scales between 1:350 000 and 1:1 499 999. The available compilation or ‘viewing’ scales for this General scale band are 1:700 000 and 1:350 000.
- **Overview.** To provide for route planning and ocean passage before progressing to ‘General’ for landfall purposes. For paper charts, generally at scales of 1:~~2~~ 000 000 and smaller, normally provided for by the two established series of small scale INT charts. For ~~ENC~~s, the Overview navigational purpose is defined as compilation scales smaller than 1:1 499 999, based on the 1:3~~-~~500

**000M** small scale INT paper chart series to provide a seamless and consistent scale coverage. The available compilation or ‘viewing’ scales for this Overview scale band are 1:3 000 000 and 1:1 500 000. 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.

3.4.2 For example, in uncomplicated areas an approach chart will not usually be necessary. —S-57 provides guidance for the assignment of Navigational Purpose to scale and radar ranges. —Those scale bands are usually suitable for **International INT** charts; for **National national** series, the scale bands may well be different. (For example, the coastal band may well include charts as large scale as 1:50 000). Other values may be used if agreed by the **Regional Hydrographic CommissionRHC**.

3.4.3 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 1984 Datum. INT charts should be referenced to WGS 1984 Datum or equivalent and, where not, priority should be given to their re-positioning to WGS 1984 Datum as a significant part of their modernisation (S-4, B-201 refers). The choice of projection 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. —It is generally accepted that 87 degrees north is approximately the northern limit of ENCs; some ECDIS systems are limited in their ability to display ENCs further north than that.

### 3.6 Dimensions.

**3.6.1 INT Chart.** 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 gives details of the use of A0 size paper.

**3.6.2 ENC** cells must be rectangular, (i.e. defined by 2 parallels of latitude and 2 meridians of longitude). The geographic extent of the cell must be chosen by the ENC Producer to ensure that the resulting dataset file ~~contains no more than 5Mb 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~~ is no larger than stated in **S-57 Appendix B.1 - ENC Product Specification**.

### 3.7 Coverage

**3.7.1 INT 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 charts should be sufficient to enable the mariner to safely transfer 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.

- 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, e.g. 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 correction 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's 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, e.g. 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 existing paper charts, a grid or a combination of both, preferably in differing usage bands. If possible a producer should not mix a combination of grid and chart limits in the same Navigational Purpose.

- The **area covered** in a given usage band must be split into cells in order to facilitate the efficient processing of ENC data.
- Each cell of data must be contained in a physically separate, **uniquely identified file** on the transfer medium, known as a data set file.
- | • 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 will be based on the most appropriate paper chart (e.g. scale, currency).
  - In some cases, data may be incomplete due to the paper chart's design (e.g. placement of chart titles, scales etc) leading to the creation of 'no coverage areas'. Consideration should be given to infilling such areas, where data exists.
- | • When **edgematching** 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 to 10000000 ( $10^7$ ). It is also recommended to use the same CSCL 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 the 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 CATCOV = 2 (no coverage available) covering the overlap area. This rule applies even if several producers are involved.

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- | • **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 national boundaries, producing countries should define the boundaries for ENC production within a technical arrangement. These limits are for cartographic convenience in ENC production only and do not have any significance 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 (e.g. a succession of straight segments and turning points, corresponding to by preference-things such as meridians and parallels or paper chart limits, for technical reasons diagonal lines should be avoided).

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- | • A **data gap** in the same navigational purpose must be avoided.
- | • An **overlap** of up to 5 metre 'on the ground' is permissible.

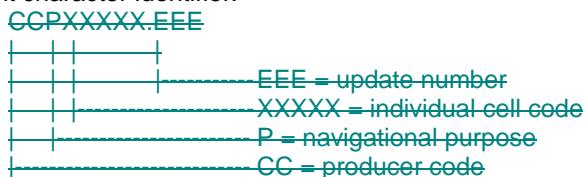
## 3.8 Chart Numbering

**3.8.1 INT Chart.** Blocks of approved INT 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. a series of charts numbered sequentially around a coast).

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 CSPCWG Chairman.

When a producer replaces an existing International INT Chart chart by a new International INT Chart chart (i.e. 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.

**3.8.2 ENC Cell.** ENCs must be named (numbered) according to the following convention in S-57 Appendix B.1 - ENC Product Specification. The main part forms an eight character identifier:



- The first two characters identify the producer. These must be in accordance with the list of data producers in S-62.
- The third character indicates the navigational purpose. This must be one of six options listed in S-57 Appendix B.1 (ENC Product Specification).
- The fourth to eighth characters are the cell code. This code can be used in any way by the producer to provide a unique file name. If characters other than numbers are used, only upper case letters are allowed.

ENC numbers must not be reused.

## 3.9 Draft Schemes.

3.9.1 A first draft of any new or amended chart scheme should be prepared. Indexes should be drawn on a large enough scale to show clearly all charts affected and 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 inner neat-line dimensions. Where proposed INT charts correspond to existing national National charts, this should be indicated. In some complex cases, explanatory notes of how particular 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 usage standards of S-57 (where open to interpretation) both within an ENC scheme and between different Producers' data where they abut. This should be achieved in consultation with neighbouring producer HOs, with all nations within a Regional Electronic Chart Coordinating Centre (RENC), and with ICCWG (or Regional Hydrographic Commission 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 values.

### 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 chart schemes should be circulated for comment to the following, as appropriate:

- All members of the [International Charting Coordination Working Group|CCWG](#) and, where appropriate, members of the [Regional Hydrographic Commission|RHC](#).
- The Coordinators of adjoining [International Charting Coordination Working Groups|CCWGs](#), if the scheme impacts on their region.
- [Hydrographic Offices|HOs](#) producing or printing ([INT](#)) charts in the region.
- [Regional Electronic Chart Coordinating Centres|RENCs](#).
- Technical Experts Working Groups (e.g. a regional ENC Harmonisation Working Group).
- The Chairman of the CSPCWG.
- The [International Hydrographic Bureau|IHB](#).

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 [International Charting Coordination Working Group|CCWG](#) at significant points may speed up the process. The final draft of the scheme should be submitted to the RHC for formal approval.

### 3.11 Allocation of Producers

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

3.11.2 Where an INT 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 reproxmat;
- One nation compiling the chart, the other nation completing quality control, reproxmat production and printing for both nations.

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

3.11.3 An agreed production schedule should be determined when the allocation of Producer Nations has been completed for all the proposed INT charts. This will

facilitate the forward planning for the adoption of these charts by potential Printer Nations and will enable the [International Charting Coordination Working Group](#)[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.

3.11.4 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.

3.11.5 In areas of national jurisdiction for which there is no recognised ENC Producer Nation, the ICCWG or [Regional Hydrographic Commission](#)[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.

3.11.6 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 chart schemes and coverage under continuous review. Adjustments will be required in order to cater for, [for example, e.g.](#) 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 chart or ENC-cell 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 scheme and, in that time, [national](#)[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 an INT chart or ENC-cell, for partial re-scheming and for the addition or deletion of an INT chart or ENC-cell, the ICCWG should be consulted, via the Regional Co-ordinator.

3.13 **Maintenance of S-11.** Any changes to scale, limits or numbering of [International INT Charts](#)[charts](#), which affect S-11 Part B 'Catalogue of International Charts', shall be notified to IHB, who will update the Catalogue.

<b>DOCUMENT CONTROL</b>			
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<b>Author:</b>	Paul Barrett	<b>Version</b>	Edition 3.0.1 Draft
<b>Title:</b>	S-11 Part A Guidance for the preparation and maintenance of International (INT) Chart and Electronic Navigational Chart (ENC) schemes.		
<b>Purpose:</b>	This paper incorporates guidelines for the preparation and maintenance of ENC schemes into the existing guidance for INT (paper) charts. This refers to CSPCWG Work Plan item B3 (as directed by HSSC).		



**GUIDANCE FOR THE PREPARATION  
AND MAINTENANCE OF  
INTERNATIONAL (INT) CHART AND ELECTRONIC  
NAVIGATIONAL CHART (ENC) SCHEMES  
S-11 PART A**

**Proposed amendments to S-11 Edition 2.0.5, May 2012**

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PREFACE

1. The International Hydrographic Organization was formed as the result of a desire for greater standardization of nautical charts and associated publications, and consequently for greater safety of mariners. To some degree this standardization has been achieved in paper charts in a way that language differences are minimized and that a chart produced by one country is perfectly comprehensible to a navigator from another country. This work has now extended to cover ENCs. Small scale paper chart schemes at scales of 1:10 million and 1:3.5 million have already been produced, providing international shipping with uniform modern chart coverage for all ocean passages. The majority of these charts have now been converted to ENCs based on S-57. Special Publication S-57 is the IHO Transfer Standard for Digital Hydrographic Data. There are drawbacks in constraining the content of ENCs to replicate the paper chart equivalent. Constructing ENCs from source material utilising survey data, databases etc. should mean a more tailored product for the

mariner.

2. 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 International Hydrographic Conference (IHC) of that year, the North Sea Hydrographic Commission (NSHC) began to assess the problem by making a pilot study of the North Sea. Once again the Member States involved had to agree to a 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.

For ENCs, in 1996, the Transfer Standard Maintenance and Applications Development Working Group (TSMAD) of the IHO established navigational purpose levels.

3. Following the study of INT charts at medium and large scales for the North Sea, Regional Chart Committees or Groups were established 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 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 ocean.

4. Increased production of ENCs 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 will, on a regional basis, collaborate and coordinate activities in respect of both paper and electronic charts.

5. Guidance for the Preparation and Maintenance of ENC Schemes are contained in S-11.

6. With the production of ENCs, a need was identified to extend and apply similar principles to ENCs for those already applied to paper nautical charts, in respect of coordinated scheme development, production and maintenance. For ENCs, the IHO TSMAD established six navigational purpose levels. 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. All of these ENCs have now been produced, being converted from paper charts to ENCs based on S-57. However in general, there are drawbacks in constraining the design and content of ENCs to fully replicate the equivalent scale paper chart. Further, the potential of constructing ENCs from source material (for example, utilising rich survey data contained in a database), may provide for an enhanced and more tailored ENC product for the mariner.

7. In order to provide for collaboration and coordination on a regional basis in respect of both international paper and electronic charts, the concept of ICCWG was created. To support these ICCWG, Guidance for the Preparation and Maintenance of International Chart Schemes was developed. This guidance was then extended to incorporate similar principles to apply to ENC Schemes along with generic Terms of Reference for ICCWG. All these elements are contained in Part A of S-11.

8. The current status of INT charting development and production, at all scales and in all regions, is presented in S-11.

## **1. INTRODUCTION**

**1.1 Regional Hydrographic Commissions** (RHC), the creation of which was encouraged by the International Hydrographic Bureau (IHB) under IHO Administrative Resolution T1.3, bring together those Member States having common regional problems of charting, research or data collection, so that cooperative solutions may be reached. Regional Charting Groups or Committees, later retitled 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 INT charts for the areas concerned.” They consist of any Member States with an interest in the charting of a particular region. The Chairman of such a group is referred to as the **Regional Co-ordinator**.

**1.2 The Chart Standardization and Paper Chart Working Group** (CSPCWG) (formerly the Chart Standardization Committee (CSC)) has a range of duties in the charting field, as set out in IHO Technical Resolutions (TR) 2/1982 and 11/2002. It has an on-going role (TR 1/1982) to advise the IHB on the setting up of RHCs and ICCWGs to develop integrated schemes of INT charts at medium and large scales. Under TR 2/1982, it also has the responsibility to offer advice on the construction of INT chart schemes, in order to ensure consistency. This role of the CSPCWG is purely consultative.

**1.3** This guidance for application to International (paper) charts has been prepared by the Chairman and Secretary of the CSPCWG, draws upon, and supersedes, 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 INT Charts in 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 CSPCWG to extend the guidance developed for INT charts to include small and medium scale ENC schemes. This extended guidance was developed 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 (K2.19). It should be used in conjunction with IHO publication S-57 and its appendices.

## **2. OBJECTIVE AND CONCEPT**

**2.1** The overall objective for 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 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 series, one on a relatively large scale, the other slightly smaller.

**2.2** For **INT 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 charts will allow updates to be restricted to items which are essential for international shipping, thus keeping the maintenance of the series manageable. Conceived for the needs of the international mariner, 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.

**2.3** In using ENCs in an ECDIS, the burden on the user of updating and maintenance is not so significant compared to a paper chart folio. Further, noting that ECDIS is primarily targeted at the categories of shipping subject to SOLAS, most first generation ENCs have content firmly based on their equivalent scale paper chart; this is usually to effect initial production and to maintain consistency in the updating of the producer's charts, both paper and ENC.

**2.4** In both chart formats the content must be sufficiently complete and comprehensive for use by the international mariner; and 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.

### **3 PROCEDURE**

**3.1 Port Selection.** The ports to be covered by large (i.e. 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 is 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.

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.

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 to satisfy users' needs.

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.** All relevant IHO Member States' chart catalogues should be examined, including those in digital format for ENC coverage. 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.

Ideally, 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 INT charts. They can then often be published with a minimum of delay. It will not always be possible to simply select INT charts from existing national series. Where new limits and scales are proposed for INT charts, the member country should be encouraged to amend their National chart series to accommodate the INT coverage, so that, for example, the smaller of the two national coastal series may be utilised for INT 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 port entry. Although the precise structure of a chart 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 the ENC Product Specification within the IHO's consistency recommendations which further defines a link between scale and navigational purpose. S-57 provides a more detailed correlation between scale, navigational purpose and radar ranges. For ENCs it is important for there to be a regional commonality of scale.

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 chart which always displays its content as it is designed to be shown ('what you see is what you get'). In ENCs, compilation scale refers both to the primary source data and to pre-defined standard 'viewing' scales whilst recognising the user's ability to modify the actual scale that the ENC is portrayed in the ECDIS. For example, in constructing an ENC, the scale of a data source (e.g. a paper chart) may need to be 'rounded' to fit one of the defined ENC compilation scales, based on standard radar ranges for viewing (e.g. an ENC constructed from a 1:25 000 scale paper chart should have a compilation scale of 1:22 000 applied to it - in the 'Compilation scale of data' CSCL subfield in the ENC header) in order to provide for an optimum viewing scale of the ENC in an ECDIS).

- **Berthing.** 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 specifically defined as compilation scales larger than 1:4000. Where the source data used to produce the ENC is of a scale larger than 1:4000, then that source scale may be used as the compilation scale for the ENC.
- **Harbour.** 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 defined as compilation scales between 1:4000 and 1:21 999. The available compilation or 'viewing' scales for this Harbour scale band are 1:12 000, 1:8000 and 1:4000.

- **Approach.** To provide for navigating in the approaches to ports, in major channels or through intricate or congested waters. Such areas may contain complicated traffic routeing measures. For paper charts, generally at scales between 1:30 000 and 1:75 000. 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 defined as compilation scales between 1:22 000 and 1:89 999. The available compilation or 'viewing' scales for this Approach scale band are 1:45 000 and 1:22 000.
- **Coastal.** 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; the database manager in facilitating the creation of a seamless database. For paper charts, generally at scales between 1:75 000 and 1:350 000. 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 defined as compilation scales between 1:90 000 and 1:349 999. The available compilation or 'viewing' scale for this Coastal scale band is 1:180 000 and 1:90 000. 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.** 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 defined as compilation scales between 1:350 000 and 1:1 499 999. The available compilation or 'viewing' scales for this General scale band are 1:700 000 and 1:350 000.
- **Overview.** To provide for route planning and ocean passage before progressing to 'General' for landfall purposes. For paper charts, generally at scales of 1:2 000 000 and smaller, normally provided for by the two established series of small scale INT charts. For ENCs, the Overview navigational purpose is defined as 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 compilation or 'viewing' scales for this Overview scale band are 1:3 000 000 and 1:1 500 000. 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.

3.4.2 For example, in uncomplicated areas an approach chart will not usually be necessary. S-57 provides guidance for the assignment of Navigational Purpose to

scale and radar ranges. Those scale bands are usually suitable for INT charts; for national series, the scale bands may well be different. For example, the coastal band may well include charts as large scale as 1:50 000. Other values may be used if agreed by the RHC.

3.4.3 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 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 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. It is generally accepted that 87 degrees north is approximately the northern limit of ENCs; some ECDIS systems are limited in their ability to display ENCs further north than that.

### **3.6 Dimensions.**

**3.6.1 INT Chart.** 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 gives details of the use of A0 size paper.

**3.6.2 ENC cells** must be rectangular, i.e. defined by 2 parallels of latitude and 2 meridians of longitude. The geographic extent of the cell must be chosen by the ENC Producer to ensure that the resulting dataset file is no larger than stated in S-57 Appendix B.1 - ENC Product Specification.

### **3.7 Coverage**

**3.7.1 INT 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 charts should be sufficient to enable the mariner to safely transfer 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.

- 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, e.g. 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 correction 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, e.g. 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 existing paper charts, a grid or a combination of both, preferably in differing usage bands. If possible a producer should not mix a combination of grid and chart limits in the same Navigational Purpose.

- The **area covered** in a given usage band must be split into cells in order to facilitate the efficient processing of ENC data.
- Each cell of data must be contained in a physically separate, **uniquely identified file** on the transfer medium, known as a data set file.

- 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 will be based on the most appropriate paper chart (e.g. scale, currency).
  - In some cases, data may be incomplete due to the paper chart's design (e.g. placement of chart titles, scales etc) leading to the creation of 'no coverage areas'. Consideration should be given to infilling such areas, where data exists.
- When **edgematching** 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 to 10000000 ( $10^7$ ). It is also recommended to use the same CSCL 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 the 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 CATCOV = 2 (no coverage available) covering the overlap area. This rule applies even if several producers are involved.
- **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 national boundaries, producing countries should define the boundaries for ENC production within a technical arrangement. These limits are for cartographic convenience in ENC production only and do not have any significance 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 (e.g. a succession of straight segments and turning points, corresponding to things such as meridians and parallels or paper chart limits) for technical reasons diagonal lines should be avoided.
- A **data gap** in the same navigational purpose must be avoided.
- An **overlap** of up to 5 metre 'on the ground' is permissible.

### 3.8 Chart Numbering

**3.8.1 INT Chart.** Blocks of approved INT 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. a series of charts numbered sequentially around a coast).

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 CSPCWG Chairman.

When a producer replaces an existing INT chart by a new INT chart (i.e. 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.

**3.8.2 ENC Cell.** ENCs must be named (numbered) according to the convention in S-57 Appendix B.1 - ENC Product Specification. The main part forms an eight character identifier:

ENC numbers must not be reused.

### **3.9 Draft Schemes.**

3.9.1 A first draft of any new or amended chart scheme should be prepared. Indexes should be drawn on a large enough scale to show clearly all charts affected and 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 inner neat-line dimensions. Where proposed INT charts correspond to existing National charts, this should be indicated. In some complex cases, explanatory notes of how particular 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 usage standards of S-57 (where open to interpretation) both within an ENC scheme and between different Producers' data where they abut. This should be achieved in consultation with neighbouring producer HOs, 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 values.

### **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 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.
- HOs producing or printing INT charts in the region.
- RENCs.
- Technical Experts Working Groups (e.g. a regional ENC Harmonisation Working Group).
- The Chairman of the CSPCWG.
- The IHB.

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.

### **3.11 Allocation of Producers**

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

3.11.2 Where an INT 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.

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

3.11.3 An agreed production schedule should be determined when the allocation of Producer Nations has been completed for all the proposed INT 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.

3.11.4 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.

3.11.5 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.

3.11.6 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 chart schemes and coverage under continuous review. Adjustments will be required in order to cater for, e.g. 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 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 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 an INT chart or ENC, for partial re-scheming and for the addition or deletion of an INT 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 charts, which affect S-11 Part B 'Catalogue of International Charts', shall be notified to IHB, who will update the Catalogue.