INTERNATIONAL HYDROGRAPHIC ORGANIZATION

ORGANISATION HYDROGRAPHIQUE INTERNATIONALE

Dossier du BHI No. S3/8151/CHRIS

LETTRE CIRCULAIRE 64/2007
13 juillet 2007

CODAGE COHERENT DES ENC

Référence : a) LC du BHI 32/2007 en date du 14 mars 2007.

Madame la Directrice, Monsieur le Directeur,

1 La lettre circulaire en référence a) demandait, entre autres, que les Etats membres approuvent la codification d'un ensemble de recommandations pour un codage cohérent des ENC dans les Résolutions techniques de l'OHI dans le but d'accroître leur visibilité et d'encourager leur utilisation. A ce jour, 32 Etats membres ont répondu avec une seule réponse défavorable; cependant, certains Etats membres ont fait, dans le cadre de leur réponse négative ou de leurs approbations conditionnelles, des commentaires substantiels. En particulier, des préoccupations ont été émises à propos de l'attribution d'échelle de compilation basée sur les variations de portée du radar, variation entre les bandes d'usage définies dans la M-4 et celles notées dans les recommandations et les procédures d'attribution des valeurs SCAMIN. Les commentaires des EM sont contenus dans **l'Annexe A**. En outre, comme indiqué dans la réponse du SH du RU, IC-ENC a présenté aux réunions du TSMAD et du C&SMWG en mai/juin 2007, une nouvelle procédure pour l'attribution des valeurs SCAMIN qui peut être automatisée et qui procure un degré supérieur de cohérence entre les données des cellules ENC. Cette procédure a reçu un soutien général du TSMAD, qui a recommandé que le CHRIS l'examine et la soumette aux Etats membres pour approbation. Cette recommandation est fournie en **Annexe B** pour examen avant la prochaine réunion du CHRIS (Rotterdam, 4-9 novembre 2007).

2 Le BHI propose de suspendre le vote concernant la Résolution technique proposée annexée à la référence a) jusqu'à ce que le CHRIS puisse examiner la nouvelle procédure, les commentaires des Etats membres et formuler ses recommandations. Il doit être noté que les recommandations pour un codage cohérent des données ENC ont été présentées initialement aux Etats membres en juillet 2004 et restent, dans l'ensemble, une méthode efficace qui permet d'accroître la cohérence entre les cellules ENC. La nouvelle procédure **en Annexe B** affecte les recommandations proposées, actuellement au paragraphe 2. Les Etats membres sont invités à examiner en détail la facilité d'utilisation et l'efficacité de cette méthode d'attribution des valeurs SCAMIN.

Veuillez agréer, Madame la Directrice, Monsieur le Directeur, l'assurance de ma haute considération,

Pour le Comité de direction,

Contre-amiral Kenneth BARBOR
Directeur

PJ : Annexe A – Commentaires des Etats membres
Annexe B – Proposition pour l'utilisation cohérente de l'attribut SCAMIN (*anglais seulement).*

Commentaires des Etats membres à la LC du BHI 32/2007

1. Les Etats membres suivants ont voté, sans commentaire, en faveur de l'adoption des *Recommandations pour un codage cohérent des données ENC* en tant que Résolution technique de l'OHI :

Belgique, Brésil, Colombie, Danemark, Estonie, Finlande, Allemagne, Islande, Italie, Pays-Bas, Norvège, Pakistan, Pérou, Pologne, Singapour, Slovénie, Afrique du Sud, Espagne, Tunisie et Ukraine.

2. Des Etats membres ont fourni les commentaires suivants avec leur vote en faveur de l'adoption des *Recommandations pour un codage cohérent des données ENC* en tant que Résolution technique de l'OHI :

- **Argentine** - Ce SH approuve le fait que "les Recommandations pour un codage cohérent des données ENC" contenues dans l'Annexe A à la lettre circulaire No. 32/2007 deviennent la nouvelle Résolution technique de l'OHI A 3.14, sans inclure l'item 2 concernant les critères d'attribution des valeurs SCAMIN.

  A cet égard, ce SH détermine actuellement les valeurs SCAMIN via une procédure automatisée qui permet au logiciel qui est utilisé de produire des données ENC, au moyen d'un tableau de référence en usage depuis 2004, conformément aux recommandations de l'OHI. Par exemple, pour les objets qui doivent être visualisés pendant une plus longue période (comme les bouées et les balises).

  Se conformer à l'item 2 impliquerait une détermination manuelle, objet par objet, ou par petits groupes, et entraînerait une plus longue procédure et le risque de commettre un plus grand nombre d'erreurs.

- **Australie** – Bien que le SHA soutienne fermement les efforts visant à promouvoir la cohérence des données ENC, il note avec préoccupation qu'une Résolution technique peut ne pas avoir la visibilité et le statut souhaités au sein du personnel technique impliqué dans les activités de codage. Il est en conséquence envisagé que cette question soit également soulevée en tant que Bulletin de codage des ENC dans le but de soutenir et de clarifier plus directement les spécifications existantes, avec le Bulletin tenu à jour par le TSMAD.

- **Colombie** - Le Service hydrographique de Colombie pense qu'il est positif d'officialiser toutes les recommandations via une Résolution technique de l'OHI, étant donné que cela contribue à obtenir un produit final homogène de meilleure qualité. Cela signifie que le producteur doit également appliquer ces recommandations aux données ENC.

- **Equateur –**Nous devons faire en sorte que les bandes d'échelle relatives aux types de navigation coïncident, à la fois pour les cartes papier et les cartes électroniques et pour les cartes papier, qui sont mentionnées dans la publication M-4 à la section B 126.

- **Inde** – Les recommandations pour un codage cohérent des données ENC faciliteront grandement les problèmes relatifs aux limites de cellule des données et conduiront à une amélioration de la cohérence des ENC.

- **Japon** – Toutes les ENC doivent répondre à ces recommandations le plus tôt possible.

- **Oman** – Plus l'OHI fournira de directives à cet égard, mieux ce sera.

- **Papouasie-Nouvelle-Guinée –** La Papouasie-Nouvelle-Guinée ne produit pas encore ses cartes ; le Service hydrographique australien nous a prodigué un grand soutien dans notre région. Nous appuyons sans réserve les recommandations pour un codage cohérent des données ENC.

- **Portugal –** L'IHPT approuve entièrement que les « *Recommandations pour un codage cohérent des données ENC* » telles qu'elles figurent à l'Annexe A de la LC du BHI No. 32/2007, fasse l'objet d'une nouvelle résolution technique de l'OHI A3.14. Comme l'IHPT l'a indiqué plusieurs fois, nous sommes convenus que chaque mesure prise afin d'améliorer la cohérence rende le produit plus convivial pour l'utilisateur final. L'OHI a établit les bonnes pratiques en matière de codage des ENC, a produit des publications telles que le GUIDE DE PRODUCTION DES ENC et est apte à élaborer les résolutions techniques relatives à la cohérence des ENC. Cette proposition de résolution technique représente une contribution supplémentaire.

- **Suède** - Les recommandations doivent demeurer des recommandations même en tant que Résolutions techniques de l'OHI.

- **Royaume-Uni** - Bien qu'il soit prévu que ces recommandations fassent partie de la S-101 dans le futur, le SH du RU convient que la cohérence des ENC est une question primordiale et qu'en conséquence une Résolution technique sera utile à court terme.

  Des travaux supplémentaires relatifs à l'attribut SCAMIN sont actuellement entrepris au sein de l'IC-ENC en vue de fournir un cadre plus détaillé et structuré aux Etats membres qui souhaitent aller au-delà de l'approche minimum décrite dans l'alinéa 2 du paragraphe 2 des recommandations actuelles. IC-ENC présentera ces travaux à la prochaine réunion du TSMAD. Le BHI peut en conséquence souhaiter examiner les conclusions de la réunion du TSMAD avant de finaliser la Résolution technique, car une référence croisée appropriée à ces directives additionnelles pourrait être bénéfique.

- **Etats-Unis –** Les Recommandations doivent changer rapidement. En faire l'objet d'une RT conduirait à une bureaucratie inutile pour les mettre à jour, au fur et à mesure que les nouvelles questions de codage sont identifiées et les directives publiées. Une RT qui dirait « Suivre les directives de codage (publiées plus loin) » pourrait être une alternative acceptable.

  En outre, les Recommandations telles qu'elles sont rédigées actuellement ont les inconvénients suivants :

  Recommandation 1:

  - La détermination des échelles de compilation des ENC en fonction des valeurs contenues dans le tableau, et l'indication de la plus grande échelle suivante comme l'échelle de compilation pour les ENC entre les valeurs du tableau font que la précision de trop nombreuses ENC est surestimée. Par exemple les nombreuses ENC à échelle de compilation à 1 : 40 000 des USA seraient codées comme ayant une échelle de compilation à 1 : 20 000 impliquant une précision plus grande que celle qui existe. Les USA (NOAA) n'encouragent pas une telle surestimation de la précision ;
  - Recommandation 1, deuxième point : la situation y est incorrectement décrite. Indiquer une échelle supérieure une diminution de l'encombrement et non pas son accroissement.
  - Tableau1 – Portée du radar /tableau des échelles standard, il s'agit en partie d'une question de visualisation et en partie d'une question de données. Ces questions devraient être distinguées et traitées séparément.

  Recommandation 2:

  -Cette recommandation n'est plus d'actualité. NAV 52/MSC 82 a modifié le contenu Affichage de base/affichage standard en déplaçant les "bouées et balises" de l'affichage de base vers l'affichage standard.

3. **Bangladesh –** S'est abstenu de voter au motif que " le Bangladesh ne possède pas encore de capacité de production d'ENC ni le niveau souhaité de compétence pour évaluer les "Recommandations pour un codage cohérent des données". En conséquence, il ne peut remettre aucun vote à ce sujet.

4. **France –** A voté contre l'adoption des recommandations en tant que Résolution technique et a fait le commentaire suivant :

La France n'approuve pas l'incorporation des recommandations relatives au codage cohérent des ENC dans le répertoire des résolutions techniques. Elle préconise que le comité CHRIS soit invité à mener une analyse objective des avantages et inconvénients respectifs de l'adaptation d'une part de la norme d'affichage des ECDIS et d'autre part de la spécification de produit des ENC, dans le but d'atteindre l'objectif de cohérence au moindre coût. Cette analyse devrait associer des représentants des producteurs d'ENC et des fabricants d'ECDIS et être conduite en tenant compte de l'objectif ambitieux que se sont donnés les Etats membres de l'OHI en adoptant au cours de la 17e Conférence hydrographique internationale la proposition 23 relative à la réalisation d'une couverture adéquate d'ENC.

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Annexe B à la LC du BHI 64/2007
Dossier du BHI No S3/8151/CHRIS

ic-enc.org
International Centre for ENCs

Proposal for the consistent application of the attribute SCAMIN

April 2007

1. Background

In October 2003, IC-ENC published a paper entitled "SCAMIN", describing the importance of the consistent use of the attribute SCAMIN by data producers. At the time, many HOs were not making use of this attribute and those that were encoding it used different methods. This paper was subsequently submitted to TSMAD for review and was used as the basis for the SCAMIN recommendation in IHO CL 47/2004 (see Annex A).

These IHO recommendations define a minimum application of SCAMIN, which is to apply a global SCAMIN value linked to the compilation scale of the next available ENC. Whilst this approach provides a simple and cost effective method of populating this important attribute, it has a number of inherent weaknesses - most importantly:

- No account is taken of the relative importance of individual occurrences of an object or object class.
- Where there are large gaps in the scales of coverage available, this method will not achieve a sufficient degree of de-cluttering.
- Features common across navigational purposes will have different SCAMIN values causing them to disappear and reappear as the user zooms out.

The IHO recommendations go on to describe the optional use of intermediate SCAMIN values for certain object classes to address these issues, but does not offer guidance on how to determine these intermediate values.

More recent research by IC-ENC has highlighted that HOs are now either:

- Relying on the automated SCAMIN functions available within their ENC production software (which varies from system to system);
- Using only the minimum approach outlined in the IHO recommendations;
- Going beyond this minimum approach by determining the intermediate value based on the smallest scale depiction of an object (but only a few);
- Seeking more definitive guidance before applying SCAMIN (the majority).

IC-ENC has therefore developed an updated set of proposals designed to:

- Improve the current IHO minimum approach so that many of the inherent weaknesses are addressed without needing significant additional resources to achieve.
- Offer the guidance necessary to give HOs who wish to apply a more refined application of SCAMIN the confidence to do so in a consistent and logical manner.

These proposals are now submitted for wider consideration following a period of consultation with Production software manufacturers, OEMs and Hydrographic offices.

2. Proposals

2.1. Compilation Scale

As already stated in the IHO recommendations, it is very important that HOs follow the recommendation to set compilation scale for ENCs from the list of fixed standard scales below as this then acts as the reference point for SCAMIN attribution.

Standard scale
1:3,000,000
1:1,500,000
1:700,000
1:350,000
1:180,000
1:90,000
1:45,000
1:22,000
1:12,000
1:8,000
1:4,000

An example to illustrate this:
An ENC produced from a 1:25,000 paper chart has a nearest larger standard scale of 1:22,000, so should normally have a compilation scale of 22,000. Exceptionally, however, the compilation scale for such an ENC may be set to 12,000, but only if the source material for the paper chart is from surveys of a scale larger than 1:12,000.

2.2. Application of SCAMIN – Revised minimum approach

IC-ENC now proposes the following rules for the revised minimum application of SCAMIN:

1. SCAMIN values used must be selected from the following list:-

1:19,999,999
1:9,999,999
1:4,999,999
1:2,999,999
1:1,499,999
1:699,999
1:499,999
1:349,999
1:259,999
1:179,999
1:119,999
1:89,999
1:59,999
1:44,999
1:29,999
1:21,999
1:17,999
1:11,999
1:7,999
1:3,999

1:1,999
1:999

Note that additional SCAMIN values have been added midway between the recommended compilation scales in order to take advantage of the wider range of display scales available on many ECDIS systems. These additional values will enable a more refined approach to the setting of SCAMIN resulting in a more subtle reduction of the data displayed.

The list has also been extended to include SCAMIN values for ENCs with compilation scales greater than 1:4,000 and smaller than 1:3,000,000.

2. SCAMIN values for features within an ENC must be set to either 1, 2, 3 or 4 steps smaller scale than the compilation scale of the ENC.

For example a point ACHBRT object depicted on an ENC with a compilation scale of 8,000 would have a SCAMIN value of 11,999 (i.e. 1 step smaller scale than 8,000)

3. Annex B lists the step values (i.e. 1, 2, 3 or 4) that must be applied for specific object classes together with any relevant conditions.

An example to illustrate this: when setting the SCAMIN value for a conspicuous BUISGL object in a Harbour cell (CS = 12,000), the value of SCAMIN would be determined as three steps smaller than 12,000 which would be 29,999.

4. Linear & area objects that extend beyond the coverage of a cell into an adjacent cell must be assigned a SCAMIN value based on the compilation scale of the smaller scale cell.

An example to illustrate this: when setting the SCAMIN value for a linear CBLSUB object in a Harbour cell (CS = 8,000) that extends into an adjacent Harbour cell with a compilation scale of 12,000, the value of SCAMIN would be determined as three steps smaller than 12,000 which would be 29,999.

2.3. Application of SCAMIN – Optional Advanced approach

The revised minimum approach described above offers an automated solution which addresses many of the current limitations, such as:

- Account is taken of the relative importance of different object classes rather than switching off all objects at the same scale.
- Sufficient de-cluttering will occur even where there are large gaps in the scales of coverage available.

However, this revised minimum approach still takes no direct account of the relative importance of individual occurrences of an object, and may still result in the unsettling situation where an object disappears and then reappears as the user zooms out.

To address these remaining issues, IC-ENC now proposes the following optional rule which replaces rule 2 described above:-

5. The SCAMIN value of an individual occurrence of an object must be set to either 1, 2, 3 or 4 steps smaller scale than the compilation scale of the smallest scale ENC that the specific geometric depiction of that object appears on.

For example a BUISGL object may be depicted as an area in ENCs with compilation scales of 2,000 and 8,000 but as a point in an ENC with a compilation scale of 22,000. Its SCAMIN value would therefore be set to 11,999, 1 step smaller scale than 8,000 not 45,000.

Setting SCAMIN based on the scale of the smallest scale product that a particular object appears on will ensure that the most significant features remain on display longer and ensure consistent display as the user zooms in and out.

This approach will require significant manual intervention where ENC production is based on digitising paper charts. However it will become more feasible in the future with the advent of "Hydrographic Database" solutions, since a single value of SCAMIN can be set for all objects stored in the database to achieve the desired outcome.

2.4. S-52 Conditional Symbology Procedures

In drafting the steps proposed in Annex B, IC-ENC has taken into account the fact that the rules for ECDIS "Base Display" will change following the adoption of a revised ECDIS performance standard by IMO. This change means that objects which appear in "Base Display" will become dependent on the safety contour set by the user.

The new rules define that Display Base (i.e. to be permanently shown on the ECDIS display) will consist of:

1. Coastline (high water);
2. Own ship's safety contour;
3. Isolated underwater dangers of depths less than the safety contour which lie within the safe waters defined by the safety contour;
4. Isolated dangers which lie within the safe water defined by the safety contour, such as fixed structures, overhead wires, etc.,
5. Scale, range and north arrow;
6. Units of depth and height;
7. Display mode

In order to ensure safe and optimal de-cluttering, it is therefore proposed that the Colours and Symbols Maintenance Working Group review the Conditional Symbology Procedures to ensure that underwater hazards, and isolated dangers that fall into the categories listed under 3 and 4 above, will remain displayed regardless of any SCAMIN value encoded. This review should form part of the development of the planned new edition of S-52.

3. Conclusions

This review of the current situation has highlighted the wide variety of different solutions that have been adopted by various HOs for the encoding of SCAMIN since the publication of the IHO recommendations. In many cases, HOs have already identified the limitations of the minimum approach proposed in the IHO recommendations and have introduced more detailed approaches; a few have adopted the minimum proposal in the IHO recommendations, whilst many others await more detailed guidance. This inconsistent approach across data producers was raised as a major concern at the 2nd ECDIS Stakeholders Forum and 10th WEND meeting (Sept 2006).

IC-ENC has, therefore, proposed a more detailed minimum approach. This proposed method takes into account the relative importance of individual occurrences of an object class and will achieve a sufficient degree of de-cluttering even when there are large gaps in the scales of data available. By

applying the optional advanced option, HOs with Hydrographic databases can also ensure a consistent display as the user switches between usage bands.

If this proposal is approved at the RENC level, IC-ENC recommends that it is forwarded to TSMAD for consideration as part of its work to develop the new ENC product specification (S-101).

Richard Fowle IC-ENC, Taunton, March 2007

ANNEX A

IHO Circular Letter 47/2004 - IMPROVING ENC CONSISTENCY

SCAMIN values should be determined using a method that reduces the number of individual objects displayed and ensures clarity, using the standard rounded display scales listed in the above table:

- SCAMIN should be applied to all SCAMIN-attributable objects and also to buoys and beacons which belong to the display category "base display" of the IMO Performance Standards for ECDIS. SCAMIN should not be applied to any other base display objects.

- As a minimum, a single standard value should be applied to all SCAMIN-attributable objects. This single standard value should be set to the compilation scale minus 1 of the next available smaller scale ENC covering the area, e.g. for an ENC with a compilation scale of 12000, where the next available smaller scale ENC has a compilation scale of 90,000, this standard SCAMIN value should be set to 89,999.

- In order to achieve clarity of display as the user zooms out, intermediate SCAMIN values should be applied to those individual objects in SCAMIN-attributable object classes that the HO considers are less important and that are contributing to clutter. These values should be set to one of the rounded standard scales (minus one) between the compilation scale of the cell and the compilation scale of the next smaller scale ENC available. For instance, for an ENC with a compilation scale of 12,000, where the next available smaller scale ENC has a compilation scale of 90,000, a SCAMIN value of 44,999 could be applied to such objects.

- If it is desired to continue displaying navigationally important objects of the ENC at zoom levels beyond the compilation scale of the next smaller scale ENC available, other smaller scale SCAMIN values should be applied to such individual objects. These values should be set to one of the rounded standard scales (minus one) beyond the compilation scale of the next smaller scale ENC available. For instance, in the example above, a SCAMIN value of 179,999 may be applied to such objects. The number of upward steps in rounded standard scales will differ for different objects/object classes of differing importance for navigation, e.g. selected soundings may possibly have SCAMIN values of two steps beyond, whereas aids to navigation (buoys, beacons etc.) may possibly require three or more steps beyond.

For the purposes of consistency, and to support a seamless transition between ENC cells, it makes sense if the objects selected for smaller scale SCAMIN values broadly correlate with the objects which appear on the next smaller scale ENC available.

- If there is currently no smaller scale ENC available, it is recommended that the starting point for use of SCAMIN be set at two steps beyond the compilation scale. The values should be set to one of the rounded standard scales (minus one) beyond the compilation scale of the ENC as described above.

- If the above recommendations are used to apply SCAMIN values, the last bullet point of UOC clause 2.2.7 recommending the use of the same SCAMIN value for all navigational purposes no longer applies.

- In order to ensure consistency of display at their boundaries, it is essential that HOs liaise with their neighbouring HOs, RENC and/or Regional Hydrographic Commission when defining these SCAMIN values.

ANNEX B

Specific SCAMIN step values for Object and attribute combinations

In the following table, group 2 objects have been sub-divided into the following sub-groups:-

2M Meta objects.
2B Group2 objects that are always part of base display.
2CB Group 2 objects that are part of base display dependent on safety contour setting.
2S Group 2 objects in standard display

The final column **SCAMIN STEPS** indicates the number of steps above (smaller scale) the compilation scale that SCAMIN values should be set to.

NB. Producers should be prepared to deviate from the step values specified when the significance of the feature dictates, e.g. the recommended number of steps for a LIGHTS object is 4, but there will be circumstances where a LIGHTS object is so important that no SCAMIN value be applied; alternatively, the light could be so minor that a step value of 1 can be applied.

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
ACHARE	Point	2		2
ACHARE	Area	2S	If RESTRN defined	3
ACHARE	Area	2		2
ACHBRT	Point	2		1
ACHBRT	Area	2		1
ADMARE	Area	2		1
AIRARE	Point	2S	If CONVIS = 1(visually conspicuous)	3
AIRARE	Point	2		1
AIRARE	Area	2S	If CONVIS = 1(visually conspicuous)	2
AIRARE	Area	2		1
ARCSLN	Area	2S		4
ASLXLN	Line	2S		4
BCNCAR	Point	2S		3
BCNISD	Point	2CB		4
BCNLAT	Point	2S		3
BCNSAW	Point	2S		3
BCNSPP	Point	2S		3
BERTHS	Point	2		1
BERTHS	Line	2		1
BERTHS	Area	2		1
BOYCAR	Point	2S		3
BOYINB	Point	2S		3
BOYISD	Point	2CB		4
BOYLAT	Point	2S		3
BOYSAW	Point	2S		3
BOYSPP	Point	2S		3
BRIDGE	Point	2CB	Over navigable water	4
BRIDGE	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
BRIDGE	Point	2		1
BRIDGE	Line	2CB	Over navigable water	4
BRIDGE	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
BRIDGE	Line	2		1
BRIDGE	Area	2CB	Over navigable water	4
BRIDGE	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
BRIDGE	Area	2		1
BUAARE	Point	2S	If CONVIS = 1(visually conspicuous)	3
BUAARE	Point	2		1
BUAARE	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
BUAARE	Area	2		1
BUISGL	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) or FUNCTN = 33	3
BUISGL	Point	2		1
BUISGL	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) or FUNCTN = 33	3
BUISGL	Area	2		1
C_AGGR	N/A	2		NOT SET
C_ASSO	N/A	2		NOT SET
CANALS	Line	2		1
CANALS	Area	2		2
CAUSWY	Line	2		2
CAUSWY	Area	2		2
CBLARE	Area	2S	If RESTRN defined	3
CBLARE	Area	2		2
CBLOHD	Line	2CB	Over Navigable Water	4
CBLOHD	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
CBLOHD	Line	2		1
CBLSUB	Line	2		3
CGUSTA	Point	2		1
CHKPNT	Point	2		1
CHKPNT	Area	2		1
COALNE	Line	2B		NOT SET
CONVYR	Line	2CB	Over Navigable Water	4
CONVYR	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
CONVYR	Line	2		1
CONVYR	Area	2CB	Over Navigable Water	4
CONVYR	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
CONVYR	Area	2		1
CONZNE	Area	2		2
COSARE	Area	2		1
CRANES	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1	3

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
			(radar conspicuous)	
CRANES	Point	2		1
CRANES	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
CRANES	Area	2		1
CTNARE	Point	2S		4
CTNARE	Area	2S		4
CTRPNT	Point	2		1
CTSARE	Point	2		1
CTSARE	Area	2		1
CURENT	Point	2		3
CUSZNE	Area	2		2
DAMCON	Point	2		1
DAMCON	Line	2B	If sharing geometry with LNDARE & DEPARE or DRGARE	NOT SET
DAMCON	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
DAMCON	Line	2		1
DAMCON	Area	2B	Making up part of coastline	NOT SET
DAMCON	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
DAMCON	Area	2		1
DAYMAR	Point	2S	If Slave SCAMIN must match that of Master	3
DEPARE	Line	2		1
DEPARE	Area	1		NOT SET
DEPCNT	Line	2CB	If VALDCO = 0 (drying line) or 30 (default safety contour ref S-52)	4
DEPCNT	Line	2		2
DISMAR	Point	2		2
DMPGRD	Point	2S	If RESTRN defined	3
DMPGRD	Point	2		2
DMPGRD	Area	2S	If RESTRN defined	3
DMPGRD	Area	2		2
DOCARE	Area	2		1
DRGARE	Area	1		NOT SET
DRYDOC	Area	2		1
DWRTCL	Line	2S		4
DWRTPT	Area	2S		4
DYKCON	Line	2B	If sharing geometry with LNDARE & DEPARE or DRGARE	NOT SET
DYKCON	Line	2		1
DYKCON	Area	2B	If sharing geometry with LNDARE & DEPARE or DRGARE	NOT SET
DYKCON	Area	2		1
EXEZNE	Area	2		1
FAIRWY	Area	2S		3
FERYRT	Line	2S		3

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
FERYRT	Area	2S		3
FLODOC	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FLODOC	Area	1		NOT SET
FNCLNE	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FNCLNE	Line	2		1
FOGSIG	Point	2S	If Slave SCAMIN must match that of Master	3
FORSTC	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FORSTC	Point	2		1
FORSTC	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FORSTC	Line	2		1
FORSTC	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
FORSTC	Area	2		1
FRPARE	Area	2		2
FSHFAC	Point	2		2
FSHFAC	Line	2		2
FSHFAC	Area	2		2
FSHGRD	Area	2		1
FSHZNE	Area	2		1
GATCON	Point	2		2
GATCON	Line	2B	If sharing geometry with LNDARE & DEPARE or DRGARE	NOT SET
GATCON	Line	2		2
GATCON	Area	2B	If sharing geometry with LNDARE & DEPARE or DRGARE	NOT SET
GATCON	Area	2		2
GENOBJ	Point	2S		4
GENOBJ	Line	2S		4
GENOBJ	Area	2S		4
GRIDRN	Point	2		1
GRIDRN	Area	2		1
HRBARE	Area	2		3
HRBFAC	Point	2		1
HRBFAC	Area	2		1
HULKES	Point	2		1
HULKES	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
HULKES	Area	1		NOT SET
ICEARE	Area	2		3
ICNARE	Point	2		1
ICNARE	Area	2S	If RESTRN defined	3
ICNARE	Area	2		1
ISTZNE	Area	2S		3
LAKARE	Area	2		1

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
LIGHTS	Point	2S	If Slave SCAMIN must match that of Master	4
LITFLT	Point	2S		4
LITVES	Point	2S		4
LNDARE	Point	2		NOT SET
LNDARE	Line	2		NOT SET
LNDARE	Area	1		NOT SET
LNDELV	Point	2S	If CONVIS = 1(visually conspicuous)	3
LNDELV	Point	2		1
LNDELV	Line	2		1
LNDMRK	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) or FUNCTN = 33	3
LNDMRK	Point	2		1
LNDMRK	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
LNDMRK	Line	2		1
LNDMRK	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous) or FUNCTN = 33	3
LNDMRK	Area	2		1
LNDRGN	Point	2		1
LNDRGN	Area	2		1
LOCMAG	Point	2		3
LOCMAG	Line	2		3
LOCMAG	Area	2		3
LOGPON	Point	2CB	On Navigable Water	4
LOGPON	Point	2		1
LOGPON	Area	2CB	On Navigable Water	4
LOGPON	Area	2		1
LOKBSN	Area	2		1
M_ACCY	Area	2M		NOT SET
M_COVR	Area	2M		NOT SET
M_CSCL	Area	2M		NOT SET
M_HOPA	Area	2M		NOT SET
M_NPUB	Area	2M		NOT SET
M_NSYS	Area	2M		NOT SET
M_QUAL	Area	2M		NOT SET
M_SDAT	Area	2M		NOT SET
M_SREL	Area	2M		NOT SET
M_VDAT	Area	2M		NOT SET
MAGVAR	Point	2		3
MAGVAR	Line	2		3
MAGVAR	Area	2		3
MARCUL	Point	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
MARCUL	Point	2		1
MARCUL	Line	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
MARCUL	Line	2		1

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
MARCUL	Area	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
MARCUL	Area	2S	If RESTRN defined	3
MARCUL	Area	2		2
MIPARE	Point	2S		3
MIPARE	Area	2S		3
MORFAC	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
MORFAC	Point	2S		2
MORFAC	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
MORFAC	Line	2S		2
MORFAC	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
MORFAC	Area	2S		3
NAVLNE	Line	2		2
OBSTRN	Point	2CB	Isolated obstructions	4
OBSTRN	Point	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
OBSTRN	Point	2	The most significant OBSTRN of a group of OBSTRNS within close proximity	NOT SET
OBSTRN	Point	2	For groups of OBSTRNs in close proximity, or within an OBSTRN area	2
OBSTRN	Line	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
OBSTRN	Line	2CB		4
OBSTRN	Area	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
OBSTRN	Area	2CB		4
OFSPLF	Point	2CB	Isolated Installations	4
OFSPLF	Point	2S		3
OFSPLF	Area	2CB		4
OFSPLF	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
OILBAR	Line	2CB		4
OSPARE	Area	2CB		4
OSPARE	Area	2CB	If RESTRN = defined or CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	4
PILBOP	Point	2		3
PILBOP	Area	2		3
PILPNT	Point	2CB	Where used to mark position of LIGHTS object in water	4
PILPNT	Point	2S	If CONVIS = 1(visually conspicuous)	3
PILPNT	Point	2		2
PIPARE	Point	2S		3
PIPARE	Area	2S		3
PIPOHD	Line	2CB	Over Navigable Water	4
PIPOHD	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
PIPOHD	Line	2		1
PIPSOL	Point	2	Submarine	3
PIPSOL	Point	2	On land	1
PIPSOL	Line	2	Submarine	3
PIPSOL	Line	2	On land	1
PONTON	Line	2		2
PONTON	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PONTON	Area	1		NOT SET
PRCARE	Point	2S		3
PRCARE	Area	2S		3
PRDARE	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PRDARE	Point	2		1
PRDARE	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PRDARE	Area	2		1
PYLONS	Point	2CB	Bridge supports in navigable water	4
PYLONS	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PYLONS	Point	2		1
PYLONS	Area	2CB	Bridge supports in navigable water	4
PYLONS	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
PYLONS	Area	2		1
RADLNE	Line	2		3
RADRFL	Point	2	If Slave SCAMIN must match that of Master	3
RADRNG	Area	2		3
RADSTA	Point	2	If Slave SCAMIN must match that of Master	2
RAILWY	Line	2		1
RAPIDS	Point	2		1
RAPIDS	Line	2		1
RAPIDS	Area	2		1
RCRTCL	Line	2S		3
RCTLPT	Point	2S		3
RCTLPT	Area	2S		3
RDOCAL	Point	2S		3
RDOCAL	Line	2S		3
RDOSTA	Point	2	If Slave SCAMIN must match that of Master	1
RECTRC	Line	2S		3
RECTRC	Area	2S		3
RESARE	Area	2S		3
RETRFL	Point	2S	If Slave SCAMIN must match that of Master	3
RIVERS	Line	2		1
RIVERS	Area	2		4
ROADWY	Point	2		1
ROADWY	Line	2		1

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
ROADWY	Area	2		1
RSCSTA	Point	2		3
RTPBCN	Point	2S	If Slave SCAMIN must match that of Master	3
RUNWAY	Point	2S	If CONVIS = 1(visually conspicuous)	3
RUNWAY	Point	2		1
RUNWAY	Line	2S	If CONVIS = 1(visually conspicuous)	3
RUNWAY	Line	2		1
RUNWAY	Area	2S	If CONVIS = 1(visually conspicuous)	3
RUNWAY	Area	2		1
SBDARE	Point	2		1
SBDARE	Line	2		1
SBDARE	Area	2		1
SEAARE	Point	2		1
SEAARE	Area	2		1
SILTNK	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1(radar conspicuous) or Representative of a group of SILTNKs	3
SILTNK	Point	2		1
SILTNK	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1(radar conspicuous) or Representative of a group of SILTNKs	3
SILTNK	Area	2		1
SISTAT	Point	2	If Slave SCAMIN must match that of Master	1
SISTAW	Point	2	If Slave SCAMIN must match that of Master	1
SLCONS	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLCONS	Point	2		1
SLCONS	Line	2B	If sharing geometry with LNDARE & DEPARE or DRGARE	NOT SET
SLCONS	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLCONS	Line	2		2
SLCONS	Area	2B	If sharing geometry with LNDARE & DEPARE or DRGARE	NOT SET
SLCONS	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLCONS	Area	2		2
SLOGRD	Point	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLOGRD	Point	2		1
SLOGRD	Area	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLOGRD	Area	2		1
SLOTOP	Line	2S	If CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
SLOTOP	Line	2		1
SMCFAC	Point	2		1
SMCFAC	Area	2		1

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
SNDWAV	Point	2		3
SNDWAV	Line	2		3
SNDWAV	Area	2		3
SOUNDG	Point	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
SOUNDG	Point	2	Critical Depths over sand bars etc where EXPSOU < 30m	3
SOUNDG	Point	2		1
SPLARE	Point	2S	If RESTRN defined	3
SPLARE	Point	2		1
SPLARE	Area	2S	If RESTRN defined	3
SPLARE	Area	2		1
SPRING	Point	2		1
STSLNE	Line	2		1
SUBTLN	Area	2S		3
SWPARE	Area	2		3
T_HMON	Point	2		1
T_HMON	Area	2		1
T_NHMN	Point	2		1
T_NHMN	Area	2		1
T_TIMS	Point	2		1
T_TIMS	Area	2		1
TESARE	Area	2S	If RESTRN defined	3
TESARE	Area	2		2
TIDEWY	Line	2		1
TIDEWY	Area	2		1
TOPMAR	Point	2S	If Slave SCAMIN must match that of Master	3
TS_FEB	Point	2		3
TS_FEB	Area	2		3
TS_PAD	Point	2		2
TS_PAD	Area	2		2
TS_PNH	Point	2		2
TS_PNH	Area	2		2
TS_PRH	Point	2		2
TS_PRH	Area	2		2
TSELNE	Line	2S		NOT SET
TSEZNE	Area	2S		NOT SET
TSSBND	Line	2S		NOT SET
TSSCRS	Area	2S		NOT SET
TSSLPT	Area	2S		NOT SET
TSSRON	Area	2S		NOT SET
TS-TIS	Point	2		2
TS-TIS	Area	2		2
TUNNEL	Point	2		1
TUNNEL	Line	2		1
TUNNEL	Area	2CB	If Navigable	4
TUNNEL	Area	2		1

OBJECT	PRIMITIVE	GROUP	CONDITION	SCAMIN STEPS
TWRTPT	Area	2S		3
UNSARE	Area	1		NOT SET
UWTROC	Point	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m	4
UWTROC	Point	2	Not within an OBSTRN area	3
UWTROC	Point	2		2
VEGATN	Point	2S	If CONVIS = 1(visually conspicuous)	3
VEGATN	Point	2		1
VEGATN	Line	2S	If CONVIS = 1(visually conspicuous)	3
VEGATN	Line	2		1
VEGATN	Area	2S	If CONVIS = 1(visually conspicuous)	3
VEGATN	Area	2		1
WATFAL	Point	2S	If CONVIS = 1(visually conspicuous)	3
WATFAL	Point	2		1
WATFAL	Line	2S	If CONVIS = 1(visually conspicuous)	3
WATFAL	Line	2		1
WATTUR	Point	2		3
WATTUR	Line	2		3
WATTUR	Area	2		3
WEDKLP	Point	2		3
WEDKLP	Area	2		3
WRECKS	Point	2CB	If EXPSOU = 2(shoaler than range of the surrounding depth area) & VALSOU ≤ 30m or CATWRK = 2,4 or 5	4
WRECKS	Point	2S	CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
WRECKS	Point	2	For groups of WRECKSs in close proximity, the most significant should not have SCAMIN	2
WRECKS	Area	2CB	If EXPSOU = 2 & VALSOU ≤ 30m or CATWRK = 2,4 or 5	4
WRECKS	Area	2S	CONVIS = 1(visually conspicuous) or CONRAD = 1 (radar conspicuous)	3
WRECKS	Area	2		2