

INTERNATIONAL HYDROGRAPHIC
ORGANIZATION



ORGANISATION HYDROGRAPHIQUE
INTERNATIONALE

CHART STANDARDIZATION & PAPER CHART WORKING GROUP (CSPCWG)

[A Working Group of the Committee on Hydrographic Requirements for Information Systems – CHRIS]

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CSPCWG Circular Letter: 06/2005

UKHO ref: HA317/010/031-03 & HA317/004/058-01

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To CSPCWG Members

Date 17 May 2005

Dear Colleagues,

Subject: Draft revision M-4 Section B-400 to B-429

We plan to progress Work Item A.4, the revision of M-4 Part B-400, in manageable portions. Annex A is the first portion, covering B-400 to B-429. It is still formatted as a Word document, derived from the last Word version of M-4 produced by IHB. It includes changes from IHO Technical Resolutions (TR) and various modifications and additions from outstanding CSC records, from UK's internal quality documents and suggestions received from other HO's. The Secretary has also replaced words as necessary to reflect the agreed conventions in B-120 ('shall' to 'must', etc) and made many textual improvements to simplify the English or clarify the meaning. Nevertheless, we have attempted to keep changes to a necessary minimum.

Significant changes are marked as 'track changes', with marginal comments where an explanation is needed. CSC reference numbers refer to the CSC records; in many cases these are lengthy discussion papers with copies of correspondence. To avoid overburdening WG members, these have not been repeated here. It is hoped that the resultant draft text will be sufficient explanation of why a change was needed; if not, then additional material can be made available. Changes which are directly due to the conventions or improvements to the English are not marked, to avoid cluttering the document. Where we propose a non-conventional change however (eg 'shall' to 'should' or 'may'), this has been marked.

Some of the graphics need modernizing, or amendment. This has been indicated as a comment at present; the amendment will be done when the final version is converted to InDesign for incorporation into M-4. Page set-up and other format problems will also be resolved at that time.

I commend this work by our Secretary, Mr Andrew Heath-Coleman, to you. I would be grateful if members would now examine Annex A, and compare it carefully with the existing version in M-4 Part B-400, paying

particular attention to the track changes. I will assume that any proposed change which is not commented on can be incorporated into the draft revision without further WG consultation. There are also some specific questions arising, which are noted in the comment boxes, and repeated in the response form at Annex B. Please send me your responses and any suggestions for improvements **by 28 June 2005**.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Peter G.B. Jones', with a stylized flourish at the end.

Peter G.B. Jones,
Chairman

Annex A: Draft Revision of M-4 Part B-400 to B429.

Annex B: Response form

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SECTION 400 - HYDROGRAPHY AND NAVIGATIONAL AIDS

B-400 HYDROGRAPHY AND NAVIGATIONAL AIDS

This section covers the essential marine features of charts, including all navigational aids, whether on land or sea. Intertidal areas are also included. For landmarks useful to navigation but not expressly established for navigational purposes and for coastline features, see section B-300.

B-401 LEVELS OF DETAIL CHARTED

B-401.1 Full depiction of detail is naturally the cartographer's aim on the largest scale charts. Strictly, it is impossible because all features are symbolized to an extent which is partly determined by scale and partly by the conventions of charting practice. However, over the greater part of any chart the aim is to omit nothing essential for safe navigation and this is described as 'full depiction'. Most of the specifications, from B-405 onwards, deal with full depiction of hydrographic features, except where stated otherwise.

B-401.2 Generalization of detail is the elimination of the least essential information by 'smoothing' line symbols, omitting the less significant depth figures, simplifying the descriptions of navigational aids, and so on, while still showing as much **relevant** information as space permits. It is particularly important in the coastal zone on charts of second or smaller scales. See also B-402 and B-403.

B-401.3 Minimal depiction of detail is an extreme case of generalization where most features are omitted even though there is space to show at least some of them. It is most frequently used for semi-enclosed areas such as estuaries and harbours on smaller-scale charts, where use of a larger scale chart is essential for all sizes of vessels. See also B-402 and B-404.

B-402 PARTIAL DEPICTION OF DETAILS: PRINCIPLES

B-402.1 The purpose of generalization is primarily to avoid over-crowding charts where space is very limited. It also serves to reduce the correctional maintenance needed and to induce navigators, at least of deeper draught vessels, to use larger charts. For generalization of depths see B-403.1

B-402.2 The purpose of minimal depiction is to eliminate almost all correctional maintenance by retaining only the coastline and generalized depth contours and tints, showing the mariner a 'diagrammatic' picture of the length and orientation of channels. This minimal depiction is preferable to leaving areas entirely blank. For a further description see B-404.

B-402.3 The possible risks of omitting detail must be foreseen and avoided by the cartographer, who must study the Sailing Directions and other relevant publications to understand the use made of particular routes and harbours. Some of the possibilities which must be taken into account are:

- a. Mariners are not always able to take their intended routes and may have to make for a harbour of refuge or use an alternative passage.
- b. Minor navigational aids which would be omitted from an area immediately adjacent to a main channel may have to be charted to prevent confusion in recognizing navigational aids in the main channel.
- c. Too radical an elimination of detail could deprive the mariner of the overall picture of an area, such as an indication of the routes used by local traffic, which could be a hazard.
- d. The use of smaller scale charts for route planning must be considered; it would be inconvenient for a 'non-navigating' user (such as a marine superintendent) to have to refer to very many of the larger scale charts

when planning a passage.

e. Where the second scale national chart is the largest scale INT chart, it must contain sufficient information so that it may be used as a first scale chart for international shipping (see M-11 Part A 2.3).

B -402.4(I) **On International charts**, printer nations may use partial depiction to reduce correctional maintenance by omitting some detail from the producer's versions. For example, channels used only by local vessels either because of their limited depth or the fact that they do not lead to a port of international interest, may give rise to many corrections yet be of virtually no value to international traffic on printer nations' versions.

When a printer nation reproduces a producer nation's largest scale chart, it will naturally be the printer who is likely to be able to omit certain details without affecting the particular users of that version of the chart, the omissions being from areas of local interest only.

B -402.5(I) **Conversely**, when a printer nation reproduces the second scale of the producer's series (without reproducing the largest scale), the printer is unlikely to be able to omit any detail and might conceivably need to add some information by selection from the producer's largest scale. However, printers must not add detail to a second scale International chart in order to avoid adopting the larger scale chart, where the larger scale chart has been agreed as a necessary part of the International scheme. Producers should bear this aspect in mind in applying partial depiction techniques to second and small scale international charts (see B -402.3e).

B -402.6(I) **An alternative to partial depiction on international charts** is for the printer nation to reproduce the producer's chart in full detail, but to indicate that certain areas are of minor interest, and will not be kept corrected by the printer's Notices to Mariners. This method will be most useful in changeable areas where the producer is likely to publish fairly frequent new editions, making extensive amendment to the reprint by the printer, on each occasion, particularly wasteful. Such areas may be designated by means of a magenta boxed cautionary note. In complicated cases, it may be necessary for the printer to draw a bold coloured magenta line with magenta tint band on the inside around the areas which are not kept corrected (between the publication of new editions); a cautionary note should must be used to explain the line.

B-403 GENERALIZATION

Guidance on the generalization of specific features is included in many of these chart specifications, eg B-472 **Abridged light descriptions**. General guidance is more easily learned from the study of charts than from written descriptions, but, to demonstrate the need for very careful attention to be paid to this subject, the following paragraph deals with some of the problems of generalizing the most important charted feature: **submarine topography/depth**.

B-403.1 Generalization of depths (see also B-410). When a survey or chart is reduced in scale the generalization that is required has several effects:

- a. Deeper soundings tend to be eliminated while the shoaler ones are retained for safety. Sufficient numbers of deeper soundings should be retained to show the full range of depths. This is to assist the navigator who uses his echo sounder to help verify his position, or the mariner choosing an anchorage of suitable depth.
- b. It proceeds by the inclusion of shoals lying to seaward of the principal contour, and by the smoothing of severely indented contours, with the effect of pushing the contours seaward. However, as a shoal which rises steeply from deep water is much more of a hazard than one which rises gradually, the cartographer must ensure that the contours are not pushed seaward unduly. If he gives the impression that a mariner will get warning of too close an approach to the danger, by relying on his echo sounder to show gradually shoaling depths - when the danger is, in fact 'steep-to' - he may seriously mislead and endanger the chart user.
- c. With the 'expansion' of shoals, described above, it may become increasingly difficult to find space on a chart to show the line of deepest soundings through a channel, or even to show a channel at all. Yet even at small scales it is important to show the usable channels and indicate their least depth. The cartographer may have to make greater use of depth contours than soundings in depicting narrow channels.
- d. Even such dangers as drying rocks and islets have to be generalized in coastal areas, recognizing the principle that, whereas they are particularly dangerous in isolation and must then be shown as precisely as possible, where they occur in groups a selection of representative symbols is permissible, showing the outermost ones as individually as space permits.

B-404 MINIMAL DEPICTION OF DETAIL

B-404.1 The limit of minimal depiction of detail should ideally be a natural line, eg the entrance to a semi-enclosed harbour, the outer edge of an archipelago of islets, or where the open sea gives way to the mouth of an estuary encumbered by sandbanks. Along such lines there is a more or less abrupt change in character of navigation, frequently coinciding with the location of pilotage boarding places.

Occasionally the use of a completely arbitrary line (generally the limit of a larger scale chart) may be justified by special circumstances, eg for an area covered by a large scale inset plan on the same chart. In general, though, the overall picture needed for an appraisal of all the factors involved in planning passages can only be properly shown when the cartographer adheres to **natural** 'boundaries'.

In some cases, it may be advisable to omit all soundings, including wrecks, inshore of a particular depth contour. It may be necessary to insert a cautionary note on the chart to the effect that it must not be used for navigation in depths of less than a stated figure, **although in most cases the areas of minimal depiction will be obvious**.

B-404.2 Detail retained in an area of minimal depiction. The **coastline** is the single most important feature which gives the mariner a general picture of the whole area covered by the chart and should only be omitted in areas of minimal depiction where other information, such as chart title, notes, etc, unavoidably have precedence. In the areas of minimal depiction minor piers, jetties, groynes, etc should be omitted but a generalized outline of docks and major breakwaters should be retained.

Long range navigational aids of use to the mariner navigating the outer parts of the chart should be retained.

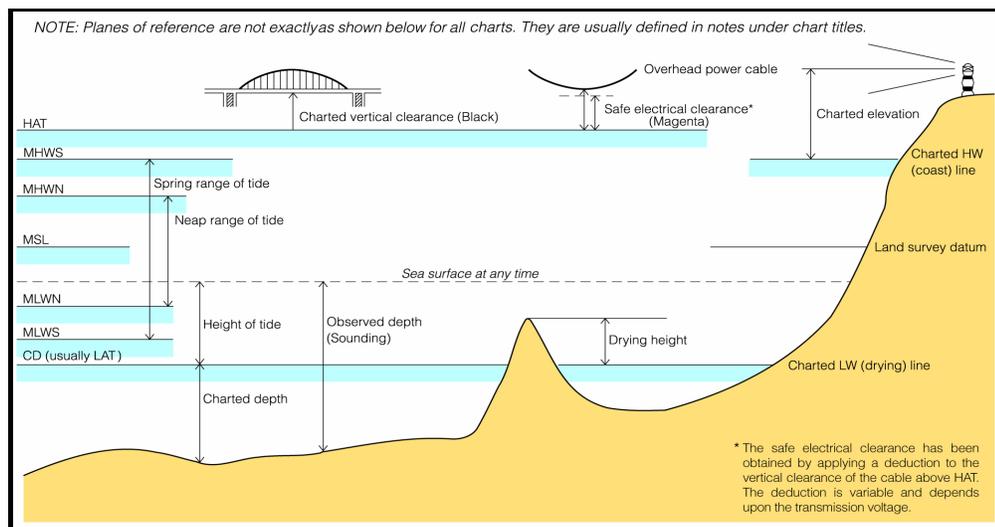
Depth contours, suitably generalized, are useful to the mariner in conveying general information, eg the length and orientation of channels within the inshore area, the likely sea conditions to leeward of coastal banks, and the probable traffic pattern. Furthermore, colour tints need not be arbitrarily terminated at the start of minimal depiction if depth contours are shown. Only exceptionally should the generalized contours need to be updated.

B-404.3 **Details omitted from areas of minimal depiction** will be those most subject to change: soundings, wrecks, buoys and other short range navigational aids. Also, features of lesser significance should be omitted, eg tidal stream data, maritime areas, cables.

In the case of fjords with a great range of depths it may be preferable to omit all contours.

B-405 CHART DATUM

Chart Datum (CD) is the plane of reference to which all charted depths and drying heights are related. In tidal areas it is chosen to show the least depth of water found in any place under 'normal' meteorological conditions. as defined by the IHO (TR A2.5) it 'shall be a plane so low that the tide will not frequently fall below it'. It will vary from place to place in relation to the land survey datum or mean sea level. For further information, see [Technical Resolution A2.5](#).



B-405.1 **Uniformity** of formulae for establishing CD for different nations would be difficult to achieve and is not essential for practical purposes. A general statement of the datum used must be included in the explanatory notes close to the chart title (see B-241.5) on charts of scale 1:500 000 and larger.

B-405.2 **Where the tidal range is not appreciable**, ie less than about 0.3m, CD may be Mean Sea Level (MSL).

B-405.3 **Where the tidal range is appreciable**, the Lowest Astronomical Tide (LAT), or as closely equivalent to this level as is practically acceptable to Hydrographic Offices, should be adopted as chart datum. Alternatively, the differences between LAT and national chart datums may be specified on nautical documents. If low water levels in a specific area frequently deviate from LAT, chart datum may be adapted accordingly. CD shall either be the lowest predicted tide (Lowest Astronomical Tide: LAT), the Indian Spring Low Water or a low water spring tide datum. Since LAT is the only CD with worldwide application, and has the additional merit of removing all negative values from tide tables, this should be adopted as a long term objective, to be considered when opportunity for change arises.

B-405.4 **In some offshore areas**, co-tidal charts and atlases may be available for use as a basis for reduction of soundings (for new surveys) and to CD, eg Co-Tidal charts for the North Sea compiled under the auspices of the North Sea Hydrographic Commission. In depths greater than 200m, a reduction for tide is not necessary.

B-405.5 Tide tables and chart datum: whatever CD is used, it is essential that it is the same as the datum adopted for the predictions given in the authoritative Tide Tables. Where, over a long period of time, datums are under adjustment to conform to LAT, or to take account of changes in sea level, the changes to Tide Tables and charts should be coordinated as far as possible.

B-405.6 The connection between chart datum and land survey datums should not be quoted on charts but should be readily available for the use of surveyors and engineers in national Tide Tables.

B-405.7 Rivers and estuaries: on the largest scale charts it may be desirable to indicate marked changes in CD over short distances by means of a diagram.

B-406 TIDAL LEVELS

The term ‘tide’ (or its equivalent) is used to designate the periodical vertical movements of water, which are astronomical in origin. In coastal navigation, where the tidal range is appreciable, it is useful to the mariner to know the approximate height of water, above chart datum, which may be found at high and low tide at both springs and neaps. This information, which does not normally change from year to year, must be shown as a table on medium and large scale charts, giving the navigator an indication of the significance of the tide in any area so that he knows when to refer to the Tide Tables for details of heights at any particular time.

B-406.1 Places for which tidal levels are given. On large scale harbour charts, and in harbour approaches, it is likely that only one or two sets of figures are required, identified in the table by the name of the place or places.

On the largest scale continuous coastal cover, figures must be given for the main ports and other places which differ significantly. Not more than 10 places shall-should be shown in the table on any chart. Where some places may be difficult to identify on the chart by name only, and exceptionally where the place does not fall within the limits of the chart, latitudes and longitudes (to the nearest minute only) may be quoted in addition to the names.

B-406.2 Semi-diurnal tides: the levels given in the table must be the mean heights, in metres and decimetres, of high and low water at both springs and neaps. If full information is not available, partly complete data, eg for springs only, may be given. A statement of the height of MSL may be included where this is considered to be useful, eg where MSL is used as the plane of reference for heights (see B-302.2). The table should be in the form of the specimen below, but variations are acceptable. The order of the columns of heights may be changed to conform with national Tide Tables. As stated in B-406.1, latitudes and longitudes need be given only where useful.

Tidal Levels referred to Datum of Soundings

Place	Lat. N/S	Long. E/W	Heights in metres/feet above datum			
			MHWS	MHWN	MLWN	MLWS
Rozel	49° 14'	2° 02'	10,7	8,2	3,9	1,6

H30

The table may be accompanied by a statement of the type of tide, eg ‘tide is semi-diurnal’.

B-406.3 Semi-diurnal tides with large diurnal inequalities: the levels given in the table must be the mean heights, in metres and decimetres, of the two daily high and low waters. A statement of the height of MSL may be included where this is considered to be useful.

The table should be in the form of the specimen below, but variations are acceptable.

Tidal Levels referred to Datum of Soundings

Place	Lat. N/S	Long. E/W	Heights in metres/feet above datum			
			MHWS	MHWN	MLWN	MLWS
Mina Rashid	25° 15'	55° 16'	1,7	1,8	0,8	0,4
Dubayv (Al Maktoum Bridge)	25° 15'	55° 19'	1,7	1,3	0,7	0,4
Ash Shiraqah (Sharjah)	25° 22'	55° 23'	2,0	1,7	1,2	0,8
Umm Al Qaywayn	25° 35'	55° 35'	1,7	1,5	0,9	0,5

H30

The table may be accompanied by a statement indicating the type of tide.

B-406.4 Diurnal tides: the levels given in the table must be the mean heights of high and low water. A statement of the height of MSL may be included where this is considered to be useful.

The table should be in the form of the specimen below, but variations are acceptable.

Tidal Levels referred to Datum of Soundings

Place	Lat. N/S	Long. E/W	Heights in metres/feet above datum				Datum and Remarks
			MHWS	MHWN	MLWN	MLWS	
Baie de Choiseul	6° 42'	156° 24'	1,2	-	-	0,5	The tide is usually diurnal

H30

The table may be accompanied by a statement indicating the type of tide.

B-406.5 Offshore areas where depths are critical. In areas where vessels may operate offshore with minimal underkeel clearance, the tidal information on charts, and in the Tide Tables, can usefully be supplemented by reference to co-tidal charts and atlases, where these exist. On appropriate charts, a note must be inserted under the Tidal Levels table, as follows:

‘For offshore data see Co-Tidal Chart(s)’ or
‘For offshore data see Co-Tidal and Co-Range Atlas(es)
or equivalent.

Where detailed tidal data are available for offshore positions (eg off the Dutch coast), the positions, the positions may be identified by a small magenta square with a letter, corresponding to the position quoted in the tabular statement of tidal levels.

B-406.6 Areas where tidal range is not appreciable. Where on the largest scale continuous chart cover, and larger scales, the tidal range is so small that detailed figures are not required, a note must be inserted under the title in a form such as ‘Mean Spring range of tide about 3 dm’ or: ‘Tidal rise range is not appreciable’, or equivalent. Where there is a large seasonal variation in MSL, an explanation should be added to the chart, or a note inserted referring the user to an explanation in the Tide Tables or elsewhere.

B-407 TIDAL STREAMS

The term ‘tidal streams’ (French: ‘courants de marée’, US usage: ‘tidal currents’), is used to designate the periodical horizontal movements of the water, which are astronomical in origin, and are distinguished from currents (French: ‘courants généraux’) (see B-408), which are not dependent on astronomical conditions, although in practice the navigator experiences a combination of tidal stream and current. They are defined by the direction towards which they flow. The terms ‘flood stream’ and ‘ebb stream’ may be used for designating the horizontal movement of the water when the tide is respectively rising or falling, but to avoid any ambiguity, in the case of streams which do not turn at about the time of local high or low water, an indication must be given of the direction towards which the stream flows.

Where tidal streams are predominantly semi-diurnal, they should be predicted by reference to the times of high and/or low water at a port for which daily predictions are given in tide tables. This should preferably be for a Standard Port, ie a station for which daily tidal predictions are published, and where the tides have similar characteristics to those of the tidal current streams under consideration. This information should be shown with the help of tables which should be shown on all charts of scale 1:750 000 and larger. In a few important areas eg Juan de Fuca Strait, North America, the tidal streams cannot be related to a Standard Port and it is necessary to refer to additional information to predict the rates and directions. This additional information where known, is to be found in the Tide Tables of the areas concerned.

For countries which publish Current Tables giving daily information relating to tidal streams with reference to the hours of the day, reference should be made to the time of slack or maximum current at a place for which daily tidal stream predictions are given in such Tables.

For races, overfalls and eddies associated with tidal streams, see B-423.

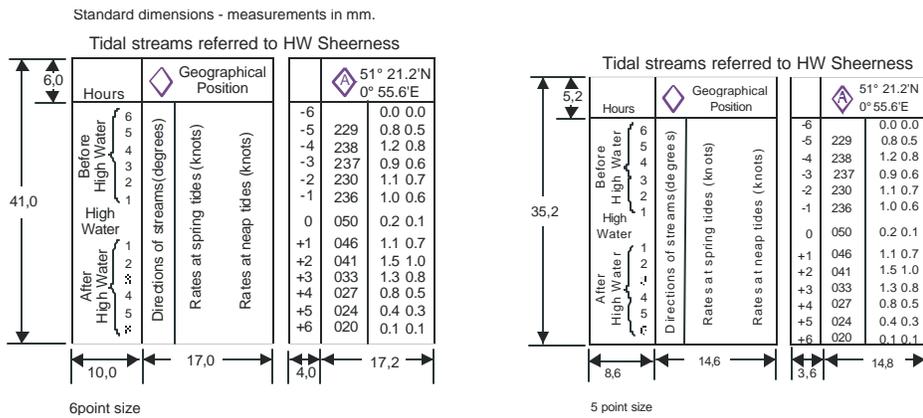
B-407.1 Rates (velocities) of tidal streams should be given in knots to one decimal place. In rivers and estuaries where there are permanent currents caused by the flow of river water, such currents must be included in the calculation of the figures shown in tidal stream tables.

B-407.2 **Stations** (locations) at which tidal streams have been observed and for which data are to be charted must be assigned reference letters A, B, C,... in some regular order. These letters, enclosed in a diamond outline and printed in magenta, must be inserted in the appropriate positions. Not more than 20 stations shall should be shown on any chart.



H46

B-407.3 **Tidal stream tables** must be in the form shown below. The 6 point size is the normal standard size but the 5 point size may be used where it is essential to save space. Only one Standard Port (port of reference) shall should normally be used on any one chart but additional information may be added below the tables if desired, eg 'HW Hoek van Holland = H W Dover + 3h' (where Dover is the Standard Port). It may be preferable to place the reference to the Standard Port on one line, centred above the tables. Slack water must be indicated by 0,0,0,0 for the rates in the tables.



H31

B-407.4 **Tidal stream arrows:** where data are inadequate for tabulated information, or where otherwise required, arrows may be used to indicate tidal streams. A flood tide stream (rising tide) must be indicated, on the black plate, by an arrow with tail feathers drawn on one side of the shaft only. The maximum speed mean spring rate in knots, if known, must be indicated along the upper side of the shaft, eg



H40

An ebb tide stream (falling tide) must be similarly indicated but the arrow must have no tail feathers.



H41

The length of the arrow must be 10mm.

B-407.5 **Tidal stream diagrams:** exceptionally, where streams are particularly significant, diagrams showing their strength and direction, at each hour before and after High Water, may be inserted on charts, eg at Dover Harbour (UK).

B-408 CURRENTS (NON-TIDAL)

The term 'current(s)' in these specifications is used to describe water movements which are generally constant in direction, and are not dependent on astronomical conditions. A current is described by the direction towards which it is running. For tidal streams, see B-407.

Currents occur as:

- the flow of river water in rivers and estuaries;
- permanent flows in other restricted waters eg Bosporus Istanbul Bogazi (Bosporus);
- permanent or seasonal oceanic currents;
- temporary wind-induced currents.

Only surface currents are to be charted.

B-408.1 **The strength of currents** must be given in knots, preferably using the abbreviation 'kn'. Ideally, the minimum and maximum strengths should be quoted, eg 2,5 - 4,5 kn, if the strength varies. If only the maximum strength is known, it should be stated in the form '*Max about 3 kn*', or equivalent.

B-408.2 **Currents in restricted waters: In tidal waters** where the flow of river water alternately reinforces the ebb tidal stream and reduces the flood, the **combined** effect shall normally must be shown on charts, for the convenience of the navigator, ie the current must be included in tidal stream tables and in the figures shown alongside tidal stream arrows. See also B-407.1. **In restricted waters where tides are negligible**, the direction of flow should be shown by an arrow with tail feathers on both sides of the shaft, if it is relatively constant in direction:



or by an undulating line with an arrowhead if it is more variable or if the information is uncertain:



It is particularly important to chart currents (both the main flows and permanent eddies) which could set a vessel towards dangers.

B-408.3 **Ocean currents** are permanent or seasonal (eg in the N Indian and China Seas), are somewhat variable in strength and direction, and generally cover broad areas. Where it is possible to show current satisfactorily by means of symbols, an undulating line with arrowhead should be used.



An indication of current strength may be added. In cases where the current strength and direction are subject to seasonal variations, the currents arrows may be labelled with seasons.



On medium scale charts where a current affects most of the water area, it may be impossible to depict it satisfactorily with symbols. In such cases legends may be inserted (horizontally) in several positions to indicate roughly the extent of the current. The legends should consist of the name of the current or the word 'CURRENT' (or equivalent) and '(see Note)'; the note should give brief information on the direction and strength of the current. This method may also be used where seasonal variations cannot easily be depicted by means of labelled arrows.

In the less common, but more important, case of a strong and relatively narrow current, such as the Gulf Stream, the axis of the current should be charted using the undulating line arrows, and the name and strength legends aligned with the arrows.

B-408.4 **Temporary wind-induced currents:** local weather conditions can produce significant temporary currents which cannot be charted. If there is a known hazard, eg if winds from a particular direction have been found to endanger vessels by setting them on to shoals unexpectedly, a cautionary note may be added to the chart, if necessary

referring to further information in other publications, such as Sailing Directions.

B-408.5

Other publications. Difficulties in charting oceanic currents have led to publications other than standard nautical charts becoming the principal authorities to which navigators should turn. Sailing Directions and Routeing Charts will normally provide more information than it is possible to show on standard charts. ~~The depiction of currents on small-scale charts is not covered by these specifications.~~

Some of the principles of depth depiction are summarized below (see also B-403.1):

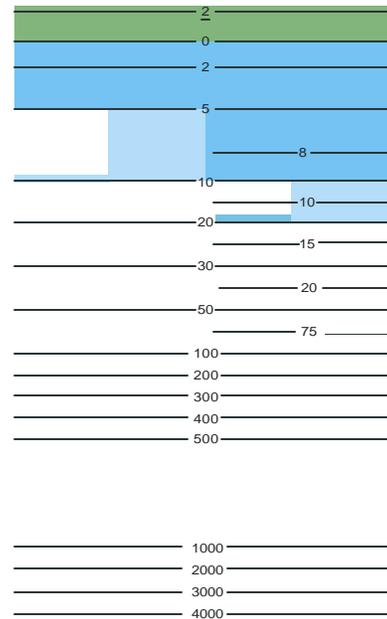
- a. The least depths over shoals and banks, and over sills (bars) in navigable channels, must be shown. Particular attention should also be paid to full and accurate representation of all other 'critical' areas, eg on ~~and adjacent to~~ leading lines and other recommended tracks, ~~in anchorages, alongside~~ jetties and quays and in ~~the entrances to~~ harbours ~~and basins~~ ~~entrances~~. Maximum as well as minimum depths should be shown where possible, eg ~~along to show~~ the line of deepest water in narrow channels. However, deeper soundings on the sloping side of a bank near to the crest line should not be selected if they could give the impression that there is a deeper passage across the crest between shoaler soundings.
- b. Soundings and contours must be used to complement each other in giving a reasonable representation of the sea bed, including all significant breaks of slope (see also B-411.6). ~~In well-surveyed areas, the compiler should incline towards a reduction in the number of soundings and a greater density of contours.~~
- c. The density of soundings is to be determined by the type of sea bed. Flat or evenly sloping areas, and banks of unconsolidated sediment, ~~shall should~~ have a minimum of soundings, fairly evenly spaced. Irregular bottom topography will require a denser, and probably irregular, pattern of soundings. A steep gradient is best represented by close contours, undistorted by soundings.
- d. In changeable areas, where surveys of different dates adjoin and do not ~~correspond match~~ exactly, gaps in the contours ~~and tints~~ may be left to indicate the ~~disparity discontinuity~~ to the navigator. (see B-416.1).
- e. Where practicable, soundings on smaller scale charts ~~shall should~~ be selected from those shown on the larger scales.
- f. In areas navigable only at high water, drying heights must be charted according to the same principles as soundings.
- g. Where surveys are inadequate, it may be advisable to omit some of the standard contour lines but those outlining blue tints should be as complete as possible (even if shown as approximate contours - see B-411.3).

B-411 DEPTH CONTOURS AND SHALLOW WATER TINT

The standard series of **depth contour lines** to be charted is: drying line (where tides are appreciable), 2, 5, 10, 20, 30, 50, 100, 200, 300, 400, 500, 1000, 2000 metres, etc. The 2 and 5 m contours may be omitted where they serve no useful purpose. It is not necessary for the complete sequence of contours to be shown, eg on steep slopes and round isolated pinnacles.

Supplementary contours, eg at 3, 8, 15, 25, 40, 75 metres and multiples of 10 or 100 may be shown, if the available data permit, where required to delineate particular bathymetric features where soundings would otherwise be the only depth information over a large area, or for the benefit of particular categories of shipping,

Other contours: in waters where the 4 or 6 metres contours have been surveyed and charted these contours may be shown in place of the standard ones, provided they are labelled with their values (even where otherwise defined by a shallow water tint).

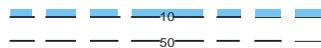


I30

B-411.1 Line symbol: depth contours should be shown as continuous black lines of approximately 0,1mm width. Alternatively, blue contours may be used, especially in complex areas, to avoid breaking the contours for other detail. Where a certain contour is to be emphasized, this should be achieved by the use of shallow water tint (see B-411.7). Thicker lines may be used to emphasize certain standard contours ~~on the black plate~~ but this practice is not recommended.

B-411.2 Depth contours must be drawn in such a way that no sounding figure having exactly the same value as the contour line will appear on the deep-water side of the contour, except where the figures represent isolated shoals. In this case, they must be encircled by a depth contour of the same value or by the danger line (see B411.5). Soundings of equal value may, however, be positioned on the contour line itself, but are not usually necessary.

B-411.3 Approximate contours: where it is desirable to draw the navigator's attention to inadequacy in survey data, depth contours may be indicated as approximate by breaking them into lengths of 4mm, with spaces of 2mm. Longer sections may be used where there are extensive areas containing approximate contours. Approximate contours must be labelled with their value and any ribbon tint used in conjunction with the contour must be broken similarly, so that the breaks are not hidden. See also B-411.7.



I31

B-411.4 Labelling: all contours in the series charted must be labelled with their depth, preferably which should be in fine sans serif upright numerals slightly smaller than soundings, or may be by true soundings of equivalent value. Labels must be placed on the alignment of the contour but must not be inverted. Contours marking shoals or depths of small extent need not be labelled provided adjacent soundings prevent ambiguity.

The drying line may be labelled 0 or 0 but this is not necessary.

B-411.5 A danger line (dotted line) must not be substituted for the shoalest contour line off rocky coasts. Its use must be restricted to emphasize particular dangers. See B-420.1.

B-411.6 **Generalization of contours:** contours ~~shall~~ should be smoothed only where it is necessary to remove intricacies which would confuse mariners. Where necessary, smoothing will include deeper water within shoaler contours, but an attempt to retain a reasonable representation of the sea bed realistic depiction of the gain of the seabed topography should be made. The fact that the intricacy of contours gives some guidance on the adequacy of the survey in areas of irregular depths should be taken into account.

B-411.7 **Shallow water tint:** a solid blue tint shall be shown on all charts to emphasize shallow water taking account of users' requirements. On the largest scale charts, the limiting contour for this depth should be 5 metres, or 6 metres where the 5m contour is not charted. On smaller scale charts, the limit of solid blue tint should be chosen according to the scale of the chart and the prevailing depths in the area.

Beyond the area tinted solid blue, deeper contours may be emphasized either by a lighter blue (screened) tint over the area between the darker tint and the selected contour or by being backed by a ribbon of blue tint normally about 1 mm wide on the shallower side ~~or by screened tints or solid single hatches on the same colour plate~~. On the largest scale charts, the standard series of limiting contours for emphasis ~~shall~~ should be 10 m or 20 m. The limiting contour for smaller scale charts should be chosen as appropriate to the chart.

One or two screened tints may be used, the ~~deepest darkest~~ tint representing the shallowest water. It is recommended that screened tints should be used in areas of very irregular seabed topography where a ribbon tint might be confusing.

Blue tint must be added to all water areas of the chart, including over wrecks, other obstructions and foul areas, where the depth is appropriate. Solid blue tint ~~shall~~ must be shown over dangerous wrecks and obstructions of unspecified depth and over lakes and inland waters of no interest to the navigator.

For the special cases of the upper reaches of rivers, see B-353; for docks, see B-326; and for works under construction, see B-329.

B-412 **SOUNDINGS**

Charted soundings must be true depths placed in such a way that the centre of gravity of the set of figures coincides with the position referred to. ~~Increasing depths shall~~ must normally be shown by means of sounding figures **rounded** ~~off to the next lower down to the nearest~~ decimetre between 0,1 and 20,9m, ~~then to the next lower to the nearest~~ half metre from 21 to 30,5m and, thereafter, ~~to the next lower to the nearest~~ metre. However, these figures must be adjusted as a function of the degree of accuracy with which depths were actually measured, so that the precision with which soundings are recorded on charts can never be misleading as to the accuracy of such soundings.

Measured depths must be corrected to equate as accurately as possible to true depths for insertion on charts. In many cases, the necessary corrections will have been applied by the hydrographic surveyor before the data are supplied to the hydrographic office. However, where it is necessary for these corrections to be applied, depths shall be classified as follows:

- Shallow depths 0-30m
- Medium depths 30-200m
- Deep depths Greater than 200m

The various corrections applicable to echo soundings are classified as follows:

- Group 1 - Instrumental corrections
- Group 2 - Corrections to compensate for the position of the transducer:
 - a) Depth of immersion
 - b) 'Separation effect' due to the separation of the transmitter and receiver oscillators.

- Group 3 - Corrections to compensate for local conditions:
 - a) Tide height

b) Variations in velocity of sound in sea water (Note: Technical Resolution A 1.5 states that a standard velocity for the propagation of sound through sea water for echo sounding be adopted, the value to be 1500m (820 fathoms) per second).

The above corrections should be applied as follows:

- In shallow depths - all corrections included in Groups 1, 2 and 3
- In medium depths - corrections in Groups 1, 2(a) and 3
- In deep depths - corrections in Groups 1, 2(a) and 3(b).

The corrections for Group 3(b) shall be obtained by one of the following methods, as appropriate:

- a) bar check observations
- b) determination of sound velocity by velocimeter or calculations using observed temperatures and salinity
- c) by reference to 'Echo-Sounding Correction Tables', 3rd edition, NP 139 (UK)

Details of the methods used by hydrographic offices for correcting echo-soundings for insertion on charts and plotting sheets is contained in IHO Special publication S-46.

B-412.1 **Style of figures:** soundings should be in sloping sans serif figures (figure 1 may have a serif). Figures representing decimetres should be in a definitely smaller type face than those representing whole metres and slightly lower than the latter. If decimetre figures are not shown on a lower level, they must be separated from the metre figures by a comma, **full stop or decimal point**.

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B-412.2 **Out of position figures:** soundings should normally be charted in their true positions, but if it is necessary to show least depth soundings out of position the figures should be distinguished from normal sounding figures. This may be done by inserting a short 'pointer' (as in the case of a seamount on a small-scale chart where the sounding would otherwise mask the contours) or by enclosing the sounding in brackets where it shows the least depth over a rock, alongside a quay or in a channel which is too narrow to insert the soundings without breaking the coastline. In the latter case, the soundings are distinguished from land heights by the fact that they are in italic/subscript as opposed to upright/decimal. alongside a depth contour or rock symbol, the figures shall be distinguished from normal sounding figures preferably by enclosing them in brackets.



I11



I12

B-412.3 **'No bottom' soundings:** in general, the use of 'no bottom' soundings should be avoided, except in areas where no adequate alternative information is available. Where 'no bottom' soundings are used, they must be

shown surmounted by the symbol:

$\frac{\cdot}{330}$

I13

B-412.4 **Hairline-Unreliable soundings:** if it is thought necessary to draw the navigator's attention to the fact that soundings have been inserted from a source that might be unreliable in some respect, eg from a smaller-scale source survey where the line spacing, lack of sonar or suspect positioning is such that depth anomalies are likely, or from passage soundings. In such cases they may be shown in special style, preferably upright and hairline (fine) figures, the reason being given in the explanatory notes.

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This device is best used to distinguish soundings of less reliability amongst better data. The impact of the different style will be lost if used for large areas, where it is usually better to use another method of drawing the chart user's attention to the quality of the data, eg via the Source diagram, the use of approximate contours and/or legends and associated notes. For single doubtful soundings (usually shoal ones), see B-424.

B-413 INTERTIDAL AREAS: DRYING HEIGHTS, TINT

Where the tidal range is appreciable, an 'intertidal area' extending from the coastline to the low water line (drying line) is exposed at low water; detached shoals may also be exposed. These areas must be distinguished by being overprinted with a special colour tint; soundings made over them at high water shall be reduced to chart datum and shown as drying heights. For depiction of the nature of the bottom in intertidal areas, see B-426, and for delineation of the low water (drying) line, see B-411.4 and B-426.

B-413.1 **Drying heights** must be shown in metres and decimetres in the same style as soundings but with the metre figures underlined. Both metre and decimetre figures must be underlined if they are printed on the same level. In extensive intertidal areas of interest to navigation and having a considerable tidal rise, drying contours may be additionally shown. They should be labelled, with their values underlined.

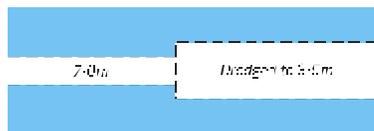


I15

B-413.2 **The tint** over intertidal areas shall may be derived from printing the land tint over the shallow water blue tint. If other printing processes are used, then the tint should be green. See B-143 to B-145.

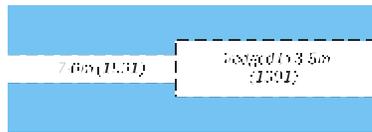
B-414 DREDGED AREAS

Dredged channels and areas must be delimited by dashed lines and the dredged depth must be given in metres and decimetres (depending on the accuracy of the control survey), always followed by 'm' or 'metres'. Decimal zeros may be omitted, but are helpful if they can imply the accuracy to which the dredging has been carried out.



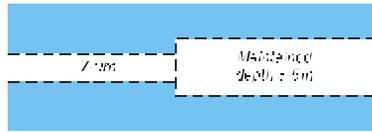
I21

B-414.1 **Areas not regularly maintained:** where it is not known that a dredged area is maintained by regular control surveys and dredging (or if it is definitely known that there is no regular maintenance), the legend on the largest scale chart must give both the depth and year of the latest control survey.



I22

B-414.2 **Areas regularly maintained:** where it is known that ~~the depth is intended to be a dredged area will be~~ regularly maintained by regular control surveys and dredging, the date must be omitted. Where space permits, insert 'Maintained depth...m'.



I23

B-414.3 **Limits of dredged areas** must be indicated by medium weight dashed lines.



I20

B-414.4 **Tables of dredged depths:** in general, the use of tables to list dredged depths should be avoided, except in areas where very frequent changes occur.

B-415 **SWEPT AREAS; AREAS INVESTIGATED FOR DEEP DRAUGHT SHIPS**

The use of the symbol  must be confined to areas swept by wire drag. Areas investigated by sonar or multibeam echo sounder must not be described as 'swept' on charts.

For swept depths over wrecks and obstructions see B-422.

B-415.1 **Swept areas:** extensive areas ~~cleared swept~~ by wire drag must be delimited by magenta dashed lines enclosing large magenta depth figures with the swept symbol (K2) beneath them. The date of the investigation should be indicated in brackets:



I24

B-415.2 **Areas investigated by sonar** ~~shall~~ should not normally be distinguished on charts unless it is necessary to show the limits of a channel specially investigated for deep draught ships, see B-435.3.

B-416 **AREAS OF CONTINUAL CHANGE**

Areas of continual and rapid change occur in many tidal rivers and estuaries, eg Hugli River (India) and Bahia Buenaventura (Colombia); over bars in the approaches to some ports, eg Esbjerg (Denmark) and Karachi (Pakistan); and over some off-lying banks, eg The Goodwin Sands (UK) and The Eastern Approaches to Nantucket Sound (USA). Some of these areas may need individual consideration and treatment on International charts.

B-416.1 **Discontinuities between surveys.** Many changeable areas are re-surveyed in sections at different times; consequently the contours at the edges of the different surveys do not match. In these cases, a 1-2mm wide 'white' gap should be left in the contours and any shallow water tints, in order to draw the mariners' attention to these discontinuities. Care should also be taken to ensure that the mariner can ascertain the dates of the various surveys from the Source Diagram (see B-294.1 & B297.8)[c25] and a reference to the Source Diagram in the gap may be useful.

B-416.2 (I) Changeable areas may need individual consideration and treatment on International charts, by printer nations, to avoid excessive maintenance. This may include the elimination of inessential soundings and insertion of a cautionary note. On smaller scale charts, secondary channels of interest mainly to local shipping may be shown in 'outline' only with the legend 'Buoyed', 'Marked', or equivalent, in place of navigational aids subject to frequent change.

~~General treatment will normally include: elimination of inessential soundings and insertion of a cautionary note. On smaller scale charts, secondary channels of interest mainly to local shipping may be shown in "outline" only with the legend "Buoyed", "Marked", or equivalent, in place of aids subject to frequent change, to avoid excessive maintenance.~~

B-417 AREAS WITH INADEQUATE DEPTH INFORMATION

In most areas which have not been wire-swept or ~~very precisely sounded~~fully insonified, there is a possibility that depths somewhat shoaler than those charted may exist. Navigators normally allow for that and other uncertainties by allowing safety margins. This paragraph is concerned with areas which are so inadequately sounded as to need special cartographic measures to put the mariner on his guard, so he may avoid the areas or proceed with extra caution.

Unsurveyed areas may be defined as those within which there is no available data derived from a systematic hydrographic survey. This will include areas which only have lines of passage soundings and/or other miscellaneous data such as isolated ship's reports.

Inadequately surveyed areas may be defined as those where hydrography is based on older lead-line surveys or other surveys which are either open in nature (eg reconnaissance surveys), or are not hydrographic surveys (eg seismic surveys). These types of surveys are inadequate for identifying all shoals that may exist between lines of soundings, or are not 'shoal-biased' in their selection of recorded depths.

Symbols and abbreviations, such as 'PA', which are applied to individual features rather than areas, are dealt with in B-424 and elsewhere.

B-417.1 **No simple rules** for deciding when and how to warn mariners of the greater degree of risk in certain areas can be offered. The need for a special warning is not merely dependent on the type of information, eg: old leadline survey; echo-sounder regular survey but without sonar; old lines of soundings, etc. The following factors may be equally important in deciding whether any special cautionary notes or cartographic devices are required:

- the general depths and nature of the bottom, from which the likelihood of undetected dangers can be assessed;
- whether the area's safety has been confirmed, even in the absence of regular surveys, by the passage of ships over many years;
- the size and type of ships or craft which have access to the area, and their associated navigational practices, eg whether the larger vessels keep to charted recommended tracks;
- whether it is reasonable to assume independent monitoring of possible dangers by buoyage authorities.

The cartographer must not err too much on the side of caution. If an experienced navigator knows that there can be no real hazard in an area for which a special warning has been given, the value of such warnings will be debased for him elsewhere. Where, for instance, a harbour approach plan has to be extended into relatively deep water further offshore, it is possible that soundings from a relatively small scale coastal survey have to be used. If the 'enlarged' area is relatively deep and flat it would be inappropriate to use upright, hairline figures and an accompanying reference to them. (See B-417.3).

B-417.2 **Citing the source data.** If it is the practice to quote dates of surveys under the chart title, or to give dates and scales of surveys in a Source diagram (see B-290 to B-298), this may itself suffice as an indication of the possible deficiencies of certain surveys where the risks are not especially great.

B-417.3 **The use of upright, hairline sounding figures** (see B-412.4) has the disadvantage that it may not be very obvious, particularly to an inexperienced chart user. If they are used, an explanatory note should be provided, giving the reason for their use. Their advantage is the ease with which areas of somewhat inadequate

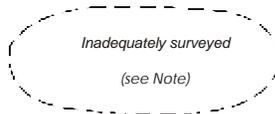
information may be precisely delineated.

B-417.4 **Selection of charted soundings** to give a markedly uneven spacing. This will occur naturally at the largest scales, but gaps in the data may be inadvertently concealed by inappropriately regular spacing on smaller scale charts unless care is taken in selection. In particular, any 'white gaps' around more recent surveys should be preserved (see B-416.1).

B-417.5 ~~Broken (or a)~~ **Approximate depth contours** (see B-411.3) may be used either in conjunction with hairline soundings (usually where the depths are shallow enough to be a possible hazard to surface navigation) or in conjunction with widely-spaced normal soundings figures (in greater depths). Their significance will be apparent to the chart user without any explanatory note, implying uncertainty of position rather than the possibility of undetected dangers. Longer discontinuities in contours will imply actual ~~unsounded~~ gaps in the source data. See also B-410d.

Where a shallow water blue ribbon tint is used in conjunction with an approximate contour, small breaks in the contours will be masked and thus be ineffective as a warning, unless the ribbon tint is broken also. This device cannot be used where a solid shallow water tint is used. See also B-416.1 for guidance on the treatment of contours and shallow water tints where surveys of different dates adjoin but do not match exactly.

B-417.6 **Areas delimited by a bold line.** In some rocky or coral reef waters, depth information may be so inadequate that a very positive form of warning is required. ~~The most effective technique is to delimit the~~ Such areas must be shown by a bold dashed black or magenta limit, with the legend 'Unsurveyed' or 'Inadequately surveyed' or 'Depths' (preferably dashed) accompanied by a cautionary note if necessary. This treatment is likely to be most appropriate in inshore waters such as coastal archipelagos and barrier reefs; it may be reinforced by the omission or insertion of colour tints within the bold line. Small areas (such as gaps left in surveys because of obstructions such as icebergs or moored vessels), may have the legend alongside the limit, or use the abbreviation 'Uns' inside the limit.



I25

Certain IMO-adopted 'Areas to be Avoided', as promulgated in 'Ships' Routing', may be regarded as a special case. They may, however, have been adopted for such reasons as insufficient aids to navigation and the existence of conservation areas, as well as inadequacy of survey. The areas are to be delimited by T-shaped dashes in magenta (see B-435.7).

B-417.7 **Cautionary notes in situ.** Where a bold line cannot easily be drawn around an inadequately surveyed area, an alternative is to insert a legend such as 'Caution: incomplete survey' in the appropriate location. A small unsounded area, possibly hazardous, should be labelled 'Unsurveyed', or equivalent, if the real significance of the gap in the depth data might be overlooked.

B-417.8 **Wide blank areas** on charts are generally self-explanatory. However, if hazards are known to exist even though no soundings are available, a warning is required, eg 'Coral heads are known to exist in this area'. On smaller scale charts, a blank area in inshore waters may be used to indicate that the chart is too small a scale for navigation (see B-404).

B-420 DANGERS: GENERAL, DANGER LINE

Full details of all dangers to navigation are to be charted except in those areas for which the chart is clearly inappropriate for navigation (see B-401 and B-402). The fullest possible information on clearance depths must be given irrespective of their depths, in preference to making any arbitrary distinction between 'dangerous' and 'non-dangerous' depths. This will allow navigators of all classes of vessels, including deep-draught ships and submarines, to make their own assessments of what is dangerous to them.

B-420.1 A **danger line**, consisting of a line of dots, shall be used to draw the navigator's attention to a danger which would not stand out clearly enough if it were represented solely by the symbol for the feature. The danger line shall also be used to delimit areas containing numerous dangers, through which it is unsafe to navigate.

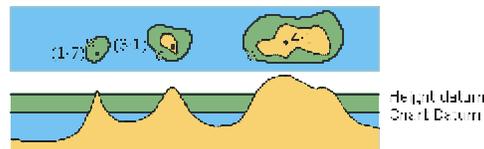


K1

However, a danger line must not be substituted for the shoalest contour line off rocky coasts. Its use must be restricted to emphasize particular dangers.

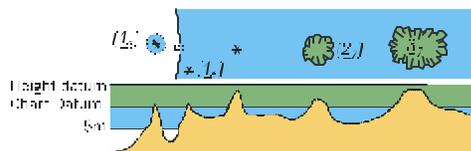
B-421 ROCKS AND CORAL REEFS

B-421.1 **Rocks which do not cover** must be shown as islets, ie using the coastline symbol and, where the size permits, land tint. Where the height is shown, it must be in metres, or metres and decimetres for heights of less than 5m, above the height datum for the chart as stated in the explanatory notes. The same type of figure as used for land spot heights must be used. If there is not sufficient space to insert the figure within the rock it must be written adjacent to it, in brackets (see also B-302.3). Very small rocks (islets), too small to be shown in their true (scale) size, must not be reduced to a width less than the width of the coastline symbol (to avoid confusion with printing imperfections). See B-310.2.



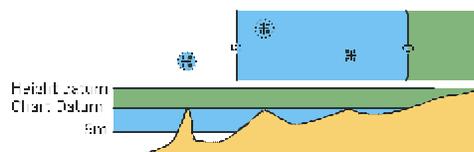
K10

B-421.2 **Rocks which cover and uncover** must be shown either by being outlined with the low water rock edge symbol, with intertidal tint superimposed, or, where appropriate, by the symbol for a pinnacle *. Drying heights must be shown above Chart Datum in the standard way (see B-413.1) and enclosed in brackets where out of position.



K11

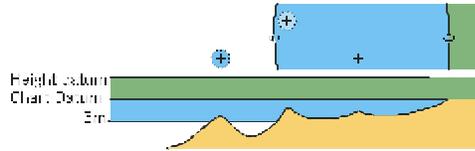
B-421.3 **Rocks which are awash** at Chart Datum must be shown as follows:



K12

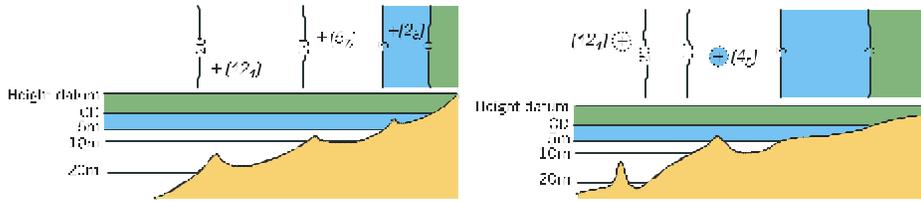
B-421.4 **Rocks which are always underwater** must be shown as follows, according to their depth:

- a. Where the depth is unknown but the rock is thought to be dangerous to surface navigation, by the symbol + with danger line and blue tint.



K13

- b. Where the depth is known and lies between 0 and 20 metres below Chart Datum, by the symbol + with the depth, in metres and decimetres, alongside it and enclosed in brackets. Figures for the depth must be shown in the normal style for soundings. In appropriate cases, dependant on the depths of the rock and the colour tint specifications, a danger line and blue tint should be added.



K14.1 Dangerous underwater rock of known depth inside the corresponding depth area.

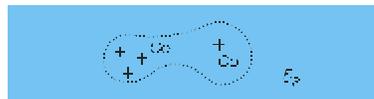
K14.2 Dangerous underwater rock of known depth outside the corresponding depth area.

- c. Where the depth is known and is more than 20,0 metres, by the appropriate sounding figure with the abbreviation for a rocky bottom beneath it (see B-425).

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K15

B-421.5 **Submerged coral reefs and pinnacles** must be charted by the same symbols as rocks but using the abbreviation for coral as appropriate.



K16

For the drying edge of the coral reefs and foreshore, see B-426.3.

The submerged edges of coral reefs **and pinnacles** frequently descend very steeply, with depths of over 200 metres existing within a cable of the edge. Sounding therefore gives very little warning of the proximity of a reef. Where the reef edge is steep-to, it should be emphasised by a danger line rather than by closely packed submarine contours.

Warnings may be needed on charts compiled from old surveys, due to the possibility of coral growth. Growth occurs most rapidly in depths of more than 5 metres, and can attain a maximum in the case of branching coral of a little over 0,1 metre a year (although massive coral grows at only half that rate). Other hazards are the difficulties of detecting all coral pinnacles during hydrographic surveys, and the fairly rapid erosion rate which gives rise to deposits of coral debris in channels and elsewhere. [For the treatment of coral areas which are inadequately surveyed, see B-417.8. Many coral areas are protected by navigational restrictions, see B-437.9.](#)

B-422 **WRECKS, FOUL GROUND, OBSTRUCTIONS**

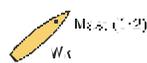
- a. The international abbreviation 'Wk' must be used wherever the symbol for a charted feature does not

identify it as a wreck.

- b. With the exception of the remains of a wreck which are charted as wrecks visible or partly visible at chart datum, and foul ground, the least depth over a wreck, if known, must be charted in preference to symbols for dangerous or 'non-dangerous' wrecks, in order to give the mariner the maximum useful information. For wrecks visible or partly visible at chart datum, the height or drying height should be shown in brackets, if known.
- c. Wrecks must be shown to whatever depth they are considered to be of interest, taking account of the needs of submarines and fishing vessels where appropriate, as well as surface vessels, but not generally in water deeper than 2000m. (Trawling regularly takes place in depths of as much as 400m and occasionally in depths as great as 1200m/2000m).
- d. On medium scale charts, certain wrecks may be omitted from inshore areas. In such cases a brief cautionary note, headed WRECKS, or the equivalent, shall should be shown describing in general terms where wrecks are omitted, eg 'Wrecks with more than 18 metres over them within 5 miles of the coast are not shown except in Lyme Bay.' (Such a note is unnecessary where wrecks have been omitted only from clearly defined areas, eg inner waters, from which navigational aids and other details have also been omitted). It is important that the largest scale International chart shows sufficient details of wrecks for safe navigation by International shipping, without reference to larger scale national charts.
- e. The abbreviation 'Wks', repeated if necessary, may be used in place of symbols on medium scale charts where there are numerous wrecks and it is necessary to navigate on a larger scale chart.
- f. Blue tint must be added over wreck symbols in accordance with their depth.
- g. 'PA' may be inserted against wreck symbols as appropriate.

h. For Historic Wrecks, see B-449.5.

B-422.1 **Large scale charts:** where the scale is large enough to show the true outline of a wreck, the outline must be shown in form continuous line if the hull is always dry, dashed line if it covers and uncovers, and dotted danger line if it is always submerged, together with the abbreviation 'Wk'. Heights above height datum, or drying heights above Chart Datum, may be shown in brackets, and depths may be shown within the danger line. Land intertidal or blue tint must be shown within the outline as appropriate.



K20



K21



K22 (depth known)



K23 (depth unknown)

Where the scale is not large enough to show the outline, symbols must be used as in the following paragraphs.

B-422.2 **A stranded wreck** with any portion of the hull or superstructure emerging above Chart Datum must be shown by the symbol.



K24

Heights above height datum, or drying heights above Chart Datum, may be shown in brackets, if known. This helps to distinguish wrecks which are always visible from wrecks which are only visible at low tide.

A wreck with masts only visible above Chart Datum must be shown by the dangerous wreck symbol (see B-422.5) with 'Mast(s)', or equivalent, alongside. The height or drying height of the masts may also be shown in brackets.



K25

B-422.3 A wreck which has been wire swept, or has had its least depth precisely determined by ~~other means~~ a diver, must be shown by sounding figures showing the depth to which it has been swept, surrounded by a danger line, with the abbreviation 'Wk'; the swept depths symbol  **K2** must be inserted under the danger line.



K27

B-422.4 A wreck over which the least depth has been found by sounding only must be shown as in B-422.3 but without the symbol 



K26

B-422.5 The term symbol for a Dangerous wreck is to may be used (if unavoidable, because the depth is not known or cannot be estimated) for wrecks which are considered to be having, or likely to have, less than 20 metres of water over them in areas where such depths are dangerous to some surface vessels capable of navigating in the vicinity: Where the depth is unknown, the symbol  may be used if no safe clearance depth can be estimated (see B-422.7).



K28

B-422.6 The ~~term~~ symbol for a Non-dangerous wreck may is to be used (if unavoidable, because the depth is not known or cannot be estimated) for wrecks which are NOT considered to be dangerous to ANY surface vessel capable of navigating in the vicinity: having more than 20 metres of water over them.



K29

The symbol  should also be used for all wrecks in waters over 200 metres deep, and may be used in water under 200 metres deep, where a clearance depth cannot be estimated (see B-422.7). This term specification excludes foul ground, which is frequently the remains of a wreck and is a hazard only for anchoring or fishing (see B-422.8).

B-422.7 Wrecks with estimated safe clearance

To avoid the ambiguity in interpreting the symbols  and  the symbol:



K30

should be used instead, if possible, for an unsurveyed wreck over which the exact depth is unknown but which is considered to have a safe clearance to the depth shown. The data used for estimating safe clearances are given in the Appendix to B-422.7.

Appendix to B-422.7 - Estimation of Safe Clearance Depth of Wrecks and Obstructions

1. **Wrecks.** First obtain the most probable depth of the sea bed in the charted position of the wreck. Latest surveys should be consulted if possible. If the position of the wreck is approximate, (PA), the shoalest depth in about a 2-mile radius should be taken.
2. Next obtain the probable maximum height of the wreck from its tonnage and type in accordance with table below:

Type	Tonnage	New Wreck (keel to truck)	Old Age of Wreck	
			5-10 years	Over 10 years
Liner	36 000	60m (200ft)	43m (140ft)	30m (100ft)
	25 000	55m (180ft)	33m (110ft)	24m (80ft)
	10 000	55m (180ft)	33m (110ft)	24m (80ft)
Cargo Liner	10 000	52m (170ft)	27m (90ft)	19m (60ft)
Tanker	10 000	40m (130ft)	24m (80ft)	15m (50ft)
Liberty ship	7 000	33m (110ft)	21m (70ft)	19m (60ft)
Cargo vessel	5 000	33m (110ft)	21m (70ft)	19m (60ft)
	3 000	33m (110ft)	17m (55ft)	14m (45ft)
Coaster	1 000	23m (75ft)	12m (40ft)	11m (35ft)
Trawler/Tug	500	21m (70ft)	12m (40ft)	9m (30ft)
Light vessel		23m (75ft)	17m (55ft)	12m (40ft)
Submarine		9m (30ft)	6m (20ft)	6m (20ft)

The above table has been obtained from examining a number of ship profiles. A wreck of 5-10 years old is considered to be dismantled and without funnel but with superstructure intact while a wreck over 10 years is considered to have the superstructure largely decomposed. This ~~is was~~ found to be ~~so the case~~ on numerous wrecks examined by divers in depths of less than about 100 m or 50 fms where they are greatly affected by surface conditions. The largest dimensions possible have been utilized, generally pertaining to older vessels. 'Moulded depth', roughly applicable to a wreck over 10 years old, is given in Lloyds Register of Shipping. Unfortunately, the dimensions 'Keel to Truck' and 'Keel to top of bridge' applicable to a new wreck or a wreck 5-10 years old respectively are not given for a particular vessel.

3. Next obtain the 'probable ~~depth~~ clearance depth' by subtracting 2. from 1. above.
4. The 'Safe clearance depth' can then be considered to be the next shoalest depth in the following steps:
 - a. 15 metres (8fms)
 - b. 18 metres (10fms)
 - c. 20 metres (11fms)
 - d. 28 metres (15fms)
 - e. 40 metres (20fms)

If the next shoalest depth is very close to the 'probable depth', then the next step shoaler still should be taken to allow for a good margin of error. With depths over 40 metres (20fms), an arbitrary 6 metres (3fms) ~~is should be~~ subtracted from the 'probable ~~depth~~ clearance depth' to obtain the 'Safe clearance depth'.

5. 'Safe clearance depths' over wrecks less than 10 years old will need to be revised as time passes. This requirement will

not be a pressing one as the superseded depths will be on the safe side. Therefore they may be revised as and when the relevant charts are taken up to amend other detail.

- Notes:** 1. Using this formula, many wrecks of known depth have been checked and the results have been well on the side of safety.
2. The figures in the table in paragraph 2 above are applicable to fairly exposed waters. In sheltered waters, to be on the safe side, it is suggested that the column headed '5-10 years' be amended to 'over 10 years' and the column headed 'over 10 years' to be deleted.

6. **Example of wrecks first charted in 1979**

- Liberty Ship sunk 1942 in 52 m:
Probable depth: $52 - 19 \text{ m} = 33 \text{ m}$
Safe clearance: 28 metres

- Tanker, 8000 tons, sunk 1976 in 59 m:
Probable depth: $59 - 40 \text{ m} = 19 \text{ m}$
Safe clearance: 15 metres rather than 18 m

- Coaster, 900 tons, sunk 1970 in 18 m:
Probable depth: $18 - 12 \text{ m} = 6 \text{ m}$
Chart as dangerous wreck

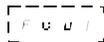
- Cargo vessel, 9000 tons, sunk 1977 in 178 m:
Probable depth: $178 - 52 \text{ m} = 126 \text{ m}$
Safe clearance: 120 metres

7. **Obstructions.** Safe clearance depths may also be estimated for other obstructions (eg wellheads, templates, diffusers, underwater turbines) where the height of the obstruction is known, on similar principles to wrecks above.

First obtain the most probable depth of the sea bed in the charted position of the obstruction. Latest surveys should be consulted if possible. If the position of the obstruction is approximate, the shoalest depth in about a 2-mile radius should be taken.

Next obtain the probable clearance depth by subtracting the maximum height of the obstruction (including the safety cage if there is one) from the probable depth of the sea bed and then calculate the 'Safe clearance depth', applying the same rules as for wrecks at (4) above.

B-422.8 Foul ground. Large areas of foul ground, ie areas over which it is safe to navigate but which should be avoided for anchoring, taking the ground or ground fishing, must be shown by legend, within dashed limits where the extent is known.



K31

Small areas at present generally charted with a danger circle and the legend 'Foul', or equivalent, should be shown by the symbol unless there is a known depth over the foul, which may be placed inside a danger circle:



K31, L22

B-422.9 Submerged obstructions of small extent must be charted similarly to wrecks but with the international abbreviation 'Obstn' ~~for Obstruction~~ in place of 'Wk'. Larger obstructions must be charted with dashed limits and a danger line and legend. Blue tint must be added over obstruction symbols in accordance with the charted depth and in all cases where a depth figure is not charted.



K40 (depth unknown)



K41 (depth known)



K42 (depth known, swept by wire drag or diver)

For swept areas, see B-415.

For breakwaters and training walls, see B-322.

For stumps of posts or piles, see B-327.5.

For works under construction, see B-329.

For submarine pipelines and outfalls, see B-444.

For submerged wellheads, see B-445.1.

For underwater turbines, see B-445.10-11

For spoil grounds, see B-446.

For fish traps and havens, see B-447.

B-423 OVERFALLS, RACES, BREAKERS, EDDIES

B-423.1 Overfalls, races and tide rips, which may endanger small vessels, must be shown by groups of approximately horizontal wavy lines, representing rough water, thus:



H44

Accompanying legends may be used to indicate positions of overfalls at flood and ebb tide. Where races cover a large area of a chart, legends, or the name of the race, may be used in place of symbols.

B-423.2 Breakers in areas where no soundings have been made, must be represented by rows of dotted semi-arcs of circles covering approximately the area where breakers appear, thus:



K17

Breakers over off-lying shoals must be charted by legend or, preferably, by the international abbreviation 'Br', to avoid obscuring the shoal soundings.



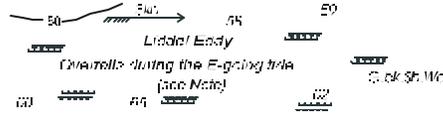
K17

B-423.3 Eddies must be represented by short spirals, thus:



H45

Legends may be used in place of the symbol for large areas, eg:



B-424 DOUBTFUL DANGERS

The international abbreviations PA, PD, ED, SD must not be written in full or translated. Brackets and full stops (periods) shall should be omitted, except that brackets should be used where the abbreviation is used to qualify or supplement another abbreviation, eg. The abbreviations should be in sloping letters when applied to a water feature, eg shoal or submerged wreck. Doubtful shoals must be encircled by a danger line, without or the appropriate depth contours. However, existing depth contours should not be extended to accommodate them.

The abbreviations PA, PD and ED may be applied to features other than dangers where necessary.

B-424.1 **PA, Position approximate.** PA must be used to indicate that the position of a shoal, wreck, etc, either has not been accurately determined or does not remain fixed. PA may be appropriate on a large scale but not a smaller scale showing the same feature.

PA

B7

B-424.2 **PD, Position doubtful.** PD must be used to indicate a wreck, shoal, etc, has been reported in various positions and not definitely determined in any.

PD

B8

B-424.3 **ED, Existence doubtful.** ED must be used to indicate the possible existence of a rock, shoal, etc (sometimes called a 'vigia'), the actual existence of which has not been established.

ED

I1

B-424.4 **SD, Doubtful sounding.** SD must be used beside a sounding figure over a shoal or rock where the depth may be less than indicated, but the position is not in doubt.

SD

I2

B-424.5 **Reported dangers.** In unsurveyed or inadequately surveyed areas, the presence of reported dangers should alert the mariner to the probable existence of other shoaler depths. Depths reported by ships on passage which may constitute a danger to navigation should therefore be charted with the abbreviation 'Rep', unless it is clear from other charted soundings and the information contained in the source diagram that they are part of an isolated line of soundings. Where it would assist the navigator to know the date on which a danger was reported, eg in areas of frequent change, the abbreviation 'Rep' (or, if necessary, a national equivalent) shall be inserted against the danger, followed by the year of the report, in brackets.

Rep

B.1

A danger circle and blue tint may be used to emphasise the reported danger where appropriate. It should not normally be necessary to include an explanatory note on the chart.

The horizontal and vertical accuracy of these depths varies considerably, dependent upon the equipment in use at the time of the report. The date on which the danger was reported is therefore of considerable assistance to the navigator. A recent date indicates that the data should be more reliable. As the year date becomes of greater antiquity, so the report becomes more dubious if the danger has remained unconfirmed, especially in well-frequented waters. Where it would assist the navigator to know the date on which a danger was reported, the abbreviation may be followed by the year of the report, in brackets.

If there is doubt over the accuracy of either the position or depth of the reported danger, additional legends such as PA(B-424.1) and/or SD(B-424.4) may be added.

For different treatment on **small-scale charts**, see C-404.3.

B-424.6 **Discoloured water.** The note 'Discoloured water' ~~shall~~should not be placed on charts ~~unless attendant circumstances if it~~ indicates the ~~probable~~ possible existence of shoal water.

B-424.7 **Deletion from charts of doubtful hydrographic data.** Technical Resolution A1.11 strongly recommends that 'whenever possible, Member States devote part of their annual hydrographic activities to systematic investigations undertaken for the purpose of eliminating from nautical charts the reports now appearing thereon as PA, PD and ED.' It also recommends that 'Hydrographic Offices:

(a) Urge mariners to take soundings whenever discoloured water is noticed; and

(b) Review the applicable legends appearing on their charts and remove all those that do not seem to refer to actual or possible dangers to navigation.'

See also B-429.2.

B-425 **NATURE OF THE BOTTOMS EABED : GENERAL**

The nature (quality) of the seabed (bottom) must be shown in sufficient detail, where known and on the appropriate scale charts, for such purposes as:

- To give some guidance on holding characteristics when anchoring;
- To help in assessing the stability of shoals and to distinguish rocks from unconsolidated material, when navigating in shoal areas;
- To show where vessels may safely take the ground at low water in tidal areas;
- To give an indication of the nature of the seabed in deeper waters for fisherman and submariners.

B-425.1 **Colours** of bottom-seabed materials should be omitted as they are no longer of interest to the navigator.

B-425.2 **Deep water:** the nature of the bottom-seabed shallshould be shown in depths of 2000 metres and less. The

nature of the bottom may be shown in greater depths if thought to be useful.

B-425.3 **Symbols and abbreviations** shall ~~generally~~ should be used in preference to legends written in full. For rock symbols, see B-421.

Abbreviations for nouns must have a capital as initial letter; abbreviations for adjectives or qualifying words must be composed of lower case letters only. ~~Whenever possible the number of letters for each for each abbreviation shall be not more than two.~~

B-425.4 **Style of abbreviations** should be fine sloping sans serif. See also B-425.9 for punctuation.

B-425.5 **Standard abbreviations.** English language abbreviations should be used, as in the following list (although national equivalents may be used on national charts).

J1	S	Sand
J2	M	Mud
J3	Cy	Clay (optional alternative to Mud)
J4	Si	Silt
J5	G	Stones
J6	G	Gravel
J7	P	Pebbles
J8	Cb	Cobbles
J9	R	Rock
J10	Co	Coral and Coralline Algae
J11	Sh	Shells (skeletal remains)
J13.1	Wd	Weed (including Kelp, etc)
J30	f	fine (only used in relation to Sand)
J31	m	medium "
J32	c	coarse "
J33	bk	broken
J34	sy	sticky
J35	so	soft
J36	sf	stiff
J37	v	volcanic
J38	ca	calcareous
J39	h	hard

B-425.6 Size criteria for using the terms 'Mud', 'Sand', 'Gravel' and 'Rock' must be as in the following table.

General Description	Abbreviation to be used on charts	Grade		Criteria	
		Name	Limits in mm		
Mud	M	Cy	Clay	<0,002	When dried on hand will not rub off easily When dried on hand will rub off easily
		Si	Silt	0,002 -0,0625	
Sand	S	fS	very fine Sand	0,0625-0,125	Use Comparator Disc
			fine Sand	0,125 -0,25	
		mS	medium Sand	0,25 -0,50	
		cS	coarse Sand	0,50 -1,0	
Stones	St	G	Gravel	2,0 -4,0	Thickness of standard pencil lead to small pea size Small pea size to clenched fist size Clenched fist size to man's head size
		P	Pebbles	4,0 -64,0	
		Cb	Cobbles	64,0 -256,0	
Rock	R	Rock	>256,0	Larger than man's head size	

B-425.7 **Hard seabed bottom:** where not positively identified as Rock, the abbreviation

h

J39

for 'hard' must be used.

B-425.8 **Underlying material:** where the underlying material is known to differ from the surface layer, the abbreviation for the quality of the surface layer and that for the quality of the underlayer must be written in that order, one after the other, separated by a stroke.

S/M

J12.1

B-425.9 **Mixed qualities:** if known, the abbreviation for the dominant quality must be shown first with a full stop or slight space between the qualities. Full stops must not be used after adjectives or at the end of whole abbreviations.

fS.M.Sh

12.2

B-426 NATURE OF THE **BOTTOMS LABELED**: INTERTIDAL AREAS

B-426.1 Areas which are not rocky must have the nature of the seabed (bottom) shown by the abbreviations listed in B-425.5, in preference to legends. The low water (drying) line must be shown as a fine continuous line (see also B-411). Within-Between the coastline and the low water line, light-weight fine dashed lines shall should be used to delimit areas of differing characteristics; alternatively, small areas of stone, gravel or shingle may be portrayed by small irregular circles thus:



J20

Alternatively, small areas of stone, gravel or shingle may be portrayed by small irregular circles, similar to the stony shore at B-312.2.

B-426.2 **Rocky areas** (see also B-421, Rocks). In areas where rock is exposed at low water, the rock edge symbol shown below ~~shall~~ must be used to show the limits of the rock.



J21

The same symbol must be used to show the low water line where a rocky bottom continues below the low water line. Significant pinnacles of rock too small to be clearly depicted by the edge symbol must be shown by the pinnacle rock symbol*. No abbreviations for a rocky bottom ~~shall~~ should be shown in intertidal areas.

B-426.3 **Coral reefs and foreshores**. Where coral is exposed at low water, the coral edge symbol must be used to indicate the low water line, or the seaward edge of the coral where the intertidal area is both sand and coral. Sand within the seaward edge of the coral may be indicated by ~~an~~ the abbreviation 'S' ~~or legend~~.



J22

No abbreviation should be used for coral where the above symbol is used. For submerged coral reefs and pinnacles, see B-421.5.

B-427 **NATURE OF THE BOTTOMS EABED: OUTSIDE THE LOW WATER LINE**

In waters outside the low water line, abbreviations (in addition to the symbol for submerged rocks, B-421.4) must be used to show the nature of the seabed (bottom). Where possible, the seabed must be shown on all shoals and in known and likely anchorages. Elsewhere, the nature of the seabed should be charted sufficiently frequently to show variations in its composition. As an approximate guide, the maximum spacing between abbreviations should be about 50mm on charts, provided the information is available. The nature of the seabed found on old surveys may be used, at discretion, in areas of little change, where the latest surveys give inadequate data. Abbreviations need not necessarily be associated with a ~~particular charted~~ sounding.

B-428 **SPECIAL BOTTOM-SEABED TYPES: SANDWAVES, KELP, ETCSPRINGS**

B-428.1 Sandwave areas may be dangerous to mariners, as the depth may be less than charted, because surveys are not necessarily conducted at the ideal time for sandwave building. Some research has shown that sandwave mobility is most evident in the vertical plane and high spots may occur on crest lines in response to calm weather, and possibly during particular times within the tidal cycle. It is therefore important to warn the mariner of the presence of sandwaves, and provide him with as much information as is available and can sensibly be included on the chart, or in associated publications.

Care must be taken not to over-generalize depth depiction in sandwave areas, as the typically convoluted contour pattern, and significant depth changes between soundings selected from crests and troughs, help to draw attention to these features. However, this will not usually be sufficient warning, as the variance between crest and trough may fall between standard contours, or the scale of the chart may be insufficient to show the sandwaves individually, or anything but the shoalest soundings. Attention should therefore be drawn to the area by use of a combination of the sandwave symbol and a legend and associated note, where useful.

The Sandwaves: known areas of seabed mobility characterized by large sandwaves shall be indicated by the symbol:



J14

or by a legend. The symbol may also be used to represent other similar forms of mobile bottom that could cause significant changes in depth. This use of the symbol will draw attention to the most significant depth(s) and also indicate a degree of unreliability in the figure charted. It is recommended that new critical depths in sandwave areas promulgated by Notices to Mariners should include the symbol. The symbol may also be used alone (ie without an associated sounding) where it is not required to identify individual charted depths as being particularly significant. Several symbols may be used to show the extent of the area.

Where frequently repeated surveys show variations in least depth, the shoalest depths found over a period of years should be charted. This blending of details from surveys of differing dates must be done with care; in particular, long-term deepening must not be overlooked. Attention may be drawn to soundings retained from older surveys by inserting in upright (hairline) style and/or by adding a date in brackets.

The extent of sandwave areas, if known and considered to be navigationally significant, may be indicated approximately by the legend 'Sandwaves' or equivalent, or by use of several sandwave symbols, not associated with particular soundings. The legend should be placed over areas where depths may be critical for surface navigation, together with the symbol associated with the most significant sounding(s). Alternatively, the extent and height of sandwaves may be shown as an overprint to the source diagram, or on a separate diagram of similar size.

The nature of the navigational hazard presented by sandwaves may be stated in a cautionary note, with '(see Note)' reference, or equivalent, against the sandwave symbol or legend, eg:

SANDWAVES
Mariners are warned that sandwaves exist in the area indicated; depths shoaler than those charted may exist, particularly after periods of calm weather. Depths in upright figures in these areas are the least depths found during the last 10 years. For further information, see [relevant publications]

Additional relevant information on the sandwave area may be inserted in Sailing Directions, and a reference to this added to the note.

B-428.2 **Kelp** (large species of seaweed) is an indication of the presence of submerged rocks. It must be charted by the following symbol:



J13.2

A legend ~~shall~~ may be used in place of the symbol only for extensive areas.

B-428.3 **Springs in the seabed** may cause false echo-soundings. They must be represented by the symbol:



J15

B-429 **OCEANIC FEATURES**

B-429.1 **Seamounts:** The international abbreviation for a seamount ~~shall be~~ is:

SMt

O33

B-429.2 **The maximum operating depth for submarines** is considered to be about 800 metres. Details of any new shoal or seamount rising from substantially greater depths with less than this depth of water over it should be inserted on charts by Notice to Mariners. Such a depth should only be shown as a substantive (i.e. confirmed) depth, if it is part of a line of soundings from a good quality source (eg an echo trace which clearly rises from deep water, the depths being comparable to those already charted, and falls again to the general depth of the

ocean). An isolated unsupported sounding (eg from a small portion of an echo trace which does not extend into deep water) which is significantly shoaler than other depths locally, should always be charted as doubtful(see B-424).

When the existence of a charted oceanic danger (whether shown as doubtful or otherwise) has been disproved as the result of a search by a survey ship or by other conclusive means, the shoal should be removed from charts by Notice to Mariners. The Notice to Mariners should give the reason for the removal. Similarly, if a search confirms the existence of a danger which is shown on the chart as doubtful, and establishes with certainty its position, depth and extent, this information should also be promulgated by Notice to Mariners.

In 1982, the XII International Hydrographic Conference decided that IHB Special Publication No 20, 'Doubtful Hydrographic Data', should no longer be maintained as an IHB publication, the need for it having been removed by the new series of small scale International Charts on 1:3 500 000 and 1:10 000 000. See C-404.3 for treatment of doubtful dangers on small-scale charts. It was further resolved that the procedures for charting doubtful data in the oceans, beyond the edge of the continental shelf (200m contour) should be regularized. Additional information on doubtful hydrographic data on ocean charts may be requested from the particular HO which produced the chart. The Conference recommended, however, that all editions of SP 20, from the 1st edition in 1928, to the 4th edition in 1973, with correction supplements, should be retained for reference as they provide the main single source of historical information on charted doubtful data in the oceans, prior to the production of the small scale International charts.

A reported danger (in deep water) whose existence or position is uncertain, is sometimes called a 'vigia'.

QUESTIONS ARISING FROM DRAFT REVISION OF B-400 TO B-429

Response form

(please return to CSPCWG Secretary by 28 June 2005)

andrew.coleman@ukho.gov.uk

	Specification	Question	YES	NO
1	B-402.6(I)	This could be described as a new symbol (which currently appears in the Swedish version of INT 1, and possibly others). Are WG members happy to accept this symbol as INT?		
2	B-411.7	Do you think that specifying the shallow water tint limits for largest scale charts is over-prescriptive, given that the chart scale and the draft of shipping using an area may vary widely?		
3	B-417.6	Do you agree that <i>UNS</i> (or <i>Uns</i>) should be approved as a new INT abbreviation?		
4	B-421.5	Does anyone have more up to date figures for speed of coral growth? If yes, please give details, including authority.		
	B-422.7	a. Do you use the table for ' Estimation of Safe Clearance Depth '?		
		b. Are the values and examples regarded as still valid?		
5	B-422.9	Should there be a cut-off depth for which obstructions without depth figures should have blue tint? If yes, please indicate what depth you think it should be.		
6	B-425.6	Is the size criteria table for seabed characters useful in M-4?		

Other comments:

Supporting comments.....

Name.....

Member State.....