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]

Chairman: Peter JONES
Secretary: Andrew HEATH-COLEMAN

UK Hydrographic Office
Admiralty Way, Taunton, Somerset
TA1 2DN, United Kingdom

Telephone:
(Chairman) +44 (0)1823 723343
(Secretary) +44 (0) 1823 337900 x 3656
Facsimile: +44 (0)1823 325823
E-mail: peter.jones@ukho.gov.uk
andrew.coleman@ukho.gov.uk

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To CSPCWG Members

Date 19 December 2005

Dear Colleagues

Subject: Draft revision M-4 Section B-400 to B-429 round 4 (follow-up to CL 14/2005)

As I advised in CSPCWG Letter 14/2005, the participants at CSPCWG2 reviewed changes to the latest draft version ('round 3') of B-400 to B-429. No further comments had been received from other WG members before the meeting. The changes agreed are now included in blue in the 'round 4' version, supplied separately as Annex A.

There are a few remaining issues to bring to your attention for which I would be grateful for your advice:

1. In the interests of standardization, and taking particular account of the implications for ENC production, the meeting agreed to remove the option (derived from TR B2.32) for soundings of equal value to be positioned on the contour line itself. This affects paragraphs B-411.1 & B-411.3.
2. A new specification B-418 '**UNSURVEYED AREAS**' was agreed at the meeting, with adjustments made to Section B-417 '**AREAS WITH INADEQUATE DEPTH INFORMATION**' as a consequence. The blue text in the new specification is transferred from the old B-417; the red text is new.
3. The meeting decided to include references to Boulders in the revision. These have been inserted at B-421.1, B-421.2, B-425.5. The Secretary has also made a note to include a reference in B-312 when that section is revised.
4. At present, INT 1 contains a generic version of the symbol for a swept depth K2 (which can be used with wrecks and any other type of obstruction). I suggest that there should be a similar generic version of the 'safe clearance depth' symbol, at K3.
5. The draft proposals for charting wrecks of unknown depth (B-422.5-7, circulated as CSPCWG 2-9.3A) was approved in principle by CSPCWG2, with the addition of a suggestion from France. On reconsidering the method for obtaining a safe clearance depth, it is apparent that the irregular sequence of 'rounding down' values (15m, 18m, 20m, 28m, 40m – derived from existing Appendix to B-422.7) relates to old, now

irrelevant, criteria. A percentage value cannot be used, as this would tend to decrease the safety margin over wrecks in shallow waters. Therefore, a consistent reduction of 5m is suggested.

6. France's suggested method for changing K29 wreck symbols to K30, includes a 'cut-off' depth at 100m. At present, the use of K29 for all wrecks over 200m is included in the specifications, at B-422.7, and this has also been used as a cut-off for the use of blue tint on obstructions of unknown depth in B-422.9. If France's suggestion is accepted, perhaps the cut-off for blue tint (at B-422.9) should also be changed to 100m. (The final draft will be amended to reflect the WG members' response). France also suggested reducing the size of the symbol (which would necessitate a reduction in the size of the depth figures), to overcome possible difficulty in crowded areas. As this is an issue relating to chart scale and would not be a new symbol, I believe this should be left to the discretion of individual hydrographic offices.

I believe we are now close to producing a 'final' draft for circulation to all IHO Member States. After receipt of your comments, I hope we will be able to prepare this final draft. The CSPCWG2 meeting agreed that each sub-section of B-400 should be published as soon as endorsed by Member States, without waiting for the complete revision of B-400. I would be grateful if you would provide your responses (using the form at Annex B), to the Secretary (copied to all WG members), by 16 January 2006.

Yours sincerely,

Peter G.B. Jones,
Chairman

Annex A: Draft revision M-4 Section B-400 to B-429: Round 4. (Separate document).
Annex B: Response form.

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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 include everything 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 soundings, 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 smaller scale charts. 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 maintenance needed and to induce navigators, at least of deeper draught vessels, to use larger scale charts. For generalization of depths see B-403.1

B-402.2 **The purpose of minimal depiction** is to eliminate almost all 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 many of the larger scale charts when planning a passage.

e(I).Where the second scale national chart is also the largest scale international 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 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 require extensive maintenance 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 may conceivably need to add some information by selection from the producer's largest scale. However, printers should 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 updated 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 repromat by the printer, on each occasion, particularly wasteful. Such areas should be designated by means of a boxed cautionary note. In complicated cases, it may be necessary for the printer to insert a bold magenta line around the areas which are not maintained (between the publication of new editions); a cautionary note should be used to explain the line.

B-403 GENERALIZATION

Guidance on the generalization of specific features is included in many of these chart specifications. 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: depth.

B-403.1 **Generalization of depth portrayal** (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 depth. 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. Generalization 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 depth - 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 require generalization in coastal areas. This is in recognition of 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 depth 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.

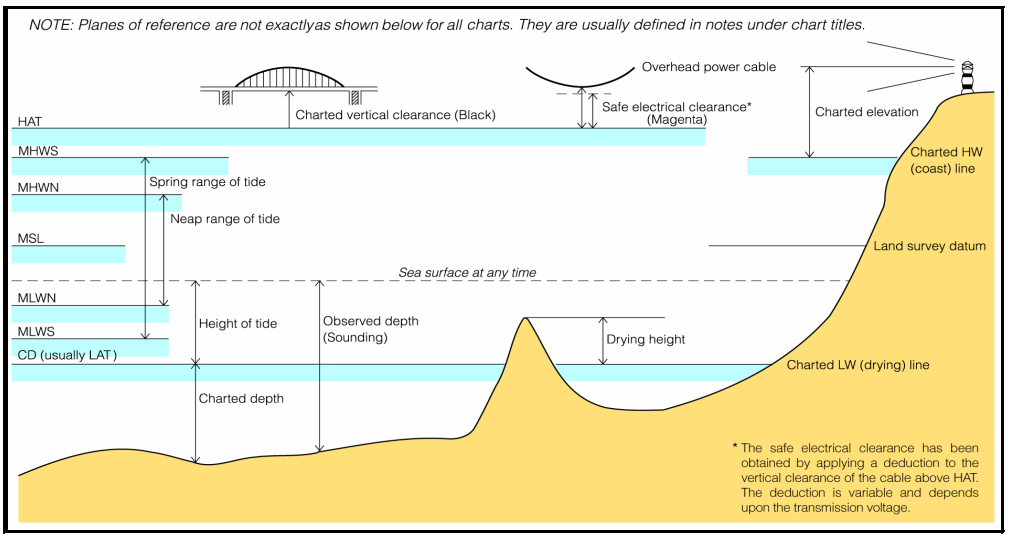
Depth contours, suitably generalized, are useful to the mariner in conveying general information, eg the length and orientation of channels within the inshore area, the likely sea conditions to leeward of coastal banks, and the probable traffic pattern. Furthermore, colour tints need not be arbitrarily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

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 CD is chosen to show the least depth of water found in any place under 'normal' meteorological conditions. CD 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.



For an explanation of abbreviations, see INT 1 Section H.

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 CD. Alternatively, the differences between LAT and national CD may be specified on nautical documents. If low water levels in a specific area frequently deviate from LAT, CD may be adapted accordingly. Since LAT is the recommended 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, and be considered when opportunity for change arises.

Highest Astronomical Tide (HAT) should be adopted as the datum for vertical clearances. Alternatively the differences between HAT and national datums for vertical clearances may be specified on nautical documents. If high water levels in a specific area frequently deviate from HAT, the datum for vertical clearances may be adapted accordingly. A HW datum should be used for vertical clearances in non-tidal waters (see Technical Resolution A 2.5).

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) 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 tidal 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 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, partial data may be given, eg for springs only. 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 (Mixed Tide).** 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
Dubayy (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 depth is 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, 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 0.3m' or 'Tidal 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. These are distinguished from currents (French: 'courants généraux') (see B-408), which are not dependent on astronomical conditions. In practice the navigator experiences a combination of tidal stream and current. Tidal streams 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. 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 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 streams under consideration. This information should be shown with the help of tables, which should be included 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 Tidal Stream or Current Tables giving daily information relating to tidal streams referred to the time of the day, reference should be made on the chart to the time of slack or maximum rate 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 should be shown on any chart.

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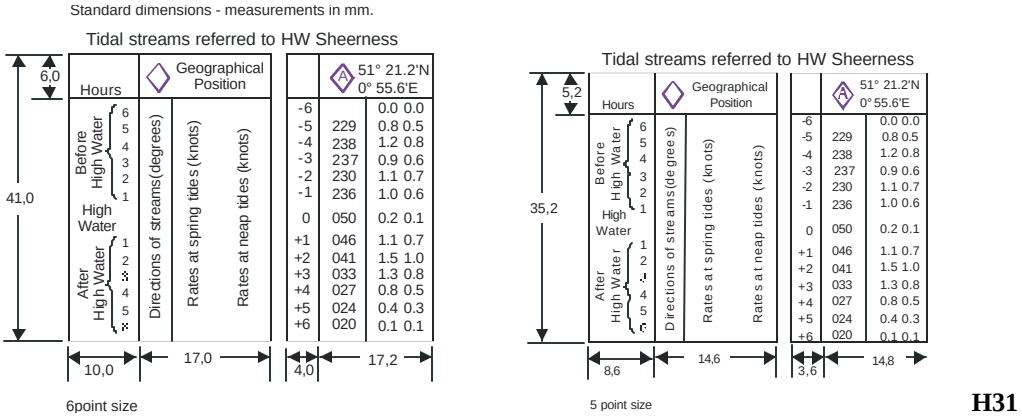
B-407.3 **Tidal stream tables** must be in the form shown below. The 6 point text size is the normal standard size but the 5 point text size may be used where it is essential to save space. Only one Standard Port (port of reference) should be used on any one chart but additional information may be added below the tables if desired, eg 'H W 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.



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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 in black, by an arrow with tail feathers drawn on one side of the shaft only. The 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, eg

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 Istanbul Bogazi (Bosporus);
- permanent or seasonal oceanic currents;
- temporary wind-induced currents.

Only surface currents may be charted.

B-408.1 **The strength of currents** must be given in knots to one decimal place. 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 must be shown on charts, for the convenience of the navigator, ie the current must be included in tidal stream tables or 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:

H42

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

H43

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, 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 must be used.

H43

An indication of current strength (to one decimal place, if required) may be added. In cases where the current strength and direction are subject to seasonal variations, the current arrows may be labelled with seasons.

H43

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 (H43), 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 the note may refer 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.

B-410 REPRESENTATION OF DEPTH: GENERAL

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

a. The least depth 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, fairways and recommended tracks, in anchorages, alongside jetties, quays and berths and in the entrances to harbours and basins. Maximum as well as minimum depth should be shown where possible, eg 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 seabed, including all significant breaks of slope (see also B-411.6).

c. The density of soundings should be determined by the type of seabed. Flat or evenly sloping areas, and banks of unconsolidated sediment, should have a minimum of soundings, fairly evenly spaced, but gradually becoming more widely spaced as the depth increases. Irregular bottom topography should be represented by a denser, and probably irregular, pattern of soundings. A steep gradient should be represented by close contours, undistorted by soundings.

d. In changeable areas, where surveys of different dates adjoin and do not match exactly, gaps in the contours and tints may be left to indicate the discontinuity of depth to the navigator (see B-416.1).

e. Where practicable, soundings on smaller scale charts 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.

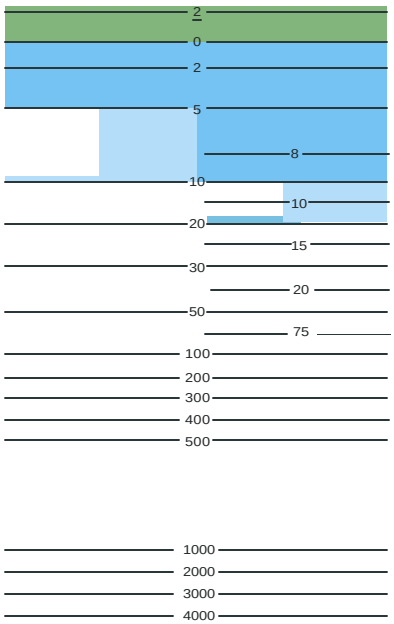
g. Where surveys are inadequate, it may be advisable to omit some of the standard contour lines, but those contours outlining blue tints should be as complete as possible (even if shown as approximate contours - see B-411.3).

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, 2000m, etc. The 2 and 5m 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 around isolated pinnacles.

Supplementary contours, eg at 3, 8, 15, 25, 40, 75m and multiples of 10 or 100m may be shown, if the available data permit, 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. The 2500m contour may be required for measuring continental shelf limits (see UNCLOS Article 76)

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).

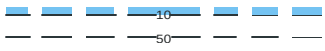


I30

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 a shallow water tint (see B-411.7). Thicker lines may be used to emphasize certain standard contours but this practice is not recommended.

Depth contours must be drawn in such a way that no sounding having exactly the same value as the contour line will appear on the deep-water side of the contour, except where the soundings represent isolated shoals. In this case, they must be encircled by a depth contour of the same value or by a danger line (see B-411.5). ~~Soundings of equal value to the contour may, however, be positioned on the contour line itself, but are not usually necessary.~~

B-411.2 **Approximate contours.** Where it is necessary to draw the navigator's attention to inadequacy in survey data, depth contours should 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. For short lengths of approximate contours, such as around a small isolated shoal, an alternative presentation breaking them into shorter lengths of 2mm with spaces of 1mm may be used. Any ribbon tint used in conjunction with the approximate contour must be broken similarly, so that the breaks are not hidden. See also B-411.7 and B-412.4.



I31

For the portrayal of discontinuities between surveys, see B-416.1.

B-411.3 **Labelling.** All contours in the series charted must be labelled with their depth, which should be in upright numerals slightly smaller than soundings~~, or may be by selecting an actual sounding of the same value.~~. Labels must be placed on the alignment of the contour but must not be inverted. Contours marking shoals or deeps of small extent need not be labelled provided enclosed soundings prevent ambiguity.

The drying line may be labelled 0.

B-411.4 **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-411.5 **Generalization of contours.** Contours 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 (ie it must be shoal-biased), but an attempt to retain a reasonable representation of the seabed 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-411.6 **Shallow water tints.** A solid blue tint must be shown on all charts to emphasize shallow water. On the largest scale charts, the limiting contour for this depth should be 5m (or 6m where the 5m contour is not charted) but, taking account of users' requirements, another contour may be chosen. 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 solid blue tint normally about 1mm wide on the shallower side. On the largest scale charts, the standard series of limiting contours for emphasis should usually be 10m or 20m, but, taking account of users' requirements, another contour may be chosen. The limiting contour for smaller scale charts should be chosen as appropriate to the chart.

One or two screened tints may be used, the 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 where the depth is appropriate, including over wrecks, other obstructions and foul areas. Solid blue tint must be shown over dangerous wrecks and over obstructions of unspecified depth in waters less than 200m deep. It may also be inserted in 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 represent the depth measured from Chart Datum to the sea floor placed in such a way that the centre of gravity (geometric centre) of the set of numerals coincides with the position referred to. Soundings must be **rounded down**, if necessary. The rounding should be:

- to the nearest decimetre between 0,1 and 21m,
- to the nearest half metre from 21 to 31m and,
- thereafter, to the nearest metre.

However, these soundings 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.

For the correction of echo soundings for their insertion on charts, see Technical Resolution B 1.2.

B-412.1 **Style of sounding numerals** should be in sloping sans serif (numeral '*1*' may have a serif). Numerals representing the decimetre part of a sounding should be visibly smaller than those representing whole metres and positioned slightly lower than the latter. Zero decimetre values must not be shown. If decimetre numerals are not shown on a lower level, they must be separated from the metre numerals by a comma, full stop or decimal point.

B-412.2 **Out of position soundings.** Soundings should be charted in their true positions, but if it is necessary to show least depth soundings out of position, the numerals should be distinguished from normal sounding numerals. 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 usually distinguishable from land heights by the fact that they are in sloping/subscript as opposed to upright/decimal. In any case of doubt, a pointer must be used.

I11

I12

B-412.3 **'No bottom' soundings.** The use of 'no bottom' soundings may be appropriate in areas surveyed by laser, but otherwise should be avoided, except in areas where no adequate alternative information is available. Where 'no bottom' soundings are used, they must be shown by the symbol, eg:

I13

B-412.4 **Unreliable soundings.** If it is 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 survey where the line spacing, lack of sonar or suspect positioning is such that depth anomalies are likely, or from passage soundings) they should be shown in fine upright (hairline) numerals, the reason being given in the explanatory notes.

I14

This portrayal 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 or additional method of drawing the chart user's attention to the quality of the data, eg via the Source or ZOC diagram, the use of approximate contours (see B-411.3) 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 portrayed with a colour tint (usually green). Soundings in drying areas must be reduced to Chart Datum and shown as drying heights. For depiction of the nature of the seabed 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** are heights above Chart Datum of any features or areas which dry at low water. The value of a drying height must not exceed the difference between Chart Datum and the high water datum of the coastline. They must be shown in metres and decimetres in the same style as soundings but with the metre numerals underlined. Both metre and decimetre numerals must be underlined if they are printed on the same level. Where the height of a feature is displaced from its symbol, it must be enclosed in brackets. 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.

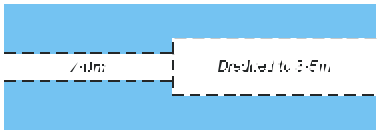
I15

B-413.2 **The tint** over intertidal areas 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

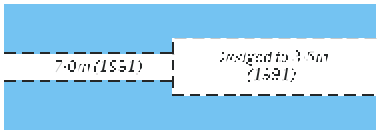
metres and decimetres (depending on the accuracy of the control survey), always followed by '*m*' or '*metres*'. Decimal zeros may be omitted. Dredged turning (or manoeuvring) basins should be charted in the same way as other dredged areas, and may be labelled accordingly.



I21

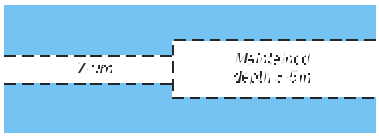
The depth should normally be inserted within the area; however, for the exceptional use of tables, see B-414.4.

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 a dredged area will be maintained by regular control surveys and dredging, the date must be omitted. Where space permits, insert '*Maintained depth...m*'.



I23

Where it is known that such areas are subject to siltation between dredgings, a cautionary note may be added.

B-414.3 **Limits of dredged areas** must be indicated by medium dashed lines. The ends should be left open where leading into deeper water.

I20

B-414.4 **Tables of dredged depths.** In general, the use of tables to list dredged depths should be avoided, except:

- in very complex cases, where areas are too small to show legends within the limits;
- in areas where very frequent changes occur, to facilitate maintenance by Notice to Mariners.

B-414.5 **Soundings within dredged areas.** Surveys or reports of depths within a dredged area which are shoaler than the stated depth may be received. If possible, advice should be obtained from the competent authority on whether they have been, or will shortly be, removed. If such assurance cannot be obtained, a cautionary note may be added which may be considered sufficient warning; if not, soundings shoaler than the stated depth may exceptionally be inserted within the dredged area, reported depths being inserted in accordance with B-424.5.

B-415 **SWEPT DEPTHS AND AREAS; AREAS INVESTIGATED FOR DEEP DRAUGHT VESSELS**

Swept depths must be shown by the symbol ⌓ K2, eg:

The use of the symbol ⌓ must be confined to areas swept by wire drag or investigated by diver. Areas investigated by sonar, laser 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 swept by wire drag must be delimited by magenta dashed lines enclosing large magenta soundings 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** should not be distinguished on charts unless it is necessary to show the limits of a channel specially investigated for deep draught vessels, see B-435.3. However, in exceptional cases, it may be important to indicate the limits of sonar swept areas on the Source diagram.

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).

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 may 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 or ZOC Diagram (see B-294.1 & B297.8) and a reference to the Source or ZOC Diagram in the gap may be useful.

B-416.2 **Changeable areas** may need individual consideration and treatment on reproduced charts, by printer nations, to avoid excessive maintenance. This may include the elimination of non-essential 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. See also B-402.4(I).

B-417 AREAS WITH INADEQUATE DEPTH INFORMATION

In most areas which have not been wire-swept or 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 specification is concerned with areas which are so inadequately surveyed as to need special cartographic measures to put the mariner on his guard, so he may avoid the areas or proceed with extra caution.

Inadequately surveyed areas may be defined as those where bathymetry 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 may not be '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 **Warning of potential hazards.** There are no simple rules for deciding when and how to warn mariners of the greater degree of risk in certain areas. 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. 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 seabed, 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 vessels 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;
- where sounding lines were widely spaced, but this is not apparent from the sounding selection, see B-417.4.

In general terms, the emphasis should be placed on making the dangers and limitations of the data stand out rather than on cartographic neatness.

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 diminished 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 fine upright (hairline) soundings 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.

B-417.3 **The use of fine upright (hairline) soundings** (see B-412.4) has the disadvantage that the meaning may not be very obvious, particularly to an inexperienced chart user. If they are used in areas having particular navigational significance, an explanatory note should be provided giving the reason for their use, or a reference be made to the Source or ZOC diagram. The advantage of fine upright soundings 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 may 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 discontinuities between surveys should be preserved (see B-416.1).

B-417.5 **Approximate depth contours** (see B-411.3) may be used either with fine upright (hairline) soundings or with widely-spaced normal soundings. Longer discontinuities in contours should be used to imply large gaps in the source data.

Where a shallow water blue ribbon tint is used in conjunction with an approximate contour, the ribbon tint must be broken so that small breaks in the contours will not be masked and thus be ineffective as a warning. This portrayal 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. Such areas must be shown by bold dashed black or magenta limits, with the legend '*Inadequately surveyed*' or '*Depths*' accompanied by a note if necessary or a reference to the Source or ZOC Diagram. A *'Depths'* note has the advantage of drawing the users' attention to the limitations of the data, without making judgements on its adequacy, which may vary for different users.

I25

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.

Certain IMO-adopted 'Areas to be Avoided', as promulgated in 'Ships' Routeing', may be regarded as special cases. These 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. These areas must 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 (eg: *'Depths (see Source Diagram)'* or '*Caution: incomplete survey*') in an appropriate location. A reference may be made to the Source or ZOC diagram.

B-418 UNSURVEYED AREAS

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

Most of the world's waters are unsurveyed. The use of a legend 'Unsurveyed' may give a false impression that all other areas of a chart have been fully surveyed. Therefore the legend should be used sparingly, usually only where it is necessary to draw attention to unsurveyed areas amongst surveyed areas; such areas may not otherwise be obvious to the chart user.

B-418.1 **Areas delimited by a bold line.** In unsurveyed areas which are considered dangerous for vessels to enter, a very positive form of warning is required. Such areas must be shown by bold dashed black or magenta limits, with the legend '*Unsurveyed*' or '*Depths*' accompanied by a note if necessary or a reference to the Source or ZOC Diagram.:

I25

This treatment is likely to be most appropriate in inshore waters such as coastal archipelagos and barrier reefs and where ice has receded. It may be reinforced by the omission or insertion of colour tints within the bold line. Small areas (eg gaps left in surveys because of obstructions such as icebergs or moored vessels), may have the legend alongside the limit.

B-418.2 **Wide blank areas** on charts are generally self-explanatory. In areas where the only data are passage soundings, this should be made clear to the user by selecting soundings that retain the line pattern, rather than a regularly spaced pattern. If hazards are known to exist even though the area is unsurveyed, a warning is required, eg '*Coral heads are known to exist in this area*'.

Note: a blank area in inshore waters may also 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 must 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.

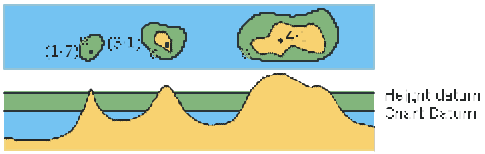
B-420.1 **A danger line,** consisting of a line of dots backed by solid blue tint, must be used to draw the navigator's attention to a danger which would not stand out clearly enough if it were represented solely by the symbol for the feature. The danger line must also be used to delimit areas containing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

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.

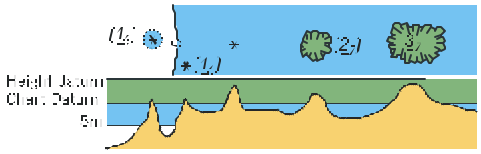
B-421 ROCKS, ROCKY AREAS AND CORAL REEFS

B-421.1 **Rocks (or large boulders) 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 style of numeral as used for land spot heights must be used (see B-352.2). If there is not sufficient space to insert the numeral within the rock it must be inserted adjacent to it, in brackets (see also B-302.3). ~~Very small~~ Islets ~~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 B310.2.~~ Islets may be landmarks; for the charting of landmarks and conspic uous objects, see B-340.



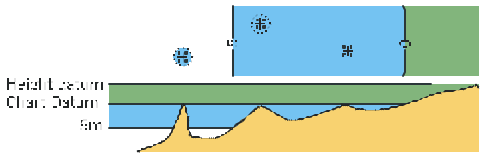
K10

B-421.2 **Rocks, boulders and rocky areas which cover and uncover** must be shown either by being outlined with the low water rock edge symbol (see B426.2), with intertidal tint superimposed, or, where ~~appropriate~~ isolated, 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

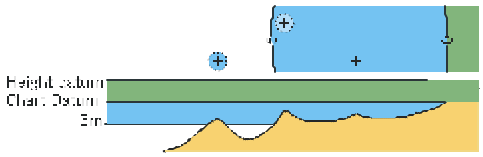
B-421.3 **Rocks which are awash** at Chart Datum must be shown as follows:



K12

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

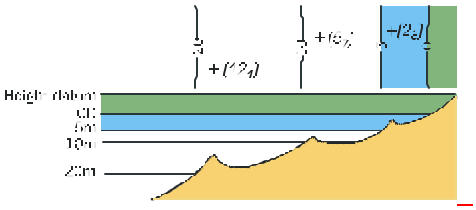
a. Where the depth is unknown but the rock is considered to be dangerous to some surface vessels capable of navigating in the vicinity, by the symbol + with danger line and blue tint.



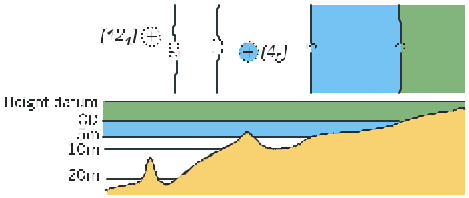
K13

b. Where the depth is known, by either:
- the symbol + with the depth, in metres and decimetres, alongside it in brackets, or
- by a sounding with the abbreviation for a rocky seabed beneath it (see B-425).

Numerals for the depth must be shown in the normal style for soundings. Blue tint should be added as appropriate to the depth. If the rock is considered to be dangerous to some surface vessels capable of navigating in the vicinity, because the rock is significantly shoaler than the general depth in the vicinity, the symbol + or the sounding should be enclosed in a danger line.



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

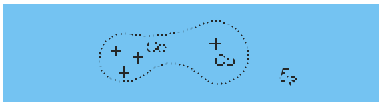


K14.2 Dangerous underwater rock of known depth outside the corresponding depth area.

21
R

K15 Non-dangerous rock, depth known

B-421.5 **Submerged coral reefs and pinnacles** must be charted by the same symbols as isolated rocks, 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 200m existing within a cable (about 185 metres) of the edge. Sounding therefore gives very little warning of the proximity of a reef. Where the reef edge is steep-to, closely packed submarine contours should be avoided; if required it may be emphasised by a danger line.

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 foul ground (see B-422.8), the least depth over a wreck, if known, must be charted in preference to symbols K28 and K29, 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. The symbol K29 should be used for all wrecks in waters over 200 metres deep.

c. Wrecks must be shown to whatever depth they are considered to be of interest, also taking account of the needs of submarines and fishing vessels where appropriate, but not generally in water deeper than 2000m. (Trawling regularly takes place in depths of 400m and occasionally in depths as great as 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, 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.

e. **(I)** 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.

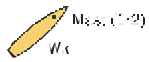
f. The abbreviation *'Wks'*, repeated if necessary, may be used in place of symbols on medium scale charts where there are numerous wrecks and it is necessary to navigate on a larger scale chart.

g. Blue tint must be added over wreck symbols in accordance with their depth.

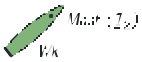
h. The abbreviations '*PA*', '*PD*' and '*ED*' may be inserted against wreck symbols as appropriate.

i. For Historic Wrecks, see B-449.5.

B-422.1 **Large scale charts**. Where the scale is large enough, the outline of a wreck must be shown as a continuous line if the hull is always dry, dashed line if it covers and uncovers, or 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, which cannot be drawn to scale (plan view), 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 (and/or funnel) only visible above Chart Datum must be shown by the ~~dangerous wreck symbol~~ symbol with the legend '*Mast(s)*', *'Funnel'* or equivalent. The height or drying height of the masts (or funnel) may also be shown in brackets, eg:

K25

B-422.3 **A wreck which has been wire swept,** or has had its least depth precisely determined by a diver, must be shown by sounding numerals 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 swept symbol.

K26

B-422.5 **A wreck with estimated safe clearance.** For a wreck (in water less than 200m deep) over which the least depth is unknown, a safe clearance depth must be estimated if possible.

To avoid the ambiguity in interpreting the symbols and , the 'safe clearance bar' must be used for a wreck which is considered to have a safe clearance to the depth shown, eg:

K3, **K30**

Method for estimating safe clearances. Some data on the sunken vessel will be required (eg vertical length from keel to highest point), so that its likely height above the seabed can be determined. Any further information about the wreck should also be taken into account (eg it may be lying on its side, in which case the beam of the vessel will determine the height of the wreck).

Then obtain the most probable depth of the seabed in the charted position of the wreck. If known, take into account the sea floor topography. Consult latest surveys if possible. If the position of the wreck is approximate, use the shoalest depth in about a 2-mile radius.

Next, obtain the 'probable clearance depth' by subtracting the maximum likely height of the wreck from the probable depth of the seabed.

Finally, subtract a safety margin of 5m from the probable clearance depth, to obtain the 'safe clearance depth'.

Safe clearance depths may also be estimated for **other obstructions** (eg wellheads, diffusers, underwater turbines) where sufficient data (eg vertical length) about the obstruction is known, on the same principles as for wrecks. Note that some wellheads have safety cages that may significantly increase their height.

B-422.6 **A wreck of unknown depth for which a safe clearance cannot be estimated.**

For a wreck over which the least depth is unknown and a safe clearance **cannot** be estimated, the underwater wreck symbol must be used:

K29

The symbol should also be used for all wrecks in waters over 200 metres deep.

For a wreck **considered to be potentially dangerous** to some surface vessels capable of navigating in the vicinity, a surrounding danger line and solid blue tint must be added:

K28

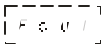
The use of symbols K28 and K29 should be reviewed whenever the size of vessels capable of navigating in the vicinity changes (eg if an access channel is dredged)

B-422.7 **Changing criteria for wrecks.** B-422.1-6 provides guidance on charting new wrecks. However, historically the criteria used for differentiating between symbols K28 and K29 for wrecks were often based on a threshold value for the estimated depth over the wreck (eg 20m, 28m). Criteria have varied between nations and over time (due to the increasing draught of large vessels). The term 'non-dangerous wreck' was formerly used for K29 symbols, even though they may be dangerous to some vessels capable of navigating in the vicinity. Unfortunately, the chart user is not necessarily aware of that fact or that, due to the changing criteria, the same symbol on a chart may have different meanings. Ideally, therefore, all charted K28 and K29 symbols should be re-assessed to conform to the guidance above.

If resources and knowledge do not allow for an immediate re-assessment of all charted K28 and K29 symbols, the following actions should be taken to reduce possible confusion, starting with priority areas:

- An explanation (or reference to an explanation in a nautical publication) of the possible inconsistency between the meaning of K28 and K29 symbols on a chart must be given in the national equivalent of INT 1, and a cautionary note may be added to charts.
- Existing K29 symbols may be updated according to the following formula:
  i. Retain K29 in water deeper than 100m.
  ii. In water shallower than 100m, amend K29 to K30, with the safe clearance depth being that formerly applied to differentiate between K28 and K29. (Take care where the criteria used has changed over time).
  iii. If this action results in over-crowding, a selection should be made to show the extent of the area, or symbols merged into extended danger lines. Alternatively, the size of the K30 symbol may be reduced.
  iv. Take care to ensure no anomalies result, such as wrecks with a safe clearance greater than the surrounding depths; in such cases, the original data must be reassessed or, if not possible, the symbol should not be changed.
- A database, maintained for wreck information, would assist any reassessment and demonstrate why a particular symbol was chosen.

B-422.8 **Foul ground and sites of cleared platforms.** 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**

Areas too small to be shown to scale should be shown by the symbol.

 **K31, L22**

This symbol may also be used for the remains of a wreck or the site of a cleared production platform, provided the platform has been removed to the seabed. Platforms which have been cut-off above the seabed must be charted as obstructions.

B-422.9 **Submerged obstructions** too small to be shown to scale must be charted similarly to wrecks (see B-422.3, 422.4, 422.7) but with the international abbreviation '*Obstn*' in place of '*Wk*'. Larger obstructions must be charted with 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 numeral is not charted and the general depth of water is less than 200m.

 **K40** (depth unknown)

 **K41** (depth known)

 **K2, K42** (depth known, swept by wire drag or diver)

For safe clearance depths over obstructions, see B-422.5.
For breakwaters and training walls, see B-322.2
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 WATER TURBULENCE: OVERFALLS, RACES, TIDE RIPS, BREAKERS, EDDIES

B-423.1 **Overfalls, races and tide rips,** which may endanger vessels, must normally be shown by groups of symbols, representing turbulent 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 unsurveyed areas must be represented by symbols covering approximately the area of the breakers, thus:

K17

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

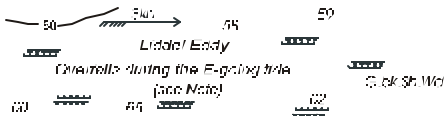
K17

In bad weather or strong winds from a particular direction, breakers may occur over shoals deeper than the draught of surface vessels. In such cases, to warn mariners of the danger presented by the breakers themselves, a legend such as '*Breaks in heavy weather*' may be inserted on the chart.

B-423.3 **Eddies** must normally be represented by symbols, thus:

H45

Legends may be used in place of the symbols 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 should be omitted. 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, or the appropriate depth contour. However, existing depth contours should not be extended to accommodate these shoals.

Note: Technical Resolution A1.11 recommends Hydrographic Offices to '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.'

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

B-424.1 **PA,** meaning **Position approximate,** 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 **B7**

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

PD **B8**

B-424.3 **ED**, meaning **Existence doubtful,** must be used to indicate the possible, but unconfirmed, existence of a rock, shoal, etc (sometimes called a 'vigia').

ED **I1**

B-424.4 **SD,** meaning **Sounding doubtful,** must be used to indicate a sounding over a shoal or rock where the depth may be less than shown, but the position is not in doubt.

SD **I2**

B-424.5 **Reported dangers.** The presence of reported dangers, usually in unsurveyed or inadequately surveyed areas, 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.

Rep **I3.1**

A danger line 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 reported dangers 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 may 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 should be followed by the year of the report, in brackets.

Rep (2005) **I3.2**

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.

B-424.6 **Discoloured water.** The legend '*Discoloured water*' may be placed on charts to indicate the possible existence of shoal water.

B-425 NATURE OF THE SEABED: 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 safety take the ground at low water in tidal areas;
- To give an indication of the nature of the seabed in deeper waters for fishermen and submariners.

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

B-425.2 **Deep water.** The nature of the seabed should be shown in a depth of 2000m and less. The nature of the seabed may be shown in greater depths if thought to be useful.

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

Abbreviations for seabed materials must have a capital as the initial letter; abbreviations for qualifying terms must be composed of lower case letters only.

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

B-425.5 **Standard abbreviations.** English language abbreviations should be used, as in the following list.

J1	S	Sand
J2	M	Mud
J3	Cy	Clay ~~(optional alternative to Mud)~~
J4	Si	Silt
J5	St	Stones
J6	G	Gravel
J7	P	Pebbles
J8	Cb	Cobbles
J9	R	Rock, Rocky
J9.1	Bo	Boulders (usually used in intertidal areas)
J10	Co	Coral and Coralline Algae
J11	Sh	Shells (skeletal remains)
J13.1	Wd	Weed (including extensive areas of Kelp, see B428.2, etc)
J30	f	fine (only used in relation to Sand)
J31	m	medium (only used in relation to Sand)
J32	c	coarse (only used in relation to Sand)
J33	bk	broken
J34	sy	sticky
J35	so	soft
J36	sf	stiff
J37	v	volcanic
J38	ca	calcareous
J39	h	hard

B-425.6 Currently unused.

B-425.7 **Hard seabed.** 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 forward slash.

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 qualifying terms or at the end of whole abbreviations.

B-426 NATURE OF THE SEABED: INTERTIDAL AREAS

B-426.1 **Areas which are not rocky or composed of coral** should have the nature of the seabed (bottom), if known, shown by the abbreviations listed in B-425.5, in preference to legends. The low water (drying) line must normally be shown as a fine continuous line (but see also B-411 for further information about contours). Between the coastline and the low water line, fine dashed lines should be used to delimit areas of differing characteristics, thus:

J20

Alternatively, small areas of stone, gravel or pebbles may be portrayed by small irregular circles.

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 must be used to show the drying limits of the rock, even when the rock continues underwater.

J21

Significant drying pinnacles of rock or isolated boulders too small to be clearly depicted by the edge symbol must be shown by the pinnacle rock symbol* (see B-421.2), not by the abbreviation '*R*'.

B-426.3 **Coral reefs and foreshores.** Where coral is exposed at low water, the coral edge symbol must be used to show the drying limits of the coral, even when it continues underwater, 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 the abbreviation '*S*'.

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 SEABED: OUTSIDE THE LOW WATER LINE

In waters outside the low water (drying) line, abbreviations must be used to show the nature of the seabed (bottom). These abbreviations are in addition to the symbol for submerged rocks; see B-421.4. 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 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 sounding.

B-428 SPECIAL SEABED TYPES: SANDWAVES, KELP, SPRINGS

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 Sandwave symbol:

 J14

must be used primarily in close association with the most significant sounding(s), usually the shoalest, in each area of sandwaves. The symbol should be placed either under the sounding or as close as other detail permits. This use of the symbol will draw attention to the most significant sounding(s) and also indicate a degree of unreliability in the sounding charted. It is recommended that new critical soundings 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 soundings 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 soundings obtained 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 them in fine 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 the depth 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. It may also be useful to include the date of the latest survey on these diagrams, especially if the survey was carried out some years ago

The nature of the navigational hazard presented by sandwaves may be stated in a cautionary note, with a '(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. Soundings in upright figures in these areas represent 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 normally be charted by the following symbol:

 J13.2

A legend may be used in place of the symbol, but 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 is:

SMt **O33**

B-429.2 **Details of any new shoal or seamount** rising from substantially greater depths with less than 800m of water over it (~~as this is considered to be~~ the maximum ~~operating~~ depth likely to be significant to~~for~~ submarines, fishing vessels and other commercial operations) 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 must 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 must also be promulgated by Notice to Mariners.

A reported danger (in deep water) of which the existence or position is uncertain, is sometimes called a 'vigia'

Note: 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. 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 Hydrographic Office 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.

Annex B
to CSPCWG Letter 16/2005

Draft revision M-4 Section B-400 to B-429 round 4

Response form

(please return to CSPCWG Secretary by 16 January 2006)

andrew.coleman@ukho.gov.uk

No.	Specification	Question	Yes	No
1	B-411.1 B-411.3	Do you agree to remove the option (derived from TR B2.32) for soundings of equal value to be positioned on the contour line itself?		
2	B-417 B-418	Do you agree with the resultant text?		
3	B-421.1 B-421.2 B-425.5.	Do you agree to the insertion of references to Boulders in the revision?		
4	B-422.5 B-422.9	Do you agree that a generic version of the 'safe clearance depth' symbol should be added to INT 1 at K3?		
5	B-422.5	Do you agree to the application of a consistent safety margin reduction of 5m for safe clearance depths?		
6a	B-422.7	Do you agree that seabed depths greater than 100m is the appropriate depth to retain K29 symbols (rather than using K30)?		
6b	B-422.9	Do you agree that blue tint should not be inserted in obstructions in depths greater than 100m?		

If you select 'No' to any of the above questions, please provide explanations with alternative options:

If you have any further comments on the draft revision round 4, please add them here:

Name:
Member State: