

Chart Specifications of the IHO – Publication S-4 (Formerly M-4)

Attached to this document is an extract from IHO Publication S-4 Chart Specifications of the IHO which relate to Tidal and Water Level Information. The TWLWG is requested to review this information and decide whether any amendments should be proposed to the Chart Standardisation and Paper Chart Working Group (CSPCWG).

SECTION 300
TOPOGRAPHY

B-302 PLANE OF REFERENCE FOR HEIGHTS

This paragraph **excludes drying heights**, ie heights of features submerged at high water; for drying heights, see B-413.1.

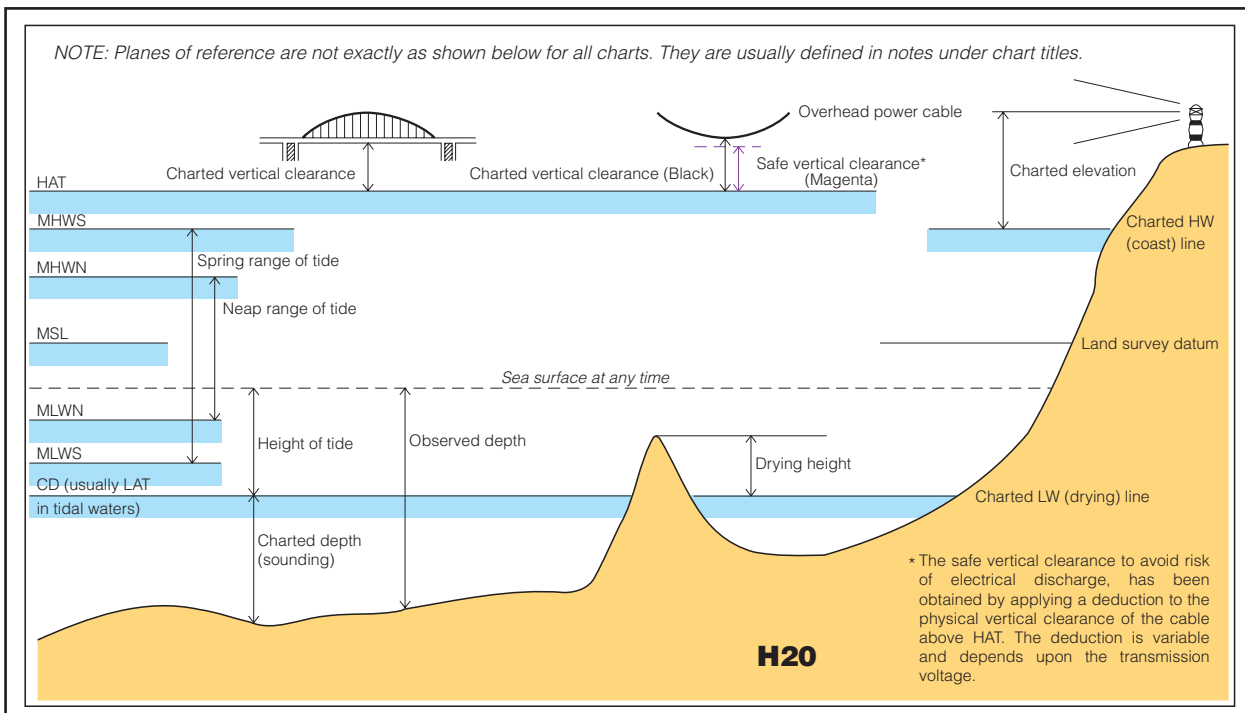
For overhead clearances beneath bridges and other obstructions, see B-380.

B-302.1 **The explanatory notes** beneath the chart title shall always quote the plane of reference for heights. See B-241.6.

B-302.2 The plane of reference for all heights, except drying heights, must be a High Water (HW) datum, such as ‘Mean High Water Springs (MHWS)’ or ‘Mean Higher High Water (MHHW)’. Where there is little appreciable tide at the adjacent shoreline, then ‘Mean Sea Level (MSL)’ may be used.

Comments: Technical Resolution 3/1919 as amended 2008 contains the following statements:

1. It is resolved that heights on shore, including elevations of lights, should be referred to a HW datum. Heights should be referred to Mean Sea Level (MSL) where the tidal range is not appreciable. The datum used should be clearly stated on all charts.
- 2b. It is resolved that Highest Astronomical Tide (HAT) be adopted as the datum for vertical clearances where tides have an appreciable effect on the water level. 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. It is further resolved that a HW datum be used for vertical clearances in non-tidal waters.



B-302.3 All height figures relating to features on land shall be upright. Height figures relating to a summit or spot height shall be placed immediately adjacent to the symbol marking the position.


All other ‘out of position’ height figures are to be enclosed in brackets (see B-421), except elevations of lights forming part of a light description (see B-471.6).

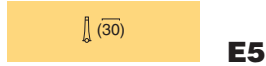


E4

B-303 HEIGHTS ABOVE PHYSICAL GROUND LEVEL

It may aid recognition of some structures, such as chimneys and towers, if their heights are given on charts. Also, it may happen that only the heights of the structure above ground level is known, not the height of its top above the normal plane of reference (ie its elevation).

It is recommended that nations wishing to show the heights of structures above ground level should use the symbol  placed above the figures, thus:

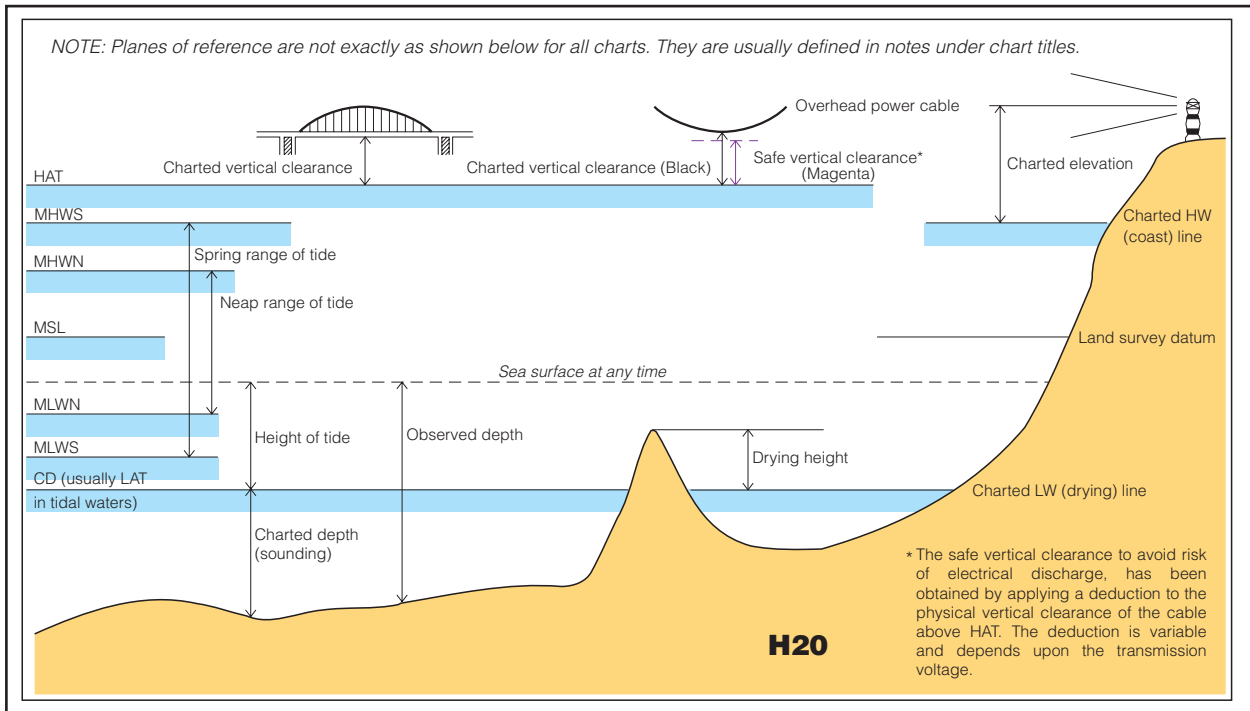


The figures are enclosed in brackets because they are necessary displaced to one side of the symbol for the structure.

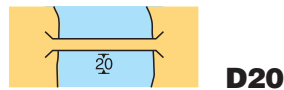
B-380 BRIDGES AND OVERHEAD OBSTRUCTIONS: CLEARANCES

A statement of the vertical clearance between (high) water level and any fixed overhead obstruction is always to be given on large scale charts intended for navigation under the obstruction or for detailed passage planning.

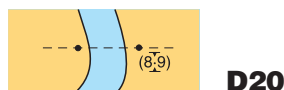
B-380.1 Vertical clearance : the datum above which clearances are given shall be a high water level, preferably Highest Astronomical Tide (HAT), where the tide is appreciable. It shall be given on the chart rounded down to the nearest whole metre (unless under 10m, when m and dm may be quoted). In areas where the tidal range is not appreciable it shall be Mean Sea Level (MSL). Necessary variations of significance to the mariner shall be stated on the chart.



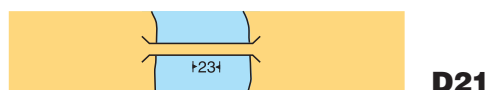
B-380.2 The figures denoting the vertical clearance shall be charted either alongside the obstruction thus:



or on the adjacent land thus:



B-380.3 Horizontal clearance, if shown, shall also be given rounded down to the nearest whole metre, and charted next to the vertical clearance figures thus:



B-381 BRIDGES

The largest, and possibly smaller, scale charts shall always make it clear whether a bridge is fixed (by indicating the vertical clearance) or opening (by a legend). On very large scales, the outline of the bridge shall be shown true to scale.

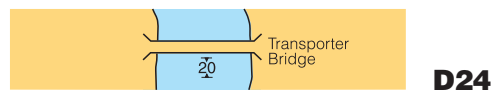
For bridge signals and lights, see B-495.3.

B-381.1 **Fixed bridges** may, where important, be named. The type of bridge is not generally indicated except for suspension bridges which are often conspicuous; for the same reason viaducts may also be described as such. The general symbol for a bridge or a viaduct shall be two parallel lines with the ends turned outwards:



Where the chart is sufficiently large scale to be used for navigation, the vertical clearance shall be given (see B-380.2). Vertical clearance is generally given between high water (see B-380.1) and the lowest part of the bridge structure, ie to give the minimum clearance; but when the opening is an arch, clearance is given to the highest part of the arch provided this is above the navigable channel.

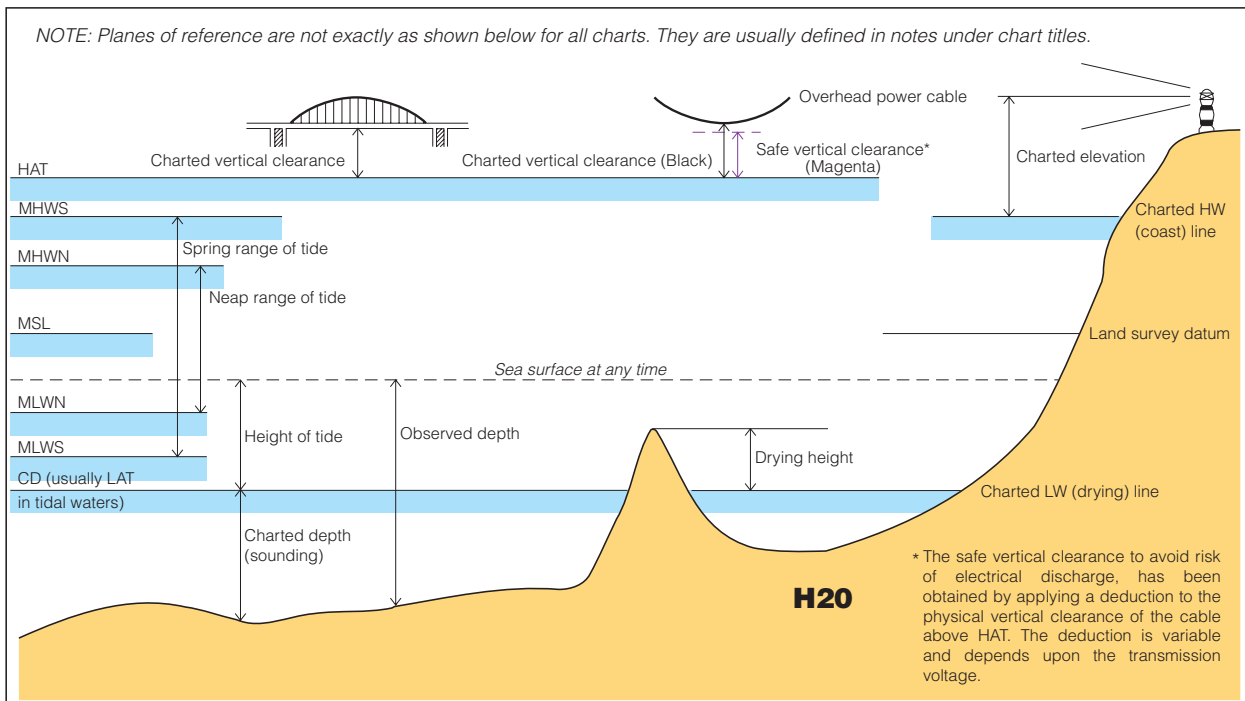
B-381.2 **Transporter bridges** have towers on each side of the waterway connected by a girder system on which a carriage runs. They are generally conspicuous and should be described on the chart as 'Transporter', or equivalent, but using the symbol for a fixed bridge. The vertical clearance shall be stated between high water and the lowest part of the fixed structure.



For aerial cableways, see B-382.

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 3/1919 (as amended 2008).



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 3/1919 as amended 2008).
- 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 co-ordinated 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) 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 national 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 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 national variations are acceptable.

Tidal Levels referred to Datum of Soundings

Place	Lat. N/S	Long. E/W	Heights in metres above datum			
			MHHW	MLHW	MHLW	MLLW
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 in metres and decimetres. 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 national variations are acceptable.

Tidal Levels referred to Datum of Soundings

Place	Lat. N/S	Long. E/W	Heights in metres above datum				Datum and Remarks
			MHHW	MLHW	MHLW	MLLW	
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 barely 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 is to 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 mean sea level, 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.

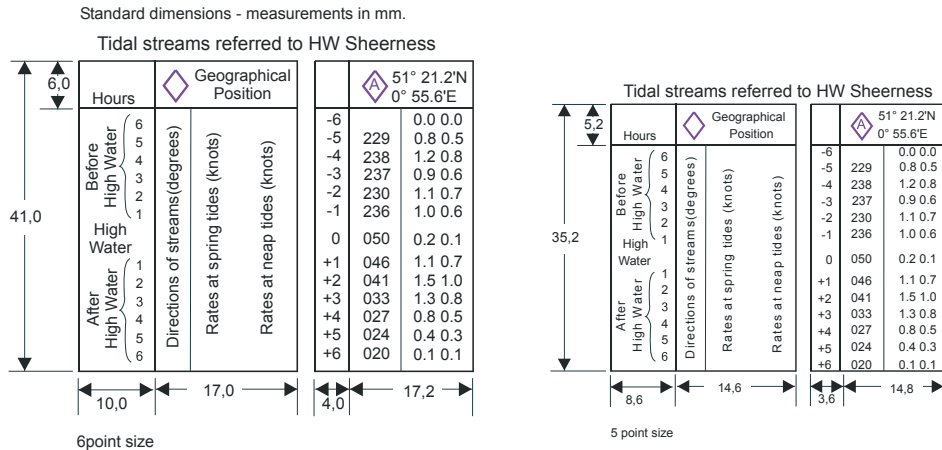
- B-407.1** **Rates** (velocities) of tidal streams should be given in knots to one decimal place. In rivers and estuaries where there are permanent currents caused by the flow of river water, such currents must be included in the calculation of the figures shown in tidal stream tables.

- B-407.2** **Stations** (locations) at which tidal streams have been observed or determined from tidal models 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.



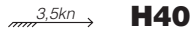
B-407.3 Tidal stream tables must be in the form shown below. The 6 point text size is the normal standard size but the 5 point text size may be used where it is essential to save space. Only one Standard Port (port of reference) should be used on any one chart but additional information may be added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

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

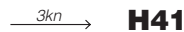


H31

B-407.4 Tidal stream arrows. Where data are inadequate for tabulated information, or where otherwise required, arrows may be used to indicate tidal streams. A flood tide stream (rising tide) must be indicated 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:



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



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.

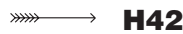
Currents occur as:

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

Only surface currents may be charted.

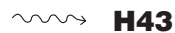
B-408.1 **The strength of currents** must be given in knots to one decimal place. Ideally, the minimum and maximum strengths should be quoted, eg *2,5 - 4,5kn*, if the strength varies. If only the maximum strength is known, it should be stated in the form ‘*Max about 3kn*’, or equivalent.

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

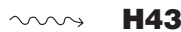
or by an undulating line with an arrowhead if it is more variable or if the information is uncertain:



H43

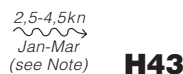
It is particularly important to chart currents (both the main flows and permanent eddies) which could set a vessel towards dangers.

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, eg:



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 Routing Charts will normally provide more information than it is possible to show on standard charts.