

**9<sup>th</sup> CSPWG MEETING**  
**Seoul, Republic of Korea, 13-16 November, 2012**



**Paper for Consideration by CSPCWG**

**'Swept depth' symbol**

<b>Submitted by:</b>	UK
<b>Executive Summary:</b>	Is the 'swept depth' symbol still relevant? Should it be re-defined?
<b>Related Documents:</b>	S-4, INT1
<b>Related Projects:</b>	None

**Introduction / Background.**

The swept depth symbol (K2, but also found at I24, K27, K42) was originally intended to mark areas or features that had been swept by a wire drag. The original texts in MP-004 were as follows:

- B-415            The use of the symbol  shall be confined to areas swept by wire drag. Areas investigated by sonar shall not be described as "swept" on charts.
- B-422.3        A wreck which has been wire swept, or has had its least depth precisely determined by other means, shall be shown by sounding figures showing the depth to which it has been swept, surrounded by a danger line, with the abbreviation "Wk"; the swept depths symbol  IK2 shall be inserted under the danger line.
- B-422.9        IK42 (depth known, swept by wire drag or diver)

Following CSPCWG revisions of these specifications, we made them consistent by including examination by diver at B-415 and B-422.3 (as original B-422.9, which was unchanged). We also clarified B-415 by stating clearly that 'areas investigated by sonar, laser (LIDAR) or multibeam echo sounder (MBES) must not be described as "swept" on charts'.

It is understood that physical wire sweeping is now rarely, if ever, used. Other methods are used to determine accurate least depths over objects and areas, although there are varying views on how well these compare with the older wire sweeping method.

The sweeping of channels and areas by wire drag is a different and less accurate process from the drift sweep technique generally used over wrecks. In this case, modern MBES is likely to give a better result than the wire drag.

**Analysis / Discussion.**

The Secretary asked two hydrographic surveying experts in UK the following questions, with the two answers in blue and red text below:

- whether this symbol is still relevant at all, ie does it tell the chart user anything useful?

It is arguable that this symbol is now irrelevant in that users will, I suspect, in general not appreciate how the swept depth was actually obtained. There is frequently confusion between an unsurveyed clearance depth and a swept depth when I question visitors [Note: this was also the finding of the DQWG questionnaire]. However for those who do understand what it means it gives the maximum information, while the others are no worse off. Thus it should be retained.

Personally I would much prefer that we showed the user the uncertainty associated with the measurement - whatever the method. I have concerns that some wrecks may have been fully wire swept, but features missed due to positional and vertical errors. Even a wire sweep has associated uncertainty, but the swept symbol implies to the user that the measurement is unambiguous.

- should it be obsolescent?

As sweeping is apparently considered to be difficult and time consuming, least depths are now generally established by multibeam sonar, although water column data may provide further data. Such least depths will not receive the 'swept' symbol and hence, in UK surveys at least, it will disappear in the fullness of time. Other nations may still use a sweep as it is inexpensive thus the symbol should not be considered to be obsolescent yet.

It should not be applied to newer acoustic methods, so will become obsolete eventually (maybe 100 years or so!).

- is it valid to retain it for obstructions which have been wire swept (or dived on) in the past, even if we no longer use it for new obstructions/areas?

It is valid to retain it in this case – but only where swept. After all, it was the method used to produce the charted depth. I have never used the swept symbol for a least depth by diver as divers have limited visibility in UK waters and limited movement, thus you cannot guarantee that they have covered the entire wreck. The Swedes certainly used to use a physical bar sweep to confirm that channels were clear and I would imagine that this method was used in coral waters.

Yes, but only because we have little choice.

- should its meaning be widened, eg to include certain types of, or all, multibeam surveys?

No. A remotely sensed least depth is quite different from a physical snag – with the latter there is no doubt that the object has been located although purists may well argue about the depth.

Not in my opinion.

- are all obstructions which have been covered by a modern hydrographic swathe survey considered to have been as well surveyed as a wire sweep investigation?

I would argue no, David would argue yes where there have been water column measurements. However, even with full surveys, acoustic depths are all that we will get. With third party data we may only get the x,y,z data and we have to accept it. I err towards the shoalest measurement on the principle of 'if in doubt, keep them out'.


For the foreseeable future charted wrecks and obstructions will be mixture of swept depths, multibeam depths, echo sounder depths, dived depths, reported depths and even LIDAR depths. We supply the 'best cut' of the data and the chart user has to be judge of the validity of the risk to the vessel.

No, if water column data has not been logged as well, because of the bottom tracking algorithms previously discussed. The current [UK survey] requirement is for MBES water column data to be collected over all potential wrecks and obstructions. This is because the real time conventional bottom detect in MBES can miss obvious features. If water column is used and properly processed by an experienced user, I believe this to be more reliable than all previous methods, as small features can be detected and the object can be positioned in three dimensions to within 20cm or so. I am convinced that some wire sweeps will have been inadequate due to positioning

errors of both the ship and the sweep wire. Wire sweeps have not been replaced in the [UK survey programme] by water column just because of the cost - the tests undertaken showed the results to be more reliable too.

So, here's an idea - we have a new symbol to indicate that a thorough target investigation has been undertaken over a wreck or obstruction, and the depth and position has been ascertained to the best standard currently available, in line with IHO standards.

## **Conclusions.**

The usefulness of the  symbol is clearly debatable. However, it has been extensively used on charts to indicate that a depth over an area or object has been rigorously examined at a particular time. The year date is usually charted for areas (I24), but not usually for wrecks, which may move. There seems to be little case for a programme to delete it from charts.

It would seem to be inappropriate to extend its use to areas and objects which have been examined acoustically (or by laser). Consequently, its use for newly surveyed areas and objects seems unlikely; therefore it is likely to become obsolescent but will exist on charts for many years. It is not yet obsolescent, unless the practice of wire sweeping has definitely ceased everywhere.

Should there be a new symbol (possibly including a date) 'to indicate that a thorough target investigation has been undertaken over a wreck or obstruction, and the depth and position has been ascertained to the best standard currently available, in line with IHO standards'?

Given:

- the debatable value of some existing data quality symbols,
- the difficulty in designing a new, compact and intuitive symbol, and
- that the gap between ordinary surveying techniques and 'rigorous examination' is now much smaller (single-beam echo sounder compared with wire sweep or MBES compared with water column data)

it is suggested that this should not be attempted.

## **Recommendations.**

Retain existing symbol, without widening its use beyond wire sweeping and diver examination. No new symbol to be designed.

## **Justification and Impacts.**

Minimum change, avoids (further) confusing the chart user.

## **Action required of CSPCWG.**

The CSPCWG is invited to:

Endorse the above recommendation.