

**7TH MEETING OF THE HYDROGRAPHIC SERVICES AND STANDARDS COMMITTEE
Busan, Republic of Korea, 10-13 November 2015**

Paper for Consideration by HSSC

Comment on the Report of the Report of the Tidal and Water Level Working Group

Submitted by:	IHB
Executive Summary:	This paper comments on the draft revised IHO Resolution 3/1919 proposed by the Tidal and Water Level Working Group for endorsement by the HSSC.
Related Documents:	HSSC7-05.8A - <i>Report of the Tidal and Water Level Working Group, Annex C</i> IHO CL 17/2014 dated 11 February - <i>Proposed revisions to IHO Resolutions on Tides, Water Levels and Tidal Publications</i> IHO CL 44/2014 dated 13 June - <i>Proposed revisions to IHO Resolutions on Tides, Water Levels and Tidal Publications</i> Final Minutes of HSSC-6 – <i>Paragraph 5.8 - Tidal and Water Level Working Group (TWLWG)</i>
Related Projects:	None

Introduction

1. At its 5th Meeting, the Hydrographic Services and Standards Committee (HSSC) endorsed the revisions proposed by the Tidal and Water Level Working Group (TWLWG) affecting the following IHO Resolutions:

- Resolution 3/1919 as amended - *Datums and Bench Marks*,
- Resolution 2/1977 as amended - *National Tidal Constituent Banks*,
- Resolution 27/1919 as amended - *Time to be used*,
- Resolution 1/1977 as amended - *Collection and Publication of Tidal Data*.

2. As reported in IHO CL44/2014, all revisions were approved by a majority of the Member States. However, considering the nature of the three objections received concerning Resolution 3/1919 and noting that a subsequent meeting of the TWLWG in March 2014 had separately identified that additional work was required on this Resolution, the Directing Committee of the IHB proposed not to promulgate any revision to Resolution 3/1919 and to invite the HSSC to provide further guidance and direction to the TWLWG. At its 6th meeting, HSSC requested the TWLWG to submit a new draft Resolution 3/1919 and relevant definitions (MSL, LAT) to HSSC, in liaison with HDWG, taking into account observations received from IHO Member States (Action HSSC6/28). The outcome of this request is a draft proposal at Annex C to the TWLWG Report to HSSC-7.

3. In order to facilitate the consideration of the TWLWG proposal by the HSSC, this paper provides a red line version of the draft which identifies the changes proposed to the text endorsed at HSSC-6 and offers some additional comments.

Comments

4. Annex A provides a copy of the current text of IHO Resolution 3/1919 and a red line version of the proposed revised version which identifies the changes proposed to the text endorsed at HSSC-6.

5. The revised draft distinguishes three regimes:

- ocean tidal areas,

- mixed water (where water level variability is due to both tidal and regionally specific forcing mechanisms) and inland waters,
- areas where the tidal range is negligible and non-tidal areas.

It provides guidance on the determination of the appropriate datums for each regime while acknowledging adaptations to specific local conditions. The reference levels associated with the second and third regimes (Lowest/Highest Water and Mean Sea Level) refer to “water levels observed over a long time period” and “long series of water level observations” while the determination of the Lowest/Highest Astronomical Tides in the first regime which refers to “a minimum of one year’s observations”. It is suggested that the typical duration of observations be indicated for all regimes, noting the possibility to compare temporary observatories with permanent control stations.

6. All abbreviations are explained at the first occurrence, except HW in paragraph 5. It is suggested that paragraph 5 read as follows:

5 *It is resolved that heights on shore, including elevations of lights, should be referred to a Highest Water (HW) datum.*

Action required of HSSC

7. The HSSC is invited to:
- a. **Note** the comments in paragraphs 5 and 6 above.
 - b. **Take any other actions** considered appropriate.

Revision of IHO Resolution 3/1919

Existing text

TITLE	Reference	Last amendment (CL or IHC)	1 st Edition Reference
DATUMS AND BENCH MARKS	3/1919 as amended	19/2008	A2.5

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.

2

a) It is resolved that the datum for tide predictions shall be the same as chart datum (datum for sounding reduction). It is further resolved that the Lowest Astronomical Tide (LAT), or as closely equivalent to this level as is practically acceptable to Hydrographic Offices, be adopted as chart datum where tides have an appreciable effect on the water level. Alternatively the differences between LAT and national chart datums may be specified on nautical documents. If low water levels in a specific area frequently deviate from LAT, chart datum may be adapted accordingly.

b) 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.

Notes:

i) *LAT (HAT) is defined as the lowest (highest) tide level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions. It is recommended that LAT and HAT be calculated either over a minimum period of 19 years using harmonic constants derived from a minimum of one year's observations or by other proven methods known to give reliable results. Tide levels should, if possible, reflect the estimated error values obtained during the determination of these levels.*

ii) *In non-tidal waters, in order to allow the development of regional solutions, it is recommended that an appropriate long term range of low/high water definitions of the lower/upper 94-100 percentile be adopted.*

3 It is resolved that chart datums (datums for sounding reduction), the datums of tide prediction and other tidal datums shall always be connected with the general land survey datum, and, in addition, with a prominent and permanent fixed mark in the neighbourhood of the tide gauge, station, observatory etc.

4 It is resolved that ellipsoidal height determinations of the vertical reference marks used for tidal observations should be made, in order to support the production of seamless data sets; i.e. to allow the translation between data sets with differing vertical datums. It is further resolved that such observations should relate to a geocentric reference system, preferably the International Terrestrial Reference System (ITRS) or one of its realizations e.g. the World Geodetic System 1984 (WGS84).

*Draft proposal submitted by the TWLWG to HSSC-7
 Redline version identifying the changes to the draft endorsed by HSSC-6
 (see Annex A to IHO CL 17/2014)*

TITLE	Reference	Last amendment (CL or IHC)	1 st Edition Reference
DATUMS AND BENCH MARKS	3/1919 as amended	xx/2014 xx/2016	A2.5

1 It is resolved that the datum of tide/water level observations and predictions for mariners shall be the same as chart datum (datum for sounding reduction).

2 It is resolved that chart datum and other tidal/water level datums used should be clearly stated on charts and all other navigational products.

3 It is resolved that chart datums (datums for sounding reduction), the datums of tide/water level prediction and other tidal/water level datums shall always be connected with the general land survey datum, and, in addition, with a prominent and permanent fixed mark in the neighbourhood of the tide gauge, station, observatory etc.

4 It is resolved that ellipsoidal height determinations of the vertical reference marks used for tidal/water level observations should be made, in order to support the production of seamless data sets; i.e. to allow the translation between data sets with differing vertical datums. It is further resolved that such observations should relate to a geocentric reference system, preferably the International Terrestrial Reference System (ITRS) or one of its realizations e.g. the World Geodetic System 1984 (WGS84).

In ocean ~~tidal areas~~ and ~~geographical areas connected to oceans~~

5 It is resolved that heights on shore, including elevations of lights, should be referred to a HW datum.

6 It is resolved that the Lowest Astronomical Tide (LAT*), or a datum as closely equivalent to this level as is practically acceptable to Hydrographic Offices, be adopted as chart datum. ~~Alternatively, another, similar datum may be used if the differences between LAT and national chart datums may be specified in nautical documents. If low water levels in a specific area frequently deviate from LAT, chart datum may be adapted accordingly or a different datum has been established by national policy.~~

7 It is resolved that Highest Astronomical Tide (HAT*), or a datum as closely equivalent to this level as is practically acceptable to Hydrographic Offices, be adopted as the datum for vertical clearances. ~~Alternatively, another, similar datum may be used if the differences between HAT and national datums for vertical clearances may be specified in nautical documents. If high water levels in a specific area frequently deviate from HAT, the datum for vertical clearances may be adapted accordingly or a different datum has been established by national policy.~~

~~Note: LAT (HAT) is defined as the lowest (highest) tide level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions. (Note: text moved at the end of the resolution)~~

8 It is recommended that LAT and HAT be calculated either over a minimum period of 19 years using harmonic constants derived from a minimum of one year's observations or by other proven methods known to give reliable results. Tide levels should, if possible, reflect the estimated uncertainty values obtained during the determination of these levels.

In mixed water (where water level variability is due to both tidal and regionally specific forcing mechanisms) and inland waters

9 It is resolved that depths, and all other navigational information should be referred to an appropriate level that is practical and acceptable to Hydrographic Offices ~~or if needed~~ (such as lowest water (LW) as a reference level for depths and highest water (HW) for vertical clearances). The selection of which one of the alternatives to be used is a difficult issue which can only be determined locally and which will be largely dependent on seasonal hydrological conditions. LW and HW are defined preferably as the mean of lowest/highest water levels, or as a suitable percentile of lowest/highest water levels, observed over a long time period. (Note: text from former paragraph 10)

In geographical areas where the tidal range is with limited connection to oceans and negligible and in non-tidal areas range (<30 cm)

108 It is resolved that depths, and all other navigational information should be referred to Mean Sea Level (MSL) or other level as closely equivalent to this as is practically acceptable to Hydrographic Offices.

Note: The adopted level may be a well-defined geodetic datum as used for heights in land survey applications or an observed local Mean Sea Level (MSL) based on long series of water level observations.

119 In order to support other non-navigational applications ~~as UNCLOS~~ and also to indicate the characteristics in the area, it is recommended to adopt the mean of yearly lowest/highest water levels, or as a suitable percentile of lowest/highest water levels, observed over a long time period.

Inland Waters

~~10 It is resolved that depths, and all other navigational information should be referred to an appropriate level practically acceptable to Hydrographic Offices or if needed LW as a reference level for depths and HW for vertical clearances. The selection of which one of the alternatives to be used is a difficult issue which can only be determined locally and which will be largely dependent on seasonal hydrological conditions. LW and HW are defined preferably as the mean of lowest/highest water levels, or as a suitable percentile of lowest/highest water levels, observed over a long time period. (Note: text moved to new paragraph 9)~~

Note: LAT (HAT) is defined as the lowest (highest) tide level which can be predicted to occur under average meteorological conditions and under any combination of astronomical conditions. (Note: text moved from paragraph 7)