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section 26 §, subsection 2, as amended
by the Act 1294/2009

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The channel depth practice in Finland
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The channel depth practice in Finland - principles and implementation

The Finnish Transport Agency publishes the enclosed instruction on the channel depth practice in Finland.

The instruction includes draught concepts associated with channels, the principles for interpreting these concepts, estimating the required gross underkeel clearance and for indicating channel depths in nautical charts.

The Finnish Transport Agency does not give more detailed operational instructions or regulations on how the authorised draught should be implemented in practice.

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ANNEXES

Annex 1	Fairway terminology
Annex 2	Draught concepts associated with channels (drawing)

1 General

In Finland channel depth is indicated as an authorised draught. The Finnish Transport Agency determines an authorised draught for each channel, which is shown on the nautical chart. The authorised draught refers to the maximum design draught at which ships can use the channel. The authorised draught is determined from the reference level.

The same practice and definition are similarly used for all public channels marked on nautical charts, with the exception of boating routes.

On nautical charts the authorised draught of a channel is indicated with a depth figure in connection with the navigation line. In those merchant shipping lanes, in which the fairway area is charted and the depth data describing the fairway area and adjacent areas are based on hydrographic surveys carried out in accordance with the quality requirements in force, the safe clearance depth in the fairway area in question is also shown on the nautical chart for the whole length of the channel.

The channels to which the revised practice of indicating the authorised draught were applied on 12 July 2005, i.e. the channels with a depth practice, will be marked as before on the nautical charts and the practice according to this instruction will also be implemented on them.

The definitions of important terms in connection with the channel depth practice are presented in annex 1.

2 Channel depth principles and practice

The authorised draught of a channel refers to the maximum design draught at which a ship can use the channel. The basis for this is formed by a certain design vessel, which when stationary has the same draught (static draught) as the authorised draught of the channel. The required gross underkeel clearance is estimated for normal circumstances and at such a speed which is sufficient in order to maintain the vessel's maneuverability in the channel in question. Normal circumstances refer to conditions of medium difficulty, but not extreme conditions.

The authorised draught and the corresponding safe clearance depth are determined from the reference level. The basis for this is that the difference between the current, actual water level at the time of navigation and the above-mentioned reference level is considered as an increase or reduction of the indicated authorised draught in the channel. Uncertainty factors, such as the position of the channel in relation to where the water level is measured and possible inaccuracies regarding the estimated rate at which the water level changes, must also be taken into consideration.

Since the observation and dimensioning of the gross underkeel clearance are based on the boundary conditions defined in connection with the planning, the authorised draught does not necessarily mean that any ship in any circumstances and conditions and at all speeds could use the channel without risk of grounding, even if her draught, taking the water level into consideration, does not exceed the draught of the channel.

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Correspondingly a ship may under certain circumstances and when taking the conditions, ship properties, safe clearance depth and other available data into consideration, use the channel when her draught exceeds the authorised draught of the channel. In such cases the channel depth can be utilized within the limits of the determined gross underkeel clearance whenever less gross underkeel clearance is required compared to the dimensioning conditions. Examples of factors which reduce the required gross underkeel clearance/vertical movements in terms of the dimensioning situation are for example low speed, calm and good conditions as well as ship type and hull shape.

The need and adequacy assessment of the gross underkeel clearance in the above-mentioned situation should be based on safe clearance depth data (the secured minimum water depth). The prerequisite for exceeding the planned authorised draught of the channel is that the safe clearance depth of the channel is shown on the nautical chart. The need assessment of the gross underkeel clearance should include the vessel's navigation plan based on nautical chart data for the whole length of the channel, with special emphasis on critical shoals and narrows.

Summary of the above presented factors influencing the application of the authorised draught:

- Channel data presented on the nautical chart
- Gross underkeel clearance according to the safe clearance depth in the channel and in the harbour
- Ship characteristics and speed
- Weather and wind conditions, sea state and ice conditions
- Available water level data and related uncertainty factors
- Position and extent of critical shoals in the channel, nature of the seabed
- Other available channel data

3 Assessing the required gross underkeel clearance

Key variables influencing the vessel's required gross underkeel clearance (drawing in annex):

- ship motions
- net underkeel clearance
- uncertainty of channel depth data
- uncertainty of water level data at the time

Ship motions consist of the following factors:

- squat
- wave response
- trim and heel

The ship's squat increases as the vessel's speed increases and again as the water depth (amount of water under the keel) is reduced. There are several methods for calculating the squat. One such formula for calculating the approximate squat, based on the Huuska-Icorels model, is available on the Finnish Transport Agency's website.

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The net underkeel clearance is the bottom clearance that should remain under the ship's keel under all circumstances, when the increased draught caused by the ship's motions is deducted from the gross underkeel clearance.

The determination of the gross underkeel clearance for each channel is based on the channel design guidelines and planning practices. The gross underkeel clearance can vary in different channel sections: The gross underkeel clearance is generally greater at open sea than in more sheltered channel areas. In ports which are generally sheltered and where the speed is low, less gross underkeel clearance is required than in the entrance. In the channels the gross underkeel clearance is on an average about 15–20 per cent of the authorised draught and 10 per cent in the harbour (amounting to about 1.5–2.0 metres and in the harbour to 1.0 metres). Under all circumstances the minimum underkeel clearance should be at least 0.6 metres. In small craft routes and boating routes the gross underkeel clearance varies between 0.2 and 0.6 metres depending on the authorised draught.

4 Plane of reference for depths

The figures and data indicating depth as well as the information about the momentary water level distributed to the seafarers by other means are based on the reference level, which is

- at sea the mean sea level
- in inland waterways the level determined for the water area in the national height system and generally chosen so that it represents the low water level of the navigation season (LW_{nav})

In the Finnish coastal waters one of the factors influencing the difference between the mean sea level and the sea bed changes is the land uplift phenomenon. The mean sea level is determined by the Marine Research Unit at the Finnish Meteorological Institute. The institute publishes the results as the theoretical mean sea level at the observation sites, which is tied to the national height system (13 mareographs). In the theoretical mean sea level an epoch year is always included, e.g. MW2010; when in Kemi the water level is sinking in relation to the earth's surface by 6.2 mm/a year, and in Hamina the water level is rising by 1.4 mm/a year.

In charts and other publications the channel depths are marked relative to the decision verifying the MW level. This MW level is not given in the chart or in other official nautical publications. The difference between the actual MW level and the theoretical mean sea level is insignificant. Still, the water level observations are given according to the MW level of the current year, indicating that over the years the gross underkeel clearance figure will diminish slightly in the Gulf of Bothnia owing to the land uplift, which causes depths to be reduced.

Basically the water level changes relative to the reference level are noted as a corresponding change in the authorised draught in the channels. In certain situations the interpretation of the required underkeel clearance stated above in item 2 can partly compensate also low water.

5 Determining and indicating channel depth in publications

The authorised draught and safe clearance depth of channels indicated in navigation publications are based on the Decision to establish a channel.

On nautical charts, channel depth is shown on the navigation line by a depth figure indicating the authorised draught (Symbol¹ M 6).

In those merchant shipping lanes in which the fairway area is marked on the nautical chart and for which all the hydrographic survey and fairway data are based on the data confirmed according to the requirements of the newest hydrographic survey standards, the safe clearance depth, i.e. the secured water depth, is indicated on the chart in addition to the authorised draught. The safe clearance depth is indicated with the symbol I 24.

The above described indication of fairway areas and safe clearance depths applies exclusively to channel sections maintained by the Finnish Transport Agency. In harbour areas, safe clearance depths are indicated on large-scale special charts of these areas.

6 Responsibilities and instructions

The Channel Authority is responsible for the indicated secured water depths (safe clearance depths). Seafarers are immediately informed about any spots detected as shallower than the safe clearance depth, and appropriate measures for their elimination or marking will be taken.

The Finnish Transport Agency's Hydrographic Office is responsible for reporting authorised draughts and safe clearance depths in chart publications according to the information given by the Channel Authority and in the Decision to establish a channel and for notifying alterations in due form in the publication Notices to Mariners.

In addition the Finnish Transport Agency ensures, in the form of nautical chart products, that mariners have access to sufficient seabed topography data in the fairway area and when necessary also outside the fairway area. If necessary and possible, the agency aims at adding large-scale special charts of narrow and otherwise critical places in the channels as well as of harbour areas to the chart display.

The channel users are responsible for the principles and possible instructions relating to the application of the channel depth practice and the required net underkeel clearance as well as for taking water level changes into account.

7 Harbour basins

The channel depth is confirmed unto the harbour/harbour basin. It is not necessary to determine the authorised draught to each quay/pier or part of the harbour; such depths can be expressed

¹ The symbols refer to the Finnish Transport Agency's publication Chart 1 - Chart Symbols

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in terms of water depth (= safe clearance depth i.e. the secured water depth). As the Channel Authority, the Finnish Transport Agency does not determine or accept any responsibility regarding the maximum draught at each quay. This is for the harbour authority and ships to consider and decide.

In order to avoid operational conflicts, the draught of the approach channel and the depths in the harbour area and at quay are to be mutually compatible.

The authorised draught and safe clearance depth (secured water depth) in the fairway sections of harbour areas and in harbour basins and at quays are stated in the Decision to establish a channel. The safe clearance depth of the areas is also shown on special harbour charts and in other special publications.

Channel depth concepts

AUTHORISED DRAUGHT

The channel depth is referred to as the authorised draught. The authorised draught of a channel refers to the maximum design draught at which a ship can use the channel. The authorised draught is determined from the reference level.

In sea areas, the reference level is the Mean Sea Level of a certain year (MW) and in inland waterways generally the low water level of the navigation season (LWnav).

The authorised draught does not mean that any ship in any circumstances and conditions could use the channel without risk of grounding, even if her draught, taking the water level into consideration, does not exceed the draught of the channel. Correspondingly a ship may, under certain circumstances and when taking the conditions, ship properties, safe clearance depth and other available data into consideration, use the channel when her draught exceeds the authorised draught of the channel.

The draught of a public channel is confirmed in the Decision of the Finnish Transport Agency to establish the channel. The authorised draught is shown on the nautical chart as a figure on the navigation line.

SAFE CLEARANCE DEPTH

The safe clearance depth, or secured water depth, refers to the depth to which it has been secured that the channel is clear.

The safe clearance depth is determined as the sum of the authorised draught and the gross underkeel clearance of the channel. The safe clearance depth may vary in different sections of the channel, depending on the gross underkeel clearance, even if the authorised draught in the channel remains the same.

The determination of the safe clearance depth is based on the reference level, which in sea areas is the Mean Sea Level of a certain year (MW) and on inland waterways, generally the low water level of the navigation season (LWnav).

The safe clearance depth with respect to the water depth is secured by a method of sufficient accuracy. There is always an error limit (+/-) associated with the establishing of the safe clearance depth. When the distance between the safe clearance depth and the actual seabed diminishes, the error limit of the method must be no higher than 0.1 m. The margin of error accommodates inevitable errors arising from the equipment and conditions. The error limit above the nominal safe clearance depth is included in the net underkeel clearance.

The safe clearance depth is indicated in the decision on the establishment of the channel.

In merchant shipping lanes, in which the fairway area is charted, the safe clearance depth can be marked on the chart. The safe clearance depths of channels are also indicated on fairway cards. Otherwise the safe clearance depth is shown on charts only in special cases.

GROSS UNDERKEEL CLEARANCE

Gross underkeel clearance refers to the minimum amount of free water required under the keel of a vessel for the channel to be clear when the vessel is stationary and has a draught according to the authorised draught of the channel.

The gross underkeel clearance is necessary in order to compensate for the vertical movements of a vessel underway as well as to maintain the maneuverability of the vessel and avoid groundings.

The determination of the gross underkeel clearance is based on the channel design guidelines and planning practices valid at the time. The extent of the gross underkeel clearance may vary in different sections of the channel.

DRAUGHT CONCEPTS ASSOCIATED WITH CHANNELS

