

FSIS-44

Finnish and Swedish joint implementation of the IHO Standards for Hydrographic Surveys Special Publication N^o 44 5th Edition (S-44)

**Joint initiative for the implementation of this international standard by January 1st, 2011,
by the Hydrographers at the Finnish Transport Agency and the Swedish Maritime Administration,
both national representatives of the International Hydrographic Organisation (IHO), hereby states
the necessity to implement the complete S-44 in Hydrographic surveying for the purpose of safe navigation.**

The navigation of vessels requires accurate knowledge of the water depth in order to exploit safely the maximum cargo carrying capacity, and the maximum available water for safe navigation. IHO has developed the original Standards for Hydrographic Surveys, Special Publication N^o 44 5th Edition, S-44. This FSIS-44 should be read in conjunction with the original standard.

The requirements of seafloor search are 100% ("full sea floor search") for all orders. By full seafloor search is meant a systematic method of exploring the sea floor, undertaken to search the whole area and detect features as well as determining the depth of the sea floor. Features in this case are all objects possible to define as accessories to the sea floor. To comply with requirements stated for the maximum horizontal uncertainty and minimum feature detection capability, it is necessary to take into consideration the density and resolution of soundings and need of multiple soundings at each feature intended for detection. The uncertainty is referring to the position of depth sounding on the sea floor and reduced depth. The uncertainty includes the whole budget of contributing, both random and systematic uncertainties, generated from the surveying to the final result (Total Propagated Uncertainty - TPU). A statistical method, combining all uncertainty sources, for determining TPU should be adopted. Predictable systematic uncertainties are not acceptable. Requirement of maximum allowed uncertainty, given in the table below, is indicated within the 95% confidence interval of error distribution. N.B. up to 5% of the survey data may be influenced by an uncertainty outside the interval stated. The equipment used to conduct the survey must be demonstrably capable of detecting features of the dimension specified. The method of demonstrating the feature detection capability is to be defined in quality control procedures. It should be noted that all measurements include errors and 100% detection of features can never be guaranteed. Maximum acceptable uncertainties do not include the influence of defective ability of manoeuvring the ship or crane as well as the natural movements of moored floating aids to navigation.

"Aids to navigation and significant topography" includes fixed and floating aids, buoys, beacons, quays, light-houses, sectors of light and leading lines. The uncertainty in positioning of the said objects has been defined slightly stricter than in the original S-44.

All anomalous features including wrecks should be examined in greater detail and their position and least depth determined, meeting the depth uncertainty standard of the appropriate order. If it is suspected that features endangering safe navigation may exist within an area and that these feature might not be detected by the Survey System being used, consideration should be given to the use of an alternative system (e.g. a mechanical sweep) to increase the confidence in the minimum safe clearance depth across the area. Consequently, bar sweeping shall be done in fairway areas where the vertical margin¹ between the surveyed, (I.R. echo sounded) depth and the maximum allowable draught² is less than 150% of the safety margin stated by specific decision; see "Bar sweeping principle criteria" appendix 1. Bar sweeping shall also be used where the mentioned vertical margin is 1 metre or less. The decision to perform bar sweeping should always be based on some kind of Hydrographic survey. Maximum allowed vertical uncertainty for bar sweeping, given in the table below, is indicated within the 99% confidence interval of error distribution. In many shallow fairway areas, the actual minimum clearance is less than 1 meter and bar sweeping is often a complementary method to eliminate the existence of unidentified features. Accordingly; the necessity of cubic feature detection capability for bar sweeping is determined to be stricter for Exclusive and Special Order.

¹ The vertical margin between the surveyed, in practice echo sounded depth and the maximum allowable draught.

² Existing, proposed or planned allowable draught including squat.

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The different Orders in this FSIS-44 apply to specified depth intervals for fairway areas and other depth areas. The specified depth interval for the fairway areas in this FSIS-44 corresponds to the interval for each Order defined in the original S-44 standard. Another Order of survey is also defined viz. Exclusive order, intended for the most demanding applications in certain areas. The use of Exclusive order is limited to areas with exceptional conditions and based on exclusive decisions. Included in "fairway areas" are existing, proposed or planned fairways, traffic separations, deepwater routes, ports and anchorage or waiting areas.

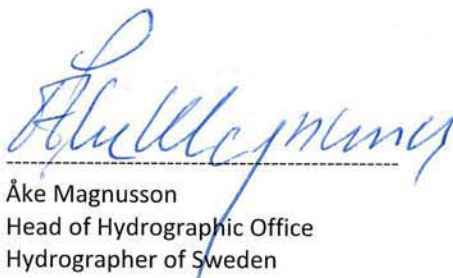
	Exclusive order	Special order	Order 1a	Order 2
Aids to navigation and significant topography ³	0.5	1.0	2.0	5.0
Coastline and topography less significant to navigation horizontal uncertainty (m)	5	10	20	20
Depth horizontal uncertainty ⁴ (m)	2.0	2.0	5.0 + 5% of depth	20 + 10% of depth
vertical uncertainty $\pm \sqrt{a^2 + (b \cdot d)^2}$ (m)	a = 0.15 b = 0.004 d = depth	a = 0.25 b = 0.0075 d = depth	a = 0.50 b = 0.013 d = depth	a = 1.0 b = 0.023 d = depth
Cubic feature detection capability ⁵	> 0.5 m >0.2m (bar sweeping)	> 0.7 m >0.3m (bar sweeping)	at least > 2 m or 10% of depths	> 10% of depths
"Full sea floor search"	required	required	required	required
Fairway areas ⁶ Other depth areas ⁷	Exclusive decision Exclusive decision	0 - 20 m -	20 - 100 m 0 - 100 m	100 m - 100 m -

Example; maximum uncertainty of depth, 95% level of confidence distribution

Depth of reference	Horizontal uncertainty (m) □ depth uncertainty (m)			
6 m	2.0 □ 0.15	2.0 □ 0.25	5.3 □ 0.51	20 □ 1.01
10 m	2.0 □ 0.16	2.0 □ 0.26	5.5 □ 0.52	21 □ 1.03
20 m	2.0 □ 0.17	2.0 □ 0.29	6.0 □ 0.56	22 □ 1.10
50 m	2.0 □ 0.25	2.0 □ 0.45	7.5 □ 0.82	25 □ 1.52
100 m	-	-	10 □ 1.39	30 □ 2.51
400 m	-	-	-	60 □ 9.25



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³ "Aids to navigation and significant topography" includes fixed and floating aids, buoys, beacons, lighthouses, sectors of light, leading lines and quays. Maximum acceptable uncertainties do not include the influence of defective ability of manoeuvring the ship or crane as well as the natural movements of moored floating aids to navigation.

⁴ Take into consideration the planning of the density of soundings.

⁵ The equipment used to conduct the survey must be demonstrably capable of detecting features of the dimension specified. In many shallow fairways the actual minimum clearance is less than 1 meter and bar sweeping is a complementary method to eliminate the existence of not identified features. For that reason the cubic feature detection capability for bar sweeping is determined us being >0.2 m for Exclusive order and >0.3 m for Special order.

⁶ Description of "fairway areas" there the intervals of depths is intended to be applied.

⁷ Description of "other depth areas" there the intervals of depths is intended to be applied.

Appendix 1: Bar sweeping principle criteria

