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INLAND TRANSPORT COMMITTEE

Working Party on Inland Water Transport

Working Party on the Standardization of Technical and Safety Requirements in Inland Navigation
(Twenty-second session, 6-8 June 2001,
agenda item 8)

HARMONIZATION OF THE REQUIREMENTS CONCERNING ANCHORS FOR INLAND NAVIGATION VESSELS

Addendum 1

Submitted by the Chairman of the Working Party

GENERAL CONCEPT FOR ANCHOR EQUIPMENT REQUIREMENTS FOR PASSENGER VESSELS, PUSHERS, SELF-PROPELLED PUSHER VESSELS AND PUSHED BARGES

1. Having taken into consideration all the available documentation on this issue, submitted by Governments and river commissions, and developed by the Working Party during its sessions, the following general concept for anchor equipment requirements for passenger vessels, pushers, self-propelled pusher vessels and pushed barges is proposed for consideration at the Working Party's twenty-first session:

(a) It would make sense, wherever necessary, to retain the principle of identifying river basins with the appropriate coefficients which define the safety criteria when determining the mass of anchors and the length of anchor chains, and which have been assigned (established) by the administrations or competent authorities for the given waterway;

(b) As a starting point for further work on the technical requirements for anchors of passenger vessels, pushers, self-propelled pusher vessels and pushed barges, it is suggested that preference be given to the general principle underlying the formula contained in the annex to resolution No. 36. It is understood in this context that the initial values for each type of vessel will need to be determined;

(c) It is suggested that, at the current stage, further work on the development of technical anchor requirements for passenger vehicles, pushers, self-propelled pusher vessels and pushed barges be conducted separately for each type of vessel;

Passenger vessels

2. Virtually all the proposals submitted suggest that the effective lateral area of passenger vessels be taken into account when determining the total mass of bow anchors. Taking into consideration paragraph (b) of the present concept, the addition is suggested to the right part of the empirical formula provided in the annex to resolution No. 36 of a term which would take into account the vessel's effective lateral area, for example, expressed as the product of the mean height of the superstructure above the waterline and half the (maximum) length of the vessel. It should be possible in this process to retain the influence of the empirical coefficient "c", which factors in the overall safety conditions for navigation on different river basins. Thus, a possible version of this formula for passenger vessels could look like this:

$$M_1 = c_1 \left(BT\sqrt{\frac{L}{8B}} + 0.5\ LH\right) \qquad \text{(kg)} \qquad (1)$$

where H is the mean height of the superstructure above the waterline.
M_1 is the total mass of bow anchors of a passenger vessel.

3. The other values are as described in the annex to resolution No. 36.

4. If this variant is chosen, values will have to be found for the empirical factor “c_1” for the corresponding dimensions of passenger vessels. The passenger vessel data provided in the proposals relate primarily to passenger vessels of less than 50 m or more than 100 m in length.

5. The data submitted on the length of anchor chains are close to the definition contained in resolution No. 36 and conceptually reflect the ratio between the length of the anchor chain and the length of the vessel.

Pushers

6. The information provided suggests that, as a minimum, two possible approaches be considered to calculate the overall mass of the stern anchors of pushers, based on the propelling power of the pushers themselves and the carrying capacity of the pushed convoys. Most of the proposals submitted make some degree of connection between the mass of the stern anchors of pushers and the combined carrying capacity of the pushed convoys and, accordingly, the significant component of the statistics provided for the total mass of the stern anchors of pushers may be described by the following equation:

$$M_2 = (15\% - 30\%)\ CC \qquad \text{(kg)} \qquad (2)$$

where: “M_2” is the combined mass of the stern anchors of the pusher in kg,

“CC” is the combined maximum carrying capacity of the pushed convoy.

7. The maximum percentage value would apply to small-tonnage convoys, more adverse navigation conditions and the use of anchors with a lower holding power.

8. The proposals submitted contain exceptions which deviate significantly from the general concept. This suggests that the carrying capacity of the pushed convoys given in table 2 is not a maximum value.

9. When considering formula (2), certain assumptions must be made to help simplify the calculation formula and to link it with the main formula provided in the annex to resolution No. 36:

- dimensions of the convoy: total length, maximum breadth and mean draught;

- in these dimensions due account is taken of the dimensions of the pusher-tug, which only affect the overall length of the convoy and its mean draught.

In this process:

- the total length of the convoy L_2 (m) is measured as the distance from the bow of the first barge to the stern of the pusher;

- The maximum breadth of the convoy B_2 (m) is determined as the distance between the port and starboard sides of the outermost barges at the widest point of the convoy;

- The mean draught of the convoy T_2 (m) is determined as the simple average of the draughts of all the vessels in the convoy.

Accordingly, the formula looks like this:

$$M_2 = c_2 B_2 T_2 \sqrt{\frac{L_2}{8B_2}} \quad \text{(kg)} \qquad (3)$$

where: M_2 is the combined mass of the stern anchors of the pusher vessels of the pushed convoy;

c_2 is an empirical factor determined in accordance with table 1.

Table 1

Maximum carrying capacity of the pushed convoy	Factor c_2
Up to 1 000 t	15-20
From 1 000 t to 5 000 t	20-25
From 5 000 t to 10 000 t	20-30
Over 10 000 t	25-35

10. In the data provided by Governments, the length of the anchor chains (or cables) "l_2" of the stern anchors of pusher-tugs varies between twice and four times the length of the pusher-tugs themselves. For the Russian Federation, this ratio is 2.0-2.5 times higher.

11. For the main basins, the length of the chains (cables) of the stern anchors of pusher-tugs is between 0.3 and 0.5 the length of the pushed convoy, including the length of the pusher-tug itself, i.e.

$$l_2 = (0.3\text{-}0.5)\, L_2$$

For the Russian Federation basin, this value will be

$$l_2\,(RF) = (0.5\text{-}1.0)\, L_2$$

Pushed barges

12. Pushed barges should be divided into two types:

- head barges - occupying the leading (first) position in pushed convoys;

- centre barges (including trailing barges) - occupying positions between the head barges and the pusher-tugs.

Head barges

13. The anchor equipment for vessels of this type must ensure the safe mooring of the entire convoy as a whole. Accordingly, the definition of the necessary anchor equipment may be the same as that for the anchor equipment (stern anchors) of pusher-tugs as set out in section (e) above.

Middle-range barges

14. The anchor equipment for a vessel of this type must be designed on the principle that it should be able to moor the vessel standing alone.

15. For the purposes of ensuring the safe single mooring of centre pushed barges, the formula for calculating the necessary anchor equipment provided in the annex to resolution No. 36 would seem, in all likelihood, to be applicable.

Self-propelled pusher vessels

16. The data submitted on vessels of this type differ widely in the dimensions of the specific anchor equipment used. At the same time, it is possible to detect a relation between the anchor equipment and the combined carrying capacity of the pusher-tug and the pushed component (barge). In most of the data provided, the combined carrying capacity was between two and three times the carrying capacity of the pusher-tug. This necessitates heavier anchor equipment than that used with normal cargo vessels. In this case, the mass of the stem anchor is increased by between 30% and 50%. Given a certain margin of error, we can use the formula contained in the annex to resolution No. 36, but increasing the empirical factor (c) by between 30% and 50%.

Accordingly, the formula will look like this:

$$M_3 = c_3 B_3 T_3 \sqrt{\frac{L_3}{8B_3}} \quad \text{(kg)} \qquad (4)$$

where: M_3 is the combined mass of the stem anchors of the pusher-tug;

c_3 is an empirical factor determined in accordance with table 2;

L_3 is the maximum length of the pusher-tug in metres;

B_3 is the maximum breadth of the pusher-tug in metres;

T_3 is the maximum draught of the pusher-tug in metres.

Table 2

Carrying capacity of the pusher-tug	Factor c_3
Up to 400 t inclusive	45-65
Between 400 t and 650 t inclusive	50-80
Between 650 t and 1 000 t inclusive	60-95
Between 1 000 t and 4 000 t inclusive	65-105

Conclusions

17. It is suggested that the Working Party gives consideration to this general concept and, should it look favourably on the basic approach to the designation of anchor equipment for the listed types of vessels, that it invites States and river commissions to submit their suggestions by the twenty-third session regarding further work in this area.