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Working Group on Inland Water Transport

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of Technical and Safety Requirements
in Inland Navigation
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STANDARDIZATION OF SHIPS AND INLAND WATERWAYS FOR RIVER/SEA NAVIGATION

Note by the secretariat

The Principal Working Party, at its forty-first session, took note of the report of the Working Party 16 of the Permanent International Association of Navigational Congresses (PIANC): "Standardization of ships and inland waterways for river/sea navigation" and asked the Working Party SC.3/WP.3 to consider whether there was a need for possible extension of existing classification of European inland waterways (annex to resolution No. 30) in order to also cover inland waterways regularly engaged by mixed river-sea navigation vessels (TRANS/SC.3/143, para. 12).

Reproduced below is the most relevant part of the PIANC report reproduced in the form as received by the secretariat.

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STANDARDIZATION OF SHIPS AND INLAND WATERWAYS FOR RIVER/SEA NAVIGATION
(Extracts from the report of the Working Party 16 of the Permanent International Association of Navigational Congresses (PIANC))

"5.2.2 The ECMT and UN/ECE classification of inland waterways

In June 1992, the ECMT fixed new standards for the dimensions of inland waterways. In November 1992, the ECE/UNO in Geneva adopted this proposal, which was defined and communicated by Resolution 30. Subsequently, the ECE/UNO and the ECMT together have prepared a new map displaying the European waterway system in accordance with the new classification. The new map has become available in the beginning of 1995.

class	type of unit	main dimensions of the units (m)			minimum bridge clearance
		length	beam	draught	
Va	motor vessel	95 - 110	11.40	2.50 - 4.50	5.25 or 7.00 or 9.10
	pushed convoy	95 - 110	11.40	2.50 - 4.50	5.25 or 7.00 or 9.10
Vb	pushed convoy	172 - 185	11.40	2.50 - 4.50	5.25 or 7.00 or 9.10
VIa	pushed convoy	95 - 110	22.80	2.50 - 4.50	7.00 or 9.10
VIb	motor vessel	140*	15	3.90	7.00 or 9.10
	pushed convoy	185 - 195	22.80	2.50 - 4.50	7.00 or 9.10
VIc	pushed convoy (6 barge, long)	270 - 280	22.80	2.50 - 4.50	9.10
	pushed convoy (6 barge, short)	195 - 200	33 - 34.20	2.50 - 4.50	9.10
VII	pushed convoy	285	33 - 34.20	2.50 - 4.50	9.10

* Currently not permitted on River Rhine.

Table 5.4 - ECMT and ECE/UNO classification for inland waterways, as far as it may apply to river/sea vessels. Main characteristics

From the viewpoint of fluvio-maritime navigation only the classes V, VI and VII are of importance, other waterways being too narrow. Table 5.4 shows the characteristics of these classes.

Only for the classes Va and VIb typical values for motor vessels are given. That does not imply, however, that the other subclasses or classes mentioned here do not qualify for river/sea navigation. The reason for this is merely that, currently, no inland waterway motor vessels specifically fall into those classes.

8. Analysis and recommendations

The following line of thought has underlain the analysis that was carried out: firstly, river/sea navigation is a trade that appears to work; secondly, there is a number of constraints, hindering further development; and thirdly, notwithstanding the constraints (or by elimination of certain constraints), it should be possible to generate and exploit new opportunities for river/sea navigation. The major elements of the analysis, and the conclusions that the Working Group arrived at, are discussed here.

In the first section of this chapter, a general discussion is given of the possibilities and problems that occur when setting up a classification system for river/sea vessels. In Section 8.2, a proposal for the classification of existing inland waterways is presented, based on the consideration that the proposal should match the existing inland classification system, and should basically draw on the existing waterway system, as efficiently as possible. As a result, the margins that are inherent in the recommendations are relatively small. As a guideline for the construction of new waterways (or the reconstruction of existing ones) for river/sea navigation, permissible dimensions for the various classes are proposed in Section 8.3, anticipating future technical and operational developments. In Section 8.4, a number of concluding remarks is made, considering mainly the economics of river/sea navigation.

8.1 Contemplation of the classification issue

As may be clear from the preceding chapters, the problem of classification of waterways is dominated by a variety of complex economic factors. Generally, these factors are either related to limitations of existing waterways, or to waterway reconstruction costs, or to costs that would be involved in exceptional (shallow draught) ship design.

Consequently, we may have to accept the existing waterways as they are, accept the limited possibilities for adaptation to the specific needs of coasters, and be prepared for draught limitation as the major limiting factor. Also, the existing vessels and the technical possibilities for new designs should be taken into account, bearing in mind that the ultimate objective of any sort of classification is economic optimization.

Eventually, classification - or optimization - of ship dimensions may never result in rigid standardisation, as local conditions, and the related economic aspects, will highly influence the optimal dimensions and equipment of the ship. For instance, there is a clear difference between Scandinavian canals and European canals. Scandinavian waterways were designed for sea-going ships while European waterways were designed for inland shipping, both categories of waterways being used nowadays by river/sea vessels. As a consequence, the optimal ship to traverse the Saimaa-lake is far from optimal when it comes to operating a Duisburg-Spain service.

As a conclusion, it is stated that the proposal presented here should include: a fairway classification that accounts for river/sea vessels, and recommendations for fairway dimensions. The fairway dimensions to define the river/sea classification, as well as the recommended fairway dimensions, should, in accordance with the conventions currently in use, be based on maximum permissible vessel dimensions.

Further, the recommendations should be drawn up with regard to various economic and operational aspects, paying special attention to the issue of supporting containerization. An other important element is the envisaged integration of the waterway networks of west Europe and the Community of Independent States. Better compatibility between both regions, considering the fleet as well as the waterway network, will inevitably result in larger recommended waterway dimensions than those which are used in the ECMT classification. An impression of the differences between the fleets and the networks was given in Section 5.1 and Subsection 5.2.1.

class	type of unit	main dimensions of the units (m)			minimum bridge clearance
		length	beam	draught	
Va	motor vessel	95 - 110	11.40	2.50 - 4.50	5.25 or 7.00 or 9.10
	pushed convoy	95 - 110	11.40	2.50 - 4.50	5.25 or 7.00 or 9.10
	River/Sea vessel (R/S Class 1)	*80 - 90*	*11.40*	*3.50 - 4.50*	*7.00*
Vb	pushed convoy	172 - 185	11.40	2.50 - 4.50	5.25 or 7.00 or 9.10
VIa	pushed convoy	95 - 110	22.80	2.50 - 4.50	7.00 or 9.10
VIb	motor vessel	140*	15	3.90	7.00 or 9.10
	pushed convoy	185 - 195	22.80	2.50 - 4.50	7.00 or 9.10
	River/Sea vessel (R/S Class 2)	*110 - 120*	*15*	*3.50 - 4.50*	*9.10*
	River/Sea vessel (R/S Class 3)	*135***	*22.80*	*4.00 - 4.50*	*9.10*
VIc	pushed convoy (6 barge, long)	270 - 280	22.80	2.50 - 4.50	9.10
	pushed convoy (6 barge, short)	195 - 200	33 - 34.20	2.50 - 4.50	9.10
VII	pushed convoy	285	33 - 34.20	2.50 - 4.50	9.10

Table 8.1 - ECMT and ECE/UNO classification for inland waterways, extended with the proposed classification for River/Sea vessels (in italics). Only Class V and higher are shown as only these classes may apply to river/sea vessels. Main characteristics

8.2 Classification of waterways

In extending the current classification so as to include river/sea navigation, the following dilemma occurs. If the dimensions to define the various classes would be based on the dimensions of the existing fleet, and on the preferences of ship operators, a large number of relevant existing fairways would not qualify for river/sea classification. Thus, serious opportunities for the

development of river/sea navigation would be discarded. On the other hand, if we want to maximize the exploitation of the smaller waterways by river/sea vessels, we have to accept that some waterways with a river/sea classification can not be navigated by a considerable part of the river/sea fleet. As a consequence, in the remainder of this section, relatively small dimensions to define the various classes are presented. In addition to that, in the next section, *recommended* waterway dimensions are presented, which are, basically, somewhat more generous.
At present, the inland waterways are primarily attuned to the needs and the characteristics of inland navigation, the main user of the network. To avoid expensive and uneconomic improvement programmes, fluvio-maritime navigation should be adapted as much as possible to the existing standards of

inland navigation, though a sea craft is not as long and as narrow as a river one. However, for fluvio-maritime navigation to be competitive, the permissible draught should be at least 3.5 m. Otherwise the vessels can not be operated efficiently, either because of the need to reduce the load factor, or by the need to build vessels that are technically and financially out of proportion.

It appeared to be possible to base two river/sea classes in a very natural way on the dimensions of the existing fleet, observing the constraint that the resulting classification should be a logical extension of the existing ECMT classification system, which is based on the specification of nominal beam dimensions. In Section 5.1, it was noticed that two dominating beam classes are standing out for the "non-Russian" fleet, and three for the "Russian". The first non-Russian and part of the first Russian beam class (only the 11.4-m-wide Ladoga class vessels) could easily be combined into one class, with a

typical beam of 11.4 m. Thus, close fitting of the STK class and part of the Ladoga class in any new R/S class was sacrificed, giving priority to the compatibility with the existing system. Similarly, from the second non-Russian beam class, the remainder of the first Russian beam class, and the entire second Russian beam class, we could defer another class, for which a typical beam of 14 m would suffice. However, for reasons of compatibility with the existing system, for this beam the dimension of 15 m, the value which the ECMT system adheres to for Class VIb motor vessels, is obviously the better choice.

It was determined that, particularly in setting up recommendations for new waterways, it is necessary to look further ahead, taking into account the considerable dimensions of the third "beam class" of Russian vessels, and the development of, for instance, catamarans. In that case a permissible beam of 16 or even 22.8 m should be considered, whereas a permissible length of 130 to 140 m would be quite sufficient. The result is a series of three classes.

Based on the preceding considerations on *permissible draught*, for all three R/S classes a draught of minimally 3.5 m (R/S classes 1 and 2) or 4.0 m (R/S class 3) was specified. This choice also stems from a uniformity point of view, given the considerations on integration of river/sea navigation in west European states and the Community of independent States; on a major part of the main CIS waterways a *minimum depth* of 3.6 m is established.

The resulting augmentation of the existing ECMT classification is presented in Table 8.1, showing the original ECMT classification as given in Table 5.4, complemented by the proposed River/Sea classes, the data of which are in italics.

The general idea of this classification can be summarized as follows:

R/S Class 1 is defined, based on existing waterway dimensions, to be used to exploit the existing waterway system as efficiently as possible;

R/S Class 2 is the proposed "state of the art" class, covering modern and near future river/sea transport as it is coming up at the moment;

R/S Class 3 is meant to anticipate for future developments that can not be precisely foreseen at the moment.

In order to illustrate the classification arrived at, in Figs 8.1 to 8.3 three typical representatives of the three classes are shown.

Appendix D comprises a number of maps of the west European waterway system, the waterways classified in correspondence with this proposal[5]. In these maps, also the waterway improvements that are planned for the relatively near future are taken into account.

8.3 Recommendations for the dimensions of new waterways

Formerly, it was emphasized that, in order to arrive at the economic optimum, the margins that are inherent in the classification proposal are relatively small. Further, the Working Group has attempted to establish R/S classes that comply as much as possible with the existing ECMT standard. However, it is necessary to achieve a proper balance between this principle, and the recommendations as to what should be done in the case of developing or improving waterways. Therefore, in Table 8.2, recommended dimensions for the various classes are presented that, obviously, differ slightly from the values featuring in Table 8.1.

5 There are waterways that do not even comply with Class 1, but which are, however, being used for river/sea navigation. These waterways are also indicated on the maps.

In particular, the maximum permissible beam for R/S Class 1 has been increased to 13 m, in order to provide better manoeuvring conditions for all related R/S. Furthermore, a value of 13 m would be sufficient to include all Ladoga and STK representatives, whereas three quarters of this group is too wide to comply with the 11.4-m-wide R/S Class 1.

Next, the Working Group has observed that a beam width of 15 m is too small to load containers five units wide, which, as argued by Engdahl (1993), is considered a prerequisite for efficient container transport in the future. A value of 16 m is a safe minimum value, which explains why for R/S Class 2 a beam of 16 m is recommended.

In principle, for free flowing rivers or partly canalized ones, the permissible draught values are related to the waterway level that is reached 240 days per year on average, following the related guidelines of the ECE/UNO. However, considering the high investments and operational costs of R/S vessels, and, consequently, the cost of not being able to ply a given waterway, it is recommended, for new or improved waterways, to have depths allowing Table 8.2 draughts during 90 % of the year.

R/S class	maximum permissible dimensions of vessels			air clearance (m)
	length (m)	beam (m)	draught (m)	
1	90	13	3.5 or 4.5	7 or 9.1
2	135	16	3.5 or 4.5	≥ 9.1
3	135	22.8	4.5	≥ 9.1

Table 8.2 - Recommendations for new fluvio-maritime waterways

8.4 Additional considerations

In fact, the proposals presented here, should serve to support and increase the share that is taken by river/sea navigation in inland transportation. The obvious first step is to achieve a better match between the geometry of waterways and vessels, which is covered by the previous two sections. However, classification, though useful to help develop sea/river trade, is not the only factor to take into

account. Ports play a very important role too, and it is necessary to be sure that the advantages of the sea/river direct transport will not be upset by poor or expensive port conditions, taking into account the detrimental attitude of some entrance ports which try to prevent sea/river vessels going further through special technical or financial constraints.

There are two main types of ports concerned by sea/river trade. First, private wharfs of various industries or storage facilities: their settling alongside waterways should be favoured to help build door-to-door direct water links when the volume of goods which could be concerned is important. Secondly, public ports, whatever may be the operating method, for which the equipment level should not try to compete with those existing in large seaports. It is the strength of such small ports to be able to offer, with pragmatism and, in cooperation with their clients, economical and flexible solutions regarding, for example, handling.

In addition to accomplishing classification or considering port development, it is of importance to have an indication of the benefits that could be realized by improving the logistics in the entire transport chain, given the actual trade patterns. This has been attempted on the basis of the pilot study. Finally, it is of importance to know how the cargo flows in Europe will develop, in order to be able to accommodate river/sea navigation optimally to the European transport needs.

The Working Group has been well aware of the danger of so-called "weak forecasting", and the danger of basing important conclusions on such forecasting. In our case, this refers to the amount of the benefits achievable on a short-term basis, and to the development of the transport needs. Any figure will be disputable, since it is for instance very difficult to discriminate between "new" cargo flows and cargo flow shifts from road, rail, or combined ocean-going and inland navigation to true river/sea navigation.

On the other hand, it is important to draw on figures, in order to direct the analysis, and to provide an objective basis for the conclusions drawn. This dichotomy has been dealt with as follows. From the pilot study it was concluded that in that particular situation savings on transport cost of 10 to 15 % can be achieved, going hand in hand with a trend towards further standardization and containerization. As a next step, having established the representativeness of these particular cargo flows for the European trade patterns as a whole, these conclusions were considered likely to hold for the rest of the European transport system as well. However, it is *not* possible to base upon this information a reliable prediction of the expected increase of river/sea transport, for Europe generally. Section 5.3 indicated that essential information for such estimations is lacking (separate figures for transport by river/sea vessels in a typically river/sea trade). The best we can do, is to indicate that the amount of river/sea transport will grow to a certain extent, an effect that is further intensified by the need for solutions to road congestion and environmental problems.

Nevertheless, it is not sufficient for river/sea navigation to be merely competitive to cause significant shifts in the market. Inducing people to change their transport mode can only be achieved by offering at least the same quality, at a definitely lower price. At the moment, some opportunities are already there to be taken. Further, the Working Group expects that in due course a number of external factors, for instance, the changes in the distribution of the cost for road and railway transport between the state and the transporters, will improve the prospects for river/sea navigation even more.

Finally, it is emphasized that, in order to stimulate river/sea trade, it is necessary to look into the entire logistic system, including terminals, feeder traffic and organizational issues, for which government policy is a major influencing factor.

9. Conclusions

It was the aim of this study, first, to conceive a definition of river/sea vessels. For this, the Working Group investigated what de facto standards could be distinguished, and what technical and commercial factors will have a major influence on the dimensions of future vessels. The basic principles for the resulting classification have been that the river/sea classification should fit in logically with the ECMT system, and that the corresponding dimensions should ensure the highest possible exploitation of the existing waterway system.

Secondly, recommendations for the dimensions of new or reconstructed fairways have been drawn up, based on the classification scheme previously presented, and anticipating for future technical and operational developments.

The outcomes of the study are summarized in the following section. Next, in Section 9.2, the recommended future steps are discussed, related either to the implementation of the proposals, or to the settlement of remaining definition issues.

9.1 Results of the study

Notwithstanding the numerous obstacles in obtaining accurate data on cargo flows in Europe, it may be concluded that there is a continuous, and very probably still growing need for continental transport capacity. Additionally, there is an ever increasing demand for alternative transport solutions, which relieve the road infrastructure, and which may help to preserve the environment.

The Working Group concludes that R/S navigation can help to solve the problem to some degree. However, in order to be able to take maximum profit from R/S navigation, standardization with respect to both the vessel dimensions and the inland waterway dimensions is necessary. Such a standardization can only be fruitfully utilized if it fits in logically with existing dimensioning standards, and if it takes into account all other relevant standards considering the entire logistic system (e.g. standards for container

dimensions). Further, for R/S navigation to seize new opportunities and to develop new markets, it is essential that new organizational concepts, characterized by door-to-door deliveries on regular terms, are adopted.

As a new standard for dimensioning R/S vessels and the corresponding inland waterways, an extension of the existing ECMT system has been proposed, featuring three new classes particularly designed for R/S navigation. Additionally, recommended future fairway dimensions are proposed, which are typically somewhat more generous than the minimum values according to the standard.

Finally, the Working Group observes that 16 m is very probably a necessary minimum beam width to accommodate 5 rows of containers. As a consequence, the Working Group suggests to reconsider the beam value of 15 m that is specified for Class VIb motor vessels according to the existing ECMT classification. By increasing this value to 16 m, better conditions are provided for efficient container transport in the future.

9.2 Additional recommendations

The Working Group found that the absence of a clear and universal system for characterizing the vertical dimensions of a fairway more or less hindered their work. Moreover, this point is considered to be a major obstacle for optimizing fairway exploitation in the future. Therefore, as a possible starting point for solving this, the Working Group has supplied a suggestion for vertical dimension standardization. Additionally, it is emphasized that it is of importance to know for every vessel the keel-truck (as the maximum draught and the corresponding air draught), and, in addition, the ballasting capacity (the air draught variation possible). This information is essential for a transporter to be able to utilize the fairway as efficiently as possible, given the fact that disadvantageous legislation is avoided, and that

the cabotage restrictions cease to prevail, universal safety standards may help to ensure safe and economically sound R/S operation.

Closely related to this study, a pilot study was performed that concentrated on the potential increase of cargo volume transport by R/S vessels, utilizing the specific capabilities of this vessel type. For their purposes, the Working Group could partly draw on the outcomes of this study, taking into account the inherent limitations of the pilot project. It is recommended to perform a comprehensive generalization of the pilot study, in order to get a better insight in the potential of R/S navigation for Europe as a whole.

Finally, the Working Group is convinced that both from an economical and an environmental point of view it is beneficial to stimulate R/S transport. For the enhancement of R/S navigation, it is considered essential that the recommendations in this report be considered seriously by the various authorities, to be implemented, possibly after amendation, in due time."
