



# PIANC

## InCom WG Report n° 179 - 2020



### STANDARDISATION OF INLAND WATERWAYS PROPOSAL FOR THE REVISION OF THE ECMT 1992 CLASSIFICATION

The World Association for Waterborne Transport Infrastructure



**PIANC**  
The World Association for  
Waterborne Transport Infrastructure

**PIANC REPORT N° 179**  
**INLAND NAVIGATION COMMISSION**

**STANDARDISATION OF INLAND WATERWAYS**  
**PROPOSAL FOR THE REVISION OF THE ECMT 1992 CLASSIFICATION**

**14 September 2020**

PIANC has Technical Commissions concerned with inland waterways and ports (InCom), coastal and ocean waterways (including ports and harbours) (MarCom), environmental aspects (EnviCom) and sport and pleasure navigation (RecCom).

This report has been produced by an international Working Group convened by the Inland Navigation Commission (InCom). Members of the Working Group represent several countries and are acknowledged experts in their profession.

The objective of this report is to provide information and recommendations on good practice. Conformity is not obligatory and engineering judgement should be used in its application, especially in special circumstances. This report should be seen as an expert guidance and state-of-the-art on this particular subject. PIANC disclaims all responsibility in the event that this report should be presented as an official standard.

**PIANC Secrétariat Général**  
Boulevard du Roi Albert II 20, B 3  
B-1000 Bruxelles  
Belgique

<http://www.pianc.org>

VAT BE 408-287-945

ISBN 978-2-87223-008-2  
© All rights reserved

# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY (ES) .....</b>	<b>4</b>
<b>1. GENERAL ASPECTS.....</b>	<b>14</b>
1.1 Scope .....	14
1.2 Introduction .....	14
1.2.1 Terms of Reference .....	15
1.2.1.1 Objective of the Working Group .....	15
1.2.1.2 Subjects of the Study .....	15
1.2.2 Structure of the Report .....	15
1.2.3 Related PIANC Reports.....	15
1.2.4 Members of the Working Group.....	16
1.2.5 Meetings .....	16
1.2.6 Acknowledgements.....	16
<b>2. PROGRAMME OF WORK.....</b>	<b>17</b>
2.1 Mission of the Working Group.....	17
2.2 Programme of Work .....	17
2.3 Collection of Data.....	17
<b>3. ANALYSIS OF COLLECTED INFORMATION ON INLAND WATERWAY SYSTEMS IN EUROPE, ARGENTINA AND CHINA.....</b>	<b>19</b>
3.1 Introduction .....	19
3.2 Current ECMT Classification in Relation to the Developed Fleet .....	19
3.2 Future Plans for Upgrading the Waterway Network .....	19
3.3 Development of Coupled Units .....	19
3.4 Development of Motor Vessels > 110m.....	19
3.5 Expectations of the Future Development of the Fleet.....	19
3.6 Existing Infrastructure Futureproof.....	20
3.7 Problem of Bridge Clearance.....	20
<b>4. FLEET CHARACTERISTICS .....</b>	<b>21</b>
4.1 Development of the Fleet .....	21
4.2 Horizontal Dimensions; Motor Vessels, Pushed Convoys, Coupled Formations .....	24
4.3 Container Transport, Vessels and Required Free Headroom .....	28
4.4 Draught (T).....	32
4.5 Other Vessel Types .....	33
4.5.1. River Cruise Vessels.....	33
4.5.2. River-Sea Vessels .....	34
4.5.3. Russian Fleet .....	36
<b>5. WATERWAY NETWORK .....</b>	<b>37</b>
5.1 Horizontal Network Dimensions .....	37
5.1.1. Sources of Data.....	37
5.1.2. Allowed Vessels Size .....	38
5.1.3. Locks Size .....	42
5.2 Vertical Headroom Dimensions .....	43
5.2.1 Bridge Clearance.....	43
5.2.2 Required Height of Bridges in Relation to Water Levels.....	45
5.2.3 Existing Headroom of Bridges.....	45
5.2.4 Experience on Bridge Replacements .....	48
5.3 Water Depth (h).....	48
5.3.1 Requirements .....	48
5.3.2 Water Levels .....	50

<b>6. MARKET ANALYSIS .....</b>	<b>51</b>
<b>7. SYNTHESIS .....</b>	<b>53</b>
7.1 Horizontal Dimensions .....	53
7.1.1 Motor Vessels.....	53
7.1.1.1 Motor Vessels 105-110 m x 9.50 m .....	53
7.1.1.2 Motor Vessels 105-110 m x 10.50 m .....	53
7.1.1.3 Motor Vessels 135 m x 11.40-11.45 m .....	53
7.1.1.4 Larger Motor Vessels ( $l > 110$ m and $b > 11.40-11.45$ m) .....	54
7.1.2 Pushed Convoys.....	54
7.1.3 Coupled Formations.....	54
7.1.4 Container Transport by Inland Vessels .....	54
7.1.5 River-Sea Vessels .....	56
7.1.6 River Cruise Ships .....	56
7.2 Headroom (see also Appendix K) .....	56
7.3 Draught.....	57
<b>8. RECOMMENDATIONS .....</b>	<b>58</b>
<b>REFERENCES .....</b>	<b>61</b>
<b>APPENDIX A TERMS OF REFERENCE .....</b>	<b>63</b>
<b>APPENDIX B ABBREVIATIONS AND SYMBOLS.....</b>	<b>67</b>
B.1 Abbreviations .....	67
B.2 Symbols .....	67
<b>APPENDIX C TERMINOLOGY .....</b>	<b>68</b>
<b>APPENDIX D CEMT/ECMT RESOLUTION NO.92/2 ON NEW CLASSIFICATION OF INLAND WATERWAYS .....</b>	<b>69</b>
<b>APPENDIX E RIJKSWATERSTAAT FLEET CLASSIFICATION 2002.....</b>	<b>73</b>
<b>APPENDIX F RIJKSWATERSTAAT FLEET CLASSIFICATION 2010.....</b>	<b>74</b>
<b>APPENDIX G QUESTIONNAIRE .....</b>	<b>75</b>
<b>APPENDIX H REPLIES TO THE QUESTIONNAIRE.....</b>	<b>76</b>
<b>APPENDIX I SCATTER-DIAGRAMS WITH IVR DATA .....</b>	<b>87</b>
<b>APPENDIX J DRAUGHT: ANALYSIS OF AVAILABLE DATABASES.....</b>	<b>89</b>
<b>APPENDIX K COMPUTATION OF REQUIRED HEADROOM .....</b>	<b>93</b>
K.1 Calculation Method .....	93
K.2 Hypothesis .....	94
K.2.1 Containers.....	94
K.2.2 Vessels .....	95
K.2.3 Loading Conditions .....	95
K.2.4 Vessel Ballasting.....	96
K.3 Required Headroom without Ballasting.....	97
K.3.1 Calculation Results .....	97
K.3.2 Comparison with ECMT 1992 Requirements .....	100
K.3.2 Comparison with Field Measurements .....	101
K.4 Effect of Ballasting on Required Headroom.....	103
References.....	105
<b>APPENDIX L REFERENCE WATER LEVELS.....</b>	<b>106</b>
A. Highest Navigable Water Levels .....	106
B. Low Navigable Water Levels.....	107
<b>APPENDIX M EXPERIENCES ON BRIDGE REPLACEMENTS .....</b>	<b>108</b>
<b>APPENDIX N SHIP DESIGN EURO PALLET VESSEL .....</b>	<b>111</b>

## LIST OF FIGURES

Figure 1: Average tonnage of passing vessels at 3 locks in the Netherlands.....	21
Figure 2: New construction tonnage in the dry shipping sector in Western Europe .....	25
Figure 3: The active motor vessels fleet, passing in the Netherlands split by horizontal dimension in absolute numbers .....	26
Figure 4: The active motor vessels fleet, passing in the Netherlands split by horizontal dimensions, twenty vessels and more .....	26
Figure 5: The number of new-built motor vessels in West Europe split by horizontal dimensions .....	27
Figure 6: The active barges fleet, passing in the Netherlands split by horizontal dimensions, in absolute numbers.....	27
Figure 7: The active barges fleet, passing in the Netherlands split by horizontal dimensions, five barges and more.....	28
Figure 8: IWT transport of containers in the Netherlands. ....	30
Figure 9: The German river cruise ships .....	34
Figure 10: Blue Book: waterway length covered in the database .....	38
Figure 11: Blue Book: Europe waterway beam-length matrix .....	39
Figure 12: Blue Book, West-Europe: waterway beam-length matrix, present values single units .....	40
Figure 13: Blue Book, West-Europe: waterway beam-length matrix, target values single units.....	40
Figure 14: Blue Book, West-Europe: waterway beam-length matrix, present values pushed convoys	41
Figure 15: Blue Book, West-Europe: waterway beam-length matrix, target values pushed convoys...	41
Figure 16: Blue Book: distribution of allowed vessels' beam. ....	42
Figure 17: Blue Book: distribution of allowed vessels' length. ....	42
Figure 18: Blue Book: locks width-length matrix. ....	43
Figure 19: Bow bridge with definitions for physical dimensions .....	44
Figure 20: Water level characteristics in rivers, regulated rivers and canals .....	44
Figure 21: Distribution of present minimum bridge height.....	46
Figure 22: Distribution of target minimum bridge height. ....	47
Figure 23: Distribution of present and target minimum bridge height for all ECMT classes. ....	47
Figure 24: Distribution of allowed draught (present values).....	49
Figure 25: Distribution of allowed draught (target values).....	49
Figure 26: Evolution of the distribution of maximum fairwau depth for all ECMT classes. ....	50
Figure 27: Inland navigation in Europe market observation, annual report 2016 .....	51
Figure 28: EU27 average inland waterway transport outlook, low and high scenario .....	52

## LIST OF TABLES

Table 1: Transport of goods over inland waterways in Europe (Source: Eurostat database).....	28
Table 2: Growth in container transport by inland vessels .....	29
Table 3:Measurements of height of container vessels including 30 cm of safety margin (source: RWS, see ref. 7).....	30
Table 4: Calculation of height of container vessels including 30 cm of safety margin (source: ref. 7) .	31
Table 5: Ballast capacity of some dedicated vessels.....	31
<i>Table 6: Recommendations for new fluvio-maritime waterways</i> .....	35
Table 7: 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. ....	35
Table 8: Necessary changes to ECMT '92 classes to fully comply with continental container transport.....	55
Table 9: Headroom underrun of stationary vessels, including safety margin of 0.30 m .....	56
Table 10: Proposal of Classification of European Inland Waterways, PIANC 2020 (WG 179).....	59