



Comparative analysis of Directive EU 2016/1629, ES-TRIN and the Recommendations on Harmonized Europe-Wide Technical Requirements for Inland Navigation Vessels (annex to resolution No. 61) with a view to harmonizing the Rules of Russian River Register with the Directive of the European Union

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Operation conditions of vessels on rivers in the Russian Federation

Volga



Volga-Baltic canal



Irtys



Ladoga Lake



Amur



Oka



Neva



The Rules of a classification society are based on the experience accumulated during the construction and operation of vessels, which builds on conditions and particular features of navigation.

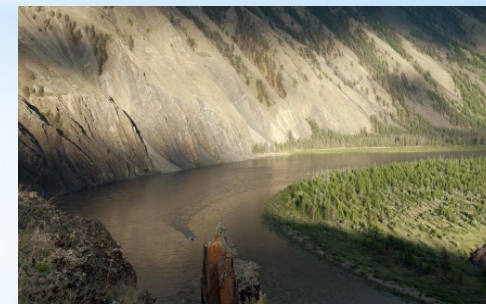
In the Russian Federation, the total length of federal inland waterways is 101,484.8 km, including 49,872.6 km with the guaranteed fairway parameters; 53,044.6 km fitted with aids to navigation; the latter includes 38,285.3 km available for day and night traffic.

Furthermore, 78% of the waterways are the only opportunity for the delivery of goods and passengers, thus ensuring the so-called "northern supply".

Most of the cargo is transported by the Unified Deepwater System of the European part of Russia with a length of about 6.5 thousand km. It includes the Volga-Baltic Waterway, the White Sea-Baltic Canal, the waterways of the Volga-Kama cascade of reservoirs, the Moscow Canal, the Volga-Don navigable canal and the lower part of the Don River.

More than 100 river ports operate in the Russian Federation.

Indigirka





Examples of large-scale series of vessels built according to the Rules of Russian River Register

Volgo-Don type, more than 200 vessels in a series



Moskva type, more than 400 vessels in a series



Hydrofoil craft, around 3000 vessels of this type have been built



The nature of rivers in the Russian Federation: shallow tributaries, high-water lakes, sills, ice conditions have an impact on the vessels' design and construction, the main dimensions ratio, the structural type, propulsion methods and, therefore, have been duly noted in the River Register Rules.

In general, vessels navigate 24 hours a day in varying conditions which include shallow river stretches, deep-water sections of reservoirs and lakes which, in rough weather conditions, are close to the sea navigation conditions.

Ensuring the high level of navigation safety under the actual operating conditions on rivers of the Russian Federation, which is laid down in the Rules, is a complex engineering task, which has been successfully solved in the past and is being continuously addressed by scientists, ship architects, shipyards and experts of the River Register.

Moskvich type, about 500 vessels in a series



Pusher tug of OT type, more than 200 vessels in a series



Pusher tug of RT type, around 700 vessels in a series



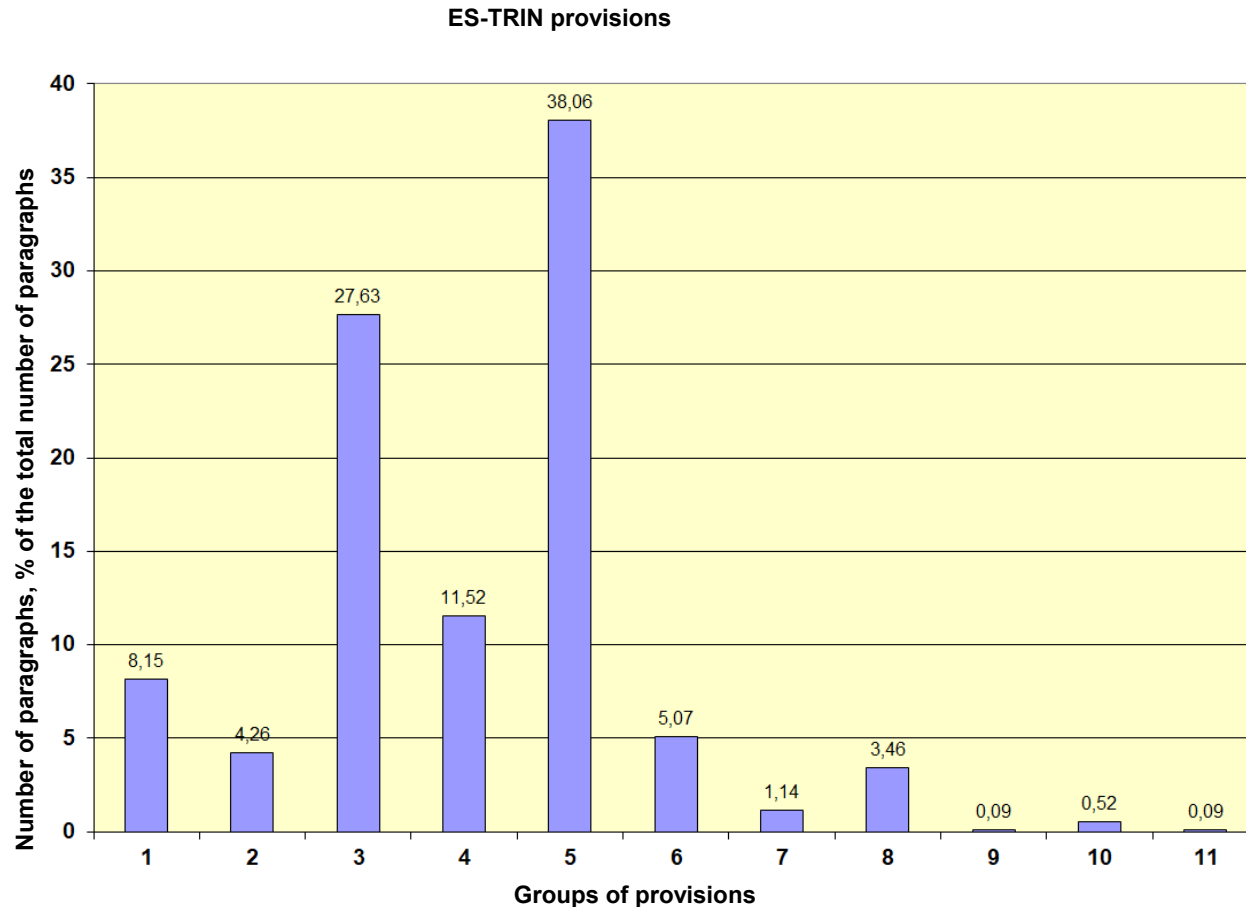
Comparative analysis of Resolution No. 61 and the River Register Rules made in 2010 – 2011 (Subdivision)

UNECE Resolution No. 61	River Register Rules	Conclusion
3-4 SUBDIVISION		
3.4.1 Watertight bulkheads		
3-4.1.2 A collision bulkhead shall be fitted at an appropriate distance from the forward perpendicular. If the vessel has a long forecastle, the Administration may require the collision bulkhead to be carried up to the forecastle deck.	2.4.64 In all ships, forepeak and afterpeak transverse watertight bulkheads shall be provided. The forepeak bulkhead shall be fitted abaft the fore perpendicular at a distance not less than the half-breadth of the hull. For ships with more than 14 m in breadth, the forepeak length may be reduced if agreed by the Register.	According to the vessels' main dimensions ratios which are covered by the River Register Rules, the forepeak bulkhead shall be fitted at $0.085 \div 0.1 L$ from the forward perpendicular, where L is L_{WL} . The River Register Rules are therefore more stringent.
3-4.1.3 In vessels navigating in zones 2 and 3 the collision bulkhead shall be between $0.04 L$ and $0.04 L + 2$ m. In vessels navigating in zone 1, the collision bulkhead shall be between $0.04 L$ and $0.08 L$ aft of the forward perpendicular, where L is the length defined in paragraph 1–2.		
3-4.1.4 In vessels more than 25 m long, a bulkhead shall be fitted in the after part of the vessel at an appropriate distance from the after perpendicular having regard to the configuration of the vessels after extremity.	2.4.64 In all ships, forepeak and afterpeak transverse watertight bulkheads shall be provided.	The River Register Rules require that the forepeak bulkhead is installed on all vessels irrespective of their length. The River Register Rules are more stringent than the European provisions for vessels having less than 25 m in length.
3-4.1.6 The Administration may require watertight bulkheads other than those mentioned above in regard to the vessel's design.	2.4.70 For dry cargo ships, the minimal number of watertight transverse bulkheads, including the forepeak and afterpeak bulkheads, shall be as follows depending in ship length, m: 20 – 60 m — 3; 61 – 80 m — 4; 81 – 100 m — 5; 101 m and over — 6.	The River Register Rules regulate the “quantity”, i.e. the number of the bulkheads, while the resolution contains a “qualitative” requirement.

Comparative analysis of Resolution No. 61 and the River Register Rules made in 2010 – 2011 (Equipment), the harmonization results

Object of the analysis	Conclusions	Improvements introduced in the River Register Rules as a result of harmonization with Resolution No. 61
Rudder-propeller, water-jet, cycloidal-propeller and bow thruster systems	The River Register Rules contain requirements for bow thrusters, other systems are not covered	The respective provisions have been introduced in the River Register Rules edition 2015
Rate-of-turn regulators	No provisions in the River Register Rules	The respective provisions have been introduced in the River Register Rules edition 2015
Arrangement and equipment of the wheelhouse	The scope of provisions is less than in the resolution	Applicable provisions have been introduced in the River Register Rules edition 2015
Special wheelhouse arrangements for radar steering by one person	No provisions in the River Register Rules	The respective provisions have been introduced in the River Register Rules edition 2015
Principles of assigning the anchor equipment	Provisions are different in both documents	Applicable provisions have been introduced in the River Register Rules edition 2015
Life-saving equipment	Resolution is more stringent	Applicable provisions have been introduced in the River Register Rules edition 2015

Analysis of ES-TRIN requirements



Provisions contained in ES-TRIN edition 2017:

1 – Definitions; 2 - Introductory proposals, organizational requirements, descriptive texts; 3 - Provisions set forth in a manner similar to the River Register Rules; 4 - Provisions set forth in a manner different from the River Register Rules; 5 - Requirements for inspections of vessels in operation; 6 - Requirements for the equipment, materials and components; 7 - Provisions for the prevention of pollution from vessels; 8 - Requirements for sailing vessels; 9 - Requirements for pleasure craft; 10 - requirements for traditional craft; 11 - Requirements for sea-going ships

Basic conclusions of the comparative analysis on Strength provisions

Recommendations (Resolution No. 61)	Provisions of ES-TRIN	Provisions of the River Register Rules	Notes
Strength			
<p>Hull structure and strength requirements are nearly missing (7 provisions in total). The following is stated:</p> <p>3-1.1 The general structural strength of the hull shall be sufficient to withstand all stresses under normal conditions of operations.</p>	<p>The standard contains more extensive requirements than in Resolution No. 61, which can be summarized as:</p> <ul style="list-style-type: none"> - the sufficient strength should be proved by calculations; - minimal values of the plate thickness for vessels in operation are assigned; - for hulls made of materials other than steel, it should be proven by calculations that the global, transverse and local strength is at least equal to the strength value for the hull made of steel with a minimal plate thickness calculated according to the standard. 	<p>Strength requirements are contained in Part I of the River Register Rules (around 1000 provisions), in particular:</p> <ol style="list-style-type: none"> 1. Calculations of strength and scantlings of the main structural components of hulls made of steel, aluminium alloys, reinforced concrete, glass-reinforced plastic, including: <ul style="list-style-type: none"> - design stresses at the global bending and local design loads; - global and local strength calculations, permissible stresses, buckling strength calculations, ultimate global strength calculations; - calculation of the hull global strength at the end of the service life (estimation of the service life for particular hull members); - vibration strength calculations; - requirements to the design of the hull framing girders, cut-outs in the structural elements, welded structures; - requirements to the minimal design thickness of the hull members; - requirements to ice strengthening of the hull for navigation in fine broken ice. 2. Requirements for the hull design of: <ul style="list-style-type: none"> - catamarans; - hydrofoil craft and hovercraft; - vessels carrying dangerous goods; - ram wing craft. 	<ol style="list-style-type: none"> 1. Provisions in Resolution No. 61 can be considered as the flag state requirements; a hull cannot be designed and built on the basis of the resolution. 2. Provisions of ES-TRIN are more detailed than in the recommendations of resolution No. 61, they can be considered as a combination of the flag state requirements and technical provisions; some of them are fragmentary, while others are duly developed. 3. The River Register Rules contain provisions for the hull strength in the basic operation modes. There is an indication that, for each vessel, the most unfavorable load conditions that may occur, should be considered.

Minimal shell plating thickness

Section of Table 3.5.5, Part I, of the River Register Rules

**Standard values of minimal residual shell plating thickness for vessels in operation,
according to the River Register Rules**

Hull structural member	Minimum residual thickness, mm, for vessels of the following classes with a length, m											
	M-SP			M-PR and M			O-PR and O			R and L		
	25	60	140	25	80	140	25	80	140	25	80	
1	2	3	4	5	6	7	8	9	10	11	12	
1 Outer shell plating												
1.1 Outer shell plating (for cases other than mentioned in paras. 1.2 - 1.7)	3.2	4.0	5.0	3.0	4.0	4.5	3.0	3.5	4.5	2.5	3.0	
1.2 Outer shell plating adjacent to the ballast and fuel tanks	3.7	4.5	5.5	3.5	4.5	5.0	3.5	4.0	5.0	3.0	3.5	
1.3 Bilge strake of the outer shell	3.7	4.5	5.5	3.5	4.5	5.5	3.0	4.0	5.0	3.0	4.0	
1.4 Sheer strake amidships	3.2	5.0	6.5	3.0	5.5	6.0	3.0	4.0	5.0	3.0	4.0	
1.5 Bottom plating of single-bottomed tankers and side plating of single-sided tankers in the cargo tank area	4.0	5.0	7.0	3.5	5.0	6.5	3.5	5.0	6.0	3.5	4.5	
1.6 Bottom plating at the fore extremity at the height up to 0.04A from the base plane	4.0	5.0	7.0	4.0	5.5	6.0	3.5	4.5	5.5	3.0	3.5	
1.7 Side plating at the fore extremity	3.7	4.5	5.5	3.5	4.5	5.5	3.5	4.5	5.5	3.0	3.5	

Minimal thickness according to ES-TRIN

In the event of periodical inspection, the minimum thickness of the bottom, bilge and side plates of vessels made from steel shall be no less than the higher of the values resulting from the following formulae:

1. for vessels that are longer than 40 m:

$$t_{\min} = f \cdot b \cdot c (2.3 + 0.04 L) \text{ [mm];}$$

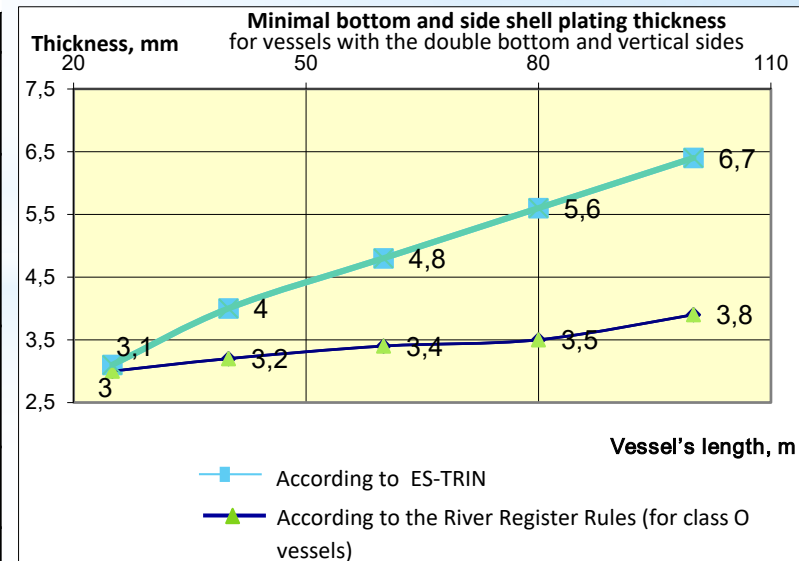
for vessels not more than 40 m in length:

$$t_{\min} = f \cdot b \cdot c (1.5 + 0.06 L) \text{ [mm]}, \text{ however, not less than 3,00 mm.}$$

$$2. \ t_{\min} = 0.0005 \cdot a \cdot \sqrt{T} \text{ [mm].}$$

**Comparison of minimal thickness values for a dry cargo vessel having a length of 100 m and
a spacing of 550 mm**

Hull structural member	Minimal thickness values			
	River Register Rules for class O		ES-TRIN	
	Under construction	In operation	Under construction	In operation
Bottom amidships, mm	6.5	3.8	Shall be proved by calculations	6.7
Bilge strake, mm	7.5	4.3		8.4
Side, mm	6.5	3.8		6.7



Basic conclusions of the comparative analysis on Stability provisions

Recommendations (Resolution No. 61)	Provisions of ES-TRIN	Provisions of the River Register Rules	Notes
Stability			
<p>Resolution No. 61 contains more extensive provisions, as compared to ES-TRIN, in particular:</p> <ul style="list-style-type: none"> - criteria for stability checking; - main stability criterion; - special and additional provisions for vessels operating in zones 1, 2 and 3; - additional requirements for checking stability of particular types of vessels. 	<p>ES-TRIN contains the stability requirements only for passenger vessels, vessels carrying containers, vessels with a length over 110 m; requirements for other types of vessels are almost missing:</p> <p>Article 3.02</p> <p>The hull shall be sufficiently strong to withstand all of the stresses to which it is normally subjected.</p>	<p>Stability requirements are contained in Part II of the River Register Rules, in particular:</p> <ul style="list-style-type: none"> - the Stability Booklet; - the inclination test; - main stability criterion; - dynamic stability curves; - maximum permissible moment for assessing stability; - assumed design roll amplitudes; - specific stability requirements for particular vessel types (passenger vessels, cargo vessels, tugboats, fishing vessels, floating cranes, worksite craft, hydrofoil craft, hovercraft, catamarans) 	<p>In the River Register Rules and Resolution No. 61, different approaches are used for standardizing the intact stability. The main difference of the River Register Rules is that, in the stability calculations, they implicitly regulate the maximum permissible static stability lever (maximum righting lever), while Resolution No. 61 and ES-TRIN implicitly regulate the minimum permissible area under the righting lever curve.</p> <p>We consider that the approach used in the River Register Rules, reflects more accurately the operating conditions of vessels on rivers of the Russian Federation.</p>

Basic conclusions of the comparative analysis on the prevention of pollution from vessels

Recommendations (Resolution No. 61)	Provisions of ES-TRIN	Provisions of the River Register Rules
Prevention of pollution from vessels		
<p>8A Exhaust and pollutant particulate emissions from diesel engines</p> <p>Limit values of NO_x, CH and CO in emissions from diesel engines are assigned (concrete values).</p>	<p>Limit values of emissions are not assigned; a reference is made to Regulation (EU) 2016/1628.</p> <p>Contain requirements for the installation of the main engines, the engine manufacturer's instructions, installation tests, intermediate and special tests as well as requirements concerning exhaust gas after treatment systems.</p>	<p>The River Register Rules contain more stringent limit values for CO emission than Resolution No. 61, while the limit values for NO_x are more stringent in Resolution No. 61. As far as the total contents of hydrocarbons (HC) is concerned, Resolution No. 61 and the River Register Rules contain identical values (1 g/(kW h)).</p> <p>The River Register Rules do not assign the limit values of particulate emissions, however, they assign the opacity limit values of exhaust gases and, therefore, they regulate the same parameter as Resolution No. 61 by means of another index.</p>
<p>8B-4 Requirements concerning equipment for the treatment of domestic waste water</p> <p>The Administration may allow the use of the equipment for the treatment of domestic waste water. In this case such equipment and its components shall meet the conditions required by the Administration.</p>	<p>Chapter 18 ON-BOARD SEWAGE TREATMENT PLANTS</p> <p>Assigns the limit and control values to be observed in the outflow of the on-board sewage treatment plant during operation, provisions for the type approval procedure (application, amendments for the type approval, conformity of the type approval, random sample measurement etc.), requirements for the competent authorities and technical services, which should comply with European standard EN ISO/IEC 17025: 2005–8.</p>	<p>3.4 ON-BOARD SEWAGE TREATMENT PLANT</p> <p>Contains only technical requirements for the on-board sewage treatment plant and limit values of treated on-board sewage water.</p>

Control values of on-board sewage water after treatment according to ES-TRIN

Table 2: Control values to be observed in the outflow of the on-board sewage treatment plant during operation

Parameter	Concentration (Stage II)	Sample
Biochemical oxygen demand (BOD_5) ISO 5815-1 and 5815-2 (2003) ¹	25 mg/l	Random sample, homogenised
Chemical oxygen demand (COD) ² ISO 6060 (1989) ¹	125 mg/l	Random sample, homogenised
	150 mg/l	Random sample
Total organic carbon (TOC) EN 1484 (1997) ¹	45 mg/l	Random sample, homogenised

Control values of on-board sewage water after treatment according to the River Register Rules

Table A2.2

Normative values of sewage water treatment

Regulated parameters	TDSW stations in passenger, transport vessels and technical fleet, installed		TDSW stations on specialised waste treatment vessels, installed	
	Before 1997	Later than 1997	Before 1997	Later than 1997
Suspended particles, mg/l	max. 50	max. 40	max. 40	max. 30
BOD_5 , mg/l	» » 50	» » 40	» » 40	» » 30
Coli index	» » 1000	» » 1000	» » 1000	» » 1000
Residual chlorine (for chlorine disinfection), mg/l	1.5 to 3.0	1.5 to 3.0	1.5 to 3.0	1.5 to 3.0

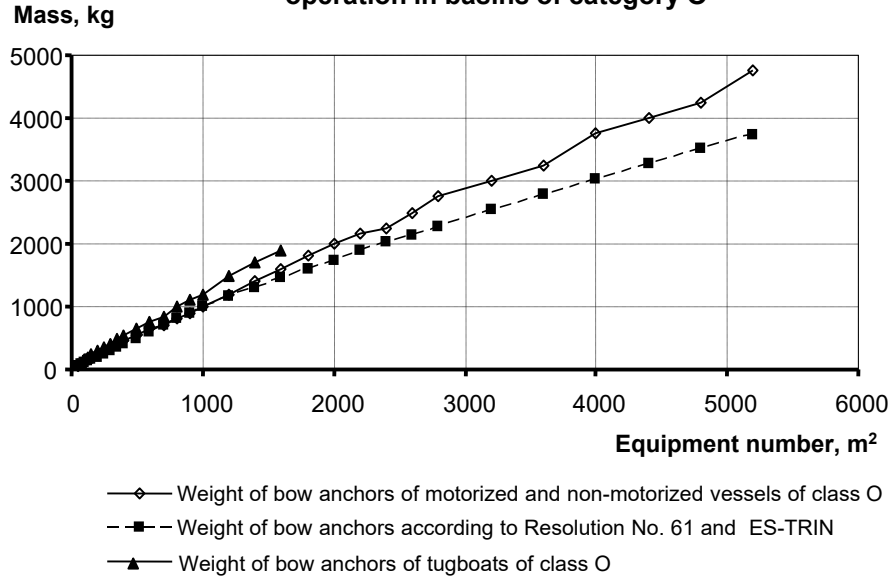
TDSW stations – sewage water treatment and disinfection stations

Basic conclusions of the comparative analysis on Equipment provisions

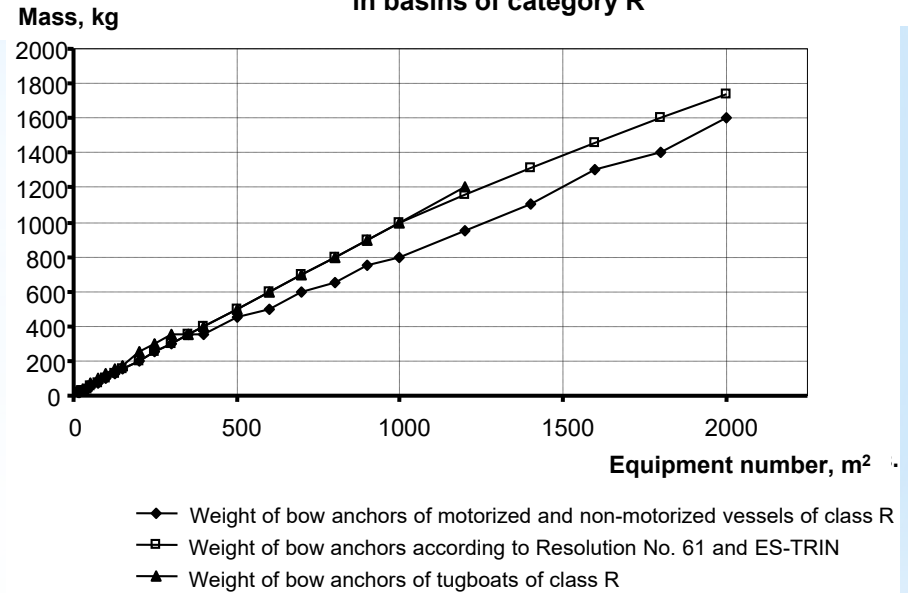
Recommendations (Resolution No. 61)	Provisions of ES-TRIN	Provisions of the River Register Rules	Notes
Fire protection			
Contains requirements for the structural fire protection and the fire-fighting equipment.	<p>Contains more extensive requirements as compared to Resolution No. 61; in addition to the structural fire protection, contains provisions (concerning passenger vessels) for:</p> <ul style="list-style-type: none"> - materials and components, tests should be carried out in accredited laboratories; - accredited laboratories, including references to European standard EN ISO/IEC 17025:2005; - test methods, including references to the Code for Fire Test Procedures. <p>Contains requirements for the fire-fighting systems of the accommodation spaces, wheelhouse, passenger cabins, engine, boiler and pump rooms (structural requirements, fire detection systems, fire detectors).</p>	<p>Fire protection requirements are contained in Part III of the River Register Rules, in particular:</p> <ul style="list-style-type: none"> - Structural fire protection (classification of materials based on their properties related to fire resistance, requirements to materials and the applicability of combustible materials, the structural fire protection on particular types of vessels); - various types of permanently installed firefighting systems; - fire safety requirements to the equipment and systems for domestic and general service equipment and systems; - fire alarm, fire protection outfit, spare parts and tools. 	<p>Requirements of the River Register Rules have been harmonized with the recommendations in Resolution No. 61 based on a research work done in 2010 – 2011.</p> <p>Requirements of ES-TRIN are more detailed than Resolution No. 61; technical requirements are complemented with references to European standards, conditions and procedures for approval, requirements for the installation; models of test reports and installation certificates; requirements to specialized firms for the equipment production, installation, replacement, repair and maintenance.</p>
Life-saving equipment			
<p>10-5 Life-saving appliances</p> <p>Contains technical requirements for individual and collective LSA and the number of on board in relation to the navigation zone.</p>	<p>Articles 13.07 - 13.08</p> <p>Technical requirements for LSA are not prescribed; references are made to European standards (EN 14144:2003, EN ISO 124022:2006, EN ISO 124023:2006 etc.).</p>	<p>Contain the number of collective and individual LSA on board depending on the type and class of vessels, technical requirements for lifeboats, liferafts, lifebuoys, immersion suits as well as their location on board.</p>	<p>Requirements of the River Register Rules have been harmonized with the recommendations in Resolution No. 61 based on a research work done in 2010 – 2011.</p> <p>ES-TRIN contains references to European standards rather than technical requirements.</p>

Anchor equipment

Weight of the bow anchors of vessels intended for operation in basins of category O



Weight of the bow anchors of vessels intended for operation in basins of category R



Note: Equipment number N , in m², is calculated according to the formula (Annex to Resolution No. 61, para. 10-1.2.2).:

$$N = L_{WL}(B_{WL} + H) + k \sum lh,$$

where: k is the coefficient;

l is the length of individual superstructures and deckhouses, in m;

h is the average height of individual superstructures and deckhouses, in m.

Basic conclusions of the comparative analysis on Electrical and navigation equipment provisions

Recommendations (Resolution No. 61)	Provisions of ES-TRIN	Provisions of the River Register Rules	Notes
Electrical and navigation equipment			
<p>Contain technical requirements (Chapter 9) to electrical supply systems, documents to be available on board, maximum permissible voltages, protection against physical contact, the insertion of solid objects, explosion proofing, distribution systems, accumulators, electrical distribution switchboards, switches, protective devices, measuring and monitoring devices, emergency circuit breakers, cables, earthing, emergency power sources, emergency alarm and safety, electronic equipment, navigation lights and their colours, technical parameters of radar equipment (Addendum 7).</p>	<p>In addition to technical requirements similar to those in resolution No. 61, the following is included:</p> <ul style="list-style-type: none"> - minimum requirements and test conditions for navigational radar installations; - minimum requirements and test conditions for rate-of-turn indicators in inland navigation, installation and performance tests; - requirements for installation and performance tests for navigational radar installations and rate-of-turn indicators; - minimum requirements, requirements for installation and performance tests for Inland AIS equipment in inland navigation; - minimum requirements, requirements for installation and performance tests for tachographs; - Installation and performance certificate for navigational radar installations, rate-of-turn indicators, Inland AIS equipment and tachographs. 	<p>Requirements for electrical equipment, radio communication and navigation equipment are contained in a separate volume (Parts VI, VII, VIII of the Rules) and include sections:</p> <ul style="list-style-type: none"> - operating conditions, materials, connections of current-carrying parts, protective earthing, electromagnetic compatibility, arrangement of electrical equipment, main sources of electric power (number and capacity, distribution of main load, automation of power stations), emergency electrical installations, distribution of electric power (distribution systems, power supply of essential equipment, supply from external power source, power supply to other vessels), distribution systems, electrical apparatus, transformers, electrical machinery and drives, accumulators, lighting and navigation lights, onboard communication and alarm, cable network, lighting protection, electrical equipment of refrigerating plants, special requirements to special types of vessels (passenger vessels, oil tankers, floating cranes etc.), electrical propulsion plants; - radio equipment and power sources, location of radio equipment and the cable network installation, antenna assemblies and grounding, requirements to radio and navigation equipment, location of navigation equipment. 	<p>Requirements of ES-TRIN are more detailed than in Resolution No. 61; technical requirements are complemented with references to standards, conditions and procedures for approval, requirements for the installation; models of test reports and installation certificates etc.</p> <p>ES-TRIN contains provisions for enforcement of European directives (2014/53/EU, 2014/30/EU), European standards (EN 60417:2002, EN 61162-1:2011, EN 61162-2:1998 and EN 61162-3:2014, EN 60945:2002 etc.), IMO standards (MSC.112(73), MSC.233(82), MSC.114(73) etc.).</p>

Conclusions

Comparison of the ES-TRIN standard and the Recommendations on Harmonized Europe-Wide Technical Requirements for Inland Navigation Vessels (annex to resolution No. 61) has identified considerable differences between the two documents, along with the following observations:

- Recommendations in Resolution No. 61 are set forth as framework provisions, while the provisions of ES-TRIN are more detailed, some of them are fragmentary, while others are developed in depth;
- In ES-TRIN, technical requirements are complemented with instructions for the installation of the equipment, tests and testing procedures; models of test reports and installation certificates; requirements to specialized firms for the equipment production, installation, replacement, repair and maintenance; deadlines for replacement or conversion (modernization) of parts, components and equipment using new or standardized components and joints; provisions concerning the enforcement of European directives, standards, IMO standards etc.;
- It can be seen that the recommendations of Resolution No. 61 and ES-TRIN are likely to converge, with the priority of the ES-TRIN requirements. Recent documents of the Working Party on Inland Water Transport related to Resolution No. 61, revised, prove the fundamental nature of this document, and provisions in the resolution differ from those of ES-TRIN, therefore it is hardly possible to meet simultaneously both the requirements of the resolution and the standard;
- Provisions of the ES-TRIN standard are often less detailed than in the Rules of the River Register and other Classification Societies. Some of the framework provisions in the ES-TRIN standard are considered in depth in the Rules and set forth in separate sections or chapters. Therefore, for designing and building vessels, in addition to ES-TRIN provisions, the rules of a Classification Society should be applied.

Thank you for your attention!

**For more information about the Russian
River Register Rules, please visit**

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