ANALYSIS OF THE BASIC PARAMETERS FOR MAINTAINING THE TECHNICAL AND OPERATIONAL COMPATIBILITY OF THE 1 520 mm AND 1 435 mm GAUGE RAIL SYSTEMS AT THE BORDER OF THE COMMONWEALTH OF INDEPENDENT STATES (CIS) AND EUROPEAN UNION (EU)

SUBSYSTEM: ROLLING STOCK – LOCOMOTIVES AND MULTIPLE UNITS

The document has been prepared by the OSJD-ERA Contact Group

(Translation from the original in Russian)

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REVISIONS AND AMENDMENTS

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0.00/ 03 April 2008		Working paper (Section 1, 4)	FAD
0.01/ 28 May 2008		In accordance with the meeting held on 28 May 2008	FAD
0.02/ 19 September 2008	1, 2, 4, 5.1	Working paper based on information received by ERA by 19 September 2008	FAD
0.03/ 03 October 2008	4, 5.1	In accordance with the meeting held on 1-3 October 2008	FAD
0.04/ 22 January 2009	4, 5.1, 5.2, 5.3, 5.4	Working paper based on information received by ERA by 20 January 2009	FAD VK
0.05/ 29 January 2009		In accordance with the meeting held on 27-29 January 2009	VK
0.06/ 17 March 2009		Working paper based on information received by ERA by 16 March 2009	VK
0.07/ 19 March 2009		In accordance with the meeting held on 17-19 March 2009	FAD VK
0.08/ 20 May 2009	5.9-5.11	Working paper based on information received by ERA by 15 May 2009	VK
0.09/ 18 September 2009	5.1-5.4	Working paper based on information received by ERA by 18 September 2009.	VK
0.10/ 10 October 2009	5.1-5.1, 6.1-6.4	In accordance with the meeting held on 29 September – October 2009	VK FAD
0.11/14 January 2010	5.3-5.8	Working paper on the basis of the meeting VNIIZhT-ERA held on 12-14 January 2010	VK
0.12/28 January 2010	5.3-5.7	In accordance with the meeting held on 26-28 January 2010	VK FAD
0.13/06 April 2010	5.4.6-5.4.8, 5.8-5.11	In accordance with the meeting held on 6-8 April 2010	VK
0.14/ 02 June 2010	5.4.6-5.4.8, 5.9.5, 6.3-6.11	In accordance with the meeting held on 31 May – 2 June 2010	VK
0.15/ 07 October 2010	1, 2, 3, 5, 6	In accordance with the meeting held on 5-7 October 2010	VK
0.16/18 February 2011	2, 5	In accordance with the meeting held on 16-18 February 2011	VK

CONTENTS

1 SCOPE OF APPLICATION OF THE DOCUMENT

This document has been prepared by the joint contact working group of experts (hereinafter referred to as "the CONTACT GROUP") of the ORGANISATION FOR COOPERATION BETWEEN RAILWAYS (hereinafter referred to as "the OSJD") and the EUROPEAN RAILWAY AGENCY (hereinafter to as "the ERA") within the framework of cooperation between these organisations in analysing the interoperability of rail systems both inside and outside the EU with a track gauge of 1 520 mm (1 524 mm for Finland) pursuant to the Memorandum of Understanding signed by them in 2008.

The OSJD was involved in this work pursuant to its Action Programme for 2008 and subsequent years.

The ERA was involved in this work pursuant to Section 4.10 (Interconnection to a 1 520/1 524-mm Rail System) of the Mandate received by the Agency for Drafting the Third Group of Technical Specifications for Interoperability (TSI).

The Contact Group performed an analysis of the existing technical specifications for "Rolling Stock – Locomotives and Multiple Units" of the 1 520 mm gauge rail system and identified the "basic parameters" for maintaining the compatibility of the 1 520 mm gauge rail system at the CIS-EU border. The analysis was confined to technical and operational aspects of the railway system. This analysis does not include high-speed traffic (speed higher than 200 kilometres (km) per hour).

This document reflects the technical requirements for the aforementioned parameters established by the regulatory acts currently applicable within the 1 520 mm track gauge and draws a comparison between these requirements and the target values established for the basic parameters of a 1 435-mm track gauge ~~rail~~ system by the draft TSI "Locomotives and Passenger Rolling Stock", which is currently under development pursuant to the Directive on the Interoperability of the European Conventional Rail System.

The language of this document is intended not only to reflect but also to generalise, insofar as possible, the technical requirements currently in effect in different countries. The terms used in this document shall not serve as regulatory references. The documents referred to in Section 2 should be used for more precise statements of the requirements.

The materials (technical information) in this document may serve as the basis for reflecting the "basic parameters" of the 1 520 mm gauge system in the EU TSI for the purpose of preserving the existing technical compatibility of the 1 520 mm gauge system at the CIS-EU border.

2 REGULATORY (BASELINE) DOCUMENTS

	Country	Document
1.	Belarus	Rules for Traction Calculations for Train Operation (PTR)
2.	Belarus	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory)
3.	Belarus	632-2000 PKB TsV Signs and Inscriptions on Cars of the 1 520 mm Gauge Freight Fleet
4.	Belarus	BCh E 009-96 Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railway Sections
5.	Belarus	VNPB-03 Passenger Cars. Fire Safety Requirements
6.	Belarus	VNTP-05-97 Categorisation of Premises and Buildings of Railway Transport Enterprises and Facilities in Terms of Explosives-and-Fire and Fire Hazard
7.	Belarus	GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions
8.	Belarus	GOST 12.1.003 SSBT (Occupational Safety Standards System). Noise. General Safety Requirements
9.	Belarus	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements
10.	Belarus	GOST 12.1.019-79 SSBT (Occupational Safety Standards System). Electrical Safety. General Requirements and Nomenclature of Types of Protection
11.	Belarus	GOST 12.1.044-89 Fire-and-Explosives Hazard of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof
12.	Belarus	GOST 12.1.044-89 SSBT (Occupational Safety Standards System). Fire-and-Explosives Safety of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof
13.	Belarus	GOST 12.2.003-91 SSBT (Occupational Safety Standards System). Production Equipment. General Safety Requirements
14.	Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements
15.	Belarus	GOST 12.4.026-76 SSBT (Occupational Safety Standards System). Signal Colours and Safety Signs

	Country	Document
16.	Belarus	GOST 13521-68 Window Glass of Passenger Cars, Electric Trains, and Diesel Trains. Main Dimensions and Technical Requirements
17.	Belarus	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment
18.	Belarus	GOST 2.601-2006 Unified Design Documentation System – Operation Documents
19.	Belarus	GOST 2.601-2006 Unified Design Documentation System – Operation Documents
20.	Belarus	GOST 2.602-95 Unified Design Documentation System – Repair Documents
21.	Belarus	GOST 2.610 Unified Design Documentation System. Rules for Drawing up Operation Documents
22.	Belarus	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents
23.	Belarus	GOST 21447-75 Automatic Coupler Contour Line. Dimensions
24.	Belarus	GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements
25.	Belarus	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions
26.	Belarus	GOST 24179 – 80 Optical Filters, Lens Optical Filters, Lenses, Diffusers, and Deflecting Glass Inserts for Signalling Devices of Railway Transport. Technical Conditions
27.	Belarus	GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements
28.	Belarus	GOST 2593-82 Connection Brake Manifolds of Rolling Stock. Technical Conditions
29.	Belarus	GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules
30.	Belarus	GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions
31.	Belarus	GOST 29076-91 Marine, Locomotive, and Industrial Diesel Engines. Fire Safety Requirements

	Country	Document
32.	Belarus	GOST 29205-91 Electromagnetic Compatibility of Technical Units. Industrial Radio Interferences Induced by Electric Transport. Test Standards and Methods
33.	Belarus	GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements
34.	Belarus	GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People
35.	Belarus	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements
36.	Belarus	GOST 31239-2004 1 520 mm Gauge Railway Car Automatic Coupler. Operating Safety Requirements
37.	Belarus	GOST 31334-2007 Axles of 1 520 mm Gauge Rolling Stock. Technical Conditions
38.	Belarus	GOST 3225-94 Rough Carbon Steel Tyres for Locomotives of 1 520 mm Gauge Railways. Types and Dimensions
39.	Belarus	GOST 5000 Rough Carbon Steel Tyres for Cars and Tenders of 1 520 mm Gauge Railways. Dimensions
40.	Belarus	GOST 6962 Electrified Transport with Overhead Contact System Power Supply. Voltage Row
41.	Belarus	GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions
42.	Belarus	GOST 9219-95 Electric Traction Apparatuses. General Technical Conditions
43.	Belarus	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways
44.	Belarus	GOST R 50952 Diesel Locomotives. Environmental Requirements. Basic Provisions
45.	Belarus	GOST R 50953 Emissions of Hazardous Exhaust Substances and Smoke by Main-Line and Shunting Diesel Locomotives. Standards and Determination Methods
46.	Belarus	Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions No. TsT-814
47.	Belarus	Instruction for Signalling at Belarusian Railways
48.	Belarus	Instruction TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock
49.	Belarus	NB ZhT TsV-TsL 022-2000 Automatic Couplers for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Safety Standards

	Country	Document
50.	Belarus	NB ZhT TsL 01-98 Diesel Trains. Safety Standards
51.	Belarus	NB ZhT TsT02-98 Diesel Locomotives. Certification Requirements
52.	Belarus	NB ZhT TsT03-98 Electric Trains. Safety Standards
53.	Belarus	NB ZhT TsT04-98 Electric Locomotives
54.	Belarus	Safety Standards NB ZhT TsT 063-2000 Locomotives and Multi-Unit Rolling Stock. Wheelsets with Axleboxes. Safety Standards
55.	Belarus	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
56.	Belarus	Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways
57.	Belarus	OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
58.	Belarus	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
59.	Belarus	OSJD O+R 655 Unification of Structural Units of the Outfit of Diesel Rolling Stock
60.	Belarus	Regulation of the System of Technical Maintenance and Repair of Locomotives and Multi-Unit Rolling Stock at Belarusian Railways
61.	Belarus	Rules for Technical Maintenance and Repair of a Specific Type of Traction Rolling Stock
62.	Belarus	Technical Operating Rules of the Belarusian Railways
63.	Belarus	Rules for Traction Calculations for Train and Shunting Operation
64.	Belarus	Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways STP 09150.17.038-2006
65.	Belarus	TOR – Technical Operating Rules
66.	Belarus	RD 32 TsV 064-99 Methodology for the Performance of Measurements in the Assembling of New and Repair of Existing Axle Units of Freight Car Wheelsets
67.	Belarus	RD RB 09150.18.009-2002 Regulation on the Centralised Control of Train Passage in accordance with Readings of Multi-Functional Complex of Technical Means (KTSM)/Remote Reporting Control System Equipment (DISK) at Belarusian Railways

	Country	Document
68.	Belarus	RD RB BCh 17.001-97 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways
69.	Belarus	SanPiN 2.2.4.13-7-2006 Sanitary Rules and Standards. Hygiene Requirements for the Control and Assessment of Vibration Levels in Cars of Rolling Stock
70.	Belarus	SanPiN 2.5.4.13-35-2006 Sanitary Rules and Standards. Hygiene Requirements for the Organisation of Passenger Traffic at Railway Transport
71.	Belarus	SanPiN 2.5.4.13-36-2006 Sanitary Rules and Standards. Hygiene Requirements for the Organisation of Freight Traffic at Public Railway Transport
72.	Belarus	STB 1639-2006 Safety Glass for Land Transport. General Technical Conditions
73.	Belarus	STP 09150.11.088-2008 Information Technologies. Development, Operation, and Maintenance of Computer-Controlled Systems. Phases and Stages
74.	Belarus	STP 09150.17.038-2006 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
75.	Belarus	STP 09150.19.019 Requirements for the Operation of Train Radio Communication
76.	Belarus	STP 09150.50.133 (draft) Trade Mark and Service Mark of the Belarusian Railways. Application Procedure
77.	Belarus	Technical Instructions for the Winterisation, Operation and Maintenance of Diesel Locomotives and Diesel Trains in Winter Conditions approved by the Department of Locomotive Facilities of the Russian Ministry of Railways on 30 December 1997, No. TsT-14/97
78.	Belarus	TM 19-001-91 Standard Methodology for Tests of Rolling Stock in Terms of Its Impact on Track after Manufacturing and prior to Putting into Operation
79.	Belarus	TsRB/4676 Regulation on Safety Signs at Railway Transport Facilities
80.	Belarus	TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock
81.	Belarus	TsE-868 Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways, 2001

	Country	Document
82.	Latvia	Rules for Traction Calculations for Train and Shunting Operation, the Ministry of Railways of the USSR, 1985
83.	Latvia	Rules for Traction Calculations for Train Operation (PTR)
84.	Latvia	(its primary source: GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways)
85.	Latvia	Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Railway Cars (for the gauge width of 1 520 mm) LDz dated 14 July 2005. No. DR 71/2005
86.	Latvia	Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for the gauge width of 1 520 mm) LDz dated 13 September 2001. No. L29/97
87.	Latvia	Control of the Technical Condition of Rolling Stock Moving in Transit on Tracks of Public Infrastructure, LDz No. D-3/39-2011 dated 25 January 2011
88.	Latvia	Instruction for the Arrangement, Installation, and Operation of Automatic Means for the Control of the Technical Condition of Moving Rolling Stock, LDz dated 20 January 2011. No. D-3/26-2011
89.	Latvia	Regulation on Primary Service Trains in Interstate Passenger Traffic
90.	Latvia	Sanitary Rules for Passenger Transportation in International Railway Traffic
91.	Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
92.	Latvia	EN 50125-2:2002 Railway Applications – Environmental Conditions for Equipment – Fixed Electrical Installations
93.	Latvia	LVS 282-2005 Railway Constructions and Rolling Stock Clearance Gauge
94.	Latvia	LVS EN 13129-1:2003 Railway Applications – Air Conditioning for Main-Line Rolling Stock – Part 1: Comfort Parameters
95.	Latvia	LVS EN 13129-2:2004 Railway Applications – Air Conditioning for Main-Line Rolling Stock – Part 2: Type Tests
96.	Latvia	LVS EN 14750-1:2006 Railway Applications – Air Conditioning for Urban and Suburban Rolling Stock – Part 1: Comfort Parameters
97.	Latvia	LVS EN 14750-2:2006 Railway Applications – Air Conditioning for Urban and Suburban Rolling Stock – Part 2: Type Tests
98.	Latvia	LVS EN 14752:2006 Railway Applications – Bodyside Entrance Systems

	Country	Document
99.	Latvia	LVS EN 14813-1:2006 Railway Applications – Air Conditioning for Driving Cabs – Part 1: Comfort Parameters
100.	Latvia	LVS EN 14813-2:2006 Railway Applications – Air Conditioning for Driving Cabs – Part 2: Type Tests
101.	Latvia	LVS EN 50121-1:2006 Railway Applications – Electromagnetic Compatibility – Part 1: General
102.	Latvia	LVS EN 50121-2:2006 Railway Applications – Electromagnetic Compatibility – Part 2: Emissions of the Whole Railway System into the Environment
103.	Latvia	LVS EN 50121-3-2:2006 Railway Applications – Electromagnetic Compatibility – Part 3-2: Rolling Stock – Apparatuses
104.	Latvia	LVS EN 50153:2002 Railway Applications – Rolling Stock – Protective Provisions Relating to Electrical Hazards
105.	Latvia	LVS EN 50155:2002 Railway Applications – Electronic Equipment Used on Rolling Stock
106.	Latvia	LVS EN-12663 Railway Application Structural requirements for Railway Vehicle Body
107.	Latvia	LVS ENV 12694:2002 Public Transport – Road Vehicles – Dimensional Requirements for Variable Electronic External Signs
108.	Latvia	No. 19/2000 LDz Instruction for the Operation of Rolling Stock Brakes (on the basis of the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277)
109.	Latvia	TSI PRM – 2008/164/EC: Commission Decision of 21 December 2007 concerning the technical specification of interoperability relating to persons with reduced mobility in the trans-European conventional and high-speed rail system (notified under document C(2007) 6633)
110.	Latvia	GOST 10791-2004 Solid-Rolled Wheels. Technical Conditions
111.	Latvia	GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions
112.	Latvia	GOST 12.1.044-89 Fire-and-Explosive Hazard of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof (informatory)
113.	Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements

	Country	Document
114.	Latvia	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment
115.	Latvia	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents (informatory) Rules No. 713 adopted by the Cabinet of Ministers on 29 August 2006. Procedure for Putting into Operation of Rolling Stock or Rolling Stock after Special Repair or Upgrading
116.	Latvia	GOST 21447-75 Automatic Coupler Contour Line. Dimensions
117.	Latvia	GOST 21889-76 Man-Machine System. Human Operator's Chair. General Ergonomic Requirements (of informatory character)
118.	Latvia	GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements (of informatory character))
119.	Latvia	GOST 22339-88 Shunting and Industrial Diesel Locomotives. Types and Basic Parameters – The Standard shall apply to diesel locomotives for 1 520 mm gauge intended for shunting and shunting-and-removal operation at railways of the Ministry of Railways of the USSR and industrial enterprises of the USSR. The Standard stipulates the types of shunting and industrial diesel locomotives and basic classification parameters characterising the stipulated types. For specific operating conditions, at the request of the customer, it shall be permitted to design special-purpose industrial diesel locomotives with parameters different from those specified in the Standard while limiting the area of application thereof on the basis of request of particular consumers
120.	Latvia	GOST 22602-91 Main-Line Diesel Locomotives. Types and Basic Parameters – The Standard shall apply to diesel locomotives intended for freight and Passenger transportation on 1 520 mm gauge railways of the Ministry of Railways of the USSR and industrial enterprises of the USSR
121.	Latvia	GOST 22780-93 Axles for Cars of 1 520 (1 524) mm Gauge Railways. Types, Parameters, and Dimensions – The Standard shall apply to axles of wheelsets of freight and passenger cars, cars of electric trains, and non-motored cars of diesel trains for main-line 1 520 (1 524) mm gauge railways. The Standard shall not apply to axles intended for the repair of wheelsets

	Country	Document
122.	Latvia	GOST 24790-81 Industrial Diesel Locomotives. General Technical Conditions – The Standard shall apply to diesel locomotives of 1 520 mm gauge railways of the USSR, Types 3-6 GOST 22339-88, intended for use in industrial transport. This Standard shall not apply to diesel locomotives intended for operation in explosive conditions
123.	Latvia	GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements – The Standard shall apply to diesel-electric locomotives with a capacity over 550 kW (750 hp) intended for freight, passenger, and shunting (shunting-and-removal) operation at 1 520 mm gauge main-line railways
124.	Latvia	GOST 2593-82 Connection Brake Manifolds of Rolling Stock. Technical Conditions
125.	Latvia	GOST 2593-82 Connection Brake Manifolds of Rolling Stock. Technical Conditions (informatory)
126.	Latvia	GOST 27705-88 Shunting Diesel Locomotives with a Capacity of 180 kW. Basic Parameters and Technical Requirements – The Standard shall apply to shunting diesel locomotives with a capacity of 180 kW intended for use on 1 435 and 1 520 mm gauge railways
127.	Latvia	GOST 29205-91 Electromagnetic Compatibility of Technical Units. Industrial Radio Interferences Induced by Electric Transport. Test Standards and Methods (informatory)
128.	Latvia	GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements (of informatory character)
129.	Latvia	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements – The Standard shall apply to diesel-electric locomotives intended for freight and passenger transportation at 1 520 and 1 435 mm gauge railways and stipulates general requirements for the locomotives and systems and components thereof. The Standard shall not apply to diesel locomotives upgraded for the extension of their service life
130.	Latvia	GOST 31334-2007 Axles for 1 520 mm Gauge Rolling Stock. Technical Conditions – the Standard shall apply to rough (profile blanks) and finished axles in the cold-temperature zone modification in accordance with GOST 15150 for rolling stock of 1 520 mm gauge railways and underground railways

	Country	Document
131.	Latvia	GOST 3225-80 (1998; from 01 July 2006 the application of the Standard was terminated in the territory of the Russian Federation. GOST R 52366-2005 is in force) (replacing GOST 3225-46): Rough Carbon Steel Tyres for Broad-Gauge Railway Locomotives. Types and Dimensions
132.	Latvia	GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions
133.	Latvia	GOST 398-96 Carbon Steel Tyres for Rolling Stock of Broad-Gauge and Underground Railways. Technical Conditions – Basic Requirements for the Material and Manufacture of Rough Carbon Steel Tyres
134.	Latvia	GOST 4491-86 Cast Wheel Centres for Rolling Stock of 1 520 mm Gauge Railways. General Technical Conditions. – The Standard shall apply to cast wheelset centres of locomotives and motored cars of electric trains and diesel trains of 1 520 mm gauge railways in the cold-temperature zone modification in accordance with GOST 15150
135.	Latvia	GOST 5000-83 Rough Carbon Steel Tyres for Cars and Tenders of 1 520 mm Gauge Railways. Dimensions – The Standard shall apply to Rough Carbon Steel Tyres for wheelsets of motored cars of electric trains and diesel trains and tenders of 1 520 mm gauge railways
136.	Latvia	GOST 5267.10-90 Profile for Tread Rings. Range of Sizes – The Standard shall apply to hot-rolled profile for tread rings
137.	Latvia	GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions (of informatory character)
138.	Latvia	GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions – The Standard shall apply to solid-rolled wheels for wheelsets of trucks of locomotive-hauled freight and passenger cars, non-motored cars of electric trains and diesel trains as well as track machines of 1 520 (1 524) mm. The Standard shall not apply to wheels intended for the repair of wheelsets
139.	Latvia	GOST 9219-88 Traction Electric Apparatuses. General Technical Requirements

	Country	Document
140.	Latvia	GOST R 51690-2000 Passenger Cars of Main-Line 1 520 mm Gauge Railways. General Technical Conditions – The Standard shall apply to newly manufactured locomotive-hauled passenger cars of main-line 1 520 mm gauge railways. The Standard shall not apply to cars of electric trains, diesel trains and special-purpose and technical-service locomotive-hauled cars
141.	Latvia	GOST R 52366-2005 Rough Carbon Steel Tyres for Broad-Gauge Railway Locomotives. Types and Dimensions – The Standard shall apply to Rough Carbon Steel Tyres for wheelsets of locomotives (electric locomotive, diesel locomotives, and steam locomotives) of railways and stipulates the types and dimensions thereof
142.	Latvia	Network Statement
143.	Latvia	Commission Directive 2001/63/EC of 17 August 2001 adapting to technical progress Directive 97/68/EC of the European Parliament and of the Council on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery
144.	Latvia	Directive 2002/88/EC of the European Parliament and of the Council of 9 December 2002 amending Directive 97/68/EC on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery
145.	Latvia	Directive 2004/26/EC of the European Parliament and of the Council of 21 April 2004 amending Directive 97/68/EC on the approximation of the laws of the Member States relating to measures against the emission of gaseous and particulate pollutants from internal combustion engines to be installed in non-road mobile machinery
146.	Latvia	Council Directive 2006/105/EC of 20 November 2006 adapting Directives 73/239/EEC, 74/557/EEC and 2002/83/EC in the field of environment, by reason of the accession of Bulgaria and Romania
147.	Latvia	Unified Technological Process for the Handling of Long-Distance and Local Passenger Train Formations at Riga Passenger Station, LDz 2002
148.	Latvia	Instruction DR-19/2000 Instruction for the Operation of Rolling Stock Brakes

	Country	Document
149.	Latvia	Instruction No. DVI-3/340 LDz Instruction for the Technical Maintenance of In-Service Diesel Locomotives
150.	Latvia	Instruction for the Assurance of Fire Safety in Cars of International Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999
151.	Latvia	Instruction of the Infrastructure Manager – List of Protection Facilities at Feeders of Sectionalising Points and Traction Substations (to be revised once in 5 years; latest approval: 15 June 2006)
152.	Latvia	Instruction of the Infrastructure Manager of LDz for the Assurance of Fire Safety of Locomotives, Multi-Unit Rolling Stock, and Passenger Cars, No. DR-64/2004 dated 04 November 2004
153.	Latvia	LDz Instruction for the Use and Maintenance of the Driver's Vigilance Control Telemechanical System (TSKBM) No. DR-20/2000 dated 27 July 2000
154.	Latvia	Instruction for the Assurance of Fire Safety of Locomotives, Multi-Unit Rolling Stock, and Passenger Cars, No. DR-64/2004 dated 04 November 2004
155.	Latvia	LDz Instruction for the Technical Maintenance of Continuous Automatic Locomotive Signalling (ALSN) and the Driver's Vigilance Control Devices approved by Order No. DV-3/367 on 26 August 2004
156.	Latvia	MSZhD 563 Fittings provided in coaches in the interests of hygiene and cleanliness
157.	Latvia	MSZhD 651 Layout of driver's cabs in locomotives, railcars, multi-unit trains and driving trailers
158.	Latvia	NB ZhT TsL 01-98 Diesel Trains. Safety Standards
159.	Latvia	NB ZhT TsT02-98 Diesel Locomotives. Certification Requirements
160.	Latvia	NB ZhT TsT03-98 Electric Trains. Safety Standards
161.	Latvia	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997

	Country	Document
162.	Latvia	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998
163.	Latvia	Standards for the Equipping of Rolling Stock in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia with Emergency Fire-Fighting Equipment. 25. Meeting of the Council for Railway Transport of 29 November 1999
164.	Latvia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999
165.	Latvia	OSJD O 522-1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
166.	Latvia	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
167.	Latvia	OSJD R 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
168.	Latvia	OST 32.193-2002 Backlash-Free Coupling Devices of Locomotive-Hauled Passenger Cars and Passenger Cars of Multi-Unit Rolling Stock for 1 520 mm Gauge Railways. Coupler Contour Line and Setting Dimensions
169.	Latvia	Rules No. 1047 adopted by the Cabinet of Ministers on 27 December 2005. Rules for the Emission of Air Pollutants from Internal-Combustion Engines of Mobile Machinery Not-Intended for Motor Roads
170.	Latvia	Rules No. 1211 adopted by the Cabinet of Ministers – Procedure for Putting into Operation, Compliance Assessment, Manufacturing, Upgrading, and Reconditioning Repair of Rolling Stock
171.	Latvia	Rules No. 82 adopted by the Cabinet of Ministers of the Republic of Latvia on 17 February 2004. Rules for Fire Safety
172.	Latvia	Rules for Traction Calculations for Train and Shunting Operation
173.	Latvia	Rules for Traction Calculations for Train Operation

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174.	Latvia	Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways, TE-3199
175.	Latvia	Rules No. 235 of the Cabinet of Ministers dated 29 April 2003 – Requirements for the Quality and Obligatory Harmlessness of Drinking Water; Procedure for Checking and Control
176.	Latvia	Rules of the Council for Railway Transport dated 07 March 2001 – Sanitary Rules for Passenger Railway Transport in International Traffic
177.	Latvia	ST SEV 5637-86, Standard of the Council for Mutual Economic Assistance. Fire-Fighting Equipment. Classification of Fires
178.	Lithuania	Rules for Traction Calculations for Train and Shunting Operation, the Ministry of Railways of the USSR, 1985
179.	Lithuania	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1998
180.	Lithuania	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1997
181.	Lithuania	15/T General Technical Requirements for Fire Safety for Traction Rolling Stock
182.	Lithuania	173/T Šilumvežių ir savaeigių sąstatų stabdžių įrangos techninės priežiūros, remonto ir bandymo iunstrukcija (Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Diesel Locomotives and Self-Propelled Rolling Stock)
183.	Lithuania	2008-04-22 LR Susisiekimo ministro įsakymas Nr.3-122 Dėl traukos riedmenų ridos nuo atlikto remonto iki kito remonto normų ir remonto periodiškumo bei traukos riedmenų techninės priežiūros ir remonto sistemos patvirtinimo (Order No. 3-122 of the Minister for Transport and Communications of the Republic of Lithuania dated 22 April 2008 regarding the approval of the System of the Standards for the Runs of Cars between Repairs and Periodicity of Repair as well as of the Technical Maintenance and Repair of Traction Rolling Stock)

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184.	Lithuania	39/V-KL Priešgaisrinės saugos normos. Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų keleiviniai vagonai. Priešgaisrinės saugos reikalavimai. (Translated from the following source: Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999)
185.	Lithuania	44/T Instruction for the Repair and Technical Maintenance of Roller-Bearing Assemblies of Locomotives and Self-Propelled Rolling Stock
186.	Lithuania	60/V Instruction for the Repair and Technical Maintenance of an Automatic Coupler of Rolling Stock
187.	Lithuania	ADV-001 Regulation on the Technical Operation of Railways
188.	Lithuania	ADV-002 Rules for Railway Signalling (Geležinkelių signalizacijos taisyklės)
189.	Lithuania	HN24:2003 Safety and Quality Requirements for Drinking Water
190.	Lithuania	ISO 1005-7:1982 Railway rolling stock material -- Part 7: Wheelsets for tractive and trailing stock -- Quality requirements
191.	Lithuania	Design Documentation
192.	Lithuania	LST EN 14750-1:2006 Air Conditioning for Urban and Suburban Rolling Stock. Part 1. Comfort Parameters
193.	Lithuania	LST L ENV 12299 Railway Applications. Ride comfort for passengers. Measurement and evaluation
194.	Lithuania	LST EN 50121-3-2 Railway Applications. Electromagnetic compatibility. Part 3-2. Rolling stock. Apparatus
195.	Lithuania	LST EN 12082 Railway Applications. Axleboxes. Performance Testing
196.	Lithuania	LST EN 12663 Railway Applications. Structural requirements of railway vehicle bodies
197.	Lithuania	LST EN 13129-1:2003 Railway Applications. Air conditioning for main line rolling stock. Part 1. Comfort parameters
198.	Lithuania	LST EN 13260 Railway Applications. Wheelsets and bogies. Wheelsets. Product requirements
199.	Lithuania	LST EN 13261 Railway Applications. Wheelsets and bogies. Axles. Product requirements

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200.	Lithuania	LST EN 13452-1 Railway Applications. Braking. Mass transit brake systems. Part 1. Performance requirements
201.	Lithuania	LST EN 13452-2 Railway Applications. Braking. Mass transit brake systems. Part 2. Methods of test
202.	Lithuania	LST EN 14067-1 Railway Applications. Aerodynamics. Part 1. Symbols and units
203.	Lithuania	LST EN 14067-2 Railway Applications. Aerodynamics. Part 2. Aerodynamics on open track
204.	Lithuania	LST EN 14067-3 Railway Applications. Aerodynamics. Part 3. Aerodynamics in tunnels
205.	Lithuania	LST EN 14067-4 Railway Applications. Aerodynamics. Part 4. Requirements and test procedures for aerodynamics on open track
206.	Lithuania	LST EN 14198:2005 Railway Applications. Braking. Requirements for the brake systems of trains
207.	Lithuania	LST EN 14531-1:2005 Railway Applications. Methods for calculation of stopping distances, slowing distances and immobilisation braking. Part 1. General algorithms
208.	Lithuania	LST EN 14752:2006 Railway Applications. Bodyside entrance systems
209.	Lithuania	LST EN 15152:2007 Railway Applications. Front windscreens for train cabins
210.	Lithuania	LST EN 15153-1:2007 Railway Applications. External visible and audible warning devices for high-speed trains. Part 1. Head, marker and tail lamps
211.	Lithuania	LST EN 2:1996/A1:2004 Gaisrų klasifikavimas (Classification of fires)
212.	Lithuania	LST EN 50121-3-1 Railway Applications. Electromagnetic compatibility. Part 3-1. Rolling stock. Train and complete vehicle
213.	Lithuania	LST EN 50125-1:2002 Railway Applications. Environmental conditions for equipment. Part 1. Equipment on board rolling stock
214.	Lithuania	LST EN 50128:2002 Railway Applications. Communications, signalling and processing systems. Software for railway control and protection systems
215.	Lithuania	LST EN 50153:2003 Railway Applications. Rolling stock. Protective provisions relating to electrical hazards
216.	Lithuania	LST EN 50155:2002/A1:2003 Railway Applications. Electronic equipment used on rolling stock

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217.	Lithuania	LST EN 50238 Railway Applications. Compatibility between rolling stock and train detection systems
218.	Lithuania	LST EN 60721-3-5:2001 Classification of environmental conditions. Part 3. Classification of environmental parameters and aggressiveness groups thereof. Sub-group 5. Ground vehicle installations (IEC 60721-3-5:1997)
219.	Lithuania	No. 137/T Instruction for the Operation and Repair of Locomotive Speed Gauges
220.	Lithuania	No. 201/S Fire Safety Rules in Railway Transport
221.	Lithuania	R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės)
222.	Lithuania	[L]ST EN 13262 Railway Applications. Wheelsets and bogies. Wheels. Product requirements
223.	Lithuania	T/108 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways
224.	Lithuania	Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų geležinkelių tarptautinio keleivinio transporto riedmenų aprūpinimo pirminėmis gaisro gesinimo priemonėmis normos. (Translated from the following source: Standards for the Equipping of Rolling Stock in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia with Emergency Fire-Fighting Equipment. 25. Meeting of the Council for Railway Transport of 29 November 1999)
225.	Lithuania	Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų keleivinių vagonų priešgaisrinės saugos užtikrinimo instrukcija. (Translated from the following source: Instruction for the Assurance of Fire Safety in Cars of International Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999)
226.	Lithuania	TSI CCS – COMMISSION DECISION of 28 March 2006 concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system (notified under document number C(2006) 964) (2006/679/EC)

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227.	Lithuania	TSI LOC&PAS – draft TSI Locomotives, produced in accordance with the Directive on the Interoperability of European Common Railways
228.	Lithuania	TSI OPE – COMMISSION DECISION of 11 August 2006 concerning the technical specification of interoperability relating to the subsystem 'Traffic Operation and Management' of the trans-European conventional rail system (notified under document number C(2006) 3593) (2006/920/EC)
229.	Lithuania	TSI PRM – 2008/164/EC: Commission Decision of 21 December 2007 concerning the technical specification of interoperability relating to persons with reduced mobility in the trans-European conventional and high-speed rail system (notified under document C(2007) 6633)
230.	Lithuania	X-542 Law on Traffic Safety
231.	Lithuania	A/85 Rules for the Control of Automatic Equipment for Rolling Stock
232.	Lithuania	GOST 10791-2004 Solid-Rolled Wheels. Technical Conditions
233.	Lithuania	GOST 11018-87 Wheelsets for Diesel Locomotives and Electric Locomotives of 1 520 mm Gauge Railways. Technical Conditions
234.	Lithuania	GOST 12.1.005-88 SSBT (Occupational Safety Standards System). General Sanitary and Hygiene Requirements for Working Area Air
235.	Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements
236.	Lithuania	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment
237.	Lithuania	GOST 17516.1-90 Electrical Products. General Requirements in Terms of Resistance to Mechanical Exposure Factors (informatory).
238.	Lithuania	GOST 2.602-95 Repair Documents (informatory)
239.	Lithuania	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents (informatory)
240.	Lithuania	GOST 2593-82 Connection Brake Manifolds of Rolling Stock. Technical Conditions
241.	Lithuania	GOST 30237-96 Finished Axles for Rolling Stock of 1 520 mm Gauge Railways. Technical Conditions (informatory)

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242.	Lithuania	GOST 30487-97 Electric Trains for Suburban Communication
243.	Lithuania	GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People
244.	Lithuania	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements (Informatory)
245.	Lithuania	GOST 9219-88 Traction Electric Apparatuses. General Technical Requirements
246.	Lithuania	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways
247.	Lithuania	GOST R 50955-96 Cars of Electric Trains. Technical Requirements for the Carriage of Handicapped People (informatory)
248.	Lithuania	GOST R 50957-96 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People (informatory)
249.	Lithuania	UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs
250.	Lithuania	UIC 617-4 Position of front and side windows and of other windows situated in the driving compartments of electric powered stock
251.	Lithuania	UIC 617-6 Regulations covering the layout of drivers' compartments in powered stock
252.	Lithuania	UIC 617-7 Regulations concerning conditions of visibility from driving compartments of electric powered stock
253.	Lithuania	UIC 651 Layout of driver's cabs in locomotives, railcars, multi-unit trains and driving trailers
254.	Lithuania	UIC 553 Heating, ventilation and air-conditioning in coaches
255.	Lithuania	UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans
256.	Lithuania	UIC 563 Fittings provided in coaches in the interests of hygiene and cleanliness
257.	Lithuania	UIC 564-1 Coaches – Windows made from safety glass
258.	Lithuania	UIC 612 Interfaces and other Locomotive Control Devices
259.	Lithuania	UIC 617-5 Special safety regulations for drivers' cabs of tractive units
260.	Lithuania	UIC 640 Motive power units – Inscriptions, marks and signs
261.	Lithuania	NB ZhT TsT03-98 Electric Trains. Safety Standards
262.	Lithuania	NB ZhT TsT04-98 Electric Locomotives

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263.	Lithuania	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
264.	Lithuania	OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
265.	Lithuania	OSJD R 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
266.	Lithuania	Procedure for the Check of the Quality of Preparedness for a Voyage of Passenger, Diesel, and Electric Trains 07 May 2004
267.	Lithuania	Railway Signalling Rules
268.	Lithuania	Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways AE/41
269.	Lithuania	Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways approved by the Ministry of Railways in 1969
270.	Lithuania	Order of the Minister regarding the putting into operation of new sub-systems
271.	Lithuania	Order No. 715 of the Minister for Environment dated 24 December 2003 regarding the approval of the Methodology LAND 18-2003/M-03 for the assessment of pollution emitted into the environment from locomotives and diesel trains
272.	Lithuania	TOR – Technical Operating Rules
273.	Lithuania	System KLUB-U (Locomotive Complex Safety Device). Operating Manual
274.	Lithuania	T/144 Instruction for the Technical Maintenance of In-Service Diesel Locomotives, Electric Locomotives, and Multi-Unit Rolling Stock
275.	Lithuania	Diesel Locomotives. Technical Regulation. Certification Requirements dated 15 August 1998 FTS ZhT 02-98 (informatory)
276.	Lithuania	TsV-4422 Instruction for the Application of Clearance Gauges of Rolling Stock (GOST 9238-83), 1987
277.	Poland	Ct-4 (Mt-11) Instruction for the Measurements and Technical Assessment of Traction Rolling Stock Pairs
278.	Poland	EN 13715 Railway Applications – Wheelsets and bogies – Wheels – Tread profile

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279.	Poland	EN 14363:2006 Railway Applications – Testing for the acceptance of running characteristics of railway vehicles – Testing of running behaviour and stationary tests
280.	Poland	EN 50121 Electromagnetic Compatibility
281.	Poland	EN-45545-3 Railway Applications. Fire protection on railway vehicles. Part 3. Fire resistance requirements for fire barriers
282.	Poland	EN-45545-4 Railway Applications. Fire protection on railway vehicles. Fire safety requirements for railway rolling stock design
283.	Poland	EN-50124 Railway Applications. Insulation coordination. Basic requirements. Clearances and creepage distances for all electrical and electronic equipment
284.	Poland	EN-50163 Railway Applications. Supply voltages of traction systems
285.	Poland	EN-50206-1 Railway Applications. Rolling stock. Pantographs: characteristics and tests. Pantographs for main line vehicles
286.	Poland	EN-50367 Railway Applications. Current collection systems. Technical criteria for the interaction between pantograph and overhead lines
287.	Poland	EN-50388 Railway Applications. Power supply and rolling stock. Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability
288.	Poland	ISO 5658-2 Reaction to fire tests -- Spread of flame
289.	Poland	LHSt 11 (Mt-11) Instruction for Geometrical Measurements of Wheelsets of Traction Rolling Stock
290.	Poland	PN 90/K-11001 Ochrona pracy. Kabina maszynisty lokomotywy elektrycznej dwukabinowej. Podstawowe wymagania bezpieczeństwa pracy i ergonomii.
291.	Poland	PN 90/K-11001 Kabina maszynisty powinna spełniać wymogi ergonomii i bezpieczeństwa pracy określone
292.	Poland	PN EN 14752:2006 Railway Applications – Bodyside entrance systems
293.	Poland	PN-91/K-88100 Pojazdy trakcyjne -- Syreny i gwizdawki
294.	Poland	PN-EN 50163:2007 Railway Applications. Supply voltages of traction systems

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295.	Poland	PN-EN 50388:2008 Railway Applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability
296.	Poland	PN-EN-15152:2007 Kolejnictwo -- Przednie szyby kabin maszynisty pociągów
297.	Poland	PN-EN-50306-1,2,3,4:2003 Railway rolling stock cables having special fire performance
298.	Poland	PN-K 88208 Wagony osobowe. Drzwi czołowe rozsuwane. Wymagania i metody badań.
299.	Poland	PN-K-02507:1997 Spalinowe pojazdy trakcyjne -- Zabezpieczenie przeciwpożarowe
300.	Poland	PN-K-02511:2000 Tabor kolejowy. Bezpieczeństwo przeciwpożarowe materiałów. Wymagania.
301.	Poland	PN-K-9146:1993 Traction Trains, Wheelset Axles. Technical Conditions and Tests
302.	Poland	TSI CCS – COMMISSION DECISION of 28 March 2006 concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system (notified under document number C(2006) 964) (2006/679/EC)
303.	Poland	TSI ENE – draft TSI Energy, produced in accordance with the Directive on the Interoperability of European Common Railways
304.	Poland	TSI LOC&PAS – draft TSI Locomotives, produced in accordance with the Directive on the Interoperability of European Common Railways
305.	Poland	TSI Noise – 2006/66/EC: Commission Decision of 23 December 2005 concerning the technical specification for interoperability relating to the subsystem rolling stock — noise of the trans-European conventional rail system (notified under document number C(2005) 5666)
306.	Poland	TSI PRM – 2008/164/EC: Commission Decision of 21 December 2007 concerning the technical specification of interoperability relating to persons with reduced mobility in the trans-European conventional and high-speed rail system (notified under document C(2007) 6633)

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307.	Poland	GOST 22703-91 Cast Pieces of Automatic Coupler Equipment for 1 520 mm Gauge Railway Rolling Stock. General Technical Conditions. With the possibility of replacement with a screw-type coupler – hook Type 6D in accordance with OSJD O 521
308.	Poland	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways, Clearance 1T
309.	Poland	Directive 2001/95/EC on general product safety. The General Product Safety Directive (GPSD) EN Standards, European Standards
310.	Poland	Instruction Cw 1 (Mw 56) for the Maintenance and Assurance of Operability of Rolling Stock Brakes
311.	Poland	Ie-1 Instruction for Signalling
312.	Poland	UIC 438-3 Identification marking for tractive stock
313.	Poland	UIC 505-1 Railway transport stock – Rolling stock construction gauge
314.	Poland	UIC 540 Brakes – Air Brakes for freight trains and passenger trains
315.	Poland	UIC 541 Brakes – Regulations concerning the manufacture of the different brake parts – Driver's brake valve
316.	Poland	UIC 543 Requirements for the Rates of Braking Effort (Braking Weight Percentage) of Passenger Cars Circulating on 1 435 mm and 1 520 mm Gauge Railways when Operating them during the Construction of Railways
317.	Poland	UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans
318.	Poland	UIC 563 Fittings provided in coaches in the interest of hygiene and cleanliness
319.	Poland	UIC 564-1 Windows made from safety glass
320.	Poland	UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs
321.	Poland	UIC 627-2 Filling devices for diesel stock
322.	Poland	UIC 641 Conditions to be fulfilled by automatic vigilance devices used in international traffic
323.	Poland	UIC 642 Special provisions concerning fire precautions and fire-fighting measures on motive power units and driving trailers in international traffic

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324.	Poland	UIC 651 Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers
325.	Poland	UIC 700 Classification of lines – Resulting load limits for wagons
326.	Poland	OSJD 516 Freight Cars for Interoperability between 1 435 mm Gauge Railways and 1 520 mm Gauge Railways. Technical Instructions and Technical Conditions for the Admission of Cars
327.	Poland	OSJD 520 Passenger Cars for Interoperability between 1 435 mm Gauge Railways and 1 520 mm Gauge Railways. Technical Instructions and Technical Conditions for the Admission of Cars
328.	Poland	OSJD 521 Passenger, Luggage, and Freight Cars as Units of a Traction Rolling Stock: Free Spaces to be Available within Units of Rolling Stock
329.	Poland	OSJD O 500 General Rules for Clearance Diagrams for Rolling Stock in Interoperable (without Transhipment or Transfer) International Traffic
330.	Poland	OSJD 521 Passenger, Luggage, and Freight Cars as Units of a Traction Rolling Stock: Free Spaces to be Available within Units of Rolling Stock
331.	Poland	OSJD R 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
332.	Poland	Resolution of the Minister for Transport dated 7 November 2007 amending the Resolution regarding the Basic Technical Requirements for the Operation of Rolling Stock
333.	Poland	Resolution of the Minister for Transport regarding the Basic Technical Requirements for the Operation of Rolling Stock dated 12 October 2005 (as amended on 07 November 2007)
334.	Poland	Technical Documentation DTR i WTO
335.	Russia	TsT-329 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways approved by the Ministry of Railways in 2000
336.	Russia	Rules for Traction Calculations for Train Operation (PTR)
337.	Russia	SSFZhT (Certification System in the Federal Railway Transport)
338.	Russia	Standards for the Strength Calculations of 1 520 mm Gauge Cars (Non-Self-Propelled)
339.	Russia	Basic Technical Requirements for Prospective Rolled Steel for Carrying Welded Structures of Rolled Stock

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340.	Russia	Lighting Requirements for Light Signalling Devices of Traction Rolling Stock, Passenger Cars, Track Self-Propelled Machines and Other Mobile Units of Railway Transport approved by the Ministry of Railways of Russia on 16 September 1998
341.	Russia	VNPB-03 Passenger Cars. Fire Safety Requirements
342.	Russia	VNTP-05-97 Categorisation of Premises and Buildings of Railway Transport Enterprises and Facilities in Terms of Explosives-and-Fire and Fire Hazard
343.	Russia	Temporary Instructive Guidance for the Repair and Maintenance of Sandboxes on Electric Locomotive (TI-60)
344.	Russia	GN 2.1.6.1338-03 Hygiene Standards. Maximum Permissible Concentrations of Pollutants in Community Air
345.	Russia	GN 2.1.6.695 Federal Sanitary Rules, Standards, and Hygiene Standards. Open Air, Indoor Air, and Sanitary Protection of Air
346.	Russia	GOST 11018 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions
347.	Russia	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements
348.	Russia	GOST 12.1.019-79 SSBT (Occupational Safety Standards System). Electrical Safety. General Requirements and Nomenclature of Types of Protection
349.	Russia	GOST 12.1.044-89 Fire-and-Explosive Hazard of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof
350.	Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements
351.	Russia	GOST 13521-68 Window Glass of Passenger Cars, Electric Trains, and Diesel Trains. Main Dimensions and Technical Requirements
352.	Russia	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment
353.	Russia	GOST 18322-78, Articles 1-2. System of Technical Maintenance and Repair of Machinery and Equipment – Terms and Definitions
354.	Russia	GOST 2.601-2006 Unified Design Documentation System – Operation Documents

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355.	Russia	GOST 2.602-95 Unified Design Documentation System – Repair Documents
356.	Russia	GOST 2.610 Unified Design Documentation System. Rules for Drawing up Operation Documents
357.	Russia	GOST 20911-89 Technical Diagnostics. Terms and Definitions
358.	Russia	GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements
359.	Russia	GOST 22339-77 Shunting and Industrial Diesel Locomotives. Types and Basic Parameters
360.	Russia	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions
361.	Russia	GOST R 53784-2010 Optical Elements for Light Signal Devices of Railway Transport. Technical Specifications
362.	Russia	GOST 2593-82 Connection Brake Manifolds of Rolling Stock. Technical Conditions
363.	Russia	GOST 26656-85 Technical Diagnostics. Controllability. General Requirements
364.	Russia	GOST 27518-87 Diagnostics of Products. General Requirements
365.	Russia	GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules
366.	Russia	GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions
367.	Russia	GOST 29205-91 Electromagnetic Compatibility of Technical Units. Industrial Radio Interferences Induced by Electric Transport. Test Standards and Methods
368.	Russia	GOST 29076-91 Marine, Locomotive, and Industrial Diesel Engines. Fire Safety Requirements
369.	Russia	GOST 30237-96 (ISO 1005-3-82). Finished Axles for Rolling Stock of 1 520 mm Gauge Railways. Technical Conditions
370.	Russia	GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements
371.	Russia	GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People
372.	Russia	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements

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373.	Russia	GOST R 52366-2005 Rough Carbon Steel Tyres for Broad-Gauge Railway Locomotives. Types and Dimensions
374.	Russia	GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions
375.	Russia	GOST 5000 Rough Carbon Steel Tyres for Cars and Tenders of 1 520 mm Gauge Railways. Dimensions
376.	Russia	GOST 5533 Figured Sheet Glass. Technical Conditions
377.	Russia	GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions
378.	Russia	GOST 6962 Electrified Transport with Overhead Contact System Power Supply. Voltage Row
379.	Russia	GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions
380.	Russia	GOST 9219-88 Traction Electric Apparatuses. General Technical Requirements
381.	Russia	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways
382.	Russia	GOST R 12.4.026-2001 SSBT (Occupational Safety Standards System). Safety Colours, Safety Signs, and Safety Marking. Purpose and Rules of Application. General Technical Requirements and Characteristics. Test Methods
383.	Russia	GOST R 50810-95 Fire Hazard of Textiles. Decorative Textiles. Flammability Test Method and Classification
384.	Russia	GOST R 52122-2003 Technical Diagnostics. Main-Line Locomotives. In-Built Diagnostics Systems. General Requirements
385.	Russia	GOST R 50951 External Noise of Main-Line and Shunting Diesel Locomotives. Standards and Methods of Measurements
386.	Russia	GOST R 50953 Emissions of Hazardous Exhaust Substances and Smoke by Main-Line and Shunting Diesel Locomotives. Standards and Determination Methods
387.	Russia	GOST R 50955-96 Cars of Electric Trains. Technical Requirements for the Carriage of Handicapped People
388.	Russia	GOST R 50957-96 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People
389.	Russia	GOST R 51249 Internal-Combustion Reciprocating Engines. Emissions of Harmful Substances with Exhaust Gases. Standards and Determination Methods

	Country	Document
390.	Russia	GOST R 51690-2000 Passenger Cars of 1 520 mm Gauge Main-Line Railways. General Technical Conditions
391.	Russia	GOST R 52120-2003 Technical Diagnostics. Main-Line Locomotives. General Requirements for Diagnosability
392.	Russia	Instruction for the Preparation for Operation and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, TsT-815
393.	Russia	Instruction for the Arrangement, Installation, and Operation of Automatic Means for the Control of the Technical Condition of Moving Rolling Stock, TsV-TsSh-453
394.	Russia	Instruction TsRB-757 for Signalling on the Railways of the Russian Federation
395.	Russia	Instruction for the Operation of Rolling Stock Brakes TsT-TsV-TsL-VNIIZhT/277
396.	Russia	Instruction R TsUVSS-6-13 Recommendations for Labour Safety in the Course of Transportation, Transport Handling, and Processing of Rolling Stock for Various Goods
397.	Russia	Instruction TsV 473 – Signs and Inscriptions on Cars of the 1 520 mm Gauge Passenger Fleet
398.	Russia	Instruction TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock
399.	Russia	Instruction TsE-462 Rules for the Installation of the Traction Power Supply System
400.	Russia	CH 4252 Methodological Recommendations for the Assessment of Potential Biological Hazards of Polymeric Substances Used in the Manufacturing of Passenger Cars
401.	Russia	UIC 505-1 Railway transport stock – Rolling stock construction gauge
402.	Russia	NB ZhT TsV-TsL 022-2000 Automatic Couplers for Railway Rolling Stock. Safety Standards
403.	Russia	NB ZhT TsL 01-98 Diesel Trains. Safety Standards
404.	Russia	NB ZhT TsT02-98 Diesel Locomotives. Safety Standards
405.	Russia	NB ZhT TsT03-98 Electric Trains. Safety Standards
406.	Russia	NB ZhT TsT04-98 Electric Locomotives. Safety Standards
407.	Russia	NB ZhT TsT144-2003 Electrical Equipment on Rolling Stock. Safety Standards

	Country	Document
408.	Russia	NB ZhT TsT-TsP 053-2001 Locomotives, Multi-Unit Rolling Stock, and Special Self-Propelled Rolling Stock. Driver's Chair. Safety Standards
409.	Russia	Safety Standards NB ZhT TsT 063-2000 Locomotives and Multi-Unit Rolling Stock. Wheelsets with Axleboxes. Safety Standards with Axleboxes. Safety Standards
410.	Russia	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on Tracks on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
411.	Russia	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on Tracks on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
412.	Russia	Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways
413.	Russia	OSJD O 500 General Rules for Clearance Diagrams for Rolling Stock in Interoperable (without Transhipment or Transfer) International Traffic
414.	Russia	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
415.	Russia	OSJD O+R 655 Unification of Structural Units of the Outfit of Diesel Rolling Stock
416.	Russia	OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
417.	Russia	OSJD R 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
418.	Russia	OST 32.120-98 Standards for Artificial Illumination of Railway Transport Facilities
419.	Russia	OST 32.193-2002 Backlash-Free Coupling Devices of Locomotive-Hauled Passenger Cars and Passenger Cars of Multi-Unit Rolling Stock for 1 520 mm Gauge Railways. Coupler Contour Line and Setting Dimensions
420.	Russia	Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways approved by the Ministry of Railways in 1989

	Country	Document
421.	Russia	Rules and Standards for the Equipping of Main-Line and Shunting Locomotives, Electric Trains, and Diesel Trains with Radio Communication and Interference Suppression Equipment, TsSh4783-91
422.	Russia	Rules for the Technical Maintenance of Locomotives
423.	Russia	Rules for Traction Calculations for Train and Shunting Operation
424.	Russia	Order No. 41 of the Ministry of Railways dated 2000. Standards for Permissible Speeds of Rolling Stock on 1 520 mm Gauge Railways of the Federal Railway Transport System
425.	Russia	Draft GOST Rail Buses. General Technical Requirements
426.	Russia	Draft GOST R. Pantographs of Electrified Rolling Stock
427.	Russia	TOR – Technical Operating Rules approved by Order No. 286 of the Ministry of Transportation of Russia dated 12 December 2010
428.	Russia	Instruction No. 3 of OAO Russian Railways dated 17 January 2005 regarding the system of technical maintenance and repair of locomotives of OAO Russian Railways
429.	Russia	Instruction No. 622r of OAO Russian Railways dated 6 April 2006 regarding schedule preventive technical maintenance of multi-unit rolling stock
430.	Russia	Guidance for the Assurance of Fire Safety of In-Service Traction Rolling Stock
431.	Russia	Instruction for the Operation, Technical Maintenance, and Repair of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (KMBSh.667120.001RE approved by Russian Railways on 27 December 2005)
432.	Russia	SanPiN 2.1.4.1074-01 Drinking Water. Hygiene Requirements for the Quality of Water of Centralised Drinking Water Supply Systems
433.	Russia	SanPiN 2.2.1/2.1.1.1278-03 Hygiene Requirements for Natural, Artificial, and Combined Illumination of Residential and Public Buildings
434.	Russia	SN TsUVSS 6/27 Sanitary Rules Regulating Physical and Chemical Environmental Factors on Rolling Stock of Railway Transport Ensuring the Safety of Personnel and Passengers
435.	Russia	SNiP 2.09.02-85 Industrial Buildings

	Country	Document
436.	Russia	SNiET TsUVS-6/1 Multi-Unit Rolling Stock of Railway Transport. Sanitary Standards and Ergonomic Requirements for the Designing of Cars of Multi-Unit Rolling Stock for Inter-Regional and Urban Communication Railway Transport
437.	Russia	SNiET TsUVS 6/35-96 Traction and Multi-Unit Rolling Stock of Railway Transport. Sanitary Standards and Ergonomic Requirements for the Designing of Cabins and Equipment of Traction and Multi-Unit Rolling Stock of Railway Transport
438.	Russia	SP 2.5.1198 Sanitary Rules for the Organisation of Railway Passenger Transportation
439.	Russia	SP 2.5.1336 Sanitary Rules for the Designing, Manufacture, and Reconstruction of Locomotive and Special Rolling Stock
440.	Russia	Technical Instructions for the Setting-up Procedures and Technical Maintenance of Electric Locomotives in Winter Conditions approved by the Department of Locomotive Facilities of the Russian Ministry of Railways on 25 October 1995, No. TsTEP-21-95
441.	Russia	Technical Instructions for the Winterisation, Operation and Maintenance of Diesel Locomotives and Diesel Trains in Winter Conditions approved by the Department of Locomotive Facilities of the Russian Ministry of Railways on 30 December 1997, No. TsT-14/97
442.	Russia	TsB-4422 Instruction for the Application of Clearance Diagrams of Rolling Stock (GOST 9238-83), 1986
443.	Russia	TsRB-393 Instruction for the Technical Maintenance and Operation of Structures, Facilities, and Rolling Stock and Organisation of Traffic at Fast-Speed Passenger Train Turn-Around Sections (for Train Speeds 141-200 km/h)
444.	Russia	TsTChS-50 Instruction for the Treatment and Application of Water for Cooling of Engines of Diesel Locomotives and Diesel Trains
445.	Russia	TsT-310 Instruction for the Procedure for the Forwarding of Locomotives and Multi-Unit Rolling Stock, 1995
446.	Russia	TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock
447.	Russia	TsT-721 Instruction for the Winterisation of Locomotive Facilities
448.	Russia	TsE-868 Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways, 2001

	Country	Document
449.	Slovakia	EN 12663 Railway Applications. Structural requirements of railway vehicle bodies. Locomotives and passenger Rolling Stock
450.	Slovakia	EN 12663 Railway Applications. Structural requirements of railway vehicle bodies. Locomotives and passenger rolling stock
451.	Slovakia	EN 13272 Railway Applications. Electrical lighting for rolling stock in public transport systems
452.	Slovakia	EN 13715 Railway Applications – Wheelsets and bogies – Wheels – Tread profile
453.	Slovakia	EN 15152
454.	Slovakia	EN 15153-1
455.	Slovakia	EN 45545-2 Railway Applications. Fire protection on railway vehicles. Requirements for fire behaviour of materials and components
456.	Slovakia	EN 50121 Electromagnetic Compatibility
457.	Slovakia	EN 50128:2002 Railway Applications. Communications, signalling and processing systems. Software for railway control and protection systems
458.	Slovakia	EN 50153 Railway Applications. Rolling stock. Protective provisions relating to electrical hazards
459.	Slovakia	EN 50155:2002/A1:2003 Railway Applications. Electronic equipment used on rolling stock
460.	Slovakia	EN 50163:2007 Railway Applications. Supply voltages of traction systems
461.	Slovakia	EN 50388:2008 Railway Applications – Power supply and rolling stock – Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability
462.	Slovakia	EN-45545-3 Railway Applications. Fire protection on railway vehicles. Part 3. Fire resistance requirements for fire barriers
463.	Slovakia	EN-45545-4 Railway Applications. Fire protection on railway vehicles. Fire safety requirements for railway rolling stock design
464.	Slovakia	EN-45545-7 Fire Protection of railway Vehicles – Part 7: Fire safety requirement for flammable liquid and flammable gas installations
465.	Slovakia	EN-50124 Railway Applications. Insulation coordination. Basic requirements. Clearances and creepage distances for all electrical and electronic equipment

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466.	Slovakia	EN-50163 Railway Applications. Supply voltages of traction systems
467.	Slovakia	EN-50206-1 Railway Applications. Rolling stock. Pantographs: characteristics and tests. Pantographs for main line vehicles
468.	Slovakia	EN-50367 Railway Applications. Current collection systems. Technical criteria for the interaction between pantograph and overhead line
469.	Slovakia	EN-50388 Railway Applications. Power supply and rolling stock. Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability
470.	Slovakia	TSI CCS – COMMISSION DECISION of 28 March 2006 concerning the technical specification for interoperability relating to the control-command and signalling subsystem of the trans-European conventional rail system (notified under document number C(2006) 964) (2006/679/EC)
471.	Slovakia	TSI ENE – draft TSI Energy, produced in accordance with the Directive on the Interoperability of European Common Railways
472.	Slovakia	TSI LOC&PAS – draft TSI Locomotives, produced in accordance with the Directive on the Interoperability of European Common Railways
473.	Slovakia	TSI Noise – 2006/66/EC: Commission Decision of 23 December 2005 concerning the technical specification for interoperability relating to the subsystem rolling stock — noise of the trans-European conventional rail system (notified under document number C(2005) 5666)
474.	Slovakia	TSI OPE – COMMISSION DECISION of 11 August 2006 concerning the technical specification of interoperability relating to the subsystem 'Traffic Operation and Management' of the trans-European conventional rail system (notified under document number C(2006) 3593) (2006/920/EC)
475.	Slovakia	TSI PRM – 2008/164/EC: Commission Decision of 21 December 2007 concerning the technical specification of interoperability relating to persons with reduced mobility in the trans-European conventional and high-speed rail system (notified under document C(2007) 6633)
476.	Slovakia	GOST 21447-75 Automatic Coupler Contour Line. Dimensions
477.	Slovakia	GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements

	Country	Document
478.	Slovakia	Directive 2001/95/EC on general product safety. The General Product Safety Directive (GPSD) EN Standards, European Standards
479.	Slovakia	Instruction B15/1
480.	Slovakia	UIC 438-3 Identification marking for tractive stock
481.	Slovakia	UIC 510-2 Trailing stock: wheels and wheelsets. Conditions concerning the use of wheels of various diameters
482.	Slovakia	UIC 518 Technical Conditions for Four-Wheeled Freight Cars intended for International Traffic with a Train Speed of 80 km/h
483.	Slovakia	UIC 540 Brakes – Air Brakes for freight trains and passenger trains
484.	Slovakia	UIC 541 Brakes – Regulations concerning the manufacturing of different brake parts – Driver's brake valve
485.	Slovakia	UIC 541-5 Brakes – Electropneumatic brake (ep brake) – Electropneumatic emergency brake override (EBO)
486.	Slovakia	UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans
487.	Slovakia	UIC 563 Fittings provided in coaches in the interest of hygiene and cleanliness
488.	Slovakia	UIC 564-1 Windows made from safety glass
489.	Slovakia	UIC 612 Interfaces and other Locomotive Control Devices
490.	Slovakia	UIC 627-2 Filling devices for diesel stock
491.	Slovakia	UIC 642 Special provisions concerning fire precautions and fire-fighting measures on motive power units and driving trailers in international traffic
492.	Slovakia	UIC 644 Warning devices used on tractive units employed on international services
493.	Slovakia	UIC 651 Layout of driver's cabs in locomotives, railcars, multi-unit trains and driving trailers
494.	Slovakia	National Technical Specification for Speed Gauges
495.	Slovakia	National Technical Specification for the Driver's Vigilance System
496.	Slovakia	OSJD 516 Freight Cars for Interoperability between 1 435 mm Gauge Railways and 1 520 mm Gauge Railways. Technical Instructions and Technical Conditions for the Admission of Cars
497.	Slovakia	OSJD 520 Passenger Cars for Interoperability between 1 435 mm Gauge Railways and 1 520 mm Gauge Railways. Technical Instructions and Technical Conditions for the Admission of Cars

	Country	Document
498.	Slovakia	OSJD 521 Passenger, Luggage, and Freight Cars as Units of a Traction Rolling Stock: Free Spaces to be Available within Units of Rolling Stock
499.	Slovakia	OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
500.	Slovakia	PPV – Passenger Transportation Rules
501.	Slovakia	Order No. 250/97 COLL of the Ministry of Transport and Communications
502.	Slovakia	Order No. 250/97 of the Minister for Transport. Code of Laws
503.	Slovakia	TOR – Technical Operating Rules
504.	Slovakia	Regulation of the Slovak Republic on the Protection against Noise and Vibration
505.	Slovakia	Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport at the Broad-Gauge Line Matovce – Haniska pri Košiciach
506.	Slovakia	STN 280312 (Slovak Technical Standards)
507.	Slovakia	TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
508.	Ukraine	Instruction for the Procedure for the Use of Automatic Locomotive Signalling of Main-Line Locomotives Type ALS-MU
509.	Ukraine	Basic Technical Requirements for Prospective Rolled Steel for Carrying Welded Structures of Rolled Stock
510.	Ukraine	105.87009.90898 Instruction for the Weighing of Axle Loads for Electric Locomotives VL80 and VL82M
511.	Ukraine	VND 31.1.07.000-02 Temporary Instruction for the Organisation of Fast Traffic of Passenger Trains. Requirements for the Infrastructure and Rolling Stock
512.	Ukraine	VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways
513.	Ukraine	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements
514.	Ukraine	GOST 12.1.019-79 (2001) SSBT (Occupational Safety Standards System). Electrical Safety. General Requirements and Nomenclature of Types of Protection

	Country	Document
515.	Ukraine	GOST 12.1.044 SSBT (Occupational Safety Standards System). Fire-and-Explosive Hazard of Substances and Materials. Nomenclature of Indices and Determination Methods
516.	Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements
517.	Ukraine	GOST 12.4.026-76 SSBT (Occupational Safety Standards System). Signal Colours and Safety Signs
518.	Ukraine	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment
519.	Ukraine	GOST 15543.1-89 Electrical Products. General Requirements in Terms of Resistance to External Climatic Influencing Factors
520.	Ukraine	GOST 17516.1-90 Electrical Products. General Requirements in Terms of Resistance to External Mechanical Influencing Factors
521.	Ukraine	GOST 18322-78, Articles 1-2. System of Technical Maintenance and Repair of Machinery and Equipment – Terms and Definitions
522.	Ukraine	GOST 2.601-2006 Unified Design Documentation System – Operation Documents
523.	Ukraine	GOST 2.602-95 Unified Design Documentation System – Repair Documents
524.	Ukraine	GOST 2.610 Unified Design Documentation System. Rules for Drawing up Operation Documents
525.	Ukraine	GOST 20911-89 Technical Diagnostics. Terms and Definitions
526.	Ukraine	GOST 21447-75 Automatic Coupler Contour Line. Dimensions
527.	Ukraine	GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements
528.	Ukraine	GOST 22339-88 Shunting and Industrial Diesel Locomotives. Types and Basic Parameters
529.	Ukraine	GOST 22780-93 (ISO 1005-9-86) Axles for Cars of 1 520 (1 524) mm Gauge Railways. Types, Parameters, and Dimensions
530.	Ukraine	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions

	Country	Document
531.	Ukraine	GOST 24179 Optical Filters, Lens Optical Filters, Lenses, Diffusers, and Deflecting Glass Inserts for Signalling Devices of Railway Transport. Technical Conditions
532.	Ukraine	GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements
533.	Ukraine	GOST 2593-82 Connection Brake Manifolds of Rolling Stock. Technical Conditions
534.	Ukraine	GOST 26656-85 Technical Diagnostics. Controllability. General Requirements
535.	Ukraine	GOST 27518-87 Diagnostics of Products. General Requirements
536.	Ukraine	GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules
537.	Ukraine	GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions
538.	Ukraine	GOST 29205-91 Electromagnetic Compatibility of Technical Units. Industrial Radio Interferences Induced by Electric Transport. Test Standards and Methods
539.	Ukraine	GOST 30237-96 (ISO 1005-3-82). Finished Axles for Rolling Stock of 1 520 mm Gauge Railways. Technical Conditions
540.	Ukraine	GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People
541.	Ukraine	GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions
542.	Ukraine	GOST 398-96 Carbon Steel Tyres for Rolling Stock of Broad-Gauge and Underground Railways. Technical Conditions
543.	Ukraine	GOST 4491-86 Cast Wheel Centres for Rolling Stock of 1 520 mm Gauge Railways. General Technical Conditions
544.	Ukraine	GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions
545.	Ukraine	GOST 6962 Electrified Transport with Overhead Contact System Power Supply. Voltage Row
546.	Ukraine	GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions
547.	Ukraine	GOST 9219-88 Traction Electric Apparatuses. General Technical Requirements
548.	Ukraine	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways

	Country	Document
549.	Ukraine	GOST SSBT 12.1.005 General Sanitary and Hygiene Requirements for Working Area Air
550.	Ukraine	GSTU 32.001-94 Emissions of Pollutants with Exhaust Gases from Diesel Engines of Diesel Locomotives. Standards and Determination Methods
551.	Ukraine	DBN B.2.3-19-2008 Transport Structures. 1 520 mm Gauge Railways. Designing Standards
552.	Ukraine	DSTU 4049-2001 Main-Line Locomotive-Hauled Passenger Cars
553.	Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
554.	Ukraine	DSTU GOST 11018:2005 Traction Railway Stock of Ukrainian 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions
555.	Ukraine	Methodology No. C-40010
556.	Ukraine	NAPB Fire Safety Regulatory Acts 03.003-2000 TsUO-0021 – Fire Safety Standards for Passenger Cars
557.	Ukraine	NAPB Fire Safety Regulatory Acts 03.004-2002 (TsUO -0023) – Standards for the Equipping of Railway Transport Facilities and Rolling Stock with Fire Safety Equipment and Inventory
558.	Ukraine	NB ZhT TsT03-98 Electric Trains. Safety Standards (informatory)
559.	Ukraine	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Tracks on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
560.	Ukraine	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Tracks on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
561.	Ukraine	Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways
562.	Ukraine	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
563.	Ukraine	O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock
564.	Ukraine	OSJD O+R 655 Unification of Structural Units of the Outfit of Diesel Rolling Stock

	Country	Document
565.	Ukraine	OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
566.	Ukraine	OSJD O-500 General Rules for Clearance Diagrams for Rolling Stock in Interoperable (without Transhipment or Transfer) International Traffic
567.	Ukraine	OSJD R 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
568.	Ukraine	OST 32.4-76 SSBT (Occupational Safety Standards System). Safety Signs at Railway Transport Facilities
569.	Ukraine	Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Alternating Current Electrified Railways approved by the Ministry of Railways in 1989
570.	Ukraine	Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways approved by the Ministry of Railways in 1969
571.	Ukraine	Rules of the Council for Railway Transport dated 07 March 2001 – Sanitary Rules for Passenger Railway Transport in International Traffic
572.	Ukraine	Rules for Traction Calculations for Train and Shunting Operation
573.	Ukraine	Regulation on the System of Scheduled and Preventive Repair and Technical Maintenance of Traction Rolling Stock
574.	Ukraine	ST SSFZhT TsT15-98. Traction Rolling Stock. Standard Methodology for Dynamic and Strength Tests of Locomotives
575.	Ukraine	ST SSFZhT TsT16-98. Traction Rolling Stock. Standard Methodology for Dynamic and Strength Tests of Electric Trains and Diesel Trains
576.	Ukraine	TI-514 – Technical Instruction on the Repair and Adjustment of Pantographs of Electrified Rolling Stock
577.	Ukraine	TM 14-01-02. Standard Methodology for Tests of Impact on the Track
578.	Ukraine	TsV-0072 – Regulation on the Approval of the Place and Method of the Application of Signs and Inscriptions on Cars of the Passenger Fleet of the Ukrainian 1 520 mm Gauge Railways
579.	Ukraine	TsV-TsL-TsT-0014. Instruction for the Repair and Maintenance of Automatic Couplers at Rolling Stock of the Ukrainian Railways

	Country	Document
580.	Ukraine	TsV-TsSh-0053. Instruction for the Arrangement, Installation, and Operation of Automatic Means for the Control of the Technical Condition of Moving Rolling Stock
581.	Ukraine	TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of the Ukrainian Railways
582.	Ukraine	TsE -0023 Rules for Installations and Technical Maintenance of the Overhead Contact System of Electrified Railways
583.	Ukraine	TsP/4422
584.	Ukraine	TsP/4425
585.	Ukraine	TsRB-0004. Technical Operating Rules for the Ukrainian Railways
586.	Ukraine	TsRP-0002. Regulation of Enhanced-Comfort Electric Trains and Diesel Trains
587.	Ukraine	TsT– 0047. Instruction for the Use of Water for the Cooling of Engines of Diesel Locomotives and Diesel Trains
588.	Ukraine	TsT-0052. Instruction for the Preparation for Operation and Technical Maintenance of Electric Locomotives in Winter Conditions
589.	Ukraine	TsT-0056. Instruction for the Technical Maintenance of In-Service Diesel Locomotives, Electric Locomotives, and Multi-Unit Rolling Stock
590.	Ukraine	TsT-0057 – Instruction for the Procedure for the Forwarding of Locomotives and Multi-Unit Rolling Stock
591.	Ukraine	TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
592.	Ukraine	TsT-0067. Instruction for the Assurance of Fire Safety at Locomotives and Multi-Unit Rolling Stock
593.	Ukraine	TsT-0070. Instructive Guidance for the Winterisation, Operation and Maintenance of Diesel Locomotives and Diesel Trains in Winter Conditions
594.	Ukraine	TsT-0073. Instruction for the Repair of Locomotive Speed Gauges
595.	Ukraine	TsT-0165. Instruction for the Technical Maintenance and Repair of Roller-Bearing Assemblies of Locomotives and Multi-Unit Rolling Stock
596.	Ukraine	TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock at Ukrainian Railways

	Country	Document
597.	Ukraine	TsT-TsSh-0072. Instruction for the Technical Maintenance of Continuous Automatic Locomotive Signalling (ALSN) Devices and the Driver's Vigilance Control Devices at Ukrainian Railways
598.	Ukraine	TsT-TsE-0104 Instruction for the Use of Pantographs of Electrified Rolling Stock in Different Operating Conditions
599.	Ukraine	TsUO-0018. Rules for Fire Safety at Railway Transport
600.	Ukraine	TsSh-0001 – Instruction for Signalling and Communication at Ukrainian Railways
601.	Ukraine	TsSh-0038 Instruction for the Technical Maintenance of Devices of Scanning Points of the Rolling Stock Automatic Identification System
602.	Ukraine	TsTSh-0058. Rules for the Organisation and Calculation of Train Radio Communication
603.	Estonia	Fire Safety Rules at Railways approved by Order No. 223 of the General Director of the Estonian Railways dated 23 July 1997
604.	Estonia	Cargo No. 17
605.	Estonia	Cargo No. 18
606.	Estonia	EVR Rules for the Operation of Brakes of Rolling Stock
607.	Estonia	GOST 2.602-95. Repair Documents (Informatory)
608.	Estonia	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents (informatory)
609.	Estonia	Railway Transport Law, 2004
610.	Estonia	Instruction for the Assurance of Fire Safety in Cars of International Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999
611.	Estonia	Instruction V-013 for the Use of Lubricants and Diesel Fuel approved by Order No. 147 dated 10 May 2000
612.	Estonia	Instruction for Signalling – Attachment to the Technical Operating Rules (TOR)
613.	Estonia	Instruction for the Technical Maintenance of Rolling Stock
614.	Estonia	Instruction of the Infrastructure Manager (Rules for the Technical Operation and Construction of the Overhead Contact System at Electrified Railways)

	Country	Document
615.	Estonia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999
616.	Estonia	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
617.	Estonia	OSJD O+R 655 Unification of Structural Units of the Outfit of Diesel Rolling Stock
618.	Estonia	List of Technological Documents for the Technical Maintenance and Repair of Rolling Stock of EVR Cargo Ltd dated 10 February 2009 (defines a list of 70 documents)
619.	Estonia	Technical Maintenance Rules for Locomotives
620.	Estonia	TOR – Technical Operating Rules
621.	Estonia	Direction No. 1-3, P. 2/7-C of EVR Cargo Board Members dated 10 February 2009
622.	Estonia	TsTChS-50 Instruction for the Treatment and Application of Water for Cooling of Engines of Diesel Locomotives and Diesel Trains

3 TERMS AND ABBREVIATIONS

Abbreviation	Definition
VNTP	Departmental Norms of Process Design
GDK	Marginally Permissible Concentrations
GOST	State Standard
DSTU	State Standardisation System of Ukraine
KM	Cabinet of Ministers
LDz	Latvian Railways
MPS	Ministry of Railways
NTP	Norms of Process Design
TOR	Technical Operating Rules
SK DBN	State Construction Standards for Construction Structures
SN	Construction Standards
SN	Construction Standards of Belarus
SNiP	Construction Standards and Rules
STN	Construction Requirements and Rules
STP	Company Standards
STsB	Signalling, Interlocking, and Blocking
TSI	Technical Specification for Interoperability
IM	Infrastructure Manager
TsNII	Central Scientific and Research Institute
TsP	Department of Tracks and Structures (Russian Federation); Chief Administration of Track Facilities (Ukraine)
TsPT	Technical Section of the Department of Tracks and Structures (Russian Federation)
TsRB	Department of Traffic Safety (Russian Federation); Chief Administration of Traffic Safety and Environmental Protection (Ukraine)
TsSZhT	The Council for Rail Transport of CIS States, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia
ADV	Train Traffic Rules
EN	European Standard
ĮST	Lithuanian Company Standard
LHS	PKP Metallurgical Broad Gauge Railway
LG	Lithuanian Railways

LVS	Latvian State Standard
PN	Polish Standard
STR	Technical Regulation for Construction (Lithuania)
HN	Hygiene Standard (Lithuania)
DTR	Dokumentacja Techniczno. Ruchowa
ISO	Quality Management Systems – Requirements
UIC	Union de Chemins de fer
UTK	Urząd Transportu Kolejowego
WTO	Warunki Techniczne Odbioru

4 LIST OF THE KEY PARAMETERS

The list presents the basic parameters for maintaining the technical and operational compatibility of the Subsystem "Rolling Stock – Locomotives and Multiple Units" of the 1 520 mm and 1 435 mm gauge rail systems at the border of the Commonwealth of Independent States (CIS) and European Union (EU). This list has been developed on the basis of the draft TSI "Locomotives and Passenger Rolling Stock", which is currently under development, and supplemented and adapted with regard to the specific features of the 1 520 mm gauge system.

SUBSYSTEM: ROLLING STOCK – LOCOMOTIVES

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
	Функциональные и технические требования к подсистеме (Functional and technical requirements for the sub-system)	Functional and technical specification of the sub-system	4.2
1	**Конструкция и механическое оборудование** **(Structure and mechanical equipment)**	**Structure and mechanical parts**	**4.2.2**
1.1	Общие положения (General provisions)	General	4.2.2.1
1.2	Механические сцепные устройства (Mechanical couplings)	Mechanical interfaces	4.2.2.2
1.2.1	Общие положения и определения (General provisions and definitions)	General provisions and definitions	4.2.2.2.1
1.2.2	Внутрисекционное сцепное устройство (Inner coupling)	Inner coupling	4.2.2.2.2
1.2.3	Концевое сцепное устройство (End coupling)	End coupling	4.2.2.2.3
1.2.4	Аварийное сцепное устройство (Rescue coupling)	Rescue coupling	4.2.2.2.4
1.2.5	Доступ персонала для сцепления и расцепления (Staff access for coupling and uncoupling)	Staff access for coupling and uncoupling	4.2.2.2.5
1.3	Межвагонный и межсекционный переход (Inter-car and inter-section gangways)	Gangways	4.2.2.3
1.4	Прочность конструкции единицы ПС (Strength of vehicle structure)	Strength of vehicle structure	4.2.2.4

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
1.5	Пассивная безопасность (Passive safety)	Passive safety	4.2.2.5
1.6	Возможность поднятия домкратом (Possibility of jacking)	Lifting and jacking	4.2.2.6
1.7	Крепление устройств к конструкции кузова (Fixing of devices to carbody structure)	Fixing of devices to carbody structure	4.2.2.7
1.8	Двери в служебные помещения (Staff and freight access doors)	Access doors	4.2.2.8
1.9	Механические характеристики стекла (Mechanical characteristics of glass)	Mechanical characteristics of glass	4.2.2.9
1.10	Условия загрузки и весовые характеристики (Load conditions and weight characteristics)	Load conditions and weighted mass	4.2.2.10
2	**Воздействие на путь и габарит ПС (Track impact and clearance gauge of rolling stock)**	**Track interaction and gauging**	**4.2.3**
2.1	Габарит ПС (Clearance gauge of rolling stock)	Kinematic gauge	4.2.3.1
2.2	Статическая осевая нагрузка (Static axle load)	Static axle load	4.2.3.2
2.3	Параметры ПС, влияющие на стационарные наземные системы (Rolling stock parameters which influence ground-based systems)	Rolling stock parameters which influence ground-based systems	4.2.3.3
2.3.1	Электромеханические параметры ПС, влияющие на путевые устройства СЦБ (Rolling stock parameters which influence the CCS subsystem)	Rolling stock parameters which influence CCS subsystem	4.2.3.3.1
2.3.2	Контроль буксового узла (Axle bearing monitoring)	Axle bearing health monitoring	4.2.3.3.2
2.4	Динамические параметры подвижного состава (Rolling stock dynamic behaviour)	Rolling stock dynamic behaviour	4.2.3.4

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
2.4.1	Устойчивость к сходу с рельсов при движении по переходным кривым и по пути с отклонениями в пределах допуска содержания пути (Safety against derailment running on twisted track and track with deviations within the track maintenance tolerance)	Safety against derailment running on twisted track	4.2.3.4.1
2.4.2	Параметры динамики движения (Running dynamic behaviour)	Running dynamic behaviour	4.2.3.4.2
2.4.2.1	Предельные значения безопасного движения (Limit values for running safety)	Limit values for running safety	4.2.3.4.2.1
2.4.2.2	Предельные значения вертикальных и поперечных нагрузок на путь (Track vertical and transversal loading limit values)	Track loading limit values	4.2.3.4.2.2
2.4.2.3	Эквивалентная конусность (Equivalent conicity)	Equivalent conicity	4.2.3.4.3
2.4.2.3.1	Проектные значения для профиля новых колёс (Design values for new wheel profiles)	Design values for new wheel profiles	4.2.3.4.3.1
2.4.2.3.2	Значения эквивалентной конусности для колесных пар в эксплуатации (In-service values of wheelset equivalent conicity)	In-service values of wheelset equivalent conicity	4.2.3.4.3.2
2.5	Ходовая часть (Running gear)	Running gear	4.2.3.5
2.5.1	Конструкция рамы тележки (Structural design of bogie frame)	Structural design of bogie frame	4.2.3.5.1
2.5.2	Колесная пара (Wheelsets)	Wheelsets	4.2.3.5.2
2.5.2.1	Механические и геометрические характеристики колесных пар (Mechanical and geometrical characteristics of wheelsets)	Mechanical and geometrical characteristics of wheelsets	4.2.3.5.2.1
2.5.2.2	Механические и геометрические характеристики колес (Mechanical and geometrical characteristics of wheels)	Mechanical and geometrical characteristics of wheels	4.2.3.5.2.2
2.5.2.3	Механические и геометрические характеристики оси (Mechanical and geometrical characteristics of axle)	Mechanical and geometrical characteristics of axle	

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
2.6	Наименьший допустимый радиус проходимой кривой (Minimum permissible curve radius)	Minimum curve radius	4.2.3.6
2.7	Устройство подачи песка (Sanding devices)	Sanding	4.2.3.7
2.8	Путеочиститель (Life irons)	Life guards	4.2.3.8
3	**Торможение (Braking)**	**Braking**	**4.2.4**
3.1	Общие положения (General provisions)	General	4.2.4.1
3.2	Основные требования функциональности и безопасности (Main functional and safety requirements)	Main functional and safety requirements	4.2.4.2
3.2.1	Функциональные требования (Functional requirements)	Functional requirements	4.2.4.2.1
3.2.2	Требования безопасности (Safety requirements)	Safety requirements	4.2.4.2.2
3.3	Тип системы торможения (Type of braking system)	Type of brake system	4.2.4.3
3.4	Управление торможением (Braking command)	Brake command	4.2.4.4
3.4.1	Экстренное торможение (Emergency braking)	Emergency braking	4.2.4.4.1
3.4.2	Служебное торможение (Service braking)	Service braking	4.2.4.4.2
3.4.3	Управление прямодействующим тормозом (Direct-action brake command)	Direct braking command	4.2.4.4.3
3.4.4	Управление динамическим тормозом (Dynamic brake command)	Dynamic braking command	4.2.4.4.4
3.4.5	Управление стояночным тормозом (Parking brake command)	Parking braking command	4.2.4.4.5
3.5	Характеристики торможения (Braking performance)	Braking performance	4.2.4.5
3.5.1	Общие требования (General requirements)	General requirements	4.2.4.5.1
3.5.2	Экстренное торможение (Emergency braking)	Emergency braking	4.2.4.5.2

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
3.5.3	Служебное торможение (Service braking)	Service braking	4.2.4.5.3
3.5.4	Расчеты термоциклической стойкости (Calculations of thermo-cyclic capacity)	Calculations related to thermal capacity	4.2.4.5.4
3.5.5	Стояночный тормоз (Parking brake)	Parking brake	4.2.4.5.5
3.6	Сцепление колес с рельсами – Система противоюзной защиты (Wheel-rail adhesion – Wheel slide protection system)	Wheel-rail adhesion solicitation – Wheel slide protection system	4.2.4.6
3.6.1	Предельное значение коэффициента сцепления колес с рельсами (Limit value of the wheel-rail adhesion factor)	Limit of wheel-rail adhesion solicitation	4.2.4.6.1
3.6.2	Система противоюзной защиты (Wheel slide protection system)	Wheel slide protection system	4.2.4.6.2
3.7	Системы динамического торможения (электродинамические, гидродинамические) (Dynamic braking systems (electro- and hydro-dynamic))	Interface with traction – Braking systems linked to traction (electric, hydro-dynamic)	4.2.4.7
3.8	Система торможения независимая от условий сцепления колеса с рельсом (Braking system independent of wheel-rail adhesion conditions)	Braking system independent of adhesion conditions	4.4.4.8
3.8.1	Общие положения (General provisions)	General	4.2.4.8.1.
3.8.2	Магниторельсовый тормоз (Magnetic track brake)	Magnetic track brake	4.2.4.8.2.
3.8.3	Вихретоковый тормоз (Eddy current track brake)	Eddy current track brake	4.2.4.8.3
3.9	Контроль состояния тормозов и индикация неисправностей (Brake state monitoring and fault indication)	Brake state and fault indication	4.2.4.9
3.10	Требования к тормозам в условиях буксировки (Brake requirements for rescue purposes)	Brake requirements for rescue purposes	4.2.4.10

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
4	**Обслуживание пассажиров (Passenger servicing)**	**Passenger related items**	**4.2.5**
4.1	Санитарные системы (Sanitary systems)	Sanitary systems	4.2.5.1
4.2	Системы оповещения и связи (Public address and communication systems)	Public address system: audible communication system	4.2.5.2
4.3	Возможность подачи сигнала тревоги для пассажирами машинисту: функциональные требования (Possibility of sending an alarm signal from passengers to the driver: functional requirements)	Passenger alarm: functional requirements	4.2.5.3
4.4	Надписи и знаки безопасности для пассажиров (Safety instructions and signs for passengers)	Safety instructions to passengers – Signs	4.2.5.4
4.5	Покрывается требованиями пункта 4.2 (Covered by the requirements of Paragraph 4.2)	Communication devices for passengers	4.2.5.5
4.6	Внешние двери: вход и выход из ПС (Exterior doors: access to and egress from rolling stock)	Exterior doors: access to and egress from Rolling Stock	4.2.5.6
4.7	Конструкция дверных систем (Door system construction)	Door system construction	4.2.5.7
4.8	Межвагонные двери (Inter-car doors)	inter-unit doors	4.2.5.8
4.9	Качество воздуха в помещениях подвижного состава (Internal air quality in rolling stock)	Internal air quality	4.2.5.9
5	**Условия окружающей среды и аэродинамические эффекты (Environmental conditions and aerodynamic effects)**	**Environmental conditions and aerodynamic effects**	**4.2.6**
5.1	**Условия окружающей среды (Environmental conditions)**		
5.2	**Аэродинамические эффекты (Aerodynamic effects)**		
6	**Защита системы (System protection)**	**System protection**	**4.2.7**

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
6.1	Электробезопасность (Electrical safety)	Protection against Electrical Hazards	4.2.7.1
6.2	Диагностика; программное обеспечение (Diagnostics; Software)	Diagnostic; Software's	4.2.7.2
6.2.1	Диагностика (Diagnostics)	Diagnostic	4.2.7.2.1
6.2.2	Программное обеспечение (Software)	Software's	4.2.7.2.2
6.3	Внешнее освещение, обозначение головы и хвоста поезда и звуковые сигналы (External lights, head and tail lights, and audible signals)	External lights & visible and audible warning devices	4.2.7.3
6.3.1	Внешнее освещение, обозначение головы и хвоста поезда (External lights; head and tail lights)	External front and rear lights	4.2.7.3.1
6.3.1.1	Внешнее освещение (External lights)	Head lights	4.2.7.3.1.1
6.3.1.2	Обозначение головы поезда (Head lights)	Marker lights	4.2.7.3.1.2
6.3.1.3	Обозначение хвоста поезда (Tail lights)	Tail lights	4.2.7.3.1.3
6.3.1.4	Управление световыми сигналами (Lamp control)	Lamp controls	4.2.7.3.1.4
6.3.2	Звуковые сигналы (тифон, свисток) (Audible signals (warning horn and whistle))	Horn	4.2.7.3.2
6.3.2.1	Общие положения (General provisions)	General	4.2.7.3.2.1
6.3.2.2	Уровень звукового давления тифона (Warning horn sound pressure level)	Warning horn sound pressure levels	4.2.7.3.2.2
6.3.2.3	Защита от внешего воздействия (Protection against external impact)	Protection	4.2.7.3.2.3
6.4	Идентификация поезда и вагона – внешняя маркировка (Train and car identification – External marking)	Train and vehicle identification – External marking	4.2.7.4
6.5	Электронная идентификация ПС (Electronic identification of rolling stock)	Electronic identification of rolling stock	not covered in TSI

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
7	**Тяговое и электрическое оборудование (Traction and electrical equipment)**	**Traction and electrical equipment**	**4.2.8**
7.1	Тяговые характеристики (Traction performance)	Traction performance	4.2.8.1
7.1.1	Общие положения (General provisions)	General	4.2.8.1.1
7.1.2	Требования к тяговым характеристикам (Requirements for traction performance)	Requirements on performance	4.2.8.1.2
7.2	Электроснабжение (Power supply)	Power supply	4.2.8.2
7.2.1	Общие положения (General provisions)	General	4.2.8.2.1
7.2.2	Диапазон рабочих напряжений и частот (Range of operating voltages and frequencies)	Operation within range of voltages and frequencies	4.2.8.2.2
7.2.3	Рекуперативное торможение с возвратом энергии в тяговую сеть (Regenerative braking with energy to the overhead contact line)	Regenerative brake with energy to the overhead contact line	4.2.8.2.3
7.2.4	Максимальные мощность и сила тока от контактной сети (Maximum power and current from the overhead contact line)	Maximum power and current from the overhead contact line	4.2.8.2.4
7.2.5	Максимальная сила тока на остановках для систем электроснабжения постоянного тока (Maximum current at standstill for DC systems)	Maximum current at standstill for DC systems	4.2.8.2.5
7.2.6	Коэффициент мощности (Power factor)	Power factor	4.2.8.2.6
7.2.7	Электромагнитная совместимость (СЦБ и связь, включая помехи, генерируемые ПС в тяговую сеть) (Electromagnetic compatibility (CCS and communication, including disturbances generated by rolling stock to the overhead contact line))	EMC Directive + System energy disturbances	EMC Directive + 4.2.8.2.7
7.2.8	Измерение потребления энергии (Energy consumption measuring)	Energy consumption measuring function	4.2.8.2.8

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
7.2.9	Требования к токоприёмнику (Requirements for pantograph)	Requirements linked to pantograph	4.2.8.2.9
7.2.9.1	Рабочий диапазон высот токоприемника (Working range in height of pantograph)	Working range in height of pantograph	4.2.8.2.9.1
7.2.9.1.1	Высота взаимодействия ПС с контактным проводом (Height of interaction of rolling stock with contact wires)	Height of interaction with contact wires	4.2.8.2.9.1.1
7.2.9.1.2	Рабочий диапазон высот токоприемника в качестве составной части (Working range in height of pantograph as a component part)	Working range in height of pantograph as component	4.2.8.2.9.1.2
7.2.9.2	Геометрия полоза токоприемника (Pantograph slide geometry)	Pantograph head geometry	4.2.8.2.9.2
7.2.9.3	Токовая нагрузка токоприемника (Pantograph current load)	Pantograph current capacity	4.2.8.2.9.3
7.2.9.4	Материалы токопроводящей вставки (Contact strip material)	Contact strip material	4.2.8.2.9.4
7.2.9.5	Статическое нажатие токоприемника (Pantograph static contact force)	Pantograph static contact force	4.2.8.2.9.5
7.2.9.6	Усилие и динамика контакта токоприемника (Pantograph contact force and dynamic behaviour)	Pantograph contact force and dynamic behaviour	4.2.8.2.9.6
7.2.9.7	Расположение токоприемников (Arrangement of pantographs)	Arrangement of pantographs	4.2.8.2.9.7
7.2.9.8	Движение через нейтральные вставки (Running through neutral sections)	Running through phase or system separation sections	4.2.8.2.9.8
7.2.9.9	Изоляция токоприемника от единицы ПС (Insulation of pantograph from rolling stock)	Insulation of pantograph from the vehicle	4.2.8.2.9.9
7.2.9.10	Опускание токоприемника (Pantograph lowering)	Pantograph lowering	4.2.8.2.9.10
7.2.10	Защита от аварийных процессов в электрооборудовании (Protection against failure processes in electrical equipment)	Electrical protection of the train	4.2.8.2.10

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
7.3	Дизельные и другие тепловые тяговые единицы (Diesel and other thermal traction units)	Diesel and other thermal traction system	4.2.8.3
7.3.1	Выхлопные газы от двигателей (Exhaust gases of motors)	Exhaust emission Directive	New one
7.3.2	Другие требования для дизельных и других тепловых тяговых единиц (Others requirements for diesel and other thermal traction units)	Others requirements for diesel and other thermal traction system	New one, introduced by Contact Group
7.4	Входной импеданс между токоприёмником и колесом (для совместимости с рельсовыми цепями) (Input impedance between pantograph and wheels (for compatibility with rail track circuits))	Impedance between pantograph and wheels	4.2.8.4
8	**Кабина и управление** **(Cab and operation)**	**Cab and operation**	**4.2.9**
8.1	Кабина машиниста (Driver's cab)	Driver´s Cab	4.2.9.1
8.1.1	Общие положения (General provisions)	General	4.2.9.1.1
8.1.2	Вход и выход (Access and egress)	Access and egress	4.2.9.1.2
8.1.2.1	Вход и выход в условиях эксплуатации (Access and egress in operating conditions)	Access and egress in operating conditions	4.2.9.1.2.1
8.1.2.2	Аварийные выходы кабины машиниста (Driver's cab emergency exits)	Driver's cab emergency exit	4.2.9.1.2.2
8.1.2.3	Возможность приема и передачи служебной документации машинистом (Means for the driver to receive and transfer service documentation)	Means for the driver to exchange documents	4.2.9.1.2.3
8.1.3	Внешний обзор (External visibility)	External visibility	4.2.9.1.3
8.1.3.1	Обзор с места машиниста (Visibility from the driver's place)	Front visibility	4.2.9.1.3.1
8.1.3.2	Обзор хвоста и сторон поезда (Rear and side visibility)	Rear and side view	4.2.9.1.3.2

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
8.1.4	Внутренняя планировка (Interior layout)	Interior layout	4.2.9.1.4
8.1.5	Кресло машиниста (Driver's seat)	Driver's seat	4.2.9.1.5
8.1.6	Эргономика пульта управления (Driver's Desk – Ergonomics)	Driver's desk – Ergonomics	4.2.9.1.6
8.1.7	Микроклимат в кабине машиниста (Microclimate in the driver's cab)	Climate control and air quality	4.2.9.1.7
8.1.8	Внутреннее освещение (Internal lighting)	Internal lighting	4.2.9.1.8
8.2	Лобовое стекло (Windscreen)	Windscreen	4.2.9.2
8.2.1	Механические характеристики (Mechanical characteristics)	Mechanical characteristics	4.2.9.2.1
8.2.2	Оптические характеристики (Optical characteristics)	Optical characteristics	4.2.9.2.2
8.2.3	Оборудование (Equipment)	Equipment	4.2.9.2.3
8.3	Интерфейс машинист-локомотив (Driver-machine interface)	Driver machine interface	4.2.9.3
8.3.1	Функция контроля бдительности машиниста (Driver's vigilance control function)	Driver´s activity control function	4.2.9.3.1
8.3.2	Указатель скорости (Speed indicator)	Speed indication	4.2.9.3.2
8.3.3	Конструкция и размещение дисплея машиниста (Design and arrangement of the driver's display)	Driver display unit and screens	4.2.9.3.3
8.3.4	Управление и индикаторы (Controls and indicators)	Controls and indicators	4.2.9.3.4
8.3.5	Знаки и надписи в кабине машиниста (Signs and labels in the driver's cab)	Labelling	4.2.9.3.5
8.3.6	Дистанционное управление маневровыми операциями (Remote control of shunting operations)	Remote control function	4.2.9.3.6
8.4	Бортовой комплект инструментов и сигнальных принадлежностей (Onboard kit of tools and signalling accessories)	Onboard tools and portable equipment	4.2.9.4

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
8.5	Отделение для хранения личного имущества персонала (Storage facility for staff personal effects)	Storage facility for staff personal effects	4.2.9.4.3
8.6	**Регистратор параметров движения** **(Recording device of movement parameters)**	Recording device	**4.2.9.5**
9	**Противопожарная безопасность и эвакуация** **(Fire safety and evacuation)**	**Fire safety and evacuation**	**4.2.10**
9.1	Общие положения и категоризация (General provisions and categorisation)	general and Categorisation	4.2.10.1
9.1.1	Категоризация для пассажирского ПС (Categorisation for passenger rolling stock)	Categorisation of passenger rolling stock	4.2.10.1.1
9.1.2	Категоризация для грузовых локомотивов (Categorisation for freight locomotives)	Categorization of freight locomotives	4.2.10.1.2
9.2	Требования к материалам (Material requirements)	Material requirements	4.2.10.2
9.3	Специальные меры для воспламеняющихся жидкостей (Special measures for flammable liquids)	Specific measures for flammable liquids	4.2.10.3
9.4	Эвакуация пассажиров (Passenger evacuation)	Passenger evacuation	4.2.10.4
9.5	Огнезадерживающие барьеры (Fire barriers)	Fire barriers	4.2.10.5
10	**Обслуживание** **(Servicing)**	**Servicing**	**4.2.11**
10.1	Общие положения (General provisions)	General	4.2.11.1
10.2	Доступ к лобовому стеклу для очистки (Access to the windscreen for cleaning)	Cleaning of driver’s cab windscreen	4.2.11.2
10.3	Внешняя очистка поезда (Exterior cleaning of train)	Exterior cleaning through a washing plant	4.2.11.3
10.4	Система опорожнения туалета (Toilet discharge system)	Toilet discharge system	4.2.11.4

No	Title in Russian	Title in English (in accordance with draft TSI)	Draft TSI chapter number
10.5	Система водоснабжения (Water supply system)	Water refilling equipment	4.2.11.5
10.6	Разъем для заправки водой (Interface for water refilling)	Interface for water refilling	4.2.11.6
10.7	Специальные требования для отстоя поездов (Special requirements for stabling of trains)	Special requirements for stabling of trains	4.2.11.7
10.8	Оборудование заправки топливом (Refuelling equipment)	Refuelling equipment	4.2.11.8
11	**Документация по эксплуатации и техническому обслуживанию** **(Documentation for operation and maintenance)**	**Documentation for operation and maintenance**	**4.2.12**
11.1	Общие положения (General provisions)	General	4.2.12.1
11.2	Общая документация (General documentation)	General documentation	4.2.12.2
11.3	Ремонтные документы (Maintenance file)	Maintenance file	4.2.12.3
11.3.1	Обоснование системы технического обслуживания и ремонта (Justification of the maintenance and repair system)	The maintenance design justification file	4.2.12.3.1
11.3.2	Руководства по техническому обслуживанию и ремонту (Maintenance and repair manuals)	Maintenance documentation	4.2.12.3.2
11.4	Эксплуатационные документы (Operating documents)	Operating documentation	4.2.12.4
11.5	Инструкции по порядку действий в аварийных ситуациях (Instructions for actions in emergency situations)	Rescue diagram and instructions	4.2.12.5

5 ANALYSIS OF THE KEY PARAMETERS

5.1 STRUCTURE AND MECHANICAL EQUIPMENT

5.1.1 General provisions

Belarus:

The design of locomotives and electric trains should ensure the safety of locomotive crews and protection against the impact of hazardous and dangerous industrial factors occurring on locomotives as well as convenient and safe access to units and mechanisms in the course of operation, technical maintenance, and repair of locomotives.

Latvia, Lithuania, and Russia, and Slovakia:

This chapter contains requirements for the structural strength of bodies of rolling stock and mechanical interfaces between units of rolling stock.

A major part of these requirements is intended for ensuring the mechanical integrity of a train in the process of operation and in emergency situations as well as for ensuring the protection of people staying in passenger and personnel compartments in a situation of collision or derailment of a train.

Poland:

The following categories shall be established in accordance with the manufacturer's requirements: air distributor, external illumination, and warning horn.

Ukraine:

The design of traction rolling stock should comply with the requirements of the following documents:

- GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
- DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements

Methods of compliance assessment: Expert evaluation of design documentation; tests. The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements GOST 12.2.003-91 SSBT (Occupational Safety Standards System). Production Equipment. General Safety Requirements GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements
Latvia	Of referential character – GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements

Lithuania	ADV-001 Regulation on the Technical Operation of Railways X-542 Law on Traffic Safety GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements
Poland	Manufacturer's technical specification
Russia	
Slovakia	Regulation of the Slovak Republic on the Protection against Noise and Vibration Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport on the Broad-Gauge Line Matovce – Haniska pri Košiciach TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.1.2 Mechanical couplings

5.1.2.1 General provisions and definitions

Currently, requirements for this parameter in all eight countries are the same: the SA-3 automatic coupler with coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. Rolling stock with other types of couplers should be fitted with adapters for the coupling counter line in accordance with GOST 21447.

For locomotives and head cars of multi-unit rolling stock equipped with end automatic coupling devices of SA-3 type, the height from the rail head to automatic coupler centreline should be not more than 1 080 mm and not less than 980 mm.

Belarus:

Automatic coupling is a device for the coupling of units of rolling stock as well as for the transfer of traction and buffing loads.

An uncoupling arrangement is a system designed for the uncoupling of the automatic coupling and deactivation of the coupling mechanism.

A centring device is a structure ensuring the central position of the automatic coupling after the decoupling of units of rolling stock.

An SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. Besides the SA-3 automatic coupler, backlash-free BSU coupling devices with a coupling counter line

in accordance with OST 32.193 and Scharfenberg automatic couplers as well as non-automatic couplers are used on specific occasions.

The strength parameters of coupler elements transferring longitudinal load are specified in NB ZhT TsV-TsL 022.

The parameters of draft gears of multi-unit rolling stock (draft-gear capacity, initial torquing force, impact of air temperature) are defined by the safety standards under NB ZhT TsV-TsL 022. The parameters of draft gears of locomotives are not specified by regulatory documents; however, in practice, the parameters indicated in NB ZhT TsV-TsL 022 with regard to the service (passenger, freight) are applied.

Coupling devices of rolling stock should be of the buffing-and-traction type, i.e. be able to transfer and dampen compression and tensile loads.

Latvia and Lithuania:

Rolling stock should be equipped with automatic coupling.

Automatic couplers of passenger cars should be equipped with vertical movement stops.

Automatic couplers should be equipped with draft gears with capacities not lower than the following:

70 kJ – for diesel freight locomotives;

50 kJ – for diesel passenger locomotives.

The standards applicable to diesel passenger locomotives shall apply to multi-unit rolling stock.

Russia:

An automatic coupling is a device for the coupling of units of rolling stock as well as for the transfer of traction and buffing loads. An automatic coupling device consists of the body of the automatic coupler, coupling and uncoupling mechanism, and draw gear.

The uncoupling arrangement is designed for the uncoupling of the automatic coupling and deactivation of the coupling mechanism.

Draw gear is designed for dampening longitudinal shock loads occurring in the course of shunting operations and train movement.

There are several kinds of coupling devices:

- inner coupling is intended for the coupling of units of rolling stock within a section and which is not uncoupled in service;

- end coupling is used for the coupling of two (or several) sections or units of rolling stock for the purposes of prompt making-up of trains;

- emergency coupling is used in emergency, rescue, and shunting operations for the transportation of rolling stock not equipped with coupling devices with a coupling counter line in accordance with GOST 21447.

The SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. Aside from the SA-3 automatic coupler , there are BSU backlash-free coupling devices with a

coupling counter line in accordance with OST 32.193 and Scharfenberg automatic couplers as well as non-automatic couplers are used on specific occasions.

The strength parameters of coupler elements transferring longitudinal load are specified in NB ZhT TsV-TsL 022.

The parameters of draft gears of multi-unit rolling stock (draft-gear capacity, initial torquing force, impact of air temperature) are defined by the safety standards under NB ZhT TsV-TsL 022. The parameters of draft gears of locomotives are not specified by regulatory documents; however, in practice, the parameters indicated in NB ZhT TsV-TsL 022 with regard to the service (passenger, freight) are applied.

Coupling devices of rolling stock should be of the buffing-and-traction type, i.e. be able to transfer and dampen compression and tensile loads.

Ukraine:

The automatic coupling is a device for the automatic mechanical coupling of units of rolling stock as well as for the transfer of traction and buffing loads.

The SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. Aside from the SA-3 automatic coupler, non-automatic couplers are used on specific occasions.

Type TsNII-N6 draft gear is installed on type R-5P locomotives in multi-unit rolling stock.

Types 1-4 diesel locomotives should be equipped with a remote drive enabling the uncoupling of the locomotive from the train (car) to be operated from the driver's cab.

Automatic coupling is performed at a height of not more than 1 080 mm from the rail head to automatic coupler centreline and not less than 980 mm when loaded.

Methods of compliance assessment: Expert evaluation of design documentation; tests. The aforementioned requirements are approved by the following documents:

Belarus	TOR of the Belarusian Railways NB ZhT TsV-TsL 022-2000 Safety Standards at Railway Transport. Automatic Couplers for Railway Rolling Stock OST 32.193-2002 Backlash-Free Coupling Devices of Locomotive-Hauled Passenger Cars and Passenger Cars of Multi-Unit Rolling Stock for 1 520 mm Gauge Railways. Coupler Contour Line and Setting Dimensions
Latvia	TOR of the Latvian Railways, Paragraphs 395-397 Instruction for the Repair and Maintenance of Automatic Coupling Devices of Rolling Stock DR-41-2002
Lithuania	ADV-001 Regulation on the Technical Operation of Railways GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements GOST 31187-2003 (Informatory) 60/V Automatic Coupler of Rolling Stock – Repair and Technical

	Maintenance
Poland	GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions GOST 88-55 Automatic Coupling SA-3
Russia	GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions TOR of the Russian Federation Railways, Paragraph 11.5 GOST 21447-75 Automatic Coupler Contour Line. Dimensions NB ZhT TsV-TsL 022-2000 Safety Standards at Railway Transport. Automatic Couplers for Railway Rolling Stock OST 32.193-2002 Backlash-Free Coupling Devices of Locomotive-Hauled Passenger Cars and Passenger Cars of Multi-Unit Rolling Stock for 1 520 mm Gauge Railways. Coupler Contour Line and Setting Dimensions
Slovakia	GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions GOST 88-55 Automatic Coupling SA-3
Ukraine	GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions. GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements; TsRB-004. Technical Operating Rules for the Ukrainian Railways; TsV-TsL-TsT-0014. Instruction for the Repair and Maintenance of Automatic Couplers on Rolling Stock of Ukrainian Railways GOST 21447-75 Automatic Coupler Contour Line. Dimensions
Estonia	

5.1.2.2 Inner coupling

Currently, requirements for this parameter are the same in all the countries: basically, the SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. Rolling stock with other types of inner couplers should be fitted with adapters for the coupling counter line in accordance with GOST 21447.

For locomotives and head cars of multi-unit rolling stock equipped with end automatic coupling devices of the SA-3 type, the height from the rail head to automatic coupler centreline should be not more than 1 080 mm and not less than 980 mm.

Belarus:

SA-3 – Soviet-style automatic coupler, version III, is a draw-and-buffer non-rigid type coupler.

Latvia and Lithuania:

The SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used.

Permissible height difference between longitudinal axes of automatic couplers shall not exceed:

a) for a freight train: 100 mm;

b) between the locomotive of a freight train and the first loaded car: 110 mm;

c) for a passenger train with a travel speed of up to 120 km/h: 70 mm;

d) for a passenger train with a travel speed of 121 — 140 km/h: 50 mm;

e) between the locomotive of a passenger train and the first passenger car: 100 mm (for Lithuania).

Poland:

There are no trains with inner coupling between cars.

Russia and Slovakia:

Inner couplings should ensure resilient connection between the units of rolling stock and withstand a specified excess of operating loads.

Different designs of coupling devices shall be permitted.

Ukraine:

Inner couplings should ensure resilient connection between the units of rolling stock and withstand specified excess of operating loads.

SA-3 automatic coupler with coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives.

Permissible height difference between longitudinal axes of automatic couplers shall not exceed:

- of a freight train: 100 mm
- between the locomotive of a freight train and the first loaded car: 110 mm
- of a passenger train with a travel speed of up to 120 km/h: 70 mm
- of a passenger train with a travel speed of 121-140 km/h: 50 mm
- between the locomotive of a passenger train and the first passenger car: 100 mm

Compliance assessment: Instrumental measurements, visual and experimental control as well as bench tests and running tests.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 21447-75 Automatic Coupler Contour Line. Dimensions GOST 31239-2004 1 520 mm Gauge Railway Car Automatic Coupler. Operating Safety Requirements
Latvia	TOR of the Latvian Railways Paragraph 436
Lithuania	ADV-001 Regulation on the Technical Operation of Railways 60/V Instruction for the Repair and Technical Maintenance of an Automatic Coupler of Rolling Stock
Poland	Not installed in rolling stock; all rolling stock single-unit
Russia	
Slovakia	TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	GOST 21447-75 Automatic Coupler Contour Line. Dimensions TsRB-0004. Technical Operating Rules for the Ukrainian Railways, Paragraph 11.5
Estonia	TOR, Paragraph 146

5.1.2.3 End coupling

Currently, requirements for this parameter are the same in all the countries: basically, the SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. Rolling stock with other types of couplers should be fitted with adapters for the coupling counter line in accordance with GOST 21447.

For locomotives and driving cars of multiple-units equipped with end automatic coupling devices of the SA-3 type, the height from the rail head to automatic coupler centreline should be not more than 1 080 mm and not less than 980 mm.

Belarus:

Inner couplings should ensure resilient connection between the units of rolling stock and withstand a specified excess of operating loads.

For locomotives equipped with automatic coupling devices of the SA-3 type, the grasp width of the coupling device and turning angle to the vertical axis of its joint should ensure the possibility of the coupling of the locomotive with cars located at the junction of a tangent track with a curve of a radius of 120 mm in accordance with the Standards for the Strength Calculations of 1 520 mm Gauge Cars (Non-Self-Propelled).

For multi-units and passenger train locomotives equipped with type SA-3 automatic coupling devices, the grasp width of the coupling device and turning angle to the vertical axis of its joint should ensure the possibility of coupling with cars located at the junction of a tangent track with a curve of a radius of 250 mm (Instruction OSJD O-522/1).

For locomotives and driving cars of multi-units equipped with end automatic coupling devices of the SA-3 type, the height from the rail head to automatic coupler centreline should be not more than 1 080 mm and not less than 980 mm.

Latvia and Lithuania, and Estonia:

The distance from the automatic coupler centreline to the surface of the rail head should be:

a) for locomotives and empty passenger and empty freight cars: not more than 1080 mm;

b) for locomotives and passenger cars carrying people: not less than 980 mm;

c) for loaded freight cars: not less than 950 mm.

Poland:

Coupler SA-3 GOST 22703-77 (parameters of the Russian Railways may be applied) with the possibility of replacement with a screw-type coupler – hook of type 6D in accordance with OSJD O 521.

Russia:

Different designs of coupling devices shall be permitted.

The end coupler should ensure resilient coupling between units of rolling stock and withstand standardised operating overloads.

For locomotives equipped with type SA-3 automatic coupling devices, the grasp width of the coupling device and turning angle to the vertical axis of its joint should ensure the possibility of the coupling of the locomotive with cars located at the junction of a tangent track with a curve of a radius of 120 mm in accordance with the Standards for the Strength Calculations of 1 520 mm Gauge Cars (Non-Self-Propelled).

For multi-units and passenger train locomotives equipped with type SA-3 automatic coupling devices, the grasp width of the coupling device and turning angle to the vertical axis of its joint should ensure the possibility of coupling with cars located at the junction of a tangent track with a curve of a radius of 250 mm (Instruction OSJD O-522/1).

For locomotives and driving cars of multi-units equipped with SA-3 type end automatic coupling devices of, the height from the rail head to automatic coupler centreline should be not more than 1 080 mm and not less than 980 mm.

Slovakia and Ukraine:

The end coupler should ensure resilient coupling between units of rolling stock and withstand standardised operating overloads.

The SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard end coupler in all kinds of rolling stock and locomotives.

The distance from the automatic coupler centreline to the surface of the rail head should be:

- for locomotives and empty passenger and empty freight cars: not more than 1080 mm
- for locomotives and passenger cars carrying people: not less than 980 mm
- for loaded freight cars: not less than 950 mm

Compliance assessment: Instrumental measurements and visual and experimental control.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 21447-75 Automatic Coupler Contour Line. Dimensions GOST 31239-2004 1 520 mm Gauge Railway Car Automatic Coupler. Operating Safety Requirements
Latvia	TOR of the Latvian Railways, Paragraph 398 OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
Lithuania	ADV-001 Regulation on the Technical Operation of Railways 60/V Instruction for the Repair and Technical Maintenance of an Automatic Coupler of Rolling Stock TOR of the Latvian Railways, Paragraph 239 OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
Poland	GOST 22703-91 Cast Pieces of Automatic Coupler Equipment for 1 520 mm Gauge Railway Rolling Stock. General Technical Conditions. With the possibility of replacement with a screw-type coupler – hook Type 6D in accordance with OSJD O 521 OSJD O 521
Russia	Instruction OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways TOR Standards for the Strength Calculations of 1 520 mm Gauge Cars (Non-Self-Propelled)
Slovakia	GOST 21447-75 Automatic Coupler Contour Line. Dimensions Instruction OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways TOR of the Slovak Railways. Part II – Rolling Stock and Repair Thereof
Ukraine	GOST 21447-75 Automatic Coupler Contour Line. Dimensions Instruction OSJD O-522/1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways TsRB-0004. Technical Operating Rules for the Ukrainian Railways, Paragraph 11.5
Estonia	TOR, Paragraph 146

5.1.2.4 Rescue coupling

Currently, requirements for this parameter are the same in all the countries: basically, the SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. Rolling stock with other types of couplers should be fitted with adapters for coupling counter line in accordance with GOST 21447.

For locomotives and driving cars of multi-units equipped with end automatic coupling devices of the SA-3 type, the height from the rail head to automatic coupler centreline should be not more than 1 080 mm and not less than 980 mm.

Belarus:

For rolling stock not equipped with a coupling system compatible with the type SA-3 automatic coupler, it is necessary to envisage the possibility of coupling with a type SA-3 automatic coupler through a rescue adapter, which should meet the following requirements:

- The design of the adapter should ensure a towage speed of at least 30 km/h;
- The design of the adapter should ensure reliable coupling of the towing vehicle and the towed rolling stock in all permissible traffic conditions;
- The adapter and its mount system should withstand the envisaged forces that occur when coupling and towing;
- The design of the adapter should provide for the possibility of its installation by one person without using any hoisting and transport devices;
- The design of the adapter should not interfere with the function of the brake system.

The height from the rail head to the automatic coupler centreline at the side of the coupling with the SA-3 automatic coupler should be not more than 1 080 mm and not less than 980 mm.

Latvia, Lithuania, and Estonia:

No rescue coupling is used, and the SA-3 automatic coupler is used as the standard coupler in all kinds of rolling stock.

Poland:

An adapter may be used only on cars, or a screw coupling may be used in accordance with the requirements of Instructions OSJD-520, 521, and 516.

Russia:

For rolling stock not equipped with a coupling system compatible with the type SA-3 automatic coupler, it is necessary to envisage the possibility of coupling with a type SA-3 automatic coupler through a rescue adapter, which should meet the following requirements:

- The design of the adapter should ensure a towage speed of at least 30 km/h;
- The design of the adapter should ensure reliable coupling of the towing vehicle and the towed rolling stock in all permissible traffic conditions;
- The adapter and its mount system should withstand the envisaged forces that occur when coupling and towing;

- The design of the adapter should provide for the possibility of its installation by one person without using any hoisting or transport devices;
- The design of the adapter should not interfere with the function of the brake system;

The height from the rail head to the automatic coupler centreline at the side of the coupling with the SA-3 automatic coupler should be not more than 1 080 mm and not less than 980 mm.

Slovakia and Ukraine:

An SA-3 automatic coupler with coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives.

Compliance assessment: Instrumental measurements and visual and experimental control.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 21447-75 Automatic Coupler Contour Line. Dimensions GOST 31239-2004 1 520 mm Gauge Railway Car Automatic Coupler. Operating Safety Requirements
Latvia	TOR of the Latvian Railways, Paragraph 396 Of referential character – GOST 21447-75 Automatic Coupler Contour Line. Dimensions GOST 3475-81 Automatic Coupler for Rolling Stock of 1 520 (1 524) mm Gauge Railways. Setting Dimensions OST 32.193-2002 Backlash-Free Coupling Devices of Locomotive-Hauled Passenger Cars and Passenger Cars of Multi-Unit Rolling Stock for 1 520 mm Gauge Railways. Coupler Contour Line and Setting Dimensions OSJD O-522.1 Technical Conditions for an Automatic Coupler of the Railways of the Organisation for Cooperation between Railways and the International Union of Railways
Lithuania	TOR, 60/V Instruction for the Repair and Technical Maintenance of an Automatic Coupler of Rolling Stock
Poland	OSJD-520, 521, and 516
Russia	TOR, Paragraph 11.5
Slovakia	OSJD-520, 521, 516 TOR of the Slovak Railways. Part II – Rolling Stock and Repair Thereof
Ukraine	GOST 21447-75 Automatic Coupler Contour Line. Dimensions TsRB-0004. Technical Operating Rules for the Ukrainian Railways
Estonia	

5.1.2.5 Staff access for coupling and uncoupling

Currently, requirements for this parameter are the same in all the countries: basically, the SA-3 automatic coupler with a coupling counter line in accordance with GOST 21447 is used as the standard coupler in all kinds of rolling stock and locomotives. The design of the coupling and its position within the rolling stock should ensure the safety of work of the servicing personnel and easy access for inspection, repair, and technical maintenance.

Couplings devices, which require the involvement of shunting masters for uncoupling of units of rolling stock, should be equipped with an uncoupling arrangement allowing the control of operations to be performed with coupling devices without the presence of shunting masters in the inter-car (inter-sectional) area at the moment of application of longitudinal compressive force.

Belarus:

The design of the automatic coupling and its position at the car should ensure the safety of work of the servicing personnel and easy access to parts of the car for inspection, repair, and technical maintenance.

Latvia:

The design of the automatic coupling and its position at the car should ensure the safety of work of the servicing personnel and easy access to parts of the car for inspection, repair, and technical maintenance.

Shunting locomotives shall be equipped with devices for uncoupling them from cars to be operated from the driver's cab.

Lithuania:

Types 1-4 diesel locomotives in accordance with GOST 22339-77, in addition to a manual coupler release rod, should be equipped with a remote drive enabling the uncoupling of the locomotive from the train (car) to be operated from the driver's cab.

The design of the coupling and its position at the car should ensure the safety of work of the servicing personnel and easy access to parts of the car for inspection, repair, and technical maintenance.

Poland:

Coupler GOST (parameters of the Russian Railways may be applied).

Russia:

The design of the coupling and its position within the rolling stock should ensure the safety of work of the servicing personnel and easy access for inspection, repair, and technical maintenance.

Manual coupling devices, which require the involvement of shunting masters for uncoupling of units of rolling stock, should be equipped with an uncoupling arrangement allowing the control of operations to be performed with coupling devices without the presence of shunting masters in the inter-car (inter-sectional) area at the moment of application of longitudinal compressive force (in accordance with the draft Amendments No. 2 to the Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT03 Electric Trains, and NB ZhT TsT04 Electric Locomotives. The amendments to NB

ZhT TsT 03 were put into effect in February 2009, and the introduction of changes to the other NB is expected to take place in March 2009).

Slovakia and Ukraine:

The design of the coupling and its position within the rolling stock should ensure the safety of work of the servicing personnel and easy access for inspection, repair, and technical maintenance.

Types 1-4 diesel locomotives should be equipped with remote drive enabling the uncoupling of the locomotive from the train (car) to be operated from the driver's cab.

At both ends of the locomotive (car), the automatic coupling should have drive units for the uncoupling of the automatic coupling to be serviced from the right side of the locomotive (car) by means of a rod.

Methods of compliance assessment: Visual and experimental control.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 31239-2004 1 520 mm Gauge Railway Car Automatic Coupler. Operating Safety Requirements
Latvia	TOR of the Latvian Railways Paragraph 385 GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (Informatory)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	UIC 560
Russia	Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, NB ZhT TsT 04 Electric Locomotives.
Slovakia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Estonia	

5.1.3 Inter-car and inter-section gangways

Currently, requirements for this parameter are the same in all the countries: for multi-units, the width of the vestibule platform should be not less than 600 mm (Ukraine – not less than 700 mm for balloon-type vestibule platforms of new rolling stock), and height should be not less than 1 800 mm. Vestibule platforms should be equipped with handrails. Means for preventing passengers from gaining access to non-coupled vestibule platforms should be envisaged.

For Member States of the European Union, the requirements of the TSI PRM (Clause 4.2.2.7) shall apply to new rolling stock.

Belarus:

If a gangway is envisaged as a means for the passage of passengers from one car to another or from one train section to another, passengers should not be exposed to risk when passing.

The provisions of the standards GOST 30487-97 Electric Trains for Suburban Communication, General Safety Requirements, draft GOST Rail Buses, General Technical Requirements, and draft Amendments No. 2 to the Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 03 Electric Trains apply to gangways of multi-units.

Means for preventing passengers from getting access to non-coupled vestibule platforms should be envisaged.

The width of the vestibule platform should be not less than 600 mm, and height should be not less than 1 800 mm. Vestibule platforms should be equipped with handrails.

Doors of vestibule platforms should open inward to the car.

Latvia and Lithuania:

Multi-section locomotives should have closed platforms for passing from one section to another:

- Width: not less than 600 mm;
- Height: not less than 1 800 mm.

Poland and Slovakia:

Gangways are not available in the existing rolling stock; there is no electric train type rolling stock.

Russia:

If a gangway is envisaged as a means for the passage of passengers from one car to another or from one train section to another, passengers should not be exposed to risk when passing.

The provisions of the standards GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements, draft GOST Rail Buses. General Technical Requirements, and draft Amendments No. 2 to the Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 03 Electric Trains apply to gangways of multi-units.

Means for preventing passengers from getting access to non-coupled vestibule platforms should be envisaged.

The width of the vestibule platform should be not less than 600 mm, and height should be not less than 1 800 mm. Vestibule platforms should be equipped with handrails.

Doors of vestibule platforms should open inward the car.

Ukraine:

Multi-section locomotives should have closed (balloon-type) platforms for passing from one section to another:

- Width: at least 600 mm;
- Height: at least 1 800 mm.

Cars of multi-unit rolling stock should have closed (balloon-type) platforms, equipped with handrails of handles, for the passage of servicing personnel and passengers from one car to another:

- Width: at least 700 mm;
- Height: at least 1 800 mm.

The design of doors should ensure free passage.

Doors of vestibule platforms should open inward to the car.

Compliance assessment: Instrumental measurements and linear measurements.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 03 Electric Trains
Latvia	Of referential character – GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements, Paragraph 1.2 NB ZhT TsT 01 Diesel Trains, Table 1, Paragraph 47, Column 3 NB ZhT TsT 03 Electric Trains, Table 1, Paragraph 41, Column 3 NB ZhT TsT02-98 Diesel Locomotives. Certification Requirements, Table 1, Paragraph 47, Column 4 NB ZhT TsT02-98 Diesel Locomotives. Certification Requirements
Lithuania	Instruction UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans TSI PRM
Poland	UIC 560
Russia	GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements, Paragraph 3.4.1 Draft GOST Rail Buses. General Technical Requirements Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 03 Electric Trains
Slovakia	Instruction UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans TSI PRM TOR of the Slovak Railways. Part II – Rolling Stock and Repair Thereof
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements, Paragraph 1.2 DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and

	Electric Trains. Safety Requirements, Paragraph. 4.4
Estonia	

5.1.4 Strength of vehicle structure

Currently, requirements for this parameter in all the countries differ; however, they are mostly be covered by the requirements applicable in Russia and Ukraine.

The standard collision force is as follows:

- for a passenger locomotive – 2 000 kN.;
- for a freight locomotive – 2 500 kN.

The standard collision force for electric trains (within brackets, for diesel trains) is as follows:

- 2 500 (2 000) kN. – for the front cantilever part of the carbody of the head car, the construction whereof involves non-corrosion resistant materials. The cantilever part of the carbody means the end part of the carbody including all elements by which the carbody rests on the bogie;
- 2 000 (1 500) kN. – for car areas occupied by passengers and/or servicing personnel.

Calculation standards. Longitudinal compression and tension forces of the carbody and frame of diesel trains:

- Passenger: 1 960 kN.
- Freight: 2 450 kN.
- For cantilever parts: 2 940 kN.

Belarus:

The carbody of a car in multi-unit rolling stock is made of all-steel and the supporting structure, composed of a set of longitudinal and transversal stiffeners, is covered with a thin steel sheet.

Longitudinal stiffeners (lateral frame rails, top frame angles of side walls, corrugations of side walls and roof) and transversal (posts of side walls, roof bows, and transversal frame rails) are assembled into a complex structure, which ensures simultaneous operation of all elements of the carbody). The frame of the carbody is welded without a centre sill. A welded girder connecting the buffer beam with the bolster beam and transferring traction and buffing forces through diagonals to lateral elements of the carbody is located centrally in the cantilever part of the frame.

Obligatory requirements for strength parameters of rolling stock are specified in the Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, and NB ZhT TsT 04 Electric Locomotives.

The standard value of strength of the carbody elements is the non-exceedance of constraints σ arising in the supporting elements of the carbody (for multi-units when empty) under the impact of the standard collision force, yield limit of $\sigma 0.2$ of the material used in

manufacturing: $\sigma \leq \sigma 0.2$, where the value of σ is determined by lateral approximation (interpolation/extrapolation) by the method of least squares of stresses registered during tests.

The standard collision force is as follows:

- for a passenger locomotive: 2 000 kN;
- for a freight locomotive: 2 500 kN.

The standard collision force for electric trains (within brackets, for diesel trains) is as follows:

- 2 500 (2 000) kN. – for the front cantilever part of the carbody of the head car, the construction whereof involves non-corrosion resistant materials. The cantilever part of the carbody means the end part of the carbody including all elements by which the carbody rests on the bogie;
- 2 000 (1 500) kN. – for car areas occupied by passengers and/or servicing personnel.

It is permitted to reduce the standard collision force to 1 500 kN. for car areas not occupied by passengers and/or servicing personnel and considered as casualty areas in case of collision. For long-distance multi-unit rolling stock, car vestibules can be considered as casualty areas if it is specified in the technical documentation.

If the standard force of 1 500 kN. is established for casualty areas of the carbody, the maximum collision force in collision tests is limited to the value of 1 500 kN. Stresses in the supporting elements of the carbody of the occupied area are extrapolated to the corresponding value of collision force, i.e. 2 000 and/or 2 500 kN.

The first natural frequency of bending vibrations of the carbody in the vertical plane should be at least 8 Hz.

The safety factors of the fatigue strength of the vehicle structures, with the exception of wheelsets, traction drive shafts, toothed wheels, bolster springs, and springs of the spring suspensions, should be as follows:

- for steel structures – at least 2.0;
- for aluminium alloy structures – at least 2.2.

The structural strength of bogie frames and subframes (beams) of the secondary spring suspension is determined during vibration bench tests. No fatigue cracks should appear on frames and beams after 10 million cycles of load.

Latvia:

Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Obligatory requirements for strength parameters of rolling stock are specified in the Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, and NB ZhT TsT 03 Electric Trains.

or

LVS EN 12663 Railway Applications. Structural requirements of railway vehicle bodies.

Note. When designing bodies and supporting assemblies of bogies in accordance with the standards of the Ministry of Railways of the Russian Federation, 11 different loads grouped into 4 basic schemes are taken into account, and certain standards are established for each kind of load.

The standard LVS EN 12663 contains not more than four design loads, and not all the loads are strictly regulated.

Since strength criteria are related to design loads and schemes for the application thereof, strength assessment in accordance with the two regulatory documents will not be adequate. Special analysis is required for their correlation.

Lithuania:

The requirements of GOST 31187-2003 were incorporated in the technical assignment for the designing of new diesel locomotives.

Requirements in accordance with: Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1997,

Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Locomotive Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1997,

and

LST EN 12663 Railway Applications. Structural requirements of railway vehicle bodies.

After the entry into force of the TSI LOC&PAS for newly designed rolling stock, the requirements of the document will also apply.

Poland:

PN-EN 12663-1:2010.

For the existing rolling stock, the same as for 1 520 mm gauge (the parameters of the Russian Railways may be applied).

For newly built locomotives, in accordance with the TSI LOC&PAS.

Russia:

The following regulatory documents are in force:

Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Obligatory requirements for strength parameters of rolling stock are specified in the Safety Standards NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, and NB ZhT TsT 04 Electric Locomotives.

The standard value of strength of the carbody elements is the non-exceedance of stresses σ arising in the supporting elements of the carbody (for multi-units when empty) under the impact of the standard collision force, yield limit of σ0.2 of the material used in manufacturing: $\sigma \leq \sigma 0.2$, where the value of σ is determined by lateral approximation (interpolation/extrapolation) by the method of least squares of stresses registered during tests.

The standard collision force is as follows:

- for a passenger locomotive: 2 000 kN;
- for a freight locomotive: 2 500 kN.

The standard collision force for electric trains (within brackets, for diesel trains) is as follows:

- 2 500 (2 000) kN. – for the front cantilever part of the carbody of the head car, the construction whereof involves non-corrosion resistant materials. The cantilever part of the carbody means the end part of the carbody including all elements by which the carbody rests on the bogie;
- 2 000 (1 500) kN. – for car areas occupied by passengers and/or servicing personnel.

It is permitted to reduce the standard collision force to 1 500 kN. for car areas not occupied by passengers and/or servicing personnel and considered as casualty areas in case of collision. For long-distance multi-units, car vestibules can be considered as casualty areas if it is specified in the technical documentation.

If the standard force of 1 500 kN. is established for casualty areas of the carbody, the maximum collision force in collision tests is limited to the value of 1 500 kN. Stresses in the supporting elements of the carbody of the occupied area are extrapolated to the corresponding value of collision force, i.e. 2 000 and/or 2 500 kN.

The first natural frequency of bending vibrations of the carbody in the vertical plane should be at least 8 Hz.

The safety factors of the fatigue strength of the vehicle structures, with the exception of wheelsets, traction drive shafts, toothed wheels, bolster springs, and springs of the spring suspensions, should be as follows:

- for steel structures: at least 2.0;
- for aluminium alloy structures: at least 2.2.

The structural strength of bogie frames and subframes (beams) of the secondary spring suspension is determined during vibration bench tests. No fatigue cracks should appear on frames and beams after 10 million cycles of load.

Slovakia:

EN standards apply; however, for longitudinal loads, these standards should be adapted to the conditions of the 1 520 mm gauge system.

Ukraine:

Strength safety factor: at least 2.

Supporting elements of the carbody frame and bogie frames should be made of materials specified in the Basic Technical Requirements for Prospective Rolled Steel for Carrying Welded Structures of Rolled Stock.

The standard collision force is as follows:

- for a passenger locomotive: 2 000 kN;
- for a freight locomotive: 2 500 kN.

The standard collision force for electric trains (within brackets, for diesel trains) is as follows:

- 2 500 (2 000) kN. for the front cantilever part of the carbody of the head car, the construction whereof involves non-corrosion resistant materials. The cantilever part of the carbody means the end part of the carbody including all elements by which the carbody rests on the bogie;
- 2 000 (1 500) kN. for car areas occupied by passengers and/or servicing personnel.

Calculation standards. Longitudinal compression and tension forces of the carbody and frame of diesel trains:

- Passenger: 1 960 kN.
- Freight: 2 450 kN.
- For cantilever parts: 2 940 kN.

The aforementioned requirements are approved by the following documents:

Methods of compliance assessment: Tests, calculation, weighing on the weighing bench, and visual control.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, NB ZHT TST 04 Electric Locomotives.
Latvia	Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Paragraph 2.2 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998. Paragraph

	2.2 NB ZhT TsT 01 Diesel Trains Table 1, Paragraph 13.1 NB ZhT TsT 03 Electric Trains Table 1, Paragraph 12.1 NB ZhT TsT02-98 Diesel Locomotives. Certification Requirements. Table 1, Paragraph 10.1 or – LVS EN-12663 Railway application structural requirements of railway vehicle body
Lithuania	GOST 31187-2003 (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Locomotive Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1998 LST EN 12663 Railway Applications. Structural requirements of railway vehicle bodies TSI LOC&PAS
Poland	TSI LOC&PAS PN-EN 12663-1:2010
Russia	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Basic Technical Requirements for Prospective Rolled Steel for Carrying Welded Structures of Rolled Stock Safety standards: NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, NB ZhT TsT 04 Electric Locomotives
Slovakia	EN 12663 Railway applications. Structural requirements of railway vehicle body
Ukraine	ST SSFZhT TsT 15-98 ST SSFZhT TsT 16-98 Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit

	Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Basic Technical Requirements for Prospective Rolled Steel for Carrying Welded Structures of Rolled Stock Calculation standards
Estonia	

5.1.5 Passive safety

Currently, no. requirements for this parameter in the 1 520 mm gauge track system are established.

Latvia and Lithuania:

No standards are available.

Poland and Slovakia:

It is not available in the existing rolling stock.

For newly built locomotives, in accordance with the TSI LOC&PAS.

Russia:

No standards for crash systems are established in Russia. During 2009-2010, it is planned to develop new regulatory documents similar to EN 15227 regarding the application and designing of crash systems for rolling stock with a design speed of 160 km/h and above on the basis of collision scenarios. However, the parameters to be standardised and the design scenarios themselves are likely to differ from EN because statistics of collisions on the Russian Railways differ significantly from those in Europe.

Ukraine:

The design of rolling stock should comply with safety requirements throughout the whole period of operation subject to compliance with the requirements of the standards, technical specifications, instructions, and technical operating rules effective within the territory of Ukraine.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	No standards are available
Lithuania	
Poland	PN-EN 15227:2008
Russia	No standards are available
Slovakia	
Ukraine	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the

	Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation. GOST 12.2.056-81 Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements. Paragraph 4.1.13
Estonia	

5.1.6 Lifting and jacking

Currently, requirements for this parameter are the same in all the countries:

The design of the carbody frame should allow for the possibility to lift the carbody, including all the equipment, by means of four jacks or a hoisting crane as well as allow for the possibility to lift the carbody from one end (when removing or placing a bogie). The carbody should be hoisted at special points, and the lifting of the carbody frame should not cause any residual deformation.

The structure of the carbody should be designed and tested for loads occurring when lifting the equipped carbody (for multi-units when empty) by two jacks installed in the area of bolster beams of the frame diagonally as well as loads occurring in case of emergency lifting at the automatic coupler (end part of the carbody). This should not result in any residual deformations or loss of the stability of the structure elements.

Poland:

On the existing rolling stock, four fixation points.

On the existing locomotives, in accordance with the technical documentation DTR i WTO and UIC 438-3.

Belarus, Latvia, Lithuania, and Russia:

The following regulatory documents are in force:

Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation

The structure of the carbody should be designed and tested for loads occurring when lifting the equipped carbody (for multi-units when empty) by two jacks installed in the area of bolster beams of the frame diagonally as well as loads occurring in case of emergency lifting at the automatic coupler (end part of the carbody). This should not result in any residual deformations or loss of the stability of the structure elements.

Ukraine and Slovakia:

The design of the carbody frame should allow for the possibility to lift the carbody, including all the equipment, by means of four jacks or a hoisting crane as well as allow for the possibility to lift the carbody from one end (in case of removing or placing a bogie). The carbody should be hoisted at special points, and the lifting of the carbody frame should not cause any residual deformation.

The structure of the carbody should be designed and tested for loads occurring when lifting the equipped carbody (for multi-units when empty) by two jacks installed in the area of bolster beams of the frame diagonally as well as loads occurring in case of emergency lifting at the automatic coupler (end part of the carbody). This should not result in any residual deformations or loss of the stability of the structure elements.

Compliance assessment: .

The aforementioned requirements are approved by the following documents:

Belarus	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.
Latvia	Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998
Lithuania	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Locomotive Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1998 The same as in Russia
Poland	UIC 438-3
Russia	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation

	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.
Slovakia	UIC 438 TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.
Estonia	

5.1.7 Fixing of devices to carbody structure

Currently, requirements for this parameter are the same in all the countries:

Attachments for mounting the main equipment at the locomotive body are designed on the basis of longitudinal acceleration of 6 g and lateral acceleration of 0.4 g. The transversal acceleration of all frames of the locomotive bogie parts is assumed as 1.5 g, and the longitudinal acceleration is assumed as 3 g.

Inertial forces for the designing of parts of the interface between the body of multi-unit rolling stock and the bogie are determined on the basis of the acceleration of the bogie weight alongside the track centreline, which is equal to 3 g for motored bogies and to 6 g for non-motored bogies.

Stresses in designed elements under the impact of this force, added up with static stresses due to the gross gravity of the locomotive or car, should not exceed 0.9 of the yield limit of the material.

Suspended equipment, the reliability of mounting whereof determines traffic safety and which contains rotating parts and/or has weight of at least 500 kg, as well as brake gears and brake beams should be fitted with a securing device preventing them from falling down in the event of failure of the main mounting system.

Securing devices should be designed for a force equal to the double gravity (weight) of the equipment to be protected. Maximum design stresses σ in the securing devices should not exceed the yield limit of the material (σ0.2), from which they are made.

Hinged parts, which in the event of failure may drop on the track and affect traffic safety, should be fitted with securing devices designed for a load of at least double gravity of the element fitted with the securing device.

Poland:

Mounting of devices – outside the area intended for maintenance.

Latvia, Lithuania, and Russia:

The following regulatory documents are in force:

Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Attachments for mounting the main equipment at the locomotive body are designed on the basis of longitudinal acceleration of 6 g and lateral acceleration of 0.4 g. The transversal acceleration of all frames of the locomotive bogie parts is assumed as 1.5 g, and the longitudinal acceleration is assumed as 3 g.

Inertial forces for the designing of parts of the interface between the body of multi-units and the bogie are determined on the basis of the acceleration of the bogie weight alongside the track centreline, which is equal to 3 g for motored bogies and to 6 g for non-motored bogies.

Stresses in designed elements under the impact of this force, added up with static stresses due to the gross gravity of the locomotive or car, should not exceed 0.9 of the yield limit of the material.

Suspended equipment, the reliability of mounting whereof determines traffic safety and which contains rotating parts and/or has weight of at least 500 kg, as well as brake gears and brake beams should be fitted with a securing device preventing them from falling down in the event of failure of the main mounting system.

Securing devices should be designed for a force equal to the double gravity (weight) of the equipment to be protected. Maximum design stresses σ in the securing devices should not exceed the yield limit of the material ($\sigma 0.2$), from which they are made.

Slovakia:

The standards of EN 12663 are applied.

Belarus and Ukraine:

Attachments for mounting the main equipment at the locomotive body are designed on the basis of longitudinal acceleration of 6 g and lateral acceleration of 0.4 g. The transversal acceleration of all frames of the locomotive bogie parts is assumed as 1.5 g, and the longitudinal acceleration is assumed as 3 g.

Inertial forces for the designing of parts of the interface between the body of multi-units and the bogie are determined on the basis of the acceleration of the bogie weight alongside the track centreline, which is equal to 3 g for motored bogies and to 6 g for non-motored bogies.

Stresses in designed elements under the impact of this force, added up with static stresses due to the gross gravity of the locomotive or car, should not exceed $0.9\sigma T$ of the yield limit of the material.

Hinged parts, which in the event of failure may drop on the track and affect traffic safety, should be fitted with securing devices designed for a load of at least double gravity of the element fitted with the securing device.

Suspended equipment, the reliability of mounting whereof determines traffic safety and which contains rotating parts and/or has weight of at least 500 kg, as well as brake gears and brake beams should be fitted with a securing device preventing them from falling down in the event of failure of the main mounting system.

Securing devices should be designed for a force equal to the double gravity (weight) of the equipment to be protected. Maximum design stresses σ in the securing devices should not exceed the yield limit of the material (σ0.2), from which they are made.

The aforementioned requirements are approved by the following documents:

Belarus	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, NB ZhT TsT 04 Electric Locomotives.
Latvia	Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998 NB ZhT TsT 01 Diesel Trains NB ZhT TsT 03 Electric Trains NB ZhT TsT02-98 Diesel Locomotives. Certification Requirements or – LVS EN-12663 Railway application structural requirements of railway vehicle body
Lithuania	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1997 (Informative)

	Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Locomotive Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1998 (Informative) Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informative) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informative)
Poland	
Russia	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Safety standards: NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, NB ZhT TsT 04 Electric Locomotives
Slovakia	Standards of EN 12663 TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	ST SSFZhT TsT 15-98 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and

	Electric Trains. Safety Requirements
Estonia	

5.1.8 Staff and freight access doors

Currently, requirements for this parameter are the same in all the countries:

	Doorway height (minimum)	Doorway width (minimum)
External door of the service vestibule	1 680 mm	530 mm
Driver's cab	1 740 mm	530 mm
Hood or hatch	1 230 mm	
Rolling stock service vestibule door	1 680 mm	530 mm
Driver's cab door	1 780 mm	530 mm

Doors of vestibule platforms and service vestibule of the head car as well as entrance doors at locomotives should open inward the car vestibule (machinery compartment).

Special parameters for external service doors, which are intended for the provision of service needs (loading and unloading of foodstuffs, service facilities, etc.) and not used in the process of the train trip, are not standardised. Technical requirements specify the need of the availability of locking devices and an open-door stopper. In the open position, such doors should not obstruct or limit passage for passengers.

Belarus:

For electric trains:

	Doorway height	Doorway width
External door of the service vestibule	minimum 1 680 mm	minimum 530 mm
Driver's cab	minimum 1 740 mm	minimum 530 mm

Doors of vestibule platforms and service vestibule of the head car as well as entrance doors at locomotives should open inward to the car vestibule (machinery compartment).

Latvia:

Doors of the machinery and service compartments and of the service vestibule should open inward to the compartment.

	Doorway height	Doorway width
External door of the service vestibule	1 680 mm	530 mm
Driver's cab	1 740 mm	530 mm
Rolling stock service vestibule door	1 680 mm	530 mm
Driver's cab door	1 780 mm	530 mm

Lithuania:

The requirements stipulated in GOST 12.2.056-81, Paragraph 1.2.4.

Instruction UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland:

Instruction UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans.

They are not available in the existing rolling stock.

There is no rolling stock of passenger type.

Russia:

This clause does not cover doors intended for use by passengers and the driver's cab doors.

Special parameters for external service doors, which are intended for the provision of service needs (loading and unloading of foodstuffs, service facilities, etc.) and not used in the process of the train trip, are not standardised. Technical requirements specify the need of the availability of locking devices and open-door stopper. In the open position, such doors should not obstruct or limit passage for passengers.

Slovakia:

This clause does not cover doors intended for use by passengers and the driver's cab doors.

Ukraine:

Doors of the machinery and service compartments and of the service vestibule should open inward to the compartment.

- Locomotive doors: Width and height – minimum 530 mm and 1 780 mm, correspondingly
- Hood or hatch: Height – minimum 1 230 mm
- Rolling stock service vestibule door: Width and height – minimum 530 mm and 1680 mm, correspondingly
- Driver's cab door: Width and height – minimum 530 mm and 1780 mm, correspondingly

Methods of compliance assessment: linear measurements.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements

Latvia	Of referential character – GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements Paragraph 1.2.4.
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements Instruction UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans
Poland	Instruction UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans
Russia	
Slovakia	
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements, Paragraph 1.2.4 Paragraph 4.5.5, Paragraph 4.5.6 DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.1.9 Mechanical characteristics of glass

Currently, requirements for this parameter are different in all the countries:

Car windows should be designed for overpressure and/or underpressure of at least 2 000 Pa from the head shock wave from the train passing by the adjacent track (Russia).

Belarus:

The requirements are established by STB 1639-2006 and GOST 13521-68.

Latvia

Windshields should withstand the impact of a ball with a weight of (227+2) g at temperatures plus (40±2) °C and minus (20± 2) °C. The drop height of the ball and weight of glass fragments that came off from the side opposite to the impact should comply with the table below.

Actual glass thickness, mm	**Drop height, m At temperature**		**Weight of glass fragments**
	-20 C	**+ 40 C**	
Up to 4.5 inclusively	8.5	9.0	12
over 4.5”, 5.5”	9.0	10	16
5.5” , 6.5”	9.5	11	20
6.5”	10	12	25

At least eight of ten samples tested at each temperature value should not split into separate fragments, and the ball should not pass through at least eight samples.

Windshields should be resistant to penetration by a ball with a weight of (2 260±20) g and diameter of approximately 82 mm from a height of (4+025-0) m. The ball should not penetrate through the glass within 5 seconds after the impact. Windshields should withstand the impact of an anthropomorphic dummy falling from a height of (1.5+0-0.005) m. The impact should cause formation of numerous radial and circular cracks. The distance from the impact point to the closest circular crack should not exceed 80 mm. Glass fragments should not detach from the glue film. Detachment of one or several glass fragments with a width not exceeding 4 mm from both sides of cracks within a circle with a diameter of 60 mm with the centre in the impact point is permitted. The intermediate layer should not become exposed at the impact side within an area exceeding 20cm^2. Occurrence of a rupture with a length of up to 35 mm at the intermediate layer is permitted.

Lithuania:

Requirements in accordance with the Instruction UIC 564-1 Windows made from safety glass.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland:

UIC 564-1, UIC 625-2, PN-B-13059-1985.

Russia:

The requirements are stipulated by GOST 5727 and GOST 13521.

Car windows should be designed for overpressure and/or underpressure of at least 2 000 Pa from the head shock wave from the train passing by the adjacent track.

Slovakia:

UIC 564-1

Ukraine:

Glasses should prevent perceptual aberration of signal colours. The transmission factor for the visible portion of the spectrum shall be as follows:

- at least 75 % for tempered safe glasses;

- at least 70 % for toughened glasses.

In terms of dynamic strength, toughened glass of windshields should withstand the impact by a stone or bottle with a weight of 0.5 kg flying at a speed equal to the double design speed of the traction rolling stock and prevent the penetration by such stone or bottle. Toughened electrically-heated glass should be fitted with an automatic controller preventing the overheating of the glass.

The aforementioned requirements are approved by the following documents:

Belarus	STB 1639-2006 Safety Glass for Land Transport. General Technical Conditions GOST 13521-68 Window Glass of Passenger Cars, Electric Trains, and Diesel Trains. Main Dimensions and Technical Requirements
Latvia	Of referential character – GOST 5727-88 Safety Glass for Land Transport. General Technical

	Conditions. GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions
Lithuania	Instruction UIC 564-1 Windows made from safety glass
Poland	UIC 564-1, UIC 625-2, PN-B-13059-1985
Russia	GOST 5727 GOST 5533 GOST 13521
Slovakia	UIC 564-1
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements, Paragraph 3.2 Paragraph 4.8.6 – Paragraph 4.8.8, 10.2 DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions
Estonia	

5.1.10 Load conditions and weighted mass

Currently, requirements for this parameter are the same in all the countries:

The weight of multi-unit rolling stock is assumed as the weight of car tare plus the equivalent weight of train personnel, inventory, foodstuffs, and passengers with luggage (with regard to the occupancy rate). For long-distance trains, the weight of one passenger with luggage (member of the train crew) is assumed as equal to 100 kg, and that for suburban trains is assumed as equal to 70 kg.

The maximum occupancy rate is used for the calculation of the mechanical strength and braking parameters. For suburban trains, the number of passengers in a car is assumed on the basis of the accommodation of sitting passengers on all passenger seats and standing passengers in passages and car vestibules with a density of 7 persons/m^2 (for Ukraine – 5 persons/m^2). For long-distance trains, the design occupancy rate of cars is limited to the number of berths/seats for the accommodation of passengers.

Latvia:

In accordance with the Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, the maximum passenger load is as follows:

- for strength calculations – 7 persons/ m^2;

- for traction calculations – 5 persons/m^2 or 150 % seats.

In accordance with the standard LVS EN-12663 Railway Application Structural requirements for Railway Vehicle Body, the maximum passenger load is as follows:

- for strength calculations – 5-10 persons/m^2; for certain trains – 4 persons/ m^2;

- for traction calculations – is not defined.

Lithuania:

The gravity (weight) of passengers is determined under the maximum design occupancy rate of a car.

The gravity (weight) of passengers is determined under the maximum design occupancy rate of a car and car vestibules with standing passengers at a rate of 7 persons per 1 m^2. The area between benches occupied by passengers' legs/feet (at a length of 200 mm at the bench edge) is not taken into account.

The average weight of a passenger with luggage is assumed as equal to 70 kg. When designing separate elements of the structure and their mounting assemblies, the actual gravity of passengers loading that element is taken into account.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland and Slovakia:

EN-12663-1:2010

There is no passenger communication at 1 520 mm gauge lines. The requirements of the Instruction UIC are applied.

Belarus and Russia:

Weight characteristics of rolling stock for the carriage of passengers are defined by the safety requirements NB ZhT TsT 01 Diesel Trains, NB ZHT, and NB ZhT TsT 03 Electric Trains.

For electric railcars and motor railcars, which can be operated as single-unit, the wheel load on rail of at least 55 kN. is designed in order to ensure cohesiveness with the rail track circuit.

The weight of multi-units is assumed as the weight of car tare plus the equivalent weight of train personnel, inventory, foodstuffs, and passengers with luggage (with regard to the occupancy rate). For long-distance trains, the weight of one passenger with luggage (member of the train crew) is assumed as equal to 100 kg, and that for suburban trains is assumed as equal to 70 kg.

For equipment heating calculations and determination of scheduled travel time for suburban trains, the number of passengers in a car is assumed on the basis of the accommodation of sitting passengers on all passenger seats and standing passengers in passages and car vestibules with a density of 3 persons/m^2. For long-distance trains, the design occupancy rate of cars is limited to the number of berths/seats for the accommodation of passengers.

The maximum occupancy rate is used for the calculation of the mechanical strength and braking parameters. For suburban trains, the number of passengers in a car is assumed on the basis of the accommodation of sitting passengers on all passenger seats and standing passengers in passages and car vestibules with a density of 7 persons/m^2. For long-distance trains, the design occupancy rate of cars is limited to the number of berths/seats for the accommodation of passengers.

Ukraine:

The weight of multi-units is assumed as the weight of car tare plus the equivalent weight of train personnel, inventory, foodstuffs, and passengers with luggage (with regard to the occupancy rate). For long-distance trains, the weight of one passenger with luggage (member of the train crew) is assumed as equal to 100 kg, and that for suburban trains is assumed as equal to 70 kg.

The maximum occupancy rate is used for the calculation of the mechanical strength and braking parameters. For suburban trains, the number of passengers in a car is assumed on the basis of the accommodation of sitting passengers on all passenger seats and standing passengers in passages and car vestibules with a density of 5 persons/m^2. For long-distance trains, the design occupancy rate of cars is limited to the number of berths/seats for the accommodation of passengers.

The aforementioned requirements are approved by the following documents:

Belarus	Safety standards: NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 03 Electric Trains
Latvia	Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998 NB ZhT TsT 01 Diesel Trains NB ZhT TsT 03 Electric Trains NB ZhT TsT02-98 Diesel Locomotives. Certification Requirements or – LVS EN-12663 Railway application structural requirements of railway vehicle body
Lithuania	LST EN 12663 Railway Applications. Structural requirements of railway vehicle bodies (Informatory) TSI LOC&PAS
Poland	EN-12663-1:2010 There is no passenger communication on 1 520 mm gauge lines
Russia	Safety standards: NB ZhT TsT 01 Diesel Trains, NB ZHT, NB ZhT TsT 03 Electric Trains
Slovakia	EN-12663-1:2010 There is no passenger communication on 1 520 mm gauge lines
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and

	Electric Trains. Safety Requirements
Estonia	

5.2 TRACK IMPACT AND CLEARANCE GAUGE OF ROLLING STOCK

5.2.1 Clearance gauge of rolling stock

Currently, requirements for this parameter are the same in all the countries: the following clearance gauges are applied: T, 1-T, 1-VM, 0-VM, 02-VM, and 03-VM in accordance with GOST 9238.

Belarus and Latvia

Clearance gauge of rolling stock means the transverse contour (perpendicular to the track centreline), within which both new rolling stock and rolling stock with maximum standardised wear rates, both empty and loaded, should fit without extending when placed on a horizontal track (in the least favourable position in the track gauge and absence of lateral inclinations on springs and dynamic fluctuations); (GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways).

Identification marking and area of application of clearance gauges of rolling stock shall be assumed as follows:

T – for rolling stock permitted to operate on public and private tracks of the Republic of Latvia as well as external and internal sidings of industrial and transport enterprises, structures and facilities whereof meet the requirements for clearance diagrams S (with a top contour for non-electrified lines) and Sp;

Tts – for tank-cars and dump-cars permitted to operate on public and private tracks of the Republic of Latvia as well as external and internal sidings of industrial and transport enterprises, structures and facilities whereof meet the requirements stipulated by the Instruction for the Application of Clearance Diagrams and Gauge of Rolling Stock;

Tpr – for open cars permitted to operate on public and private tracks of the Republic of Latvia as well as external and internal sidings of industrial and transport enterprises, structures and facilities whereof meet the requirements stipulated by the Instruction for the Application of Clearance Diagrams and Gauge of Rolling Stock;

1-T – for rolling stock permitted to operate on all public and private tracks of the Republic of Latvia, external and internal sidings of industrial and transport enterprises as well as permitted to operate in international traffic on all tracks of 1 520 (1 524) mm gauge;

1-VM – for rolling stock permitted to operate on both all public tracks of the railways of the Republic of Latvia with a gauge of 1 520 (1 524) mm and on trunk lines and a number of other lines of member railways of the Organisation for Cooperation of Railways (OSJD) with a gauge of 1 435 mm used for international traffic;

0-VM – for rolling stock permitted to operate on both all public tracks of the railways of the Republic of Latvia and other countries with a gauge of 1 520 (1 524) mm and on all main lines of member railways of the OSJD with a gauge of 1 435 mm;

02-VM – for rolling stock permitted to operate on both all public tracks of the railways of the Republic of Latvia and other countries with a gauge of 1 520 (1 524) mm and on all member railways of the OSJD with a gauge of 1 435 mm;

03-VM – for rolling stock permitted to operate on both all public tracks of the railways of the Republic of Latvia and other countries with a gauge of 1 520 (1 524) mm and on all railways of European and Asian countries with a gauge of 1 435 mm.

Lithuania

The clearance gauge of rolling stock should comply with the requirements of the standard.

1. ADV-001 Regulation on the Technical Operation of Railways (Techninio geležinkelio naudojimo nuostatai).

2. GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways.

Clearance gauge of rolling stock means the transverse contour (perpendicular to the track centreline), within which both new rolling stock and rolling stock with maximum standardised wear rates, both empty and loaded, should fit without going beyond when placed on a horizontal track (in the least favourable position in the track gauge and absence of lateral inclinations on springs and dynamic fluctuations); (GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways).

Identification marking and area of application of clearance gauges of rolling stock shall be assumed as follows:

T – for rolling stock permitted to operate on public and private tracks of the Republic of Lithuania as well as external and internal sidings of industrial and transport enterprises, structures and facilities whereof meet the requirements for clearance diagrams S (with a top contour for non-electrified lines) and Sp;

Tts – for tank-cars and dump-cars permitted to operate on public and private tracks of the Republic of Lithuania as well as external and internal sidings of industrial and transport enterprises, structures and facilities whereof meet the requirements stipulated by the Instruction for the Application of Clearance Diagrams and Gauge of Rolling Stock;

Tpr – for open cars permitted to operate on public and private tracks of the Republic of Lithuania as well as external and internal sidings of industrial and transport enterprises, structures and facilities whereof meet the requirements stipulated by the Instruction for the Application of Clearance Diagrams and Gauge of Rolling Stock;

1-T – for rolling stock permitted to operate on all public and private tracks of the Republic of Lithuania, external and internal sidings of industrial and transport enterprises as well as permitted to operate in international traffic on all tracks of 1 520 (1 524) mm gauge;

1-VM – for rolling stock permitted to operate on both all public tracks of the railways of the Republic of Lithuania with a gauge of 1 520 (1 524) mm and on trunk lines and a number of other lines of member railways of the Organisation for Cooperation of Railways (OSJD) with a gauge of 1 435 mm used for international traffic;

0-VM – for rolling stock permitted to operate both all public tracks of the railways of the Republic of Lithuania and other countries with a gauge of 1 520 (1 524) mm and on all main lines of member railways of the OSJD with a gauge of 1 435 mm;

02-VM – for rolling stock permitted to operate on both all public tracks of the railways of the Republic of Lithuania and other countries with a gauge of 1 520 (1 524) mm and on all member railways of the OSJD with a gauge of 1 435 mm;

03-VM – for rolling stock permitted to operate on both all public tracks of the railways of the Republic of Lithuania and other countries with a gauge of 1 520 (1 524) mm and on all railways of European and Asian countries with a gauge of 1 435 mm.

Poland

GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways.

UIC 505-1, OSJD O 500 Appendix A.

Russia

The clearance gauge of new rolling stock is selected in accordance with the Instruction for the Application of Clearance Gauge of Rolling Stock, GOST 9238-83 (TsV/4422).

The clearance gauge of newly built rolling stock (public or special-purpose) is established by the technical requirements and technical assignment agreed upon with the infrastructure owner. The top contour of the gauge should be selected with due account of the type, intended purpose, area of application, technical and economic indicators of the rolling stock, and clearance network characteristics. Options of the intended purpose of rolling stock: intended only for turn-around on railways with a gauge of 1 520 (1 524) mm; permitted for turn-around both on railways with a gauge of 1 520 (1 524) mm and railways with a gauge of 1 435 mm.

GOST 9238 establishes the initial contours of clearance gauge of rolling stock and the static method of calculation of permissible construction contours on the basis of the former (compliance with the clearance gauge).

The Instruction for the Application of Clearance Gauge of Rolling Stock, GOST 9238-83 (TsV/4422), includes the provision on the kinematic calculation method. The kinematic calculation method for the compliance of rolling stock with the clearance gauge is set forth in the Instructions OSJD/UIC O-500 and UIC 505-6 General rules for interoperable rolling stock gauges in cross-border traffic. The kinematic calculation method will be introduced for railways with a gauge of 1 520 (1 524) mm in the course of the revision of GOST 9238 (scheduled for 2010).

Clearance gauge parameters of pantographs in rolling stock of the 1 520 (1 524) mm gauge are determined by the top contour of the clearance diagram S in accordance with GOST 9238. No special methodology for the compliance of pantograph with the clearance gauge was developed; however, Instruction TsV/4422 contains the requirement for the distance from the longitudinal centreline of the body to the most remote point of the pantograph slide. A methodology similar to the methodology of UIC 505-1 is specified in Appendix A to the Joint Instruction OSJD/UIC O-500.

The established clearance gauge for each type of rolling stock is entered in the Technical Specifications (TU) for the rolling stock.

Slovakia

Rolling stock intended for repair at technical maintenance stations should comply with STN 280312 (Slovak Technical Standards).

Ukraine

Clearance gauge of rolling stock means the transverse contour (perpendicular to the track centreline), within which both new rolling stock and rolling stock with maximum standardised wear rates, both empty and loaded, should fit without extending when placed on a horizontal track (in the least favourable position in the track gauge and absence of lateral

inclinations on springs and dynamic fluctuations); (GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways).

For rolling stock permitted to operate on at all public network tracks as well as external and internal sidings of industrial and transport enterprises:

Clearance gauges: T, 1-T, 1-VM, 0-VM, 02-VM, and 03-VM in accordance with GOST 9238.

In individual cases, numbers of drawings and contours in accordance with TsP/4422.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways
Latvia	TOR of the Latvian Railways LVS 282-2005 Railway Constructions and Rolling Stock Clearance Gauge *(its primary source:* GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways) (TOR requires compliance with the Standard)
Lithuania	ADV-001 Regulation on the Technical Operation of Railways GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways TsV-4422 Instruction for the Application of Clearance Diagrams and Gauge of Rolling Stock GOST 9238-83. Ministry of Railways. 18 October 1986
Poland	GOST 9238-83, Clearance Gauge 1TT UIC 505-1 OSJD O 500 Appendix A
Russia	GOST 9238-83 UIC 505-1 OSJD O Appendix A TsV-4422 Instruction for the Application of Clearance Diagrams and Gauge of Rolling Stock (GOST 9238-83), 1986
Slovakia	STN 280312 (Slovak Technical Standards) TOR of Slovak Railways
Ukraine	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways TM 14-01-02 (Russian Federation) TsP/4422 On individual occasions TsP/4425 Methodology No. S-40010

Estonia	

5.2.2 Static axle load

Currently, requirements for this parameter are different in all the countries:

In Latvia – 23.5 t/axle; in Lithuania – 225 kN.; in Poland PKP CARGO – (221 kN.) 22.5 t/axle and Broad Gauge Railway LHS – (240 kN.) 24.5 t/axle; in Russia – 25 t/axle and 23 t/axle (locomotives and multi-unit rolling stock); in Slovakia broad gauge railway – (240 kN.) 24.5 t/axle for a gauge of 1 520 mm; in Ukraine – diesel locomotives and electric locomotives: for freight locomotives: 117.5 kN., for passenger locomotives: 107 kN., electric trains, diesel trains of motor cars: 107, 81.6 kN. (tare), for a trailer car: 76.5, 56 kN. (tare).

Belarus

Static wheel load on rail is standardised as follows:

Diesel locomotives and electric locomotives:

- for freight locomotives: 117.5 kN.

- for passenger locomotives: 107 kN.

Electric trains and diesel trains:

- of motor cars: 107, 81.6 kN. (tare)

- for a trailer car: 76.5, 56 kN. (tare).

Passenger cars: 81.6 kN.

Weighing parameters for rolling stock are determined by the following safety standards: NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, and NB ZhT TsT 04 Electric Locomotives (hereinafter referred to as NB ZhT).

Latvia

Axle load, i.e. vertical wheel load on rail, is the result of addition of the static wheel load on rail and dynamic components occurring as a result of fluctuations of the body and unsprung weights of rolling stock.

In Latvia, static wheel pressure on rail, i.e. static axle load, is stipulated as (230 kN.) 23.5 t/axle.

Lithuania

The design wheelset load on rails, assuming the stock of fuel and sand onboard the diesel locomotive of 2/3 of the capacity, should be not more than 225 kN.

The procedure for per wheel weighing is stipulated by the Standards for the Calculation. . .

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

- PKP CARGO – (221 kN.) 22.5 t/axle
- LHS – (240 kN.) 24.5 t/axle

Russia

The maximum permitted static load on rail is not limited by any standard regulating documents. In practice, locomotives with a static load of up to 25 t/axle and multi-units with a static load of up to 23 t/axle are operated. Parameters of dynamic impact on track on curves, straight lines, and switches are determined for each type of rolling stock, a table of permitted travel speeds is drawn up, and these data are entered in Order No. 41 of the Ministry of Railways, Standards for Permissible Speeds of Rolling Stock on 1 520 mm Gauge Railways of the Federal Railway Transport System, which serves as guidance for operating organisations and divisions of the Russian Railways.

Standards stipulate the indicators of the impact on track, which are determined for traction rolling stock on the basis of the condition of axle load not exceeding 30 t.

For electric railcars and motor railcars, which can be operated as single-unit in accordance with NB ZhT TsT 01 Diesel Trains and NB ZhT TsT 03 Electric Trains, the wheel load on rail of at least 55 kN. is stipulated in order to ensure cohesiveness with the rail track circuit (see Paragraph 5.2.3.1).

Weighing parameters of rolling stocks are determined by the following safety standards: NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, and NB ZhT TsT 04 Electric Locomotives (hereinafter referred to as NB ZhT). The difference in loads at the sides of a locomotive (empty car) should not exceed 3 %, difference in loads at wheels of a wheelset should not exceed 4 %, and difference in loads at axles in one bogie should not exceed 3 %.

Dynamic linear load on track from a bogie of each vehicle should not exceed 168 kN./m.

Slovakia

- ZSSK CARGO (221 kN.) – 22.5 t/axle for a track of 1 435 mm
- Broad gauge track – (240 kN.) 24.5 t/axle for a track of 1 520 mm

Ukraine

Diesel locomotives and electric locomotives:

- for freight locomotives: 235 kN.;
- for passenger locomotives: 210 kN.

Electric trains and diesel trains:

- for motor cars: 214, 163.2 kN. (tare);
- for a trailer car: 153, 112 kN. (tare).

Weighing (per wheel weighing) of a locomotive/empty car.

The design of the underframe should ensure even axle load in accordance with the Technical Specifications (TU) for diesel locomotives, electric locomotives, diesel trains, and electric trains of a particular type.

The aforementioned requirements are approved by the following documents:

Belarus	TM 19-001-91 Standard Methodology for Tests of Rolling Stock in Terms of Its Impact on Track after Manufacturing and prior to Putting

	into Operation NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Network Statement, Paragraph 3.2.2, to be updated on an annual basis.
Lithuania	ADV-001 Regulation on the Technical Operation of Railways GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1997 (Informative) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Locomotive Underframe on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation – M., VNIIZhT, 1998 (Informative)
Poland	Documents of Infrastructure Managers UIC 700
Russia	NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, NB ZhT TsT 04 Electric Locomotives Order No. 41 of the Ministry of Railways, Standards for Permissible Speeds of Rolling Stock on 1 520 mm Gauge Railways of the Federal Railway Transport System dated 2000
Slovakia	TOR
Ukraine	ST SSFZHT TST 15-98 ST SSFZHT TST 16-98 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation 105.87009.90898 Instruction for the Weighing of Axle Loads for Electric Locomotives VL80 and VL82M
Estonia	

Note: Load values may be amended by member countries and established by railway administrations.

5.2.3 Rolling stock parameters which influence ground-based systems

5.2.3.1 Rolling stock parameters which influence the CCS subsystem

Currently, requirements for this parameter in some countries (Belarus, Latvia, and Russia) are the same: electrical resistance of a wheelset should not exceed 0.01 Ohm.

For electric railcars and motor railcars, which can be operated as single-unit, the wheel load on rail of at least 55 kN. is designed in order to ensure cohesiveness with the rail track circuit on low-density lines.

Belarus and Latvia

On the basis of GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions, Paragraph 4.4.14, the infrastructure manager regulates only the electrical resistance of wheelsets, which should not exceed 0.01 Ohm.

Lithuania

The level of interfering influence of electrical equipment of the locomotive on rail track circuits and track signalling devices

Signal current frequency (Hz)	Band-pass range (Hz)	Permissible level of interference (A)
25	19÷21 21÷29 29÷31	4.0 1.0 dangerous 4.0
50 (for direct current electric power supply systems)	42÷46 46÷54 54÷58	5.0 1.3 dangerous 5.0
175	167÷184	0.4
420 480 580 720 780	408÷432 468÷492 568÷592 708÷732 768÷792	0.35 0.35 0.35 0.35 0.35
4 545 5 000 5 555	4 508÷4 583 4 963÷5 038 5 518÷5 593	0.2 0.2 0.2

Poland

In accordance with the draft TSI LOC&PAS.

Is not available in locomotives.

Russia

Electrical resistance of a wheelset should not exceed 0.01 Ohm (GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions, Paragraph 4.4.14).

There are no special requirements for the wheel configuration of the underframe and wheel profile geometry by the tape line for ensuring cohesiveness with signalling, centralisation, and interlocking track equipment.

Slovakia

The requirements are stipulated by Order No. 250/97 COLL of the Ministry of Transport and Communications.

Ukraine

Rolling stock should not cause any interfering impact on track circuits of signalling, centralisation, and interlocking arrangements, automatic locomotive signalling (ALSN) devices, radio communication systems, and radio.

In order to rule out false actuation of rolling stock control arrangements in a moving train, it is not permitted to use in the structure of rolling stock any assemblies and systems mounted at the level of axle bearings with the following normal temperatures:

- at outside air temperature below 0 °C: not more than 35 °C
- at outside air temperature above 0 °C: not more than 30 °C

The level of interfering influence of electrical equipment of the locomotive on rail track circuits and track signalling devices

Signal current frequency, Hz	Band-pass range, Hz	Permissible level of interference, A
25	19 ÷ 21	4.1
	21 ÷ 29	1.0 dangerous
	29 ÷ 31	4.1
175	167 ÷ 184	0.4

The aforementioned requirements are approved by the following documents:

Belarus	GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions Paragraph 4.4.14
Latvia	*To be applied on a voluntary basis* GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions
Lithuania	Diesel Locomotives. Technical Regulation. Certification Requirements dated 15 August 1998 FTS ZhT 02-98 (For informatory use) LST EN 50121-3-1 Railway Applications. Electromagnetic compatibility. Part 3-1. Rolling stock. Train and complete vehicle LST EN 50121-3-2 Railway Applications. Electromagnetic compatibility. Part 3-2. Rolling stock. Apparatus

Poland	TSI LOC&PAS
Russia	GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions, Paragraph 4.4.14
Slovakia	Order No. 250/97 COLL of the Ministry of Transport and Communications TSI CCS, Annex A, Appendix 1 TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	GOST 29205-91 Electromagnetic Compatibility of Technical Units. Industrial Radio Interferences Induced by Electric Transport. Test Standards and Methods DSTU GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions
Estonia	

5.2.3.2 Axle bearing monitoring

Currently, requirements for this parameter are different in all the countries or are not regulated. The following systems are used: PONAB, DISK, NITKA, and ASDK-B.

Belarus

Axle bearings shall be monitored in accordance with RD 32 TsV 064.

In addition to locomotive arrangements as such, heating-up of the axle bearing and wheelset of tread surface is controlled by DISK and KTSM trackside equipment.

Diesel locomotives TEP70BS are equipped with sensors monitoring the heating-up of axle and traction motor support bearings in transit.

Latvia

Heating-up of the axle bearing shall be monitored only by trackside devices of the FUES type as well as, in multi-unit rolling stock, by locomotive crews by means of touch-free temperature gauges during technical stops of trains.

Lithuania

Heating-up of axle bearings and the condition of the wheel tread surface (for slippers and corrugations) shall be monitored by trackside equipment as well as by locomotive crews by means of pyrometers during technical stops of trains. The area for the measurement of heating-up of axle bearings shall be specified by technical documentation for track monitoring arrangements.

Poland

It is not available in locomotives.

Russia

It is necessary to ensure the possibility of monitoring the temperature of the axle bearing by means of onboard and trackside equipment. Temperature control trackside equipment detects impermissible heating-up of axle bearings and generates the “Alarm”

signal (in accordance with the Instruction for the Arrangement, Installation, and Operation of Automatic Means for the Control of the Technical Condition of Moving Rolling Stock, TsV-TsSh-453):

- of emergency level at temperatures of axle bearings of 70 to 120 ±5 ºC;
- of critical level at temperatures of axle bearings of 140 to 180 ±5 ºC.

Overheating of axle bearings shall be determined by devices of the PONAB type at travel speeds of 10 to 150 km/h and devices DISK at travel speeds of 5 to 250 km/h.

The visibility area of axle bearings shall be specified in technical documentation for control arrangements.

Slovakia

Currently, it is not used on 1 520 mm gauge lines.

Ukraine

It is necessary to ensure the possibility of monitoring the temperature of the axle bearing by means of onboard and trackside equipment. Temperature control trackside equipment detects impermissible heating-up of axle bearings and generates the "Alarm" signal.

It is not available on USSR-made locomotives. The system for the control of heating-up of axle and traction motor support bearings in newly built locomotives and in multi-unit rolling stock (upgrading) is as follows: NITKA. Ground-based systems include PONAB, DISK, and ASDK-B.

The aforementioned requirements are approved by the following documents:

Belarus	RD 32 TsV 064-99 Methodology for the Performance of Measurements in the Assembling of New and Repair of Existing Axle Units of Freight Car Wheelsets RD RB 09150.18.009-2002 Regulation on the Centralised Control of Train Passage in accordance with Readings of Multi-Functional Complex of Technical Means (KTSM)/Remote Reporting Control System Equipment (DISK) at Belarusian Railways
Latvia	Control of the Technical Condition of Rolling Stock Moving in Transit by Tracks of Public Infrastructure, LDz No. D-3/39-2011 dated 25 January 2011 Instruction for the Arrangement, Installation, and Operation of Automatic Means for the Control of the Technical Condition of Moving Rolling Stock, LDz dated 20 January 2011. No. D-3/26-2011
Lithuania	Technical assignments for the designing of new diesel locomotives incorporated the requirements of the interstate standard GOST 31187-2003 (Informatory) Technical documentation for rolling stock 44/T Instruction for the Repair and Technical Maintenance of Roller-Bearing Assemblies of Locomotives and Self-Propelled Rolling Stock LST EN 12082 Railway Applications. Axleboxes. Performance

	Testing A/85 Rules for the Control of Automatic Equipment for Rolling Stock
Poland	
Russia	Instruction for the Arrangement, Installation, and Operation of Automatic Means for the Control of the Technical Condition of Moving Rolling Stock, TsV-TsSh-453 Technical specifications for rolling stock
Slovakia	
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation TsT-0165. Instruction for the Technical Maintenance and Repair of Roller-Bearing Assemblies of Locomotives and Multi-Unit Rolling Stock Technical specifications for rolling stock
Estonia	

5.2.4 Rolling stock dynamic behaviour

Belarus

Requirements are stipulated in NB ZhT TsT 01 Diesel Trains,

NB ZhT TsT 02 Diesel Locomotives,

NB ZhT TsT 03 Electric Trains,

NB ZhT TsT 04 Electric Locomotives

The aforementioned requirements are approved by the following documents:

Belarus	Requirements are stipulated in NB ZhT TsT 01 Diesel Trains, NB ZhT TsT 02 Diesel Locomotives, NB ZhT TsT 03 Electric Trains, NB ZhT TsT 04 Electric Locomotives
Latvia	
Lithuania	STSSFZhT TsT 15-98. Traction Rolling Stock. Standard Methodology for Dynamic and Strength Tests of Locomotives
Poland	

Russia	
Slovakia	
Ukraine	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Estonia	

5.2.4.1 Safety against derailment running on twisted track and track with deviations within the track maintenance tolerance

Currently, requirements for this parameter are different in all the countries or are not regulated. In Russia, the safety factor of resistance to derailment should be at least 1.4.

Belarus

Limit values are stipulated by NB ZhT. Resistance of the insulation of the rolling stock control and derailment indicator shall be not less than 2.0 kOhm. Measurements are made on terminals of the coupling when the cable is disconnected.

Latvia

The requirements of NB ZhT TsT03-98 Electric Trains. Safety Standards, Paragraphs 2.1 and 2.5, are used as the information source on a voluntarily basis.

The system of standard parameters (strength and interface with infrastructure) is established in the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Lithuania

The system of standard parameters (strength and interface with infrastructure) is established in the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation and the Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of Multi-Unit Rolling Stock on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Poland

On the existing locomotives, in accordance with the technical documentation DTR i WTO – (TEM2, M62).

For locomotives manufactured after 2005, in accordance with EN 14363:2006 – in accordance with the draft TSI LOC&PAS (rolling stock type control).

Russia and Ukraine

Limiting values are stipulated by NB ZhT. The safety factor of resistance to derailment should be at least 1.4.

Slovakia

The requirements of UIC 518 and PPV.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation. (Informatory)
Latvia	Of referential character – NB ZhT TsT 03-98 Electric Trains, Paragraph 2.1 and Paragraph 2.5 Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998
Lithuania	Technical assignments for the designing of new diesel locomotives incorporated the requirements in accordance with the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory)
Poland	PN-EN 14363:2007TSI LOC&PAS
Russia	Safety standards, 4 documents
Slovakia	UIC 518 PPV TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	Standards for the Calculation and Assessment of the Strength of

	Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Estonia	

5.2.4.2 Running dynamic behaviour

Currently, requirements for this parameter are different in all the countries or are not regulated. All parameters of dynamic behaviour for the determination of the resistance of supporting structures to fatigue action should be determined by calculation methods at the designing stage. On the other hand, the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe or Multi-Unit Rolling Stock on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation are applied in Latvia, Lithuania, Russia, and Ukraine.

Latvia

It is not regulated in Latvia.

Lithuania

See Chapter 5.2.4.1.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

At the existing locomotives, in accordance with the technical documentation DTR i WTO.

$Wz \leq 4.21$

For locomotives manufactured after 2005, in accordance with EN 14363:2006 – in accordance with the draft TSI LOC&PAS (rolling stock type control).

Russia

The dynamic behaviour of the underframe determines, to a large extent, the parameters of interaction with the track infrastructure (safety of derailment, traffic safety, and load on the track) and fatigue strength of the elements of the underframe.

The system of standard parameters (strength and interface with infrastructure) is established in the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation and the Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of Multi-Unit Rolling Stock on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Limit values of impact on track on straight lines, curves, and switches are stipulated by NB ZhT.

Belarus (informatory), Ukraine, and Russia

All parameters of dynamic behaviour for the determination of the resistance of supporting structures to fatigue action should be determined by calculation methods at the designing stage in accordance with the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe or Multi-Unit Rolling Stock on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation. The compliance of running dynamic behaviour with the standard requirements is checked by means of tests in accordance with NB ZhT.

Slovakia

UIC 518

The aforementioned requirements are approved by the following documents:

Belarus	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Latvia	It is not regulated
Lithuania	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Poland	EN 14363:2006 TSI LOC&PAS
Russia	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Safety standards, 4 documents
Slovakia	UIC 518

	TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Estonia	

5.2.4.2.1 Limit values for running safety

Currently, requirements for this parameter are different in all the countries or are not regulated. On the other hand, the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe or Multi-Unit Rolling Stock on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation are applied in Latvia, Lithuania, Russia, and Ukraine.

Latvia

They are established in the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation and the Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of Multi-Unit Rolling Stock on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Lithuania

They are established in the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation and the Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of Multi-Unit Rolling Stock on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

After the entry into force of the TSI LOC&PAS, the requirements of the latter document will apply to newly designed rolling stock.

Poland

On existing locomotives, in accordance with the technical documentation DTR i WTO.

$Y/Q \leq 1.2$

For locomotives manufactured after 2005, in accordance with EN 14363:2006 – in accordance with the draft TSI LOC&PAS (rolling stock type control).

Belarus and Russia

Limit values are stipulated by NB ZhT.

The relation between the frame force and maximum vertical static axle load (horizontal dynamics factor) shall not exceed 0.3.

The vertical dynamics factor of the primary spring suspension:

- for multi-unit rolling stock (electric trains and diesel trains):

of the motor car of electric trains with a design speed of up to 160 km/h – not more than 0.35;

of the motor car of high-speed electric trains (more than 160 km/h) – not more than 0.30;

of a non-motor car – not more than 0.30.

- for locomotives:
  - shunting, freight, and clean-up – not more than 0.4;
  - passenger – not more than 0.35.

The vertical dynamics factor of the secondary spring suspension:

- for passenger rolling stock (locomotives, electric trains, and diesel trains) – not more than 0.2;
- for shunting and freight locomotives – not more than 0.25.

Prevention of contact of the underframe elements not envisaged by the design documentation should be ensured.

Slovakia

UIC 518

Ukraine

- frame forces, Yp	Yp ≤ 0.4 Po – for broken stone ballast; Yp ≤ 0.3 Po – for sand and gravel ballast; Yp ≤ 0.25 Po – for ballast with clay inclusions; where Po is axle load	
- vertical dynamics factor, Fg	≤ 0.30 (0.35; 0.40)	
- stresses in the outer and inner edges of the rail flange, Ge	≤240 MPa	
- stresses in the outer edge of point rails in standardised cross-sections, Gpe	≤275 MPa	
- relation of the maximum horizontal load to the	≤1.4 – for broken stone and asbestos ballast;	

average vertical load of rail on sleeper, a	≤1.1 – for gravel and sand ballast	
Maximum permissible traction force in terms of impact on track	-	For diesel locomotives and electric locomotives: To be determined on the basis of the condition of non-exceeding the standardised values in accordance with Paragraphs 2.4.2.1 and 2.4.2.2
Maximum electric braking force in terms of impact on track	500 kN.	For diesel locomotives and electric locomotives

The aforementioned requirements are approved by the following documents:

Belarus	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Safety standards, 4 documents NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998
Lithuania	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation. (Informatory)

Poland	PN-EN 14363:2007TSI LOC&PAS
Russia	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Safety standards, 4 documents
Slovakia	UIC 518 TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	ST SSFZHT TST 15-98 ST SSFZHT TST 16-98 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Estonia	

5.2.4.2.2 Track vertical and transversal loading limit values

Currently, requirements for this parameter are different in all the countries or are not regulated. On the other hand, the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe or Multi-Unit Rolling Stock on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation are applied in Latvia, Lithuania, Russia, and Ukraine.

Latvia

They are established in the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation and the Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of Multi-Unit Rolling Stock on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Lithuania

See Chapter 5.2.4.1.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

On existing locomotives, in accordance with the technical documentation DTR i WTO – load on track L.

For locomotives manufactured after 2005, in accordance with PN-EN 14363:2007– in accordance with the draft TSI LOC&PAS (rolling stock type control).

Belarus, Russia, and Ukraine

The permissible indicators characterising the impact of rolling stock on track of standard design are provided in the table below (NB ZhT).

Name of indicator	Standard value
Dynamic tensile stresses in edges of the rail flange in straight and curved track sections, stock rail front overhang, and turnout curves of switches, MPa, not more than	240
Dynamic stresses in edges of point rails of switches, MPa, not more than	275
Lateral force, kN., not more than • freight main-line, clean-up, and shunting electric or diesel locomotive in straight and curved track sections and at switches; • electric locomotive, passenger diesel locomotive and multi-unit rolling stock in straight and curved track sections; • electric locomotive, passenger diesel locomotive and multi-unit rolling stock at switches	0.5 R_{ST}, where R_{ST} is the static axle load ($R_{ST} \leq 300$ kN.) 100 120
Criterion of impact on the stability of assembled rails and sleepers from transverse shear over the ballast when applying the method of determination: • by the relation of the maximum horizontal load to average vertical load of rail on sleeper, not more than • by the relation of frame force to static load of wheelset on track, not more than	1.4 0.4
Stresses on the track formation, MPa, not more than	0.12
Stresses in the ballast under sleeper, MPa, not more than	0.5
Stresses on the upper bed of timber sleepers to crushing under plate, MPa, not more than	2.2

Compliance check is carried out by performing tests on specially selected test sections by experimental and calculation methods.

Slovakia

UIC 518

The aforementioned requirements are approved by the following documents:

Belarus	Safety standards, 4 documents NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998
Lithuania	For informatory use: Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation TSI LOC&PAS
Poland	PN-EN 14363:2007TSI LOC&PAS
Russia	Safety standards, 4 documents
Slovakia	UIC 518
Ukraine	ST SSFZHT TST 15-98 ST SSFZHT TST 16-98 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Estonia	

5.2.4.2.3 Equivalent conicity

Currently, requirements for this parameter are not regulated in all the countries.

Belarus

In Belarus, indicators of equivalent conicity are not used.

Lithuania

Currently, the concept of equivalent conicity is not used.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Russia

In Russia, indicators of equivalent conicity are not used.

Ukraine

Currently, the concept of equivalent conicity is not used.

The aforementioned requirements are approved by the following documents:

Belarus	Not regulated
Latvia	Not regulated
Lithuania	Not regulated
Poland	Not regulated
Russia	Not regulated
Slovakia	Not regulated
Ukraine	Not regulated
Estonia	Not regulated

5.2.4.2.3.1 Design values for new wheel profiles

Currently, requirements for this parameter are different in all the countries or are not regulated. GOST 11018 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions may be noted as a common document for Russia and Ukraine.

Belarus

Parameters of wheels and wheelsets are stipulated by the Safety Standards NB ZhT TsT 063-2000 Locomotives and Multi-Unit Rolling Stock. Wheelsets with Axleboxes. Safety Standards and GOST 11018 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions.

Latvia

Parameters of wheels and wheelsets are stipulated by the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock.

Lithuania

For newly designed and supplied rolling stock, wheel tread profiles are assumed in accordance with the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways, T/108.

Poland

Profile EN13715 – S1002/H28/e32,5/6.7%

in accordance with EN13715

Russia

Parameters of wheels and wheelsets are stipulated by the Safety Standards NB ZhT TsT 063-2000 Locomotives and Multi-Unit Rolling Stock. Wheelsets with Axleboxes. Safety Standards, GOST 11018 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions, the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways, TsT-329 approved by the Ministry of Railways in 2000, and the Instruction for the Operation, Technical Maintenance, and Repair of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (KMBSh.667120.001RE approved by Russian Railways in 2006).

The profile of a new wheel and profile of the rail head have a two-point contact.

Ukraine

Parameters of wheels and wheelsets are stipulated by DSTU GOST 11018:2005 Traction Railway Stock of Ukrainian 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions, GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions, GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions, and VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways with Amendments No. 1 and No. 2.

The aforementioned requirements are approved by the following documents:

Belarus	Safety Standards NB ZhT TsT 063-2000 Locomotives and Multi-Unit Rolling Stock. Wheelsets with Axleboxes. Safety Standards, GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions
Latvia	Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for 1 520 mm Gauge) LDz No. D-3/450 dated 01 September 2010
Lithuania	For newly designed and supplied rolling stock, wheel tread profiles are assumed in accordance with the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways, T/108 For newly designed and supplied rolling stock, wheel tread profiles are assumed in accordance with the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways, T/108
Poland	PN-EN13715:2008
Russia	Safety Standards NB ZhT TsT 063-2000 Locomotives and Multi-Unit

	Rolling Stock. Wheelsets with Axleboxes. Safety Standards, GOST 11018 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways, TsT-329 approved by the Ministry of Railways in 2000 Instruction for the Operation, Technical Maintenance, and Repair of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (KMBSh.667120.001RE approved by Russian Railways in 2006)
Slovakia	EN13715
Ukraine	DSTU GOST 11018:2005 Traction Railway Stock of Ukrainian 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions 9036-88 Solid-Rolled Wheels. Design and Dimensions VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways with Amendments No. 1 and No. 2
Estonia	

5.2.4.2.3.2 In-service values of wheelset equivalent conicity

It is an open clause in the TSI. The parameter is related to the rates of wear of the wheel tread surface and is regulated by the requirements of either the TOR or relevant instructions in each country separately.

Latvia

In accordance with the requirements of the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for 1 520 mm Gauge) issued by the Public Railway Infrastructure Manager Latvijas Dzelzceļš (LDz), No. D-3/450, dated and the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for 1 520 mm Gauge) LDz dated 14 July 2005. No. DR71/2005 regulates the profile of wheel flange (tread), which also includes requirements related to tread surface slope. For values of tread surface slope, refer to Paragraph 5.2.5.2.2 Mechanical and Geometrical Characteristics of Wheels.

Lithuania

The concept of equivalent conicity for wheelset profile is absent.

Limit standards for the wear of wheel tread surface are regulated by the Regulation on the Technical Operation of Railways, ADV/001 and the Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways, T/108.

It is not permitted to release for operation and traffic in trains any rolling stock with a crack in any part of the wheelset axle or a crack in the rim, disc, and nave of the wheel and when the wheelset flange is worn sharp as well as in case of the following types of wear and damage of wheelsets hindering the normal interaction between the track and rolling stock:

a) at travel speeds of 120 km/h to 140 km/h:

wheel tread worn hollow at locomotives/multi-unit rolling stock – more than 5 mm;

wheel flange thickness is more than 33 mm or less than 28 mm on locomotives when measuring at a distance of 20 mm from the top of the flange in case of the flange height of 30 mm, and at rolling stock with a flange height of 28 mm – when measuring at a distance of 18 mm from the top of the flange;

b) at travel speeds of up to 120 km/h:

wheel tread is worn hollow on locomotives and multi-unit rolling stock – more than 7 mm; on multi-unit rolling stock in local and suburban trains – more than 8 mm;

wheel flange thickness is more than 33 mm or less than 25 mm on locomotives when measuring at a distance of 20 mm from the top of the flange in case of the flange height of 30 mm, and on rolling stock with a flange height of 28 mm – when measuring at a distance of 18 mm from the top of the flange;

c) flange worn sharp vertically in case of flange height of more than 18 mm to be measured by means of a special gauge;

d) slipper (corrugation) on the tread surface on locomotives/multi-unit rolling stock – more than 1 mm.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

It is not regulated.

Belarus and Russia

Permissible wheel wear values are stipulated by the Rules for the Technical Operation of Railways.

It is not permitted to release for operation and traffic in trains any rolling stock with a crack in any part of the wheelset axle or a crack in the rim, disc, and nave of the wheel and when the wheelset flange is worn sharp as well as in case of the following types of wear and damage of wheelsets hindering the normal interaction between the track and rolling stock:

a) at travel speeds of 120 km/h to 140 km/h:

wheel tread worn hollow on locomotives/multi-unit rolling stock – more than 5 mm;

wheel flange thickness is more than 33 mm or less than 28 mm on locomotives when measuring at a distance of 20 mm from the top of the flange in case of the flange height of 30 mm, and at rolling stock with a flange height of 28 mm – when measuring at a distance of 18 mm from the top of the flange;

b) at travel speeds of up to 120 km/h:

wheel tread is worn hollow on locomotives and multi-unit rolling stock – more than 7 mm; on multi-unit rolling stock in local and suburban trains – more than 8 mm;

wheel flange thickness is more than 33 mm or less than 25 mm on locomotives when measuring at a distance of 20 mm from the top of the flange in case of the flange height of 30 mm, and on rolling stock with a flange height of 28 mm – when measuring at a distance of 18 mm from the top of the flange;

c) flange worn sharp vertically in case of flange height of more than 18 mm to be measured by means of a special gauge;

d) slipper (corrugation) on the tread surface on locomotives/multi-unit rolling stock – more than 1 mm.

Ukraine

The concept of equivalent conicity for wheelset profile is absent. Rates of wear of wheel tread surface are regulated depending on the speed.

The aforementioned requirements are approved by the following documents:

Belarus	Technical Operating Rules of the Belarusian Railways
Latvia	Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for 1 520 mm Gauge) LDz No. D-3/450 dated 01 September 2010
Lithuania	ADV-001 Regulation on the Technical Operation of Railways T/108 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways
Poland	
Russia	TOR
Slovakia	
Ukraine	TsRB-004. Technical Operating Rules for the Ukrainian Railways VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways with Amendments No. 1 and No. 2
Estonia	

5.2.5 Running gear

5.2.5.1 Structural design of bogie frame

Currently, requirements for this parameter are presumably the same in all the countries because the same standards for the calculation and assessment of the strength of the bogie structure are used; however, it is not possible to identify a combination of parameters because of the insufficiency of the information provided.

Latvia

They are established in the Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation and the Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of Multi-Unit Rolling Stock on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation.

Lithuania

Freight diesel locomotives with a design speed of 120 km/h should be equipped with bogies with axle support pendulum type suspension of traction electric motors. Subject to

agreement with the customer, the use of bogies with frame support suspension of traction electric motors is permitted.

Passenger diesel locomotives with a design speed of 140 km/h should be equipped with bogies with frame support suspension of traction electric motors.

At the request of the customer, bogies with a reduced angle of attack of wheelsets (with radial arrangement of wheelsets) should be envisaged on freight and passenger diesel locomotives.

The methodology for calculation and tolerances for designing are specified in the Standards for Calculation…

Poland

On existing locomotives – in accordance with the requirements for 1 520 mm gauge pertaining to that time (those of the Russian Railways may be adopted).

For newly built locomotives – in accordance with the draft TSI LOC&PAS.

Belarus, Russia, and Ukraine

An assembled bogie including all detachable equipment and interfaces with the body should withstand the following permissible operating loads:

- vertical and transverse loads;

- rotation-induced loads;

- loads from the implementation of traction and braking forces;

- torsional loads.

This condition should be combined with fatigue resistance ensured for the whole service life of the underframe.

The mechanical strength of the bogie frame should be proved by calculations, static and fatigue tests, and running tests of rolling stock.

The structural strength of bogie frames and subframes (beams) of the secondary spring suspension is determined during vibration bench tests. No fatigue cracks should appear on frames and beams after 10 million cycles of load.

The design safety factor of spring sets consisting of cylinder coiled springs with a rod with circular cross-section shall be not less than:

- primary spring sets in case of the absence of resilient restraints limiting vertical shifts of the axle-box in respect of the bogie frame – at least 1.6;

- primary spring sets in case of the presence of resilient restraints limiting vertical shifts of the axle-box in respect of the bogie frame:

when including the elastic restraint in the load diagram – at least 1.6;

before including the resilient restraint in the load diagram – at least 1.4;

- secondary spring sets – at least 1.4.

Slovakia

UIC 518 and PPV.

Ukraine (additionally)

Safety factor: 2

Carrying elements of the body frame and bogie frames should be made of the materials specified in the Basic Technical Requirements for Prospective Rolled Steel for Carrying Welded Structures of Rolled Stock.

The aforementioned requirements are approved by the following documents:

Belarus	Safety standards, 4 documents NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998 Of referential character – Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1997 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation, 1998
Lithuania	GOST31187-2003 (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory) Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation (Informatory)
Poland	TSI LOC&PAS
Russia	NB ZHT TST 01-04
Slovakia	UIC 518
Ukraine	ST SSFZhT TsT 15-98

	ST SSFZhT TsT 16-98 Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Estonia	

5.2.5.2 Wheelsets

Currently, requirements for this parameter are presumably the same in all the countries because the same standards for the calculation and assessment of the strength of the bogie structure are used; however, it is not possible to identify a combination of parameters because of the insufficiency of the information provided.

Belarus

Wheelsets should not contradict the requirements stipulated in GOST 11018-2000 and RD RB BCh 17.001-97.

Latvia

All elements of cars should ensure safe traffic of trains at the maximum established speed.

Every wheelset should comply with the technical standards for the assembling, repair, and maintenance of wheelsets of rolling stock.

Slovakia

Rolling stock arriving from the 1 520 mm gauge track system is admitted. In case of manufacturing of own rolling stock, the Instructions of the UIC are applied.

Ukraine

The mechanical and geometrical parameters of new wheelsets are specified in DSTU GOST 11018.

In-service wheelsets should comply with VND 32.0.07.001-2001 and TOR.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions RD RB BCh 17.001-97 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724

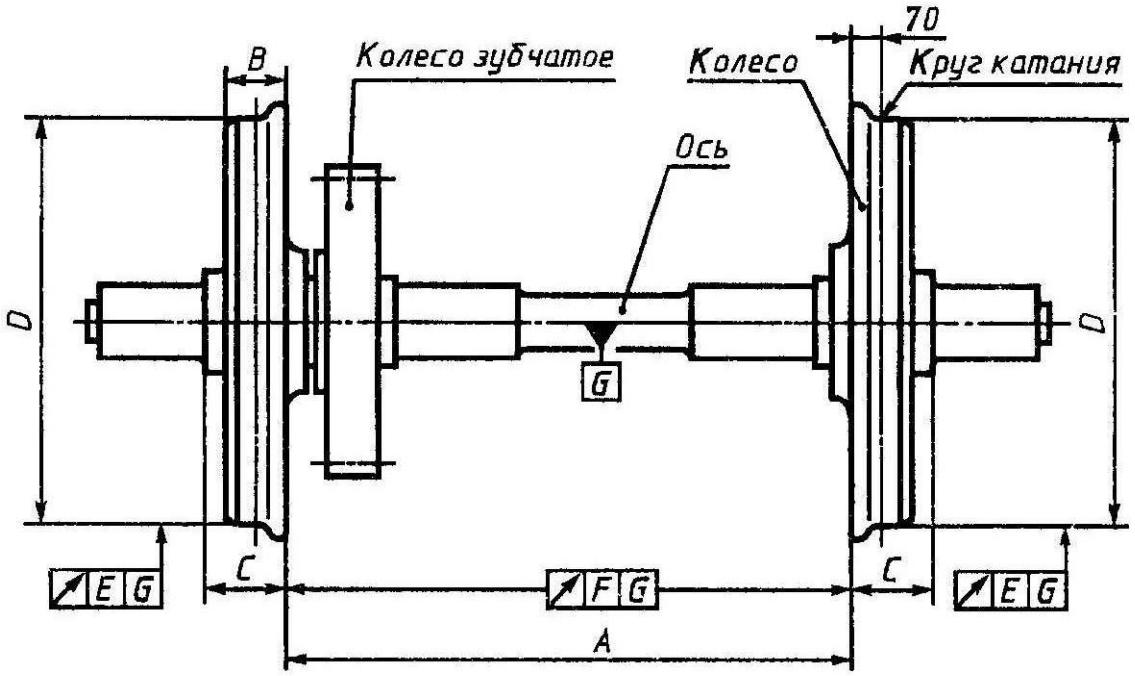
Lithuania	ADV-001 Regulation on the Technical Operation of Railways T/108 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (1 520 mm pločio vėžės traukos riedmenų aširačių formavimo remonto ir priežiūros instrukcija)
Poland	
Russia	
Slovakia	UIC PPV
Ukraine	TsRB-004. Technical Operating Rules for Ukrainian Railways DSTU GOST 11018:2005 Traction Railway Stock of Ukrainian 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation
Estonia	

5.2.5.2.1 Mechanical and geometrical characteristics of wheelsets

Currently, requirements for this parameter are presumably the same in all the countries.

The mechanical and geometrical parameters of new wheelsets are specified in GOST 11018.

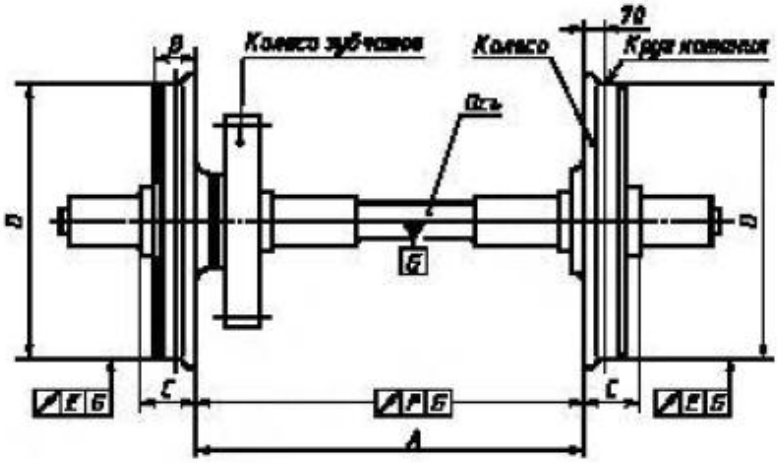
The main nominal dimensions of wheelsets are specified in the figure and in the table.



Колесо зубчатое	Running gear
Колесо	Wheel
Круг катания	Tread (contact) line
Ось	Axle

Parameter	Nominal dimensions, mm	
	Locomotives	Multi-unit rolling stock
A	1 440	1 440
B	140	130
D	GOST 3225	GOST 9036 and GOST 5000

Latvia



A — расстояние между внутренними торцами (гранями) ободьев колес; *B* — ширина обода колеса; *C* — расстояние между упорным торцем предподступичной части оси и внутренним торцем обода колеса; *D* — диаметр колес по кругу катания; *E* — допуск радиального биения круга катания колеса; *F* — допуск торцевого биения внутреннего торца обода колеса; *G* — геометрическая ось колесной пары

Рисунок 1 — Колесная пара с одним зубчатым колесом на оси

Колесо зубчатое	Running gearl
Колесо	Wheel
Круг катания	Tread (contact) line
Ось	Axle

A – distance between the inner edges of wheel rims;

B – width of the wheel rim;

C – distance between the thrust face of the axle pre-seat and inner edge of the wheel rim;

D – diameter of the wheels at the tread line;

E – circular runout tolerance;

F – face runout tolerance of the inner edge of the wheel rim;

G – centreline of the wheelset

Figure 1 – Wheelset with one toothed wheel on the axle

In accordance with the requirements of the TOR of the Latvian Railways, the distance between the inner edges of a non-loaded wheelset (distance A on Figure 1) is regulated as follows:

- for rolling stock with a travel speed of up to 120 km/h – A = 1 440 mm (tolerances: +3 mm; – 3 mm)
- for rolling stock with a travel speed of 121 km/h to 140 km/h – A = 1 440 mm (tolerances: +1 mm; – 3 mm)

It is prohibited to release for operation and traffic in trains any rolling stock with a crack in any part of the wheelset axle or a crack in the rim, disc, and nave of the wheel.

(No. L29/97)

It is prohibited to allow for traffic in trains any traction rolling stock with wheelsets which have at least one of the following defects or deviations:

- chip or dent on the top of a flange with a length exceeding 4.0 mm;
- difference in wear at the left and right sides of the wheelset exceeding 2 mm;
- weakening of the tyre at the wheel centre, toothed wheel at the axle or nave of the wheel centre, pins of the traction drive in hole bosses of the wheel centre, solid-rolled wheel or wheel centre at the axle;
- difference in wheel diameters in a complete set of a section of a diesel train for passenger traffic and electric multi-unit rolling stock of more than 12 mm, and in a complete set of a diesel train for freight traffic – more than 20 mm;
- sharp transverse grooves and scuffs at axle necks and pre-seat parts;
- worn-through places on the middle part of the axle of a locomotive with a depth of more than 4.0 mm, and on the axle of multi-unit rolling stock – with a depth of more than 2.5 mm;
- weakening of the tyre wheel in more than three places: by its circumference with a total length of the weakened place of more than 30 % of the total length of the circumference of the ring – for locomotives, and more than 20 % for multi-unit rolling stock as well as closer than 100 mm from the ring lock;
- cracks in the rim, disc, nave, and tyre of a wheel of traction rolling stock.

It is prohibited to release for operation and allow for traffic in trains any cars (note: including passenger cars) in the event of the following types of wear and damage of wheelsets hindering the normal interaction between the track and rolling stock:

- cracks in any part of the axle and wheel;
- worn-through places of the middle part of the axle with a depth of more than 2.5 mm (5 mm by diameter);
- marks of contact with an electrode or electric welding cord in any part of the axle;
- shift of a wheel;
- wearing of the setting of a wheel on the axle. Weakening of the setting of a wheel on the axle is manifested by disruption of paint along the whole perimeter with exposure of rust or oil from under the nave at the inner part of the wheel. A wheelset is not rejected as defective if disruption of paint is not associated with exposure of rust or oil from under the nave of the wheel.

When releasing cars after all types of repair, it is prohibited to place under cars or leave under cars any wheelsets for passenger and freight cars as follows:

- in the event of the presence of defects and breakdowns preventing the car from running in trains;
- with non-turned middle parts of axles;
- in case of absence or illegibility of marks and brands related to the manufacturing of the axle, assembling of the wheelset, or complete certification;

  Note: Imported wheelsets in proper condition, which do not have acceptance brands, are allowed to be placed under cars in cases of all types of repair.
- with holes in discs for leads;
- with axles manufactured 15 and more years ago, without performing a complete certification procedure (exclusion: current uncoupling repair);
- with a reduction gear from the end-face of the axle neck, which have a diameter of the pre-seat part of less than 182 mm, or middle part of less than 160 mm, or with a non-rolled middle part (for passenger cars travelling with speeds of not more than 140 km/h);
- those which have been in service with a reduction gear at each axle neck for more than four years;
- with a difference of diameters of wheels by the tape line of more than 10 mm at one bogie or 20 mm at two bogies.

Lithuania

The distance between the inner edges of tyres of non-loaded wheelsets should be equal to 1 440 mm. For trains with a travel speed 120 to 140 km/h, this distance for locomotives and cars may be 3 mm greater or 1mm smaller. For trains with speeds exceeding 120 km/h – 3 mm greater or 3 mm smaller.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

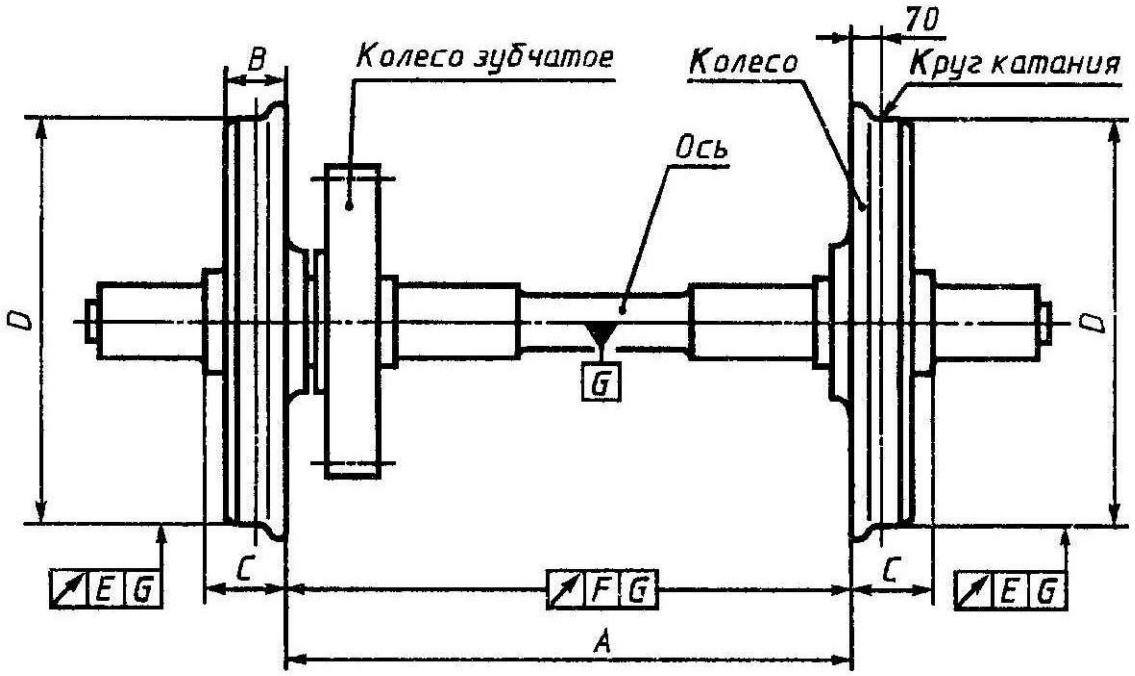
Ct-4 (Mt-11)

LHSt 11 (Mt-11)

Belarus and Russia

The mechanical and geometrical parameters of new wheelsets are specified in GOST 11018.

The main nominal dimensions of wheelsets are specified in the figure and in the table.



Колесо зубчатое	Running gear
Колесо	Wheel
Круг катания	Tread (contact) line
Ось	Axle

Parameter	Nominal dimensions, mm	
	Locomotives	Multi-unit rolling stock
A	1 440	1 440
B	140	130
D	GOST 3225	GOST 9036 and GOST 5000

Slovakia

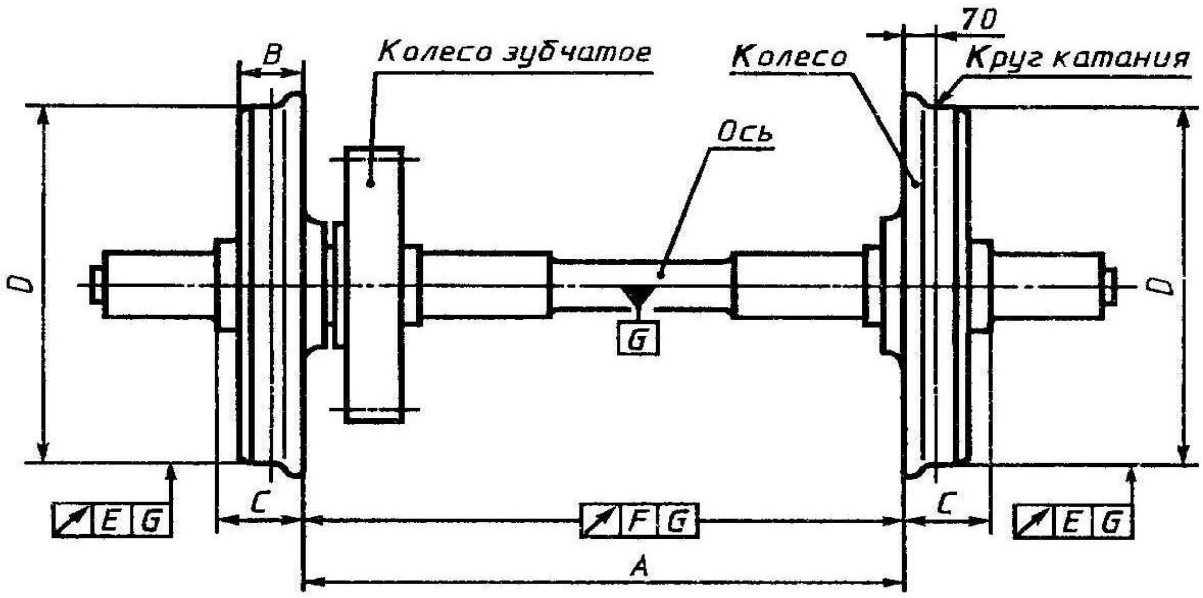
The requirements of the Instruction UIC 510-2 for the diameter and weight of a wheelset (and other instructions).

PPV.

Ukraine

The mechanical and geometrical parameters of new wheelsets are specified in DSTU GOST 11018.

The main nominal dimensions of wheelsets are specified in the figure and in the table.



Колесо зубчатое	Running gear
Колесо	Wheel
Круг катания	Tread (contact) line
Ось	Axle

Parameter	Nominal dimensions, mm	
	Locomotives	Multi-unit rolling stock
A	1 440	1 440
B	140	130
D	DSTU 3717	GOST 9036 и DSTU 3717

In service, new wheelsets should comply with VND 32.0.07.001-2001.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions GOST 3225-94 Rough Carbon Steel Tyres for Locomotives of 1 520 mm Gauge Railways. Types and Dimensions GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions GOST 5000 Rough Carbon Steel Tyres for Cars and Tenders of 1 520 mm Gauge Railways. Dimensions
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for 1 520 mm Gauge) LDz No. D-3/450 dated 01 September 2010 Instruction for the Assembling, Repair, and Maintenance of Wheelsets

	of Railway Cars (for the gauge width of 1 520 mm) LDz dated 14 July 2005. No. DR 71/2005; Paragraphs 4.1, 5.2
Lithuania	ADV-001 Regulation on the Technical Operation of Railways T/108 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (1 520 mm pločio vėžės traukos riedmenų aširačių formavimo remonto ir priežiūros instrukcija) ISO 1005-7:1982 Railway rolling stock material -- Wheelsets for tractive and trailing stock -- Quality requirements LST EN 13260 Railway Applications. Wheelsets and bogies. Wheelsets. Product requirements GOST 11018-87 Wheelsets for Diesel Locomotives and Electric Locomotives of 1 520 mm Gauge Railways. Technical Conditions
Poland	Ct-4 (Mt-11) Instruction for the Measurements and Technical Assessment of Traction Rolling Stock Pairs LHSt 11 (Mt-11) Instruction for Geometrical Measurements of Wheelsets of Traction Rolling Stock
Russia	GOST 11018-2000 GOST 3225 GOST 9036 GOST 5000
Slovakia	UIC 510-2 and others PPV
Ukraine	Standards for the Calculation and Assessment of the Strength of Supporting Members, Dynamic Properties, and Impact of the Locomotive Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation Standards for the Calculation and Assessment of the Strength of Supporting Members and Dynamic Properties of the Multi-Unit Rolling Stock Underframe on the Track on 1 520 mm Gauge Railways of the Ministry of Railways of the Russian Federation. DSTU GOST 11018:2005 Traction Railway Stock of Ukrainian 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions. VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways
Estonia	

5.2.5.2.2 Mechanical and geometrical characteristics of wheels

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified.

The profile of wheels should meet the established geometric parameters with regard to tolerances: the width of the rim (tyre), thickness and height of the flange for both new wheels

and after turning operation. Several repair profiles of wheelsets are used, and standard dimensions for them are stipulated in guidance and instructions for operation, technical maintenance, and repair of wheelsets of traction rolling stock of 1 520 mm gauge railways. For new wheelsets, profile in accordance with GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions and GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions is used.

ГОСТ 11018—2000

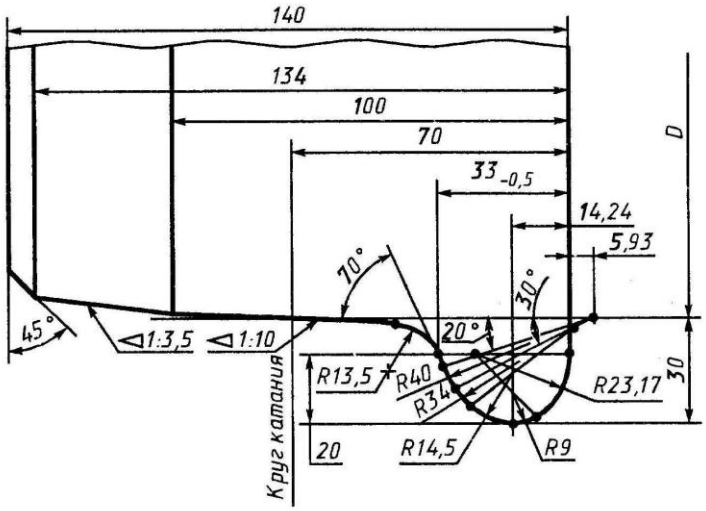


Рисунок 3 — Профиль обода колеса для локомотивов

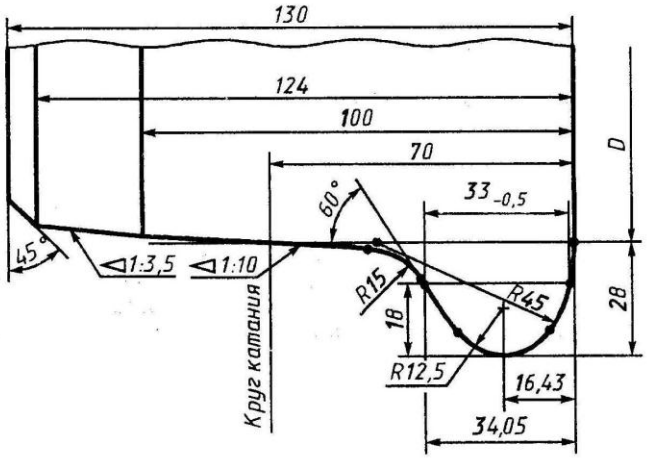


Рисунок 4 — Профиль обода колеса для МВПС

ГОST	GOST
Круг катания	Tread (contact) line
Рисунок	Figure
Профиль обода колеса для локомотивов	Wheel rim profile for locomotives
Профиль обода колеса для МВПС	Wheel rim profile for multi-units

Latvia

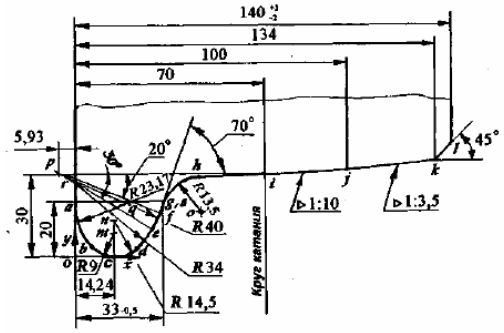
It is prohibited to release for operation and permit for traffic in trains any rolling stock in which there is the following types of damage of the wheel hindering normal interaction between the track and rolling stock:

- flange worn sharp (projection that has formed as a result of plastic deformation of surface layers of metal of the flange towards its top) on the surface area at a distance of 2 mm from the top of the flange and to 13 mm from the tape line;
- for rolling stock with a travel speed of 121 km/h to 140 km/h:
    - wheel tread worn hollow with a depth of more than 5 mm for locomotives, multi-unit rolling stock, and passenger cars;
    - wheel flange thickness is more than 33 mm or less than 28 mm on locomotives when measuring at a distance of 20 mm from the top of the flange in case of the flange height of 30 mm, and on rolling stock with a flange height of 28 mm – when measuring at a distance of 18 mm from the top of the flange;
- for rolling stock with a travel speed of up to 120 km/h:
    - wheel tread worn hollow on locomotives and multi-unit rolling stock – more than 7 mm; on multi-unit rolling stock in local and suburban trains – more than 8 mm;
    - wheel flange thickness is more than 33 mm or less than 25 mm on locomotives when measuring at a distance of 20 mm from the top of the flange in case of the flange height of 30 mm, and on rolling stock with a flange height of 28 mm – when measuring at a distance of 18 mm from the top of the flange;
- flange worn sharp vertically in the event of a flange height of more than 18 mm, which is to be measured by means of a special gauge;
- slipper (corrugation) on the tread surface on locomotives and multi-unit rolling stock as well as on tenders of steam locomotives and cars with roller axle box bearings of more than 1 mm, and on tenders and cars with friction bearings – more than 2 mm;
- – more than 1 mm.

(No. L29/97, in addition to the requirements of the TOR)

The profile of the tyre (rim) of the wheel (Paragraph 6.9) is regulated.

1) The profile of a locomotive tyre with a flange height of 30 mm:



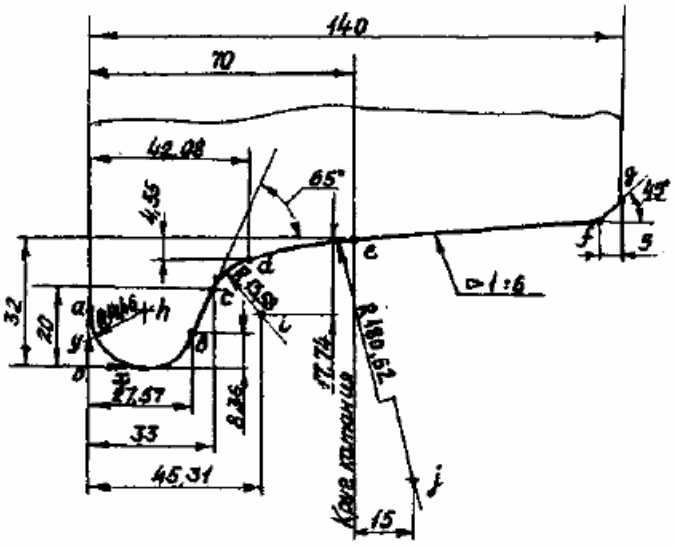
Размеры профиля бандажа контролируют шаблоном типа И477

Точка	a	b	c	d	e	f	g	h	i	j	k
x, мм	0	8,55	14,23	25,35	28,71	31,66	32,95	44,97	70	100	134
y, мм	20,0	2,02	0	5,19	10,00	16,32	19,86	28,73	30	31,5	36,36

Точка	l	m	n	o	p	q	r	s
x, ММ	140	14,23	14,23	45,64	-5,93	23,18	-0,73	33,0
y, mm	42,36	9,00	14,5	15,25	30	20	27	20

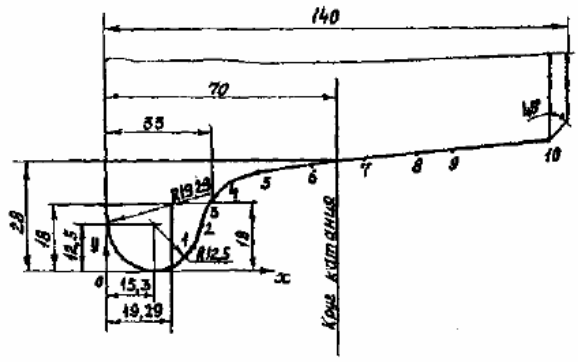
Размеры профиля бандажа контролируют шаблоном типа И477	Dimensions of the flange are controlled by a mould type I477
Круг катания	Tread (contact) line
Точка	Point
Мм	mm

2) Locomotive tyre profile with a flange height of 32 mm:



Круг катания	Tread (contact) line

3) Locomotive tyre profile with a flange height of 28 mm:

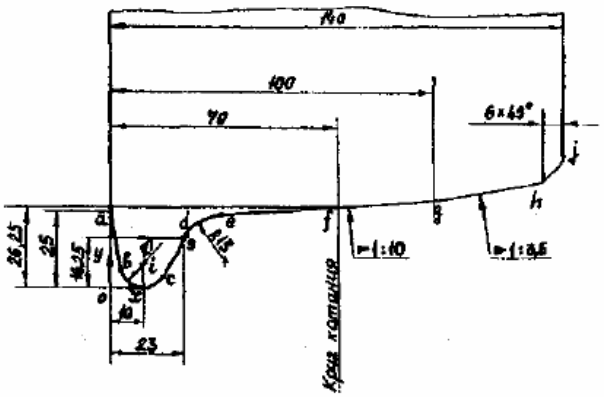


Размеры профиля бандажа контролируют шаблоном типа И433.02

Точка	1	2	3	4	5	6	7	8	9	10
x, мм	27	30	33	37	45	60	80	100	110	135
y, мм	8,06	14,06	18	21,35	24,94	27,02	28,85	30,27	31,00	35,36

Размеры профиля бандажа контролируют шаблоном типа И477	Dimensions of the flange are controlled by a mould type I477
Круг катания	Tread (contact) line
Точка	Point
Мм	mm

4) Locomotive ChME3 tyre profile for the second and fifth wheelset with the flange thickness reduced by 10 mm:



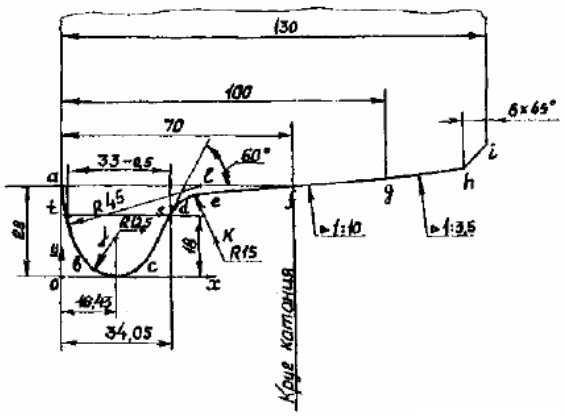
Размеры профиля бандажа контролируют шаблоном типа И478

Точка	a	b	c	d	e	f
x, мм	0	3,09	16,15	23,26	35,70	70.00
y, мм	25,00	5,88	3,66	16,73	24,54	26,25

Точка	g	h	j	i	k	s
x, мм	100.00	134,00	140,00	10,00	36,44	23.00
y, мм	27,75	32,61	38,61	7,0	9,56	16,25

Размеры профиля бандажа контролируют шаблоном типа И477	Dimensions of the flange are controlled by a mould type I477
Круг катания	Tread (contact) line
Точка	Point
мм	mm

5) Multi-unit rolling stock tyre profile with a flange height of 28 mm:



Размеры профиля бандажа контролируют шаблоном типа И720 Т 447.003

Точка	a	b	c	d	e	f	g
x, мм	0	5,45	27,26	34,84	47,08	70	100
y, мм	28,0	6,54	6,25	19,37	26,86	28	29,5

Точка	h	i	j	k	l	s	t
x, мм	124	130	16,43	47,83	45	34,05	1,13
y, мм	32,93	38,93	12,5	11,87	28	18	18

Размеры профиля бандажа контролируют шаблоном типа И477	Dimensions of the flange are controlled by a mould type I477
Круг катания	Tread (contact) line
Точка	Point
мм	mm

It is prohibited to allow for traffic in trains any traction rolling stock with wheelsets which have at least one of the following defects or deviations:

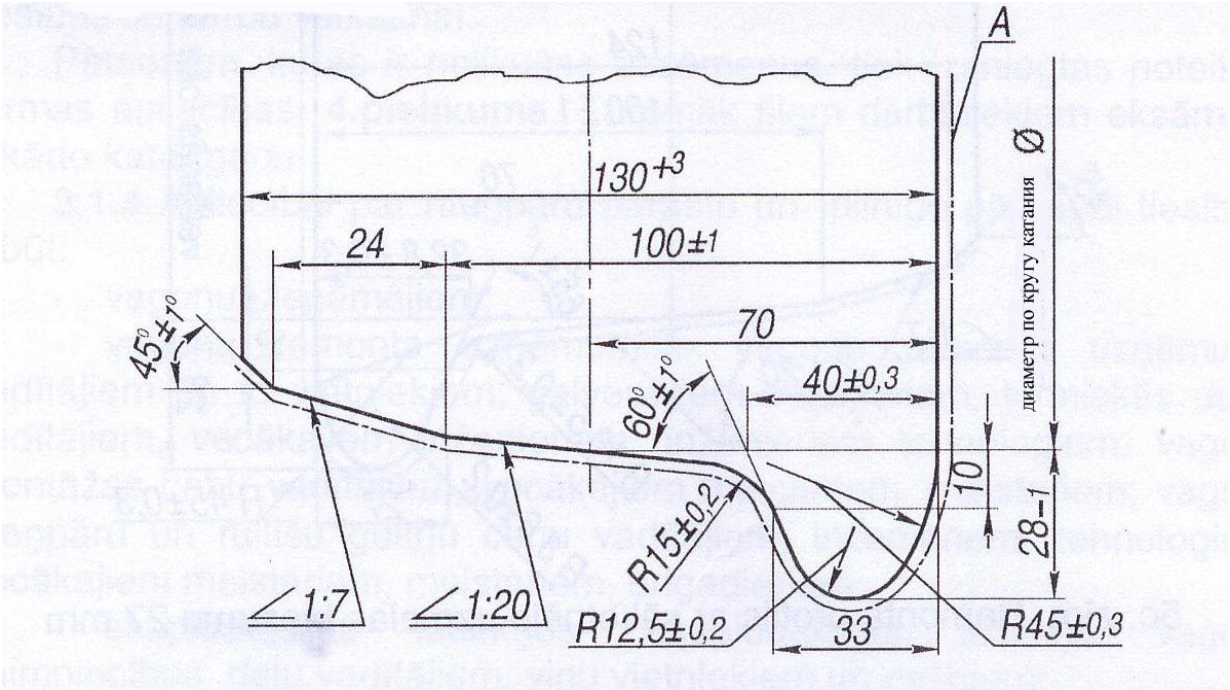
- chip, pit or dent on the tape line with a depth of more than 3.0 mm or with a length of more than 10.0 mm on a locomotive or motor car or more than 25.0 mm on a trailer car;
- dangerous shape of the flange (slope parameter of less than 6.5 mm) to be measured by the universal mould UT-1;
- local or general increase in the width of the tyre or rim of a solid-rolled wheel of more than 6.0 mm;

- ring galling on the tape line at the base of the flange with a depth of more than 1.0 mm, on conicity 1:3.5 of more than 2.0 mm and width of more than 15.0 mm;
- flange thickness of more than 23 mm and less than 21 mm on the second and fifth wheelsets of diesel locomotives of series ChME3 (if the tape line is turned in accordance with Figure 4) when measuring at a distance of 16.25 mm from the top of the flange;
- wheel flange thickness is more than 33 mm or less than 28 mm on locomotives when measuring at a distance of 20 mm from the top of the flange in the event of the flange height of 30 mm, and on rolling stock with a flange height of 28 mm – when measuring at a distance of 18 mm from the top of the flange;
- thickness of wheelset tyres of less than (mm):
  - for diesel locomotives with an axle load of 23 t and more – 40 mm;
  - for diesel locomotives with an axle load of less than 23 t – 36 mm;
  - for multi-unit rolling stock of motor cars – 35 mm;
- rim thickness of solid-rolled wheelsets of less than (mm):
  - for diesel locomotives of series TGM3, TGM4, and TGM6 – 30 mm;
  - for multi-unit rolling stock of trailer cars – 25 mm.

(No. DR 71/2005, in addition to the requirements of the TOR)

The profile of the wheel rim is regulated (Paragraph 2.5)

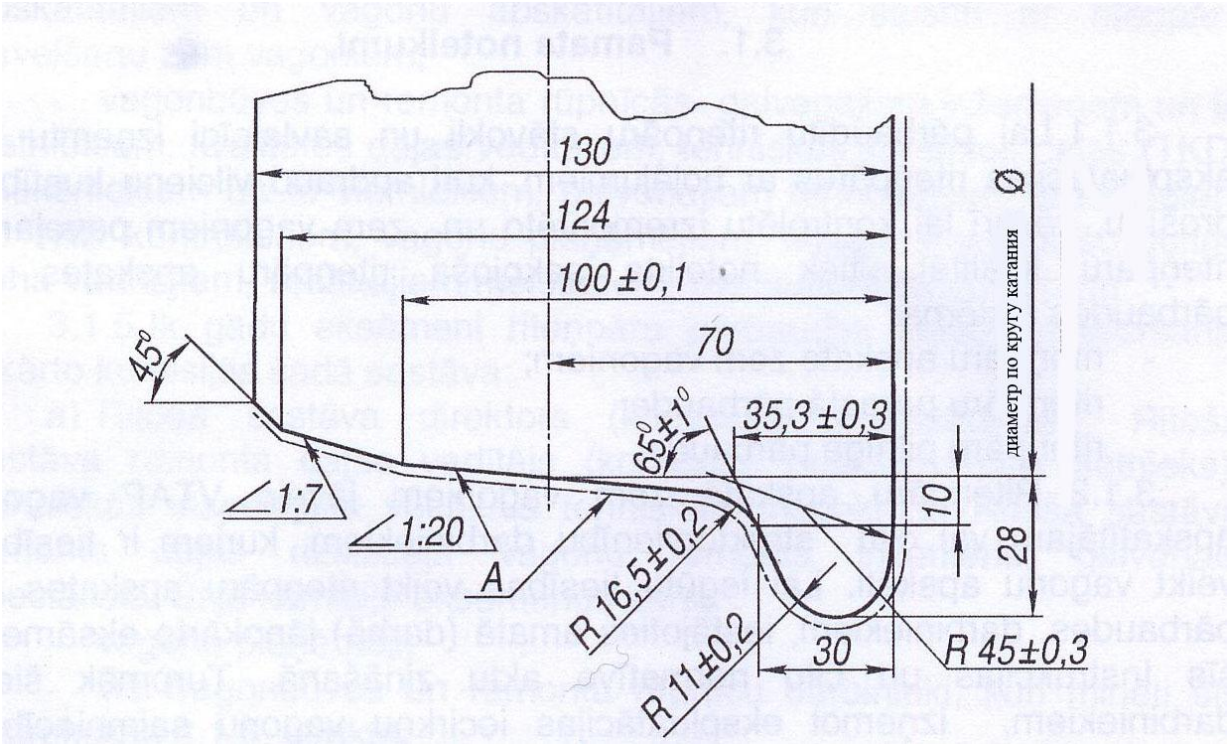
1) The profile of the wheel rim surface of a car with the initial flange thickness of 33 mm (in accordance with GOST 9036-88):



Диаметр по кругу катания	Diameter at the tread (contact) line

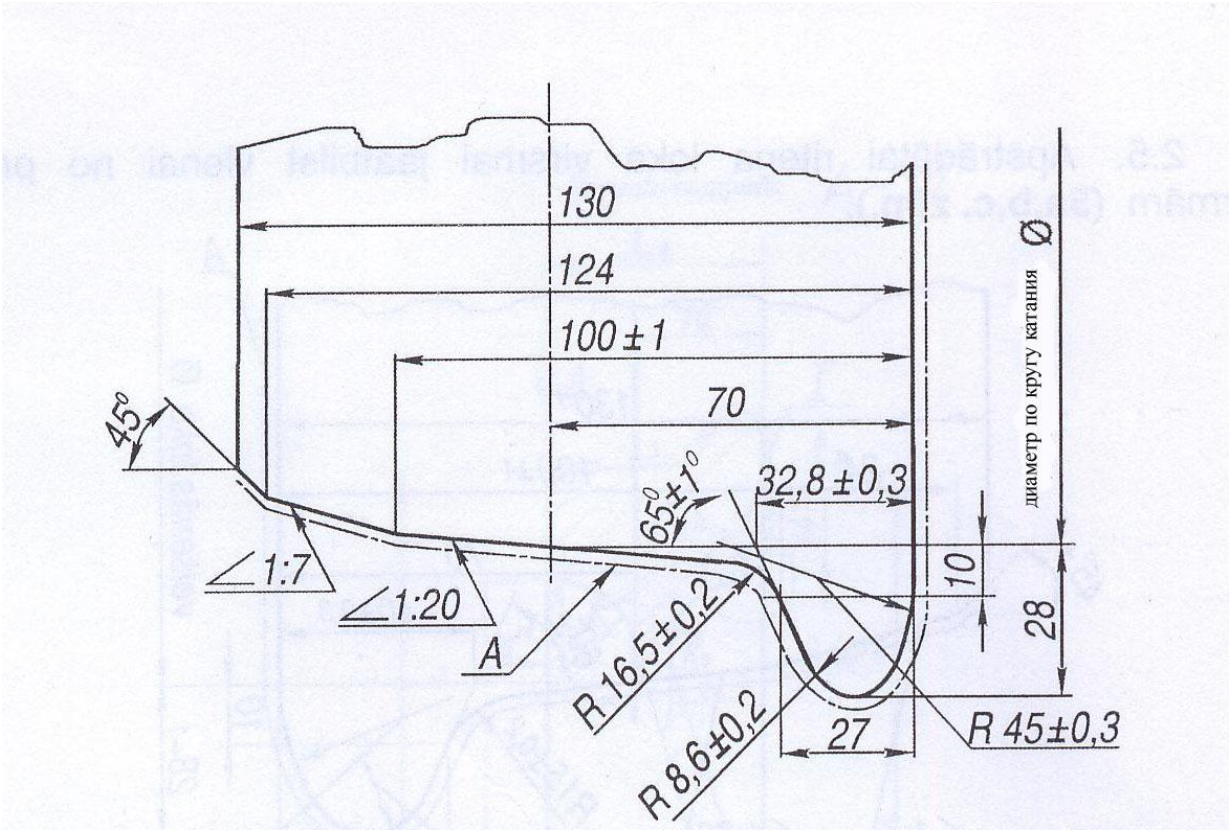
For passenger cars, only the profile of the wheel rim surface with the initial flange thickness of 33 mm is mostly used.

2) The repair profile of the wheel rim surface of a car with the initial flange thickness of 30 mm:



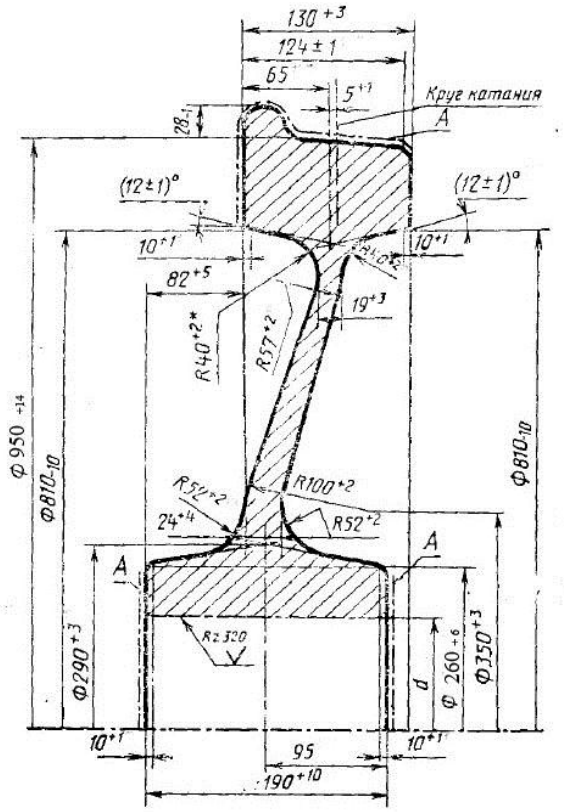
Диаметр по кругу катания	Diameter at the tread (contact) line

3) The repair profile of the wheel rim surface of a car with the initial flange thickness of 27 mm:



Диаметр по кругу катания	Diameter at the tread (contact) line

3) The main dimensions of a new wheel of a car:



Круг катания	Tread (contact) line

It is prohibited to release for operation and allow for traffic in trains any cars (note: including passenger cars) in the event of the following types of wear and damage to wheelsets hindering the normal interaction between the track and rolling stock:

- passenger cars – slipper of 1 mm and more, displacement of metal of 0.5 mm and more, and uneven rolling of 2 mm and more, and in the event of wheelsets with generator drives of all types except for flat-rope ones – uneven rolling of 1 mm and more;
- damage to the tape line of wheels caused by the displacement of metal with a height of 0.5 mm in the event of wheelsets of passenger cars;
- limit dimensions and wear of rims of in-service wheels:

Car type	Tyre worn hollow evenly, not more than, mm*	Flange thickness, mm		Wheel rim thickness, not less than, mm
		not more than	not less than	
Passenger cars circulating in trains with speeds of up to 120 km/h	7	33	25	30
Passenger cars circulating in trains with speeds of 121 to 140 km/h	5	33	28	35
Passenger cars circulating in trains with speeds of 141 to 160 km/h	5	33	30	40

Passenger cars for local and urban traffic	8	33	25	30
Special passenger cars (for the carriage of railway personnel of the infrastructure manager) only for turn-around on railways of the Republic of Latvia with a speed of up to 80 km/h	9	33	25	25

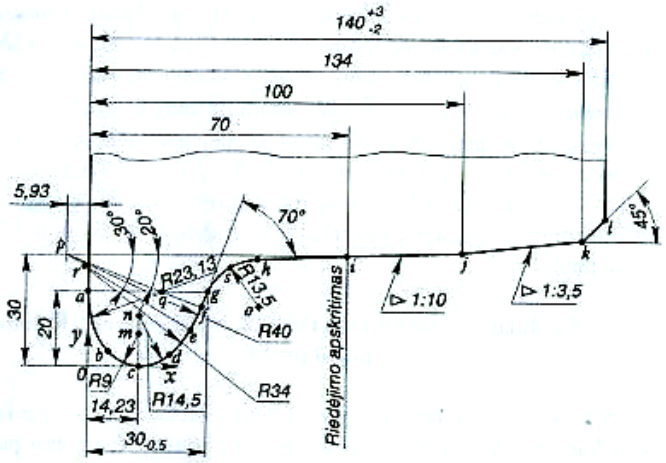
* tyres worn hollow evenly on wheelsets of passenger cars with a gear-and-cardan drive from the end-face of the axle neck should be not more than 4 mm;

- the wheel rim width of less than 126 mm (the wheel rim width shall be measured outside the places of marking);
- chips on the tape line of solid-rolled wheels with a depth of more than 10 mm or length of more than 25 mm on passenger cars detected in making-up and turnover points. A crack in the chip or delamination heading depthward in the metal is not permitted. The wheel rim thickness at the location of the chip should not be smaller than permitted. Wheelsets with chips on the tape line with a depth of up to 1 mm shall not be rejected as defective irrespective of their length;
- local increase in the wheel rim thickness (crushing) of more than 5 mm;
- ring galling on the tape line at the base of the flange with a depth of more than 1 mm, on the tape line with conicity 1:7 with a depth of more 2 mm or width of more than 15.0 mm;
- superficial split-off on the external edge of the wheel rim including a local split-off of round-shaped metal displacement with a depth (by the wheel radius) of more than 10 mm, or if the width of the remaining part of the rim in the location of the split-off is less than 120 mm, or there is a crack heading depthwards in the metal in the damaged place irrespective of sizes.

Lithuania

Instruction T/108 stipulates profiles of the tape line of wheelsets permissible for use:

1) Locomotive tyre profile with a flange thickness in accordance with Figure 3, GOST 11018-87



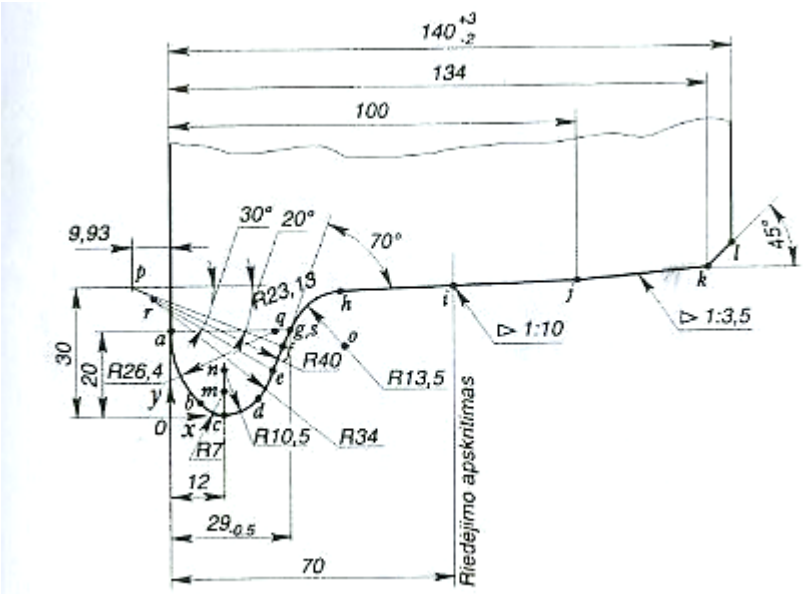
Bandažo profilio matmenys tikrinami šablonu, pagamintu pagal brėž. I4477.00.00 (rus. И4477.00.00)

Taškas	a	b	c	d	e	f	g	h	i	j
x, mm	0	8,55	14,23	25,35	28,71	31,66	32,95	44,97	70	100
y, mm	20	2,02	0	5,19	10	16,32	19,86	28,73	30	31,5

Taškas	k	l	m	n	o	p	q	r	s
x, mm	134	140	14,23	14,23	45,64	-5,93	23,18	-0,73	33
y, mm	36,36	42,36	9,00	14,5	15,25	30	20	27	20

Bandažo profilio matmenys tikrinami šablonu pagamintu pagal brież. I4477.00.00 (rus. И4477.00.00)	Dimensions of the profile of the tyre shall be checked with a mould made in accordance with Drawing I4477.00.00 (Russian: И4477.00.00)
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

2) Locomotive tyre profile with a flange thickness of 29 mm



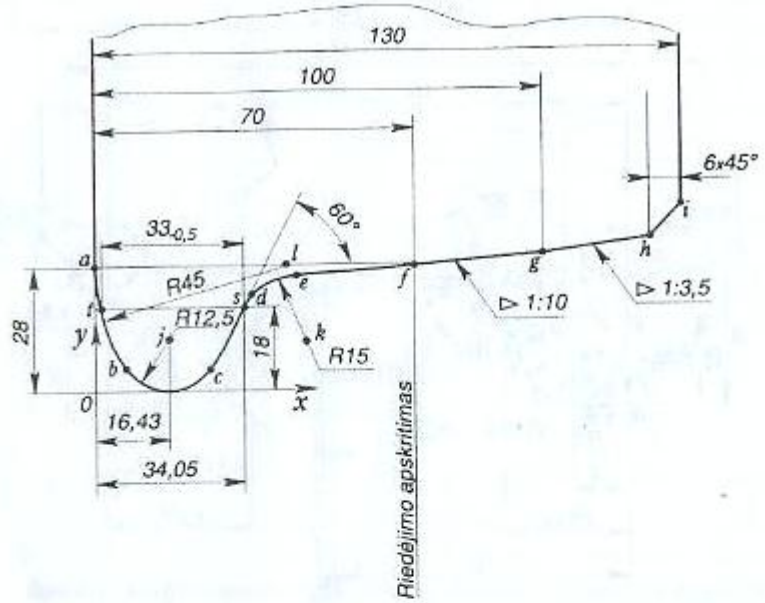
Bandažo profilio matmenys tikrinami šablonu, pagamintu pagal brėž. I718.00.00 (rus. И718.00.00)

Taškas	a	b	c	d	e	f	g	h	i	j
x, mm	0	6,80	12	19,48	24,71	27,66	28,95	40,97	70	100
y, mm	20	2,30	0	3,13	10	16,32	19,86	28,73	30,2	31,7

Taškas	k	l	m	n	o	p	q	r	s
x, mm	134	140	12	12	41,64	-9,93	26,4	-4,73	29
y, mm	36,36	42,56	7,0	10,5	15,25	30	20	27	20

Bandažo profilio matmenys tikrinami šablonu pagamintu pagal brież. I718.00.00 (rus. И718.00.00)	Dimensions of the profile of the tyre shall be checked with a mould made in accordance with Drawing I718.00.00 (Russian: И718.00.00)
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

3) Multi-unit rolling stock tyre profile with a flange thickness of 33 mm



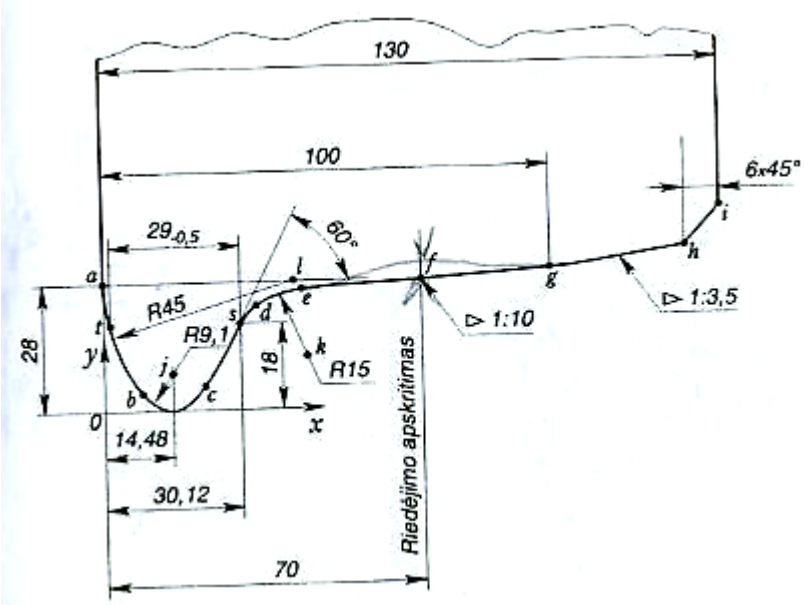
Bandažo profilio matmenys tikrinami šablonu, pagamintu pagal brėž. I720.00.00 (rus. И720.00.00)

Taškas	a	b	c	d	e	f	g
x, mm	0	5,45	27,26	34,84	47,08	70	100
y, mm	28	6,54	6,25	19,37	26,86	28	29,5

Taškas	h	i	j	k	l	s	t
x, mm	124	130	16,43	47,83	45	34,05	1,13
y, mm	32,93	38,93	12,5	11,87	28	18	18

Bandažo profilio matmenys tikrinami šablonu pagamintu pagal briež. I720.00.00 (rus. И720.00.00)	Dimensions of the profile of the tyre shall be checked with a mould made in accordance with Drawing I720.00.00 (Russian: И720.00.00)
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

4) Multi-unit rolling stock tyre profile with a flange thickness of 29 mm



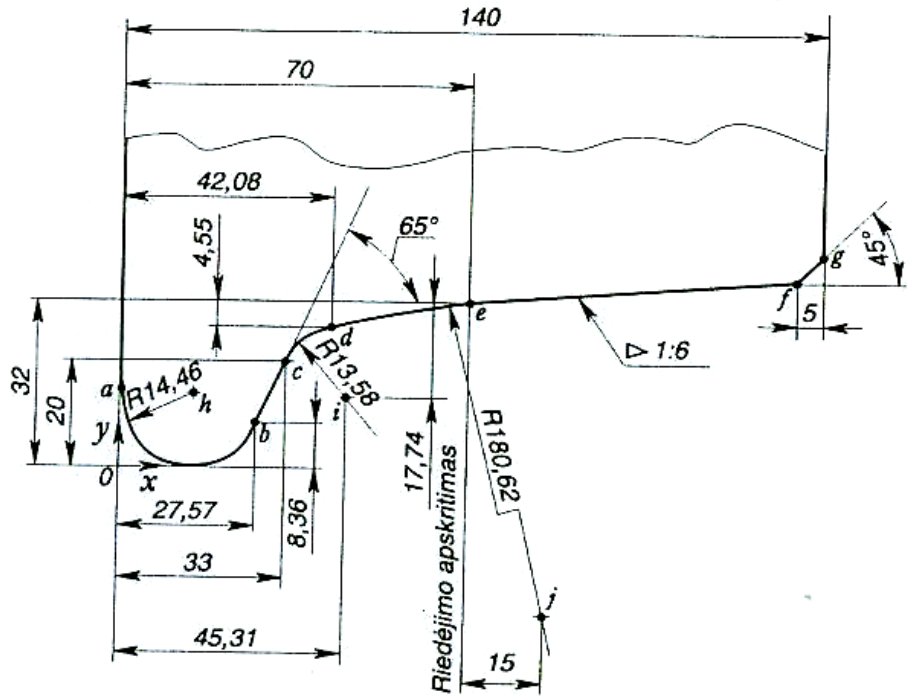
Bandažo profilio matmenys tikrinami šablonu, pagamintu pagal brėž. I719.00.00 (rus. И719.00.00)

Taškas	a	b	c	d	e	f	g
x, mm	0	6,74	22,35	30,92	43,17	70	100
y, mm	28,00	4,31	4,55	19,37	26,86	28,2	29,7

Taškas	h	i	j	k	l	s	t
x, mm	124	130	14,48	43,91	45	30,12	1,13
y, mm	33,13	39,13	9,10	11,87	28,00	18,00	18,00

Bandažo profilio matmenys tikrinami šablonu pagamintu pagal brież. I719.00.00 (rus. И719.00.00)	Dimensions of the profile of the tyre shall be checked with a mould made in accordance with Drawing I719.00.00 (Russian: И719.00.00)
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

5) Tyre profile with a flange thickness of 33 mm in accordance with the proposal by Zinyuk-Nikitskiy

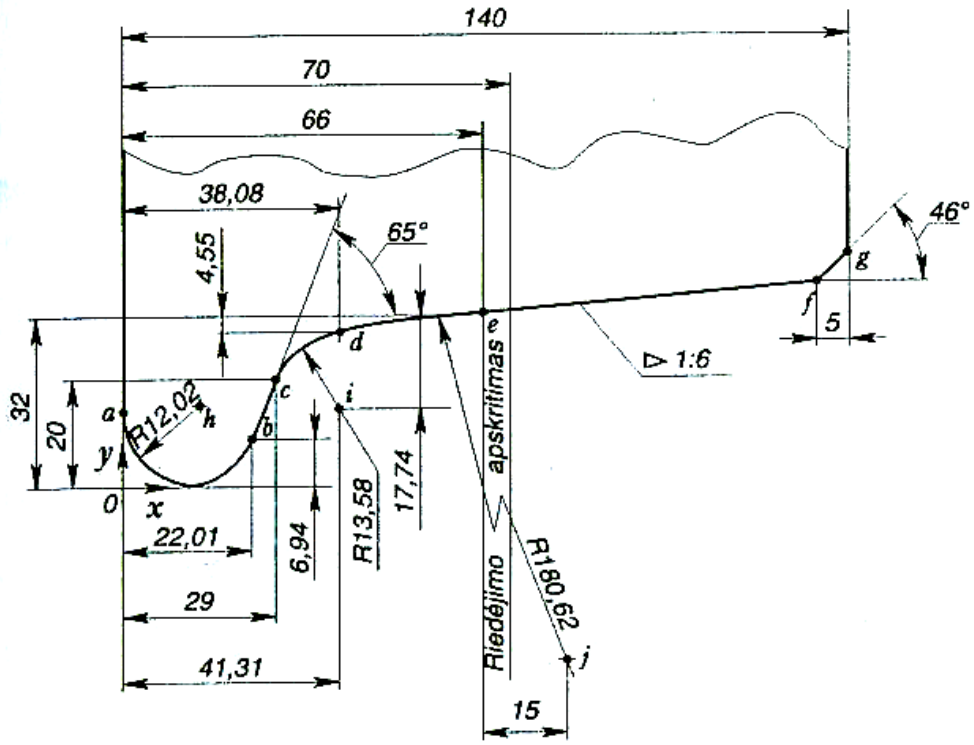


Bandažo profilio matmenys tikrinami šablonu, pagamintu pagal brėž. I477.00.00 (rus. И477.00.00)

Taškas	a	b	c	d	e	f	g	h	i	j
x, mm	0	27,57	33,0	42,08	70,0	135,0	140,0	14,46	45,31	85,0
y, mm	14,46	8,36	20,0	27,45	32,0	37,42	42,42	14,46	14,26	-148,0

Bandažo profilio matmenys tikrinami šablonu pagamintu pagal brież. I477.00.00 (rus. И477.00.00)	Dimensions of the profile of the tyre shall be checked with a mould made in accordance with Drawing I477.00.00 (Russian: И477.00.00)
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

6) Tyre profile with a flange thickness of 29 mm in accordance with the proposal by Zinyuk-Nikitskiy

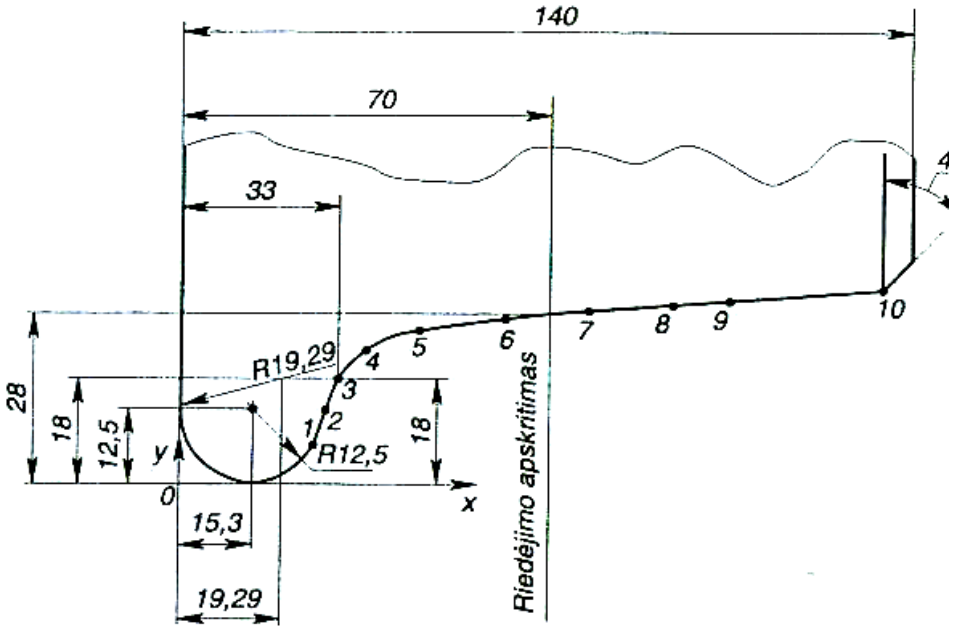


Bandažo profilio matmenys tikrinami šablonu, pagamintu pagal brėž. I718.00.00 (rus. И718.00.00)

Taškas	a	b	c	d	e	f	g	h	i	j
x, mm	0	22,91	29,0	38,08	66,0	135,0	140,0	12,02	41,31	81,0
y, mm	12,02	6,94	20,0	27,45	32,0	37,75	42,75	12,02	14,26	-148,0

Bandažo profilio matmenys tikrinami šablonu pagamintu pagal briež. I718.00.00 (rus. И718.00.00)	Dimensions of the profile of the tyre shall be checked with a mould made in accordance with Drawing I718.00.00 (Russian: И718.00.00)
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

7) Tyre profile DMeTI LB with a flange thickness of 33 mm

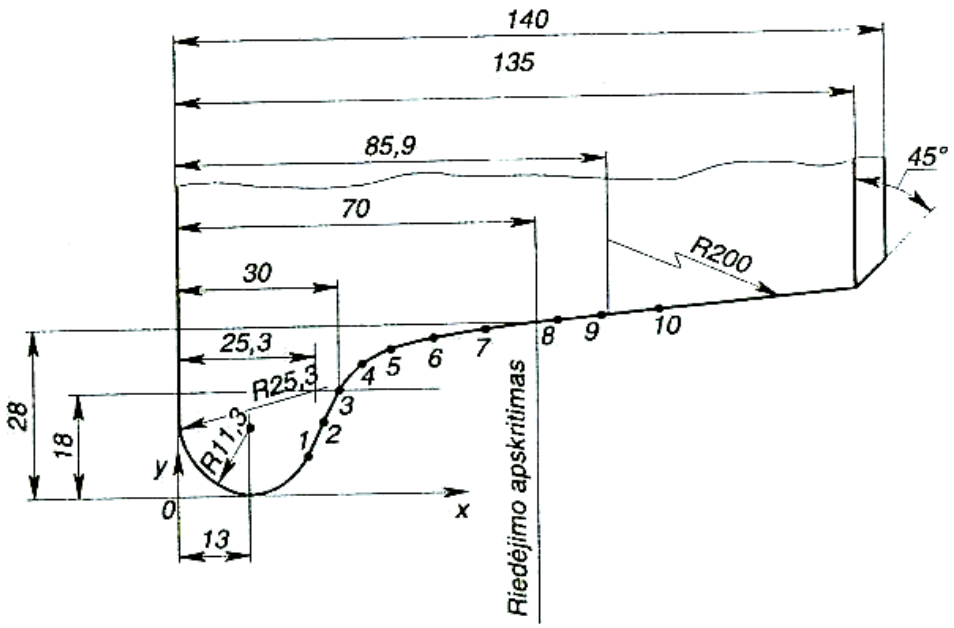


Bandažo profilio matmenys tikrinami vagoniniu-tenderiniu šablonu, pagamintu pagal brėž. I433.02.00 (rus. И433.02.00) Zaporožės RMZ (rus PM3); matuojant bandažo profilį šablonu, pagamintu iki 1995 m., prie antbriaunio pridedama 1 mm

Taškas	1	2	3	4	5	6	7	8	9	10
x, mm	27	30	33	37	45	60	80	100	110	135
y, mm	8,06	14,06	18,0	21,35	24,94	27,02	28,85	30,27	31	35,36

Bandažo profilio matmenys tikrinami vagoniniu-tenderiniu šablonu pagamintu pagal briež. I433.02.00 (rus. И433.02.00) Zaporožės RMZ (rus. PM3); matuojant bandažo profilį šablonu, pagamintu iki 1995 m., prie antbriaunio pridedama 1 mm	Dimensions of the profile of the tyre shall be checked with a car-and-tender mould made in accordance with Drawing I433.02.00 (Russian: И433.02.00) by Zaporozhye Repair and Engineering Works (Russian: PM3); when measuring the profile with a mould made before 1995, it is necessary to add 1 mm to the rim
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

8) Tyre profile DMeTI LB with a flange thickness of 30 mm

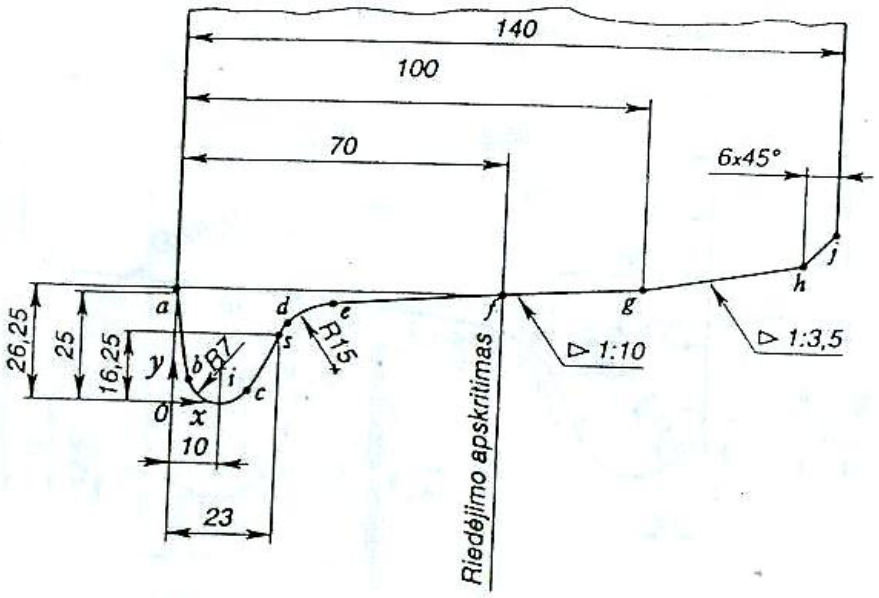


Bandažo profilio matmenys tikrinami vagoniniu-tenderiniu šablonu, pagamintu pagal brėž. I433.02.00 (rus. И433.02.00) Zaporožės RMZ (rus. PM3); matuojant bandažo profilį šablonu, pagamintu iki 1995 m., prie antbriaunio pridedama 1 mm

Taškas	1	2	3	4	5	6	7	8	9	10
x, mm	23	25	30	35	40	50	60	75	85	100
y, mm	5,95	10,36	18,00	21,93	24,14	25,86	27,05	28,41	29,13	30,05

Bandažo profilio matmenys tikrinami vagoniniu-tenderiniu šablonu pagamintu pagal brież. I433.02.00 (rus. И433.02.00) Zaporožės RMZ (rus. PM3); matuojant bandažo profilį šablonu, pagamintu iki 1995 m., prie antbriaunio pridedama 1 mm	Dimensions of the profile of the tyre shall be checked with a car-and-tender mould made in accordance with Drawing I433.02.00 (Russian: И433.02.00) by Zaporozhye Repair and Engineering Works (Russian: PM3); when measuring the profile with a mould made before 1995, it is necessary to add 1 mm to the rim
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

9) Tyre profile of the second and fifth wheelsets of a locomotive ChME3 with a sharp flange



Bandažo profilio matmenys tikrinami šablonu, pagamintu pagal brėž. I478.00.00 (rus. И478.00.00)

Taškas	a	b	c	d	e	f	g	h	j	i	k	s
x, mm	0,00	3,09	16,15	23,26	35,70	70,00	100,00	134,00	140,0	10,0	36,44	23,0
y, mm	25,00	5,88	3,66	16,73	24,54	26,25	27,75	32,61	38,61	7,0	9,56	16,25

Bandažo profilio matmenys tikrinami šablonu pagamintu pagal briež. I478.00.00 (rus. И478.00.00)	Dimensions of the profile of the tyre shall be checked with a mould made in accordance with Drawing I478.00.00 (Russian: И478.00.00)
Taškas	Point
Riedėjimo apskritimas	Tread (contact) line (Rolling circle)

The same document stipulates maximum values of deviations from these profiles in service and when releasing from repair of different scopes.

Mechanical requirements in accordance with: [L]ST EN 13262 Railway Applications. Wheelsets and bogies. Wheels. Product requirements;

GOST 10791-2004 Solid-Rolled Wheels. Technical Requirements;

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply

Poland

Ct-4 (Mt-11)

LHSt 11 (Mt-11)

Belarus and Russia

The profile of wheels should meet the established geometric parameters with regard to tolerances: the width of the rim (tyre), thickness and height of the flange for both new wheels and after turning operation. In Russia, several repair profiles of wheelsets are used and standard dimensions for them are stipulated in the Instruction for the Operation, Technical Maintenance, and Repair of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (KMBSh.667120.001RE approved by Russian Railways on 27 December 2005). For new wheelsets, profile in accordance with GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions and GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions is used.

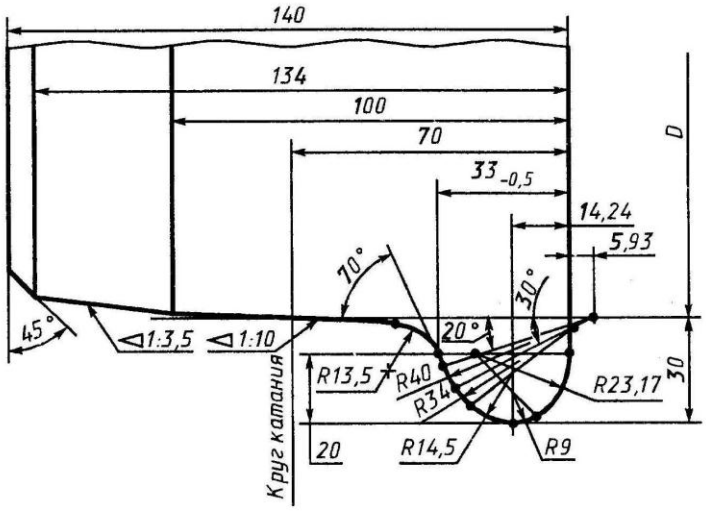


Рисунок 3 — Профиль обода колеса для локомотивов

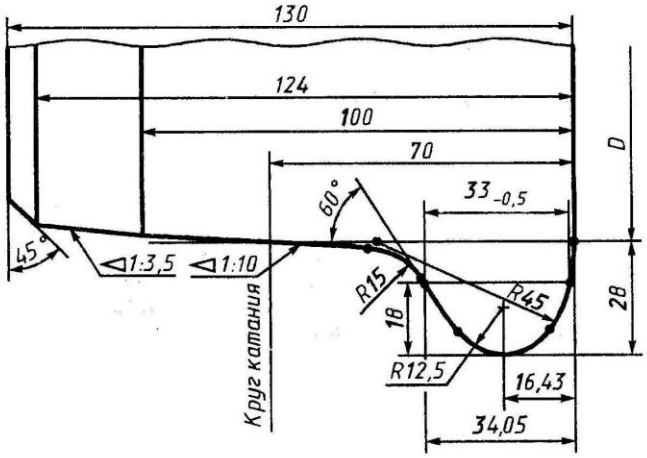


Рисунок 4 — Профиль обода колеса для МВПС

ГОST	GOST
Круг катания	Tread (contact) line
Рисунок	Figure
Профиль обода колеса для локомотивов	Wheel rim profile for locomotives
Профиль обода колеса для МВПС	Wheel rim profile for multi-units

Slovakia

Profile in accordance with the UIC is used. Profile in accordance with the PPV is admitted.

Ukraine

The profile of wheels should meet the established geometric parameters with regard to tolerances: the width of the rim (tyre), thickness and height of the flange for both new wheels and after turning operation. Repair profiles of wheelsets are used, and standard dimensions for

them are stipulated in the Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways. For new wheelsets, profile in accordance with GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions and GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions is used.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for 1 520 mm Gauge) LDz No. D-3/450 dated 01 September 2010 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Railway Cars (for the gauge width of 1 520 mm) LDz dated 14 July 2005. No. DR 71/2005; Paragraph 2.5., 4.1. The requirements of the following standards are applied as the information source on a voluntarily basis: GOST 398-96 Carbon Steel Tyres for Rolling Stock of Broad-Gauge and Underground Railways. Technical Conditions – Basic Requirements for the Material and Manufacture of Rough Carbon Steel Tyres GOST 3225-80 (1998; from 01 July 2006 the application of the Standard was terminated at the territory of the Russian Federation GOST R 52366-2005 is in force) (replacing GOST 3225-46): Rough Carbon Steel Tyres for Broad-Gauge Railway Locomotives. Types and Dimensions GOST R 52366-2005 Rough Carbon Steel Tyres for Broad-Gauge Railway Locomotives. Types and Dimensions – The Standard shall apply to Rough Carbon Steel Tyres for wheelsets of locomotives (electric locomotive, diesel locomotives, and steam locomotives) of railways and stipulates the types and dimensions thereof GOST 4491-86 Cast Wheel Centres for Rolling Stock of 1 520 mm Gauge Railways. General Technical Conditions. – The Standard shall apply to cast wheelset centres of locomotives and motored cars of electric trains and diesel trains of 1 520 mm gauge railways in the cold-temperature zone modification in accordance with GOST 15150 GOST 5000-83 Rough Carbon Steel Tyres for Cars and Tenders of 1 520 mm Gauge Railways. Dimensions – The Standard shall apply to Rough Carbon Steel Tyres for wheelsets of motored cars of electric trains and diesel trains and tenders of 1 520 mm gauge railways GOST 5267.10-90 Profile for Tread Rings. Range of Sizes – The Standard shall apply to hot-rolled profile for tread rings GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions – The Standard shall apply to solid-rolled wheels for wheelsets of trucks of locomotive-hauled freight and passenger cars, non-motored cars of electric trains and diesel trains as well as track machines of 1 520

	(1 524) mm. The Standard shall not apply to wheels intended for the repair of wheelsets GOST 10791-2004 Solid-Rolled Wheels. Technical Conditions – The Standard shall apply to solid-rolled wheels for wheelsets of freight and passenger bogies of locomotive-hauled cars, non-motored cars of electric trains and diesel trains as well as track machines of 1 520 (1 524) mm GOST 10791-2004 Solid-Rolled Wheels. Technical Conditions – The Standard shall apply to solid-rolled wheels in the cold-temperature zone modification in accordance with GOST 15150 for wheelsets of trucks of freight and passenger bogies of locomotive-hauled cars, passenger, shunting, and freight locomotives, track machines, and non-motored cars of electric trains and diesel trains of 1 520 mm gauge
Lithuania	ADV-001 Regulation on the Technical Operation of Railways T/108 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (1 520 mm pločio vėžės traukos riedmenų aširačių formavimo remonto ir priežiūros instrukcija) [L]ST EN 13262 Railway Applications. Wheelsets and bogies. Wheels. Product requirements; GOST 10791-2004 Solid-Rolled Wheels. Technical Requirements (Informatory)
Poland	Ct-4 (Mt-11) Instruction for the Measurements and Technical Assessment of Traction Rolling Stock Pairs LHSt 11 (Mt-11) Instruction for Geometrical Measurements of Wheelsets of Traction Rolling Stock
Russia	Instruction for the Operation, Technical Maintenance, and Repair of Wheelsets of Traction Rolling Stock of 1 520 mm Gauge Railways (KMBSh.667120.001RE approved by Russian Railways on 27 December 2005) GOST 11018-2000 Traction Rolling Stock of 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions.
Slovakia	UIC… PPV
Ukraine	DSTU GOST 11018:2005 Traction Railway Stock of Ukrainian 1 520 mm Gauge Railways. Wheelsets. General Technical Conditions. GOST 398-96 Carbon Steel Tyres for Rolling Stock of Broad-Gauge and Underground Railways. Technical Conditions GOST 4491-86 Cast Wheel Centres for Rolling Stock of 1 520 mm Gauge Railways. General Technical Conditions GOST 9036-88 Solid-Rolled Wheels. Design and Dimensions VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways

Estonia	

5.2.5.3 Mechanical and Geometrical Characteristics of Axles

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified.

The requirements are stipulated by GOST 31334-2007 Axles of 1 520 mm Gauge Rolling Stock. Technical Conditions.

Latvia

The main requirement of the TOR: cracks in the wheelset axle are not permitted.

(No. L29/97, in addition to the requirements of the TOR).

The following is regulated:

- roughness of wheelset axle surfaces of traction rolling stock (similarly to Paragraph 6.2.5 of the Russian Instruction ST-329)
- difference in dimensions from end-faces of the axle to the centre of the axle (marked with a centre mark) in respect of the thrust end-faces of pre-seat parts should be not more than 1 mm

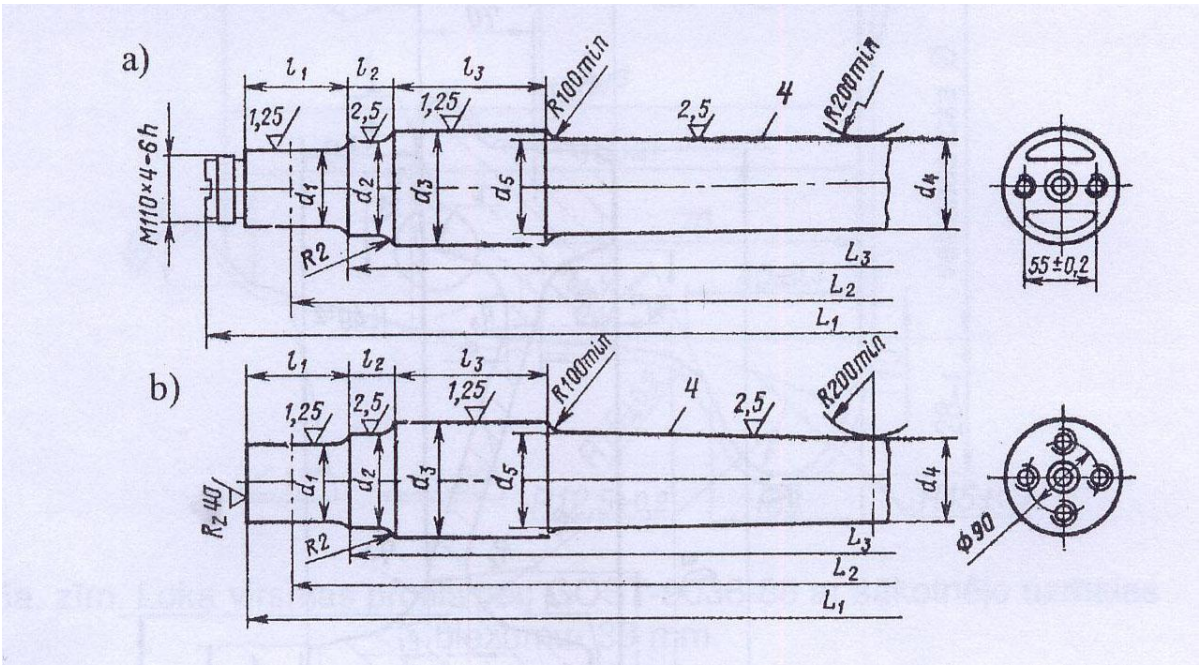
(No. DR 71/2005, in addition to the requirements of the TOR).

The main dimensions of the wheelset axle for cars (trailer cars) are regulated.

The main dimensions of a new axle:

а) type RU-1

б) type RU 1 Sh

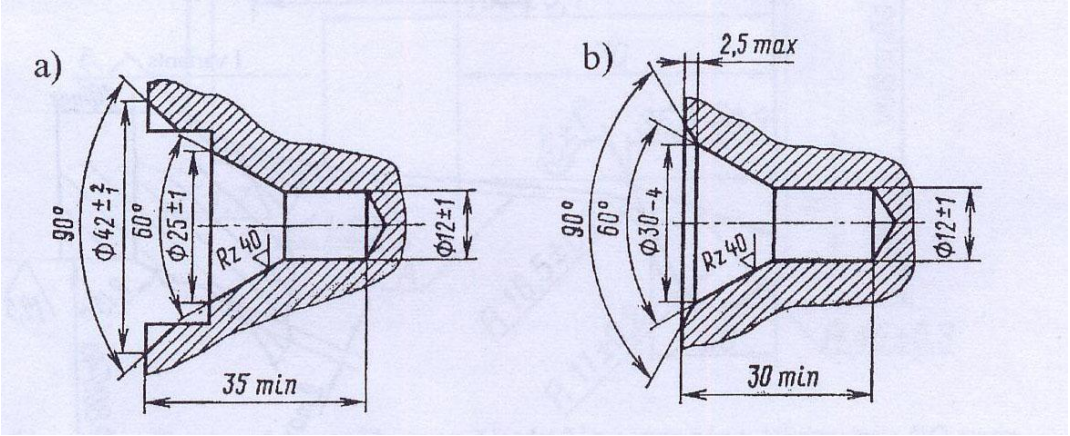


THE MAIN DIMENSIONS OF NEW WHEELSET AXLES, mm

Axle type	d1		d2		d3		d4	
	nominal	maximum deviation	nominal	maximum deviation	nominal	maximum deviation	nominal	maximum deviation
RU1	130	+ 0.052 + 0.025	165	+ 0.20 + 0.12	194	+ 2.0 - 0.5	172	+ 3.0
RUISh	130	+ 0.052 + 0.025	165	+ 0.20 + 0.12	194	+ 2.0 - 0.5	172	+ 3.0

Axle type	l_1		l_2		L_3	L_1		L_2	L_3	
	nominal	maximum deviation	nominal	maximum deviation		nominal	maximum deviation		nominal	maximum deviation
RU1	176	+ 1.0 - 0.5	76	+ 1.0	265	2 294	+ 1.0 - 3.0	2 036	1 836	+ 1.0
RUISh	190	+ 1.0	76	+ 1.0	265	2 216	+ 1.0 - 3.0	2 036	1 836	+ 1.0

Dimensions of holes at the end-face of the axle for fixing it in a workbench:



Lithuania

Dimensions and surface roughness of a new or previously used and re-finished axle should comply with the drawings, technical conditions, and requirements of this Instruction (T/108).

Mechanical requirements: in accordance with LST EN 13261 Railway Applications. Wheelsets and bogies. Axles. Product requirements.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

PN-EN-13103:2009, PN-EN-13104:2009, PN-EN-13261:2009, PN-EN-15313:2010

PN-K-02046:1993

Belarus and Russia

Requirements are stipulated by GOST 31334-2007 Axles of 1 520 mm Gauge Rolling Stock. Technical Conditions.

Slovakia

The requirements of the Instructions of the UIC are applied. Rolling stock of the 1 520 mm gauge in accordance with the PPV is admitted.

Ukraine

Dimensions and surface roughness of a new or previously used and re-finished axle should comply with the drawings, technical conditions, and requirements of the effective standards GOST and the Instruction.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 31334-2007 Axles of 1 520 mm Gauge Rolling Stock. Technical Conditions
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Traction Rolling Stock (for 1 520 mm Gauge) LDz No. D-3/450 dated 01 September 2010 Instruction for the Assembling, Repair, and Maintenance of Wheelsets of Railway Cars (for the gauge width of 1 520 mm) LDz dated 14 July 2005. No. DR 71/2005; Paragraph 2.2., Appendix 2 The requirements of the following standards are applied as the information source on a voluntarily basis: GOST 22780-93 Axles for Cars of 1 520 (1 524) mm Gauge Railways. Types, Parameters, and Dimensions – The Standard shall apply to axles of wheelsets of freight and passenger cars, cars of electric trains, and non-motored cars of diesel trains for main-line 1 520 (1 524) mm gauge railways. The Standard shall not apply to axles intended for the repair of wheelsets GOST 31334-2007 Axles for 1 520 mm Gauge Rolling Stock. Technical Conditions – the Standard shall apply to rough (profile blanks) and finished axles in the cold-temperature zone modification in accordance with GOST 15150 for rolling stock of 1 520 mm gauge railways and underground railways
Lithuania	Instruction T/108 LST EN 13261 Railway Applications. Wheelsets and bogies. Axles. Product requirements GOST 30237-96 Finished Axles for Rolling Stock of 1 520 mm Gauge Railways. Technical Conditions (Informatory)
Poland	PN-K-9146:1993 Traction Trains, Wheelset Axles. Technical Conditions and Tests PN-EN-13103:2009, PN-EN-13104:2009, PN-EN-13261:2009, PN-EN-15313:2010 PN-K-02046:1993
Russia	GOST 30237-96 (ISO 1005-3-82). Finished Axles for Rolling Stock of 1 520 mm Gauge Railways. Technical Conditions
Slovakia	UIC… PPV
Ukraine	GOST 22780-93 (ISO 1005-9-86) Axles for Cars of 1 520 (1 524) mm Gauge Railways. Types, Parameters, and Dimensions GOST 30237-96 (ISO 1005-3-82). Finished Axles for Rolling Stock of

	1 520 mm Gauge Railways. Technical Conditions VND 32.0.07.001-2001 Instruction for the Formation and Maintenance of Wheelsets of Traction Rolling Stock of Ukrainian 1 520 mm Gauge Railways
Estonia	

5.2.6 Minimum permissible curve radius

Currently, requirements for this parameter are different in all the countries or are not regulated. It is difficult to identify a common constituent because of the insufficiency of the information provided.

Belarus and Russia

It is not regulated. This parameter is included in the design for various series of traction and multi-unit rolling stock.

Latvia

In Latvia, it is not regulated.

The customer himself determines the demand for this parameter and draws up the technical assignment for the designing of rolling stock. The state (NSA) checks the rolling stock for compliance with the project when accepting for operation.

The requirements of the following standards are applied as the information source on a voluntarily basis:

GOST 22602-91 Main-Line Diesel Locomotives. Types and Basic Parameters – The Standard shall apply to diesel locomotives intended for freight and Passenger transportation on 1 520 mm gauge railways of the Ministry of Railways of the USSR and industrial enterprises of the USSR.

GOST 24790-81 Industrial Diesel Locomotives. General Technical Conditions – The Standard shall apply to diesel locomotives of 1 520 mm gauge railways of the USSR, Types 3-6 GOST 22339-88, intended for use in industrial transport. This Standard shall not apply to diesel locomotives intended for operation in explosive conditions.

GOST 27705-88 Shunting Diesel Locomotives with a Capacity of 180 kW. Basic Parameters and Technical Requirements – The Standard shall apply to shunting diesel locomotives with a capacity of 180 kW intended for use on 1 435 and 1 520 mm gauge railways.

GOST 22339-88 Shunting and Industrial Diesel Locomotives. Types and Basic Parameters – The Standard shall apply to diesel locomotives for 1 520 mm gauge intended for shunting and shunting-and-removal operation on railways of the Ministry of Railways of the USSR and industrial enterprises of the USSR. The Standard stipulates the types of shunting and industrial diesel locomotives and basic classification parameters characterising the stipulated types. For specific operating conditions, at the request of the customer, it shall be permitted to design special-purpose industrial diesel locomotives with parameters different from those specified in the Standard while limiting the area of application thereof on the basis of request of particular consumers.

Note: GOST 22339-88 contains a table, where the minimum run-through curve radius is stipulated depending on the service weight of the locomotive. The absolute minimum of the curve radius is 40 m.

GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements.

Lithuania

It is determined in the assignment for the designing of the locomotive agreed upon by the customer and the contractor.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

V=5 km/h – R 75/80*

V=15 km/h – R 90

V=30 km/h – R 125

Different – in accordance with the design documentation

* for TEM2 (SM48)

Slovakia

For locomotives – 90 m at a speed of 10 km/h, and 150 without speed limitations. Rolling stock arriving by the PPV is admitted.

Ukraine

For main-line locomotives, it is determined in the technical assignment for the designing of the locomotive agreed upon by the customer and the contractor as well as by the design documentation.

For shunting diesel locomotives, the minimum run-through curve radius is determined depending on the service weight of the locomotive in accordance with GOST 22339-88 Shunting and Industrial Diesel Locomotives. Types and Basic Parameters.

Requirements for curve radiuses, depending on the track category, are stipulated by the State Construction Standards of Ukraine GSNU DBN V.2.3-19-2008

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	In Latvia, it is not regulated. The customer himself determines the demand for this parameter and draws up the technical assignment for the designing of rolling stock. The state (NSA) checks the rolling stock for compliance with the project when accepting for operation The requirements of the following standards are applied as the

	information source on a voluntarily basis: GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements – The Standard shall apply to diesel-electric locomotives intended for freight and passenger transportation on 1 520 and 1 435 mm gauge railways and stipulates general requirements for the locomotives and systems and components thereof. The Standard shall not apply to diesel locomotives upgraded with an extension of their service life GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements – The Standard shall apply to diesel-electric locomotives with a capacity over 550 kW (750 hp) intended for freight, passenger, and shunting (shunting-and-removal) operation on 1 520 mm gauge main-line railways GOST 22602-91 Main-Line Diesel Locomotives. Types and Basic Parameters – The Standard shall apply to diesel locomotives intended for freight and Passenger transportation on 1 520 mm gauge railways of the Ministry of Railways of the USSR and industrial enterprises of the USSR GOST 24790-81 Industrial Diesel Locomotives. General Technical Conditions – The Standard shall apply to diesel locomotives of 1 520 mm gauge railways of the USSR, Types 3-6 GOST 22339-88, intended for use in industrial transport. This Standard shall not apply to diesel locomotives intended for operation in explosive conditions GOST 27705-88 Shunting Diesel Locomotives with a Capacity of 180 kW. Basic Parameters and Technical Requirements – The Standard shall apply to shunting diesel locomotives with a capacity of 180 kW intended for use on 1 435 and 1 520 mm gauge railways GOST 22339-88 Shunting and Industrial Diesel Locomotives. Types and Basic Parameters – The Standard shall apply to diesel locomotives for 1 520 mm gauge intended for shunting and shunting-and-removal operation on railways of the Ministry of Railways of the USSR and industrial enterprises of the USSR. The Standard stipulates the types of shunting and industrial diesel locomotives and basic classification parameters characterising the stipulated types. For specific operating conditions, at the request of the customer, it shall be permitted to design special-purpose industrial diesel locomotives with parameters different from those specified in the Standard while limiting the area of application thereof on the basis of request of particular consumers Note: GOST 22339-88 contains a table, where the minimum run-through curve radius is stipulated depending on the service weight of the locomotive. The absolute minimum of the curve radius is 40 m GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements GOST R 51690-2000 Passenger Cars of Main-Line 1 520 mm Gauge Railways. General Technical Conditions – The Standard shall apply to

	newly manufactured locomotive-hauled passenger cars of main-line 1 520 mm gauge railways. The Standard shall not apply to cars of electric trains, diesel trains and special-purpose and technical-service locomotive-hauled cars
Lithuania	
Poland	
Russia	
Slovakia	PPV TOR
Ukraine	GOST 22339-88 Shunting and Industrial Diesel Locomotives. Types and Basic Parameters DBN B.2.3-19-2008 Transport Structures. 1 520 mm Gauge Railways. Designing Standards
Estonia	

5.2.7 Sanding devices

Currently, requirements for this parameter are different in all the countries. A common constituent, which covers the differences in the requirements, may be identified.

Depending on the type of service of the electric locomotive or diesel locomotive, track profile, and climatic conditions, the intensity of sand supply by each nozzle is determined by the railways and ranges from 400 to 700 g/min in summertime, and not more than 1 500 g/min under the first wheelset in the direction of travel of the train and 900 g/min under the successive wheelsets in wintertime (Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, TsT-814, Paragraph 2.5.4; Temporary Instructive Guidance for the Repair and Maintenance of Sandboxes at Electric Locomotive (TI-60)).

Sandboxes are also installed on electric trains; however, they are actually not used in service.

When traction rolling stock is equipped with slide and slippage protection devices, it is necessary to envisage automatic sand supply from sandboxes with a volume which ensures sanding during at least 90 minutes when travelling in one direction without the need of refilling the sandboxes.

Belarus

The sanding system should ensure effective sand supply under the first wheelset of each bogie in the direction of travel of the diesel locomotive. When traction rolling stock is equipped with slide and slippage protection devices, automatic sand supply should be envisaged.

Latvia

From academic literature:

The book “Тепловоз 2ТЭ116”, S. P. Филонов (Транспорт, 1985) (Diesel Locomotive 2TE116, S. P. Filonov (Transport, 1985)), Part 7, Chapter III “Sanding System” refers to the following parameter: sanding intensity – 750 ± 200 g/min under each wheel.

The book "Тепловозы. Механическое оборудование. Устройство и ремонт", редакция Н. М. Хуторянского (Желдориздат, Трансинфо, 2005 г.) (Diesel Locomotives. Mechanical Equipment. Design and Repair, under the editorship of N. M. Khutoryanskiy (Zheldorizdat, Transinfo, 2005)), Chapter 20 "Design of Frames and Body. Sanding System and Fire-Fighting Installation", Paragraph 64 "Sanding System" refers to the following parameter: required sanding intensity under the first and sixth wheelsets – 1.6-2.0 kg/min, and under the third and fourth wheelsets – 0.8-1.2 kg/min.

The book "Справочник машиниста тепловоза", В. Е. Кононов (Желдориздат, 2004 г.) (Diesel Locomotive Driver's Guide, V. Ye. Kononov (Zheldorizdat, 2004)), Chapter 9 "Pneumatic Automation, Sanding, and Fire-Fighting Systems", Paragraph 9.2 "Sanding Systems of Diesel Locomotives" contains a table with technical characteristics of sanding equipment of diesel locomotives.

Тепловоз	Число бункеров	Вместимость каждого бункера кг	Число форсунок	Число воздухораспределителей	Число электропневматических вентилей	Норма подачи песка одной форсункой, кг/мин, под колесную пару	
						первую и шестую	третью и четвертую
ТЭ3	8	175	16	8	4	1,2—2,5	0,8—1,2
2М62	8	150	16	8	8	—	—
2ТЭ10М	8	254	16	8	8	1,5—2,5	0,8—1,2
2ТЭ116	8	250	16	4	8	1,5—2,5	0,8—1,2
2ТЭ121	8	265	16	—	—	1,5—2,5	0,8—1,2
ТЭП60	8	150	8	4	2	1,2—2,5	0,8—1,2
ТЭП70	4	200	8	4	4	1,6—2	0,8—1,2
ТЭМ2	4	500	8	2	1	1,4—2	0,8—1
ЧМЭ3	4	375	8	4	4	1,2—1,5	0,9—1,2
ТЭМ7	4	575	8	4	4	1,0—1,2*	0,7—0,8**

* Под каждое колесо крайних колесных пар.
** Под каждое колесо средних колесных пар.

Diesel locomotive	Number of boxes	Capacity of each box, kg	Number of nozzles	Number of air distributors	Number of electric-and-pneumatic valves	Sanding rate of one nozzle, kg/min, under a wheelset	
						first and sixth	third and fourth
TE3							
2M62							
2TE10M							
2TE116							
2TE121							
TEP60							
TEP70							
TEM2							
ChME3							
TEM7							
*Under each wheel of the outer wheelsets. **Under each wheel of the inner wheelsets.							

Lithuania

The sanding system should ensure effective sand supply under the first wheelset of each bogie and allow the locomotive driver to supply sand only under one wheelset (the first wheelset in the travel direction of the diesel locomotive).

When traction rolling stock is equipped with slide and slippage protection devices, automatic sand supply should be envisaged.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

On existing locomotives, in accordance with the technical documentation DTR i WTO.

Russia

Depending on the type of service of the electric locomotive or diesel locomotive, track profile, and climatic conditions, the intensity of sand supply by each nozzle is determined by the railways and ranges from 400 to 700 g/min in summertime, and not more than 1 500 g/min under the first wheelset in the direction of travel of the train and 900 g/min under the successive wheelsets in wintertime (Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, TsT-814, Paragraph 2.5.4; Temporary Instructive Guidance for the Repair and Maintenance of Sandboxes at Electric Locomotive (TI-60)).

Sandboxes are also installed on electric trains; however, they are actually not used in service.

Slovakia

It is not regulated, but must be available for freight traffic.

Ukraine

When traction rolling stock is equipped with slide and slippage protection devices, it is necessary to envisage automatic sand supply from sandboxes with a volume which ensures sanding for at least 90 minutes when travelling in one direction without the need of refilling the sandboxes. The sand supply intensity is adjusted during commission inspections.

Depending on the type of service of the electric locomotive or diesel locomotive, track profile, and climatic conditions, the intensity of sand supply by each nozzle is determined by the railways and ranges from 400 to 700 g/min in summertime, and not more than 1 500 g/min under the first wheelset in the direction of travel of the train and 900 g/min under the successive wheelsets in wintertime (Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, TsT-814, Paragraph 2.5.4; Temporary Instructive Guidance for the Repair and Maintenance of Sandboxes at Electric Locomotive (TI-60)).

The sandbox should be controlled either by means of a pedal installed in the foot platform under the control panel or by means of a hand valve (push button) located in an easy-to-reach area of the body field of the driver's work space.

Sandboxes are also installed on electric trains; however, they are actually not used in service.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements
Latvia	In Latvia, it is not regulated. The requirements of the GOST standards referred to in Paragraph 5.2.6 above are applied as an information source on a voluntarily basis.
Lithuania	GOST 31187-2003 (Informatory)
Poland	Design documentation
Russia	Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, TsT-814, Paragraph 2.5.4 Temporary Instructive Guidance for the Repair and Maintenance of Sandboxes on Electric Locomotive (TI-60)
Slovakia	Design documentation
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-0052. Instruction for the Preparation for Operation and Technical Maintenance of Electric Locomotives in Winter Conditions
Estonia	

5.2.8 Guard irons

Currently, requirements for this parameter are different in all the countries. A common constituent, which covers the differences in the requirements, may be identified.

Cars with a driving compartment and locomotives should be equipped with a device located under the first wheelset in the direction of travel and preventing wheels and under-body equipment from being damaged by items on rails. Guard irons are to be equipped with track sweepers.

The height of the lower edge of the guard iron from the rail head should be 80 to 150 mm under any circumstances (further specification will follow). It is necessary to take into account the wear rate of wheels and dynamic change of the body suspension height. The distance from rail heads to the end-face of the sweeper rope should be within the range of 65 to 75 mm (Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, Paragraph 2.5.6).

The guard iron should withstand, without deformation, a force of 140 to 170 kN. applied to it lengthwise along the track centreline, at the point shifted to one side from the centreline by 850-915 mm. Compliance confirmation is performed by calculations of the manufacturing plant.

The frontal parts of an electric locomotive should be equipped with guard irons designed for a uniformly distributed force of 250-300 kN. (25-30 ton-force), with holes for air penetration. It is necessary to envisage an adjustable height of the guard iron screen above the rails depending on the wear rate of wheels.

Belarus

The frontal parts of an electric locomotive should be equipped with guard irons with holes for air penetration. It is necessary to envisage an adjustable height of the guard iron screen above the rails depending on the wear rate of wheels. Different safety requirements are established for different types of rolling stock in accordance with the corresponding rules for the technical maintenance and repair of the specific type of traction rolling stock.

Latvia

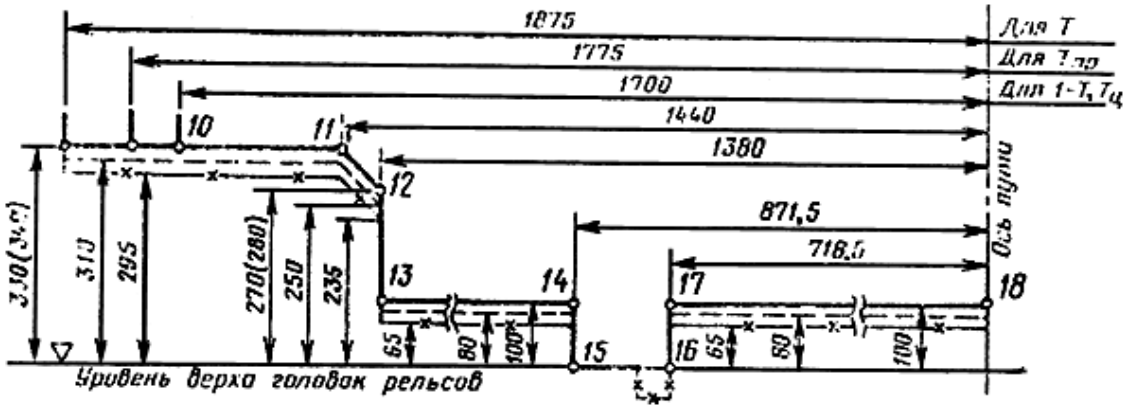
In Latvia, rolling stock clearance gauge is regulated.

Согласно LVS 282-2005 Railway Constructions and Rolling Stock Clearance Gauge:

3.2. The lower contours of the clearance gauges of T, Tts, Tpr, and 1-T.

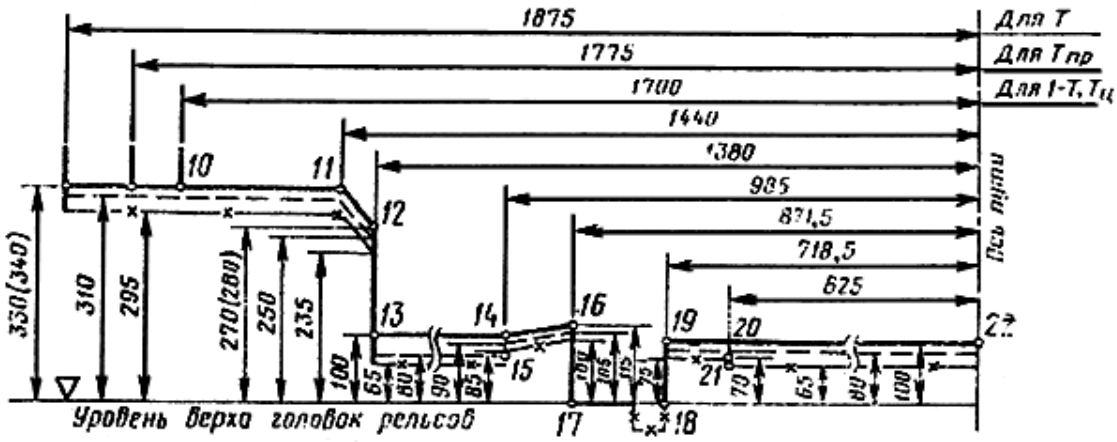
3.2.1. The lower contours of the clearance gauges of T, Tts, Tpr, and 1-T should meet those indicated on Drawing 11.

a) For rolling stock passing at all tracks of the railways of Latvia and other countries with a track gauge of 1 520 (1 524) mm, with the exception of tracks of sorting yards, equipped with car retarders.



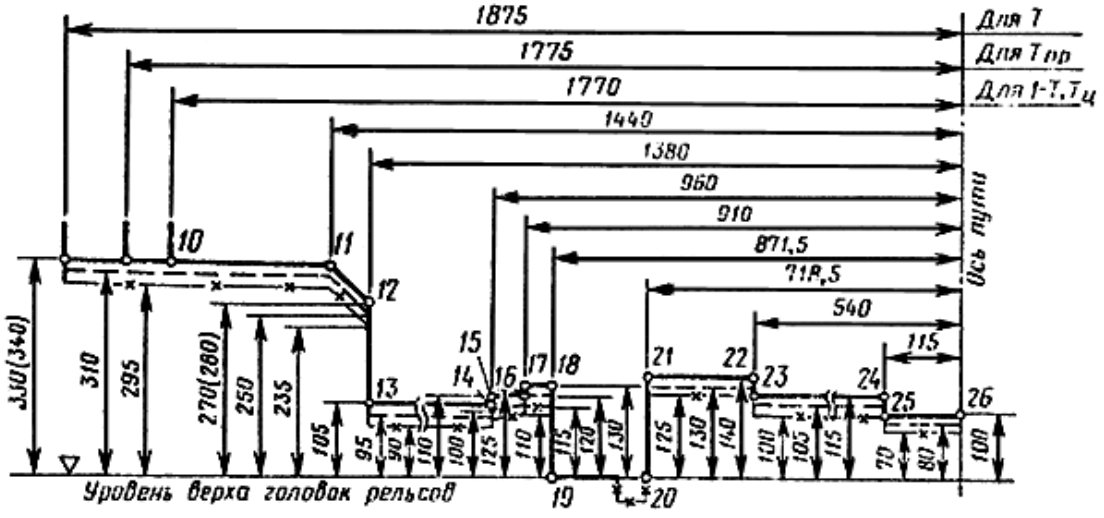
Для Т	For T
Для Тпр	For Tpr
Для 1-Т, Тц	For 1-T, Tts
Уровень верха головок рельсов	Rail head top level
Ось пути	Track centreline

b) For rolling stock passing on all tracks of the railways of Latvia and other countries with a track gauge of 1 520 (1 524) mm, including tracks of sorting yards, equipped with car retarders in the non-operating (non-brake) position thereof.



Для Т	For T
Для Тпр	For Tpr
Для 1-Т, Тц	For 1-T, Tts
Уровень верха головок рельсов	Rail head top level
Ось пути	Track centreline

c) For rolling stock passing on all tracks of the railways of Latvia and other countries with a track gauge of 1 520 (1 524) mm, including tracks of sorting yards, equipped with car retarders in any position thereof.



Для Т	For T
Для Тпр	For Tpr
Для 1-Т, Тц	For 1-T, Tts
Уровень верха головок рельсов	Rail head top level

Ось пути	Track centreline

d) For rolling stock passing on all tracks of the railways of Latvia and other countries with a track gauge of 1 520 (1 524) mm, including tracks of sorting yards, equipped with car retarders in any position thereof as well as tracks equipped with a car-humping installation (see Drawing 6).

––––––––: for sprung parts of the body;

- – - – - – - – : for the sprung frame of the bogie and parts attached thereto;

- x – x – x – x -: for unsprung parts.

Notes:

1. The vertical dimensions indicated in brackets shall be assumed only for passenger cars (except for postal cars, luggage cars, and dome cars) including cars of electric trains and diesel trains.

2. The deepening by the line 24-25-26 on Drawing 11в (c) and by the line 22-23-24 on Drawing 11г (d) shall be permitted only for clamps of brake gears.

I. e. pursuant to the standard LVS 282-2005, the distance between the lower point of the guard iron and surface of rail heads may not be smaller than 100 mm because the guard iron is an unsprung part of the body.

The infrastructure manager LDz approved the rules for the repair and maintenance of different parts of traction rolling stock, which regulate the distance between the lower point of the guard iron and surface of rail heads when releasing traction rolling stock after repair or maintenance, i.e. it is a controlled parameter.

Type of traction rolling stock	Name of the rules	Special conditions	Dimensions in the drawing, mm	Dimension for which the operation of traction rolling stock is prohibited, mm
Diesel locomotives	25.06.2002. No. DR-42/2002 Rules for the Technical Maintenance and Current Repair of a Diesel Locomotive Series ChME3 (Paragraph 4.6.8)	---	---	less than 100 more than 150
	05.11.2007. No. RSS-2/2007 Rules for the Technical Maintenance and Current Repair of Diesel Locomotives Series TEM2, TEM2U, TEM2A, and TEM2UM (Paragraph 3.3.8)	---	---	less than 100 more than 170
	09.03.2001. No. DR-29/2001 Rules for the Current Repair and Technical Maintenance of Diesel Locomotives Series M62, 2M62, and 2M62U (Paragraph 8.5.1.3)	---	---	less than 135 more than 175

	23.10.2000. No. DR-24/2000 Rules for the Current Repair and Technical Maintenance of Diesel Locomotives Series 2TE10M and 2TE10U (Paragraph 8.5.1.)	---	---	less than 135 more than 175
Electric trains	20.12.1997. No. L-31/97 Rules for the Current Repair and Technical Maintenance of Electric Trains Series ER2	under load of the tare of the head car		
		with bogies type KVZh-5/E	190	less than 175 more than 195
		with bogies type KVZh-TsNTI	250	less than 220 more than 250
Diesel trains	25.03.2002. No. DR-38/2002 Rules for the Current Repair and Technical Maintenance of Diesel Trains Series DR-1 (Paragraph 3.5.3)	---	170	less than 165 more than 180

Lithuania

The requirements in accordance with LST EN 12663 Railway Applications. Structural requirements of railway vehicle bodies

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

In accordance with design documentation (60 ±5)

> 40 mm

Russia

Cars with a driving compartment and locomotives should be equipped with a device located under the first wheelset in the direction of travel and preventing wheels and under-body equipment from being damaged by items on rails. Guard irons are to be equipped with track sweepers.

The height of the lower edge of the guard iron from the rail head should be 80 to 150 mm under any circumstances (further specification will follow). It is necessary to take into account the wear rate of wheels and dynamic change of the body suspension height. The distance from rail heads to the end-face of the sweeper rope should be within the range of 65 to 75 mm (Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, Paragraph 2.5.6).

The guard iron should withstand, without deformation, a force of 140 to 170 kN. applied to it lengthwise along the track centreline, at the point shifted to one side from the centreline by 850-915 mm. Compliance confirmation is performed by calculations of the manufacturing plant.

Slovakia

It is not regulated.

The guard rail is required for passive safety and performs the functions of a guard iron.

Ukraine

The frontal parts of an electric locomotive should be equipped with guard irons designed for a uniformly distributed force of 250-300 kN. (25-30 ton-force), with holes for air penetration. It is necessary to envisage an adjustable height of the guard iron screen above the rails depending on the wear rate of wheels.

The aforementioned requirements are approved by the following documents:

Belarus	Rules for the technical maintenance and repair of the specific type of traction rolling stock
Latvia	TOR of the Latvian Railways LVS 282-2005 Railway Constructions and Rolling Stock Clearance Gauge (its primary source: GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways) (TOR requires compliance with the Standard)
Lithuania	LST EN 12663 Railway Applications. Structural requirements of railway vehicle bodies
Poland	Design documentation
Russia	Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions, Paragraph 2.5.6
Slovakia	Design documentation
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-0052. Instruction for the Preparation for Operation and Technical Maintenance of Electric Locomotives in Winter Conditions Design documentation
Estonia	

5.3 BRAKING

5.3.1 General provisions

Currently, requirements for this parameter are the same in all the countries.

The braking system should ensure the reduction in train speed, downhill train speed control, and stopping of the train while preventing the impermissible length of stopping distance as well as immovability of a standing train.

Automatic brakes of rolling stock shall ensure braking effort guaranteeing that in case of emergency brake application the train stops at a distance not exceeding the stopping distance approved by the railway infrastructure manager.

The design of a locomotive should provide for both an automatic brake and parking brake as well as automatic stopping device. Electric locomotives and diesel locomotives should be additionally equipped with an auxiliary brake and emergency braking system. Passenger rolling stock must be equipped with electro-pneumatic brakes.

Braking equipment should ensure slip-free braking within the whole range of speeds and corresponding design pressure in braking cylinders when applying brakes at traction rolling stock provided that the operating rules are observed.

Belarus

The main rules for the operation of brakes are stipulated in the TOR and STP 09150.17.038-2006.

Latvia

Rolling stock shall be equipped with automatic brakes and rolling stock of passenger trains shall be additionally equipped with electro-pneumatic brakes.

Automatic brakes of rolling stock shall be maintained in accordance with the established technical standards and should ensure reliable operation and smooth braking as well as stopping of the train in case of disconnection or breakaway of the air manifold or in case of applying the emergency stop valve (emergency brake valve).

Automatic brakes shall ensure the possibility of applying various modes of braking depending on the track profile, load of cars, and length of the train.

Emergency stop valves in passenger cars and multi-unit rolling stock are installed in car vestibules and inside cars and are sealed.

Hauling vehicles and passenger cars shall be equipped with manually-operated brakes.

Lithuania

Rolling stock should be equipped with automatic brakes, and rolling stock of passenger trains should be additionally equipped with electro-pneumatic brakes.

Locomotives, passenger cars, and cars of diesel trains and electric trains should be equipped with manually-operated brakes.

New rolling stock shall be additionally equipped with electro-dynamic brakes.

Poland

UIC 540; PN-K-88177:1998

Russia

Rolling stock should be equipped with automatic pneumatic brakes ensuring the braking of a train with maximum permissible weight.

The obligatory parameters that determine braking efficiency are indicated in Instruction for the Operation of Rolling Stock Brakes TsT-TsV-TsL-VNIIZhT/277 (Appendix 2, Table 1). These standards are given for a single smallest braking effort of brake blocks depending on the maximum permissible travel speed of trains and distance from the train guard to places of suddenly appearing obstacles at track sides.

Slovakia

Instructions of the UIC. It ensures compatibility with the system of the OSJD.

Ukraine

The design of rolling stock should provide for an automatic brake and manually-operated brake as well as automatic stopping device, and should be additionally equipped with an auxiliary brake and emergency braking system.

Automatic brakes of rolling stock shall ensure braking effort guaranteeing that, in case of emergency brake application, the train stops at a distance not exceeding the stopping distance in accordance with the calculations approved by the State Railways Administration of Ukraine.

Automatic brakes of rolling stock shall be maintained in accordance with the established technical standards and should ensure reliable operation and smooth braking as well as stopping of the train in case of disconnection or breakaway of the air manifold or in case of applying the emergency stop valve (emergency brake valve).

Automatic brakes shall ensure the possibility of applying various modes of braking depending on the track profile, load of cars, and length of the train.

Passenger rolling stock must be equipped with electro-pneumatic brakes.

Locomotives and multi-unit rolling stock are equipped with parking (manually-operated) brakes. A parking (manually-operated) brake should ensure retention at a slope of 30 ‰.

The aforementioned requirements are approved by the following documents:

Belarus	TOR – Technical Operating Rules of the Belarusian Railways STP 09150.17.038-2006 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	ADV-001 Regulation on the Technical Operation of Railways R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės)
Poland	UIC 540, PN-K-88177:1998
Russia	Instruction for the Operation of Rolling Stock Brakes TsT-TsV-TsL-VNIIZhT/277 (Appendix 2, Table 1)
Slovakia	UIC 540, 541 TOR of the Slovak Railways. Part II – Rolling Stock and Repair Thereof Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport at the Broad-Gauge Line Matovce – Haniska pri Košiciach
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements

	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsRB-004. Technical Operating Rules for Ukrainian Railways TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock at Ukrainian Railways TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock at Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	TOR, Paragraphs 144 and 145

5.3.2 Main functional and safety requirements

5.3.2.1 Functional requirements

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Russia, and Ukraine).

The main braking system of rolling stock is automatic pneumatic, which ensures emergency and service braking. Additional braking systems for locomotives and multi-unit rolling stock include electro-pneumatic, electrodynamic, and hydrodynamic ones. On fast-speed rolling stock, magnetic track brakes may be used.

Automatic pneumatic and electro-pneumatic brakes of rolling stock should ensure braking effort guaranteeing that, in case of emergency brake application, the train stops at a distance not exceeding the stopping distance stipulated by the corresponding normative documents of each country. Locomotives and multi-unit rolling stock are equipped with parking (manually-operated) brakes in accordance with the TOR. A parking (manually-operated) brake should ensure retention at a slope of 30 ‰.

Automatic and electro-pneumatic brakes of rolling stock should have controllability and operating reliability under different operating conditions in accordance with the requirements of the TOR. The emergency brake should be automatically activated in case of the occurrence of situations threatening traffic safety in the event of a breakaway of the train or the driver's incapability to act.

A pneumatic braking system must be designed in accordance with the Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways. The dissipation of braking energy should be taken into account in the design of a braking system and should not cause any damage to the components of the braking system resulting from heating-up under normal operating conditions.

The means for the monitoring and control of the condition of the braking system are developed at the discretion of the Developer or in accordance with the requirements of the Customer ordering the rolling stock.

The rules for the maintenance of brakes and control thereof in trains are specified in the Instruction for the Operation of Rolling Stock Brakes.

The value of retardation when braking is limited by the conditions of the wheel-rail adhesion. The maximum permissible value of retardation when braking and speed of change in retardation in the event of the activation of the braking mode are not standardised.

It shall not be permitted to set rolling stock into movement when control devices of pneumatic brakes are blocked and when pressure of compressed air in the brake manifold is less than 85 % of the nominal pressure.

The pressure of compressed air in the main vessels should be at least 500 kPa.

It is necessary to envisage substitution of the electro-pneumatic brake with the pneumatic one in case of failure of the former.

Belarus

Passenger rolling stock should be equipped with automatic brakes, and passenger cars and locomotives, in addition, should be equipped with electro-pneumatic brakes.

Automatic brakes of rolling stock should be maintained in accordance with the established standards and should have controllability and operating reliability under different operating conditions as well as ensure smooth braking and stopping of the train in the event of disconnection or breakaway of the air manifold or in the event of applying the emergency stop valve (emergency brake valve).

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with manually-operating brakes. Part of the freight cars, in accordance with the established standards, should have a vestibule platform with an emergency stop valve and manually-operated brake.

The pressure of compressed air in the main vessels should be at least 500 kPa in accordance with NB ZhT TsT 01-04.

The other functional requirements are stipulated in the TOR and STP 09150.17.038 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways.

Latvia

Automatic brakes of rolling stock shall ensure braking effort guaranteeing that in case of emergency brake application the train stops at a distance not exceeding the stopping distance approved by the railway infrastructure manager.

Lithuania

Automatic brakes of rolling stock should operate in such a manner that in case of emergency braking the train could stop within the stopping distance determined on the basis of the calculations approved by the railway management.

The design of a locomotive should provide for both an automatic brake and parking brake as well as automatic stopping device. Electric locomotives and diesel locomotives should be additionally equipped with an auxiliary brake and emergency braking system.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Automatic brakes should ensure that the train or locomotive stops in the event of disconnection or breakaway of the brake manifold or in the event of opening the emergency brake valve.

When a special brake (electrodynamic, hydrodynamic, or magnetic) is installed at a locomotive in addition to the pneumatic (electro-pneumatic) brake, its operation should in all cases be matched with the operation of the pneumatic brake in the event of service or emergency braking. For locomotives equipped with an electric brake, its automatic substitution with a pneumatic brake should be ensured.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

UIC 540

Russia

The main braking system of rolling stock is automatic pneumatic, which ensures emergency and service braking. Additional braking systems for locomotives and multi-unit rolling stock include electro-pneumatic, electrodynamic, and hydrodynamic ones. On fast-speed rolling stock, magnetic track brakes may be used.

Automatic pneumatic and electro-pneumatic brakes of rolling stock shall ensure braking effort guaranteeing that, in case of emergency brake application, the train stops at a distance not exceeding the stopping distance determined in accordance with the Instruction TsRB-757 for Signalling (distance B (Б) in Table 3.1).

Locomotives, passenger cars, and multi-unit rolling stock are equipped with parking (manually-operated) brakes in accordance with TOR TsRB-756 (Paragraph 11.3). A parking (manually-operated) brake should ensure retention at a slope of 30 ‰.

Automatic and electro-pneumatic brakes of rolling stock should have controllability and operating reliability under different operating conditions in accordance with the Technical Operating Rules TsRB-756 (Paragraph 11.1). The emergency brake should be automatically activated upon the occurrence of situations threatening traffic safety and in the event of a breakaway of the train or the driver's incapability to act.

A pneumatic braking system shall be designed in accordance with the Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways.

Means for the monitoring and control of the condition of the braking system are developed at the discretion of the Developer or in accordance with the requirements of the Customer ordering the rolling stock.

The rules for the maintenance of brakes and control thereof in trains are specified in the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapters 10 and 15).

The value of retardation when braking is limited by the conditions of wheel-rail adhesion. The maximum permissible value of retardation when braking and speed of change in retardation in the event of the activation of the braking mode are not standardised.

It shall not be permitted to set rolling stock into movement when the control devices of pneumatic brakes are blocked and when pressure of compressed air in the brake manifold is less than 85 % of the nominal pressure in accordance with the Safety Standards NB ZhT TsT 01-04.

The pressure of compressed air in the main vessels should be at least 500 kPa in accordance with the Safety Standards NB ZhT TsT 01-04.

Slovakia

UIC 540

Ukraine

Automatic brakes of rolling stock shall ensure braking effort guaranteeing that in case of emergency brake application the train stops at a distance not exceeding the stopping distance in accordance with the calculations approved by the State Railways Administration of Ukraine.

Braking equipment should ensure slip-free braking within the whole range of speeds and corresponding design pressure in braking cylinders when applying brakes on traction rolling stock provided that the operating rules are observed.

Rolling stock should be equipped with devices of automatic adjustment of outlets of cylinder rods.

The aforementioned requirements are approved by the following documents:

Belarus	TOR – Technical Operating Rules of Belarusian Railways STP 09150.17.038 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	ADV-001 Regulation on the Technical Operation of Railways LST EN 13452 Railway Applications. Braking. Mass transit brake systems. Part 1. Performance requirements LST EN 13452-1 Railway Applications. Braking. Mass transit brake systems. Part 1. Performance requirements LST EN 13452-2 Railway Applications. Braking. Mass transit brake systems. Part 2. Methods of test GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės) LST EN 14198:2005 Railway Applications. Braking. Requirements for the brake systems of trains
Poland	Instructions of the UIC 540
Russia	Instruction TsRB-757 for Signalling (distance B (Б) in Table 3.1). TOR TsRB-756 (Paragraph 11.3) The Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Appendix 2, Table 1).
Slovakia	Instructions of the UIC 540 TOR of Slovak Railways. Part II – Rolling Stock and Repair Thereof Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport at the Broad-Gauge Line Matovce – Haniska

	pri Košiciach
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsRB-004. Technical Operating Rules for Ukrainian Railways TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock at Ukrainian Railways Rules for Traction Calculations for Train Operation TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	TOR, Paragraph 144

5.3.2.2 Safety requirements

Currently, requirements for this parameter are presumably the same in all the countries. The values of safety parameters are indicated in other sub-chapters of this chapter. Currently, safety requirements in the 1 520 mm gauge system do not stipulate the necessity of performing risk analysis.

Latvia

Rolling stock shall be equipped with automatic brakes and rolling stock of passenger trains shall be additionally equipped with electro-pneumatic brakes.

Automatic brakes of rolling stock shall be maintained in accordance with the established technical standards and should ensure reliable operation and smooth braking as well as stopping of the train in the event of disconnection or breakaway of the air manifold or in the event of applying the emergency stop valve (emergency brake valve).

Automatic brakes of rolling stock shall ensure braking effort guaranteeing that, in case of emergency brake application, the train stops at a distance not exceeding the stopping distance approved by the railway infrastructure manager.

Automatic brakes shall ensure the possibility of applying various modes of braking depending on the track profile, load of cars, and length of the train.

Emergency stop valves in passenger cars and multi-unit rolling stock are installed in car vestibules and inside cars and are sealed.

Hauling equipment and passenger cars shall be equipped with manually-operated brakes.

Lithuania

In the emergency braking system on electric locomotives and diesel locomotives, it is necessary to envisage the activation of automatic brakes, release of traction effort, supply of

sand under wheelsets until the travel speed decreases to 10 km/h and activation of the high-volume audible signal (warning horn).

Automatic brakes of rolling stock should ensure that the train or locomotive stops in the event of disconnection or breakaway of the brake manifold or in the event of opening of the emergency brake valve.

Poland

On existing locomotives, in accordance with the requirements of GOST pertaining to that time (those of the Russian Railways may be adopted).

For newly built locomotives – requirements will apply in accordance with the TSI LOC&PAS.

Belarus and Russia

The functional safety requirements are stipulated in the Safety Standards NB ZhT TsT 01-04.

Automatic pneumatic and electro-pneumatic brakes of rolling stock shall ensure braking effort guaranteeing that the train stops in the event of emergency brake application at a distance not exceeding the stopping distance determined in accordance with the Instruction TsRB-757 for Signalling (distance B (Б) in Table 3.1).

It is necessary to envisage automatic substitution of the electro-pneumatic brake with the pneumatic one in the event of failure of the former in accordance with the Safety Standards NB ZhT TsT 01-04.

Slovakia

It is not regulated, only the requirements of the UIC.

Ukraine

Automatic and electropneumatic brakes of rolling stock shall ensure braking effort guaranteeing that the train stops at a distance not exceeding the designed stopping distance.

Automatic brakes of rolling stock should ensure that the train or locomotive stops in the event of disconnection or breakaway of the brake manifold or in the event of opening the emergency brake valve.

In the emergency braking system on electric locomotives and diesel locomotives, it is necessary to envisage the activation of automatic brakes, release of traction effort, supply of sand under wheelsets at a travel speed of up to 10 km/h and activation of the high-volume audible signal (warning horn).

The aforementioned requirements are approved by the following documents:

Belarus	Safety Standards NB ZhT TsT 01-04 Diesel Trains TOR – Technical Operating Rules of Belarusian Railways
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės) GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge.

	Safety Requirements
Poland	Instruction Cw 1 (Mw 56)
Russia	Safety Standards NB ZhT TsT 01-04 Instruction TsRB-757 for Signalling (distance B (Б) in Table 3.1)
Slovakia	TOR of Slovak Railways. Part II – Rolling Stock and Repair Thereof
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock at Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	

5.3.3 Type of braking system

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Russia).

The diameter of the pipelines of the feed and brake manifolds should be 1¼ inch. In order to ensure shunting operation, transportation, and towage, the connection of brake and feed manifolds between cars and of head cars of multi-unit trains with a locomotive should be arranged with the use of connecting hoses type R17B in accordance with GOST 2593.

The standards of charge pressure in the brake manifold in the service position of the brake command are stipulated for the head locomotive (head car of a multi-unit train) by the Instruction for the Operation of Brakes of Rolling Stock for different types of trains within the range from 4.5 to 5.8 kgs/cm^2.

Latvia

In order to ensure shunting operation, transportation, and towage, the connection of brake and feed manifolds between cars and of head cars of multi-unit trains with a locomotive should be arranged with the use of connecting hoses type R17B.

Lithuania

There is no uniform requirement for the braking system type in Lithuania. The system should comply with the requirements of the TOR, the Rules for the Use of Rolling Stock Brakes, design documentation and, correspondingly, be compatible with the train system.

Poland

O-GP in operating traction rolling stock.

Belarus and Russia

The diameter of the pipelines of the feed and brake manifolds should be 1¼ inch. In order to ensure shunting operation, transportation, and towage, the connection of brake and feed manifolds between cars and of head cars of multi-unit trains with a locomotive should be arranged with the use of connecting hoses type R17B in accordance with GOST 2593.

The standards of charge pressure in the brake manifold in the service position of the brake valve handle are stipulated for the head locomotive (head car of a multi-unit train) by the Instruction for the Operation of Brakes of Rolling Stock TsT-TsV-TsL-VNIIZhT/277 (Table 3.2) for different types of trains within the range from 4.5 to 5.8 kgs/cm^2.

Slovakia

Instructions of the UIC. It ensures compatibility with the system of the OSJD.

Ukraine

On domestically manufactured rolling stock – the Matrosov brake system; for foreign-manufactured (Czechoslovakia) – partial application of the DAKO brake system.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions
Latvia	Of referential character – GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions No. 19/2000 Instruction for the Operation of Rolling Stock Brakes
Lithuania	ADV-001 Regulation on the Technical Operation of Railways R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės) GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions
Poland	UIC 543
Russia	The Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Table 3.2) GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions
Slovakia	TOR of the Slovak Railways. Part II – Rolling Stock and Repair Thereof Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport at the Broad-Gauge Line Matovce – Haniska pri Košiciach Instruction V15/1
Ukraine	Design documentation
Estonia	EVR Rules for the Operation of Brakes of Rolling Stock

5.3.4 Braking command

5.3.4.1 Emergency braking command

Currently, requirements for this parameter are the same in all the countries and are stipulated by the Instruction for the Operation of Brakes of Rolling Stock TsT-TsV-TsL-VNIIZhT/277 or by equivalent documents effective in each country.

The emergency braking mode should be activated from the emergency stop press-button (in the driver's cab), from the brake command handle in the driver's cab, in the event of applying the emergency stop valve, in the event of the breakaway of the safety loop (where available), in the event of the displacement of the stop valve of the signalling system and in the event of the breakaway of the brake manifold.

For multi-unit rolling stock, the maximum time of increase of the brake force from the moment of setting the emergency braking signal to the maximum value is established as not more than 7 s (for Russia).

It is necessary to envisage the possibility of blocking the pneumatic brake command system in the non-operational driver's cab.

Vestibules of cars of suburban trains should be equipped with emergency braking commands (emergency stop valves). Emergency stop valves should be accessible to passengers, should be installed in the passenger cabin and vestibule of each car, and their number should be at least three. Where car vestibules are not arranged, emergency stop valves shall be installed in close proximity to automatic passenger entrance doors. In fast-speed multi-unit rolling stock, Emergency Braking commands with the possibility of blocking the braking signal from the driver's cab shall be used.

In the event of setting the handle of the driver's brake valve or combined valve into the "Emergency Braking" position or in the event of applying the emergency stop switch, the shutdown of the traction mode and supply of sand under wheels (to be discontinued at a speed below 10 km/h) should be ensured.

Emergency braking: in the event of emergency braking, it is necessary to envisage the activation of automatic brakes, release of traction effort, supply of sand under wheelsets (at a speed over 10 km/h), and activation of the external audible signal.

Belarus

Emergency braking in all trains and at any track profile shall be applied only when immediate stopping of the train is required. It is performed by means of the driver's brake valve and, where necessary, by means of the combined valve from the hauling or hauled (in case of double or multiple heading) locomotives. After switching over the handle of the driver's brake valve or combined valve into the emergency braking position, it is necessary to activate the sandbox and auxiliary brake of the locomotive and to deactivate traction; the handle of the driver's brake valve shall be left in the emergency braking position, and the handle of the auxiliary brake shall be left in the full braking position until a complete stop. On a locomotive performing shunting operations, emergency braking shall be applied in the same manner irrespective of whether or not brakes are activated in the train.

(STP 09150.17.038-2006)

The emergency braking mode should be activated from the emergency stop press-button (in the driver's cab), from the brake command handle in the driver's cab, in the event of applying the emergency stop valve, in the event of the breakaway of the safety loop (where available), in the event of the displacement of the stop valve of the signalling system (KLUB – Locomotive Complex Safety Device), and in the event of the breakaway of the brake manifold.

For multi-unit rolling stock, the maximum time for increasing of brake force, from the moment of setting the emergency braking signal to the maximum value, is established as not more than 7 s in accordance with the Safety Standards NB ZhT TsT 01-04.

It is necessary to envisage the possibility of blocking the pneumatic brake command system in the non-operational driver's cab in accordance with the Safety Standards NB ZhT TsT 01-04.

Vestibules of cars of suburban trains should be equipped with emergency braking commands (emergency stop valves). Emergency stop valves should be accessible to passengers, should be installed in the passenger cabin and vestibule of each car, and their number should be at least three. Where car vestibules are not arranged, emergency stop valves shall be installed in close proximity to automatic passenger entrance doors.

The requirements are stipulated in the Safety Standards (NB ZhT TsT 01-04).

Latvia

When driving a train, the driver of the hauling vehicle is obliged to use means of emergency braking for stopping the train in the event of a sudden setting of a stop signal or sudden occurrence of an obstacle to moving.

Emergency braking means the type of braking used in cases when immediate stopping of a train is required, which is achieved by a quick discharging of the brake manifold through the driver's brake valve, combined valves, or as a result of the breakaway of the manifold in the train or opening of the end valve and ensures maximum braking force. (From the reference book: For braking, it is necessary to activate the Air Distributor (AD (Russian: (BP)) while reducing pressure in the Brake Manifold (BM (Russian: (TM)). The rate of decreasing of pressure in case of emergency braking (in the BM from 0.5 – 0.4 Mpa within 1.2 s). Brake wave characterises the speed of the activation of the brakes of the last car; at least 250 m/s).

Lithuania

Emergency braking means the braking of a train in extraordinary circumstances, when the maximum braking force is used, performed by means of releasing air from the brake manifold at the maximum possible rate.

The speed of pressure reduction in the braking manifold 0.08 Mpa in 1 s and above (from 0.5 to 0.4 MPa – not more than for 1.2 s). Brake wave speed: at least 250 m/s.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

$V_{brake\ wave}$ – 250 m/s; activation time – 0.25 s.

UIC 540

Russia

The emergency braking mode should be activated from the emergency stop press-button (in the driver's cab), from the brake command handle in the driver's cab, in the event of applying the emergency stop valve, in the event of the breakaway of the safety loop (where available), in the event of the displacement of the stop valve of the signalling system (KLUB – Locomotive Complex Safety Device), and in the event of the breakaway of the brake manifold.

For multi-unit rolling stock, the maximum time for increasing of brake force, from the moment of setting the emergency braking signal to the maximum value, is established as not more than 7 s in accordance with the Safety Standards NB ZhT TsT 01-04.

It is necessary to envisage the possibility of blocking the pneumatic brake command system in the non-operational driver's cab in accordance with the Safety Standards NB ZhT TsT 01-04.

Vestibules of cars of suburban trains should be equipped with emergency braking commands (emergency stop valves). Emergency stop valves should be accessible to passengers, should be installed in the passenger cabin and vestibule of each car, and their number should be at least three. Where car vestibules are not arranged, emergency stop valves shall be installed in close proximity to automatic passenger entrance doors. In fast-speed multi-unit rolling stock, Emergency Braking commands with the possibility of blocking the braking signal from the driver's cab shall be used.

The requirements are stipulated in the Safety Standards (NB ZhT TsT 01-04).

Ukraine

The emergency braking mode should be activated from the emergency stop press-button (in the driver's cab), from the brake command handle in the driver's cab, in the event of applying the emergency stop valve, in the event of the breakaway of the safety loop (where available), in the event of the displacement of the stop valve of the signalling system, and in the event of the breakaway of the brake manifold.

Vestibules of cars of suburban trains should be equipped with emergency braking commands (emergency stop valves). Emergency stop valves should be accessible to passengers, should be installed in the passenger cabin and vestibule of each car, and their number should be at least three.

In the event of setting the handle of the driver's brake valve or combined valve into the "Emergency Braking" position, applying the emergency stop switch or breakaway of the brake manifold, the shutdown of the traction mode and supply of sand under the wheels (to be discontinued at a speed below 10 km/h) should be ensured.

The aforementioned requirements are approved by the following documents:

Belarus	Safety Standards NB ZhT TsT 01-04 Diesel Trains Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways STP 09150.17.038-2006
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724 No. 19/2000 LDz Instruction for the Operation of Rolling Stock Brakes (on the basis of the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation

	TsT-TsV-TsL-VNIIZhT/277)
Lithuania	R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės) 173/T Šilumvežių ir savaeigių sąstatų stabdžių įrangos techninės priežiūros, remonto ir bandymo iunstrukcija (Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Diesel Locomotives and Self-Propelled Rolling Stock) LST EN 13452 Railway Applications. Braking. Mass transit brake systems. Part 1. Performance requirements LST EN 13452-1 Railway Applications. Braking. Mass transit brake systems. Part 1. Performance requirements LST EN 13452-2 Railway Applications. Braking. Mass transit brake systems. Part 2. Methods of test LST EN 14198:2005 Railway Applications. Braking. Requirements for the brake systems of trains
Poland	UIC 540
Russia	Safety Standards (NB ZhT TsT 01-04)
Slovakia	Instructions of the UIC 540 TOR of the Slovak Railways. Part II – Rolling Stock and Repair Thereof
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	EVR Rules for the Operation of Brakes of Rolling Stock

5.3.4.2 Service braking command

Currently, requirements for this parameter are the same in all the countries and are stipulated by the Instruction for the Operation of Brakes of Rolling Stock TsT-TsV-TsL-VNIIZhT/277 or by equivalent documents effective in each country.

Service braking is controlled from the driver's brake valve in the operational cab. The driver's brake valve in the non-operational cab should be blocked.

In case of pneumatic braking, it is necessary to envisage step braking, and in the event of electro-pneumatic braking – step braking and step release. The minimum measure of decrease in pressure in the equalising brake valve tank (brake manifold) from the set charging

pressure, in the event of service braking, should be 0.3 to 0.5 kgs/cm^2 for passenger trains and 0.4 to 0.5 kgs/cm^2 for freight trains. Complete service braking is performed at the maximum discharge of the brake manifold to a value of 1.3-1.5 kgs/cm^2.

Belarus

Service braking in trains is regulated in STP 09150.17.038.

Service braking is controlled from the driver's brake valve in the operational cab. The driver's brake valve in the non-operational cab should be blocked.

Latvia

Service braking means braking in steps of any extent to be achieved by decreasing pressure in the manifold at the service braking rate for the smooth reduction of speed or stopping of the train in a pre-established place.

Complete service braking means service braking that is achieved by decreasing pressure in the manifold in a single step at the service braking rate necessary for achieving full pressure in the brake cylinders of the train cars for the purpose of reducing the speed of the train or stopping in a shorter distance.

(From the reference book: For braking, it is necessary to activate the Air Distributor (AD (Russian: (BP)) while reducing pressure in the Brake Manifold (BM (Russian: (TM)). The rate of decreasing pressure in the event of service braking (in the BM from 0.5 – 0.4 Mpa within 2.5-10 s).

Lithuania

Service braking means braking that is achieved by decreasing pressure in the manifold at steps of any extent at the service braking rate necessary for the required reduction of speed or stopping of the train in a pre-established place.

Reinforced service braking means service braking that is achieved by decreasing pressure in the manifold in a single step at the service braking rate necessary for achieving full pressure in the brake cylinders of the train cars for the purpose of reducing the speed of the train or stopping in a shorter distance.

The rate of decreasing pressure in the brake manifold in the event of service braking: 0.01-0.04 MPa within 1 s (from 0.5 to 0.4 Mpa within 2.5-10 s).

Poland

Seven brake steps

UIC 540

Russia

Service braking in trains is regulated in the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapters 10 and 15).

Service braking is controlled from the driver's brake valve in the operational cab. The driver's brake valve in the non-operational cab should be blocked.

In the event of pneumatic braking, it is necessary to envisage step braking and stepless release, and in the event of electro-pneumatic braking – step braking and step release. The

minimum measure of decrease in pressure in the equalising brake valve tank (brake manifold) from the set charging pressure, in the event of service braking, should be 0.3 to 0.5 kgs/cm^2 for passenger trains and 0.4 to 0.5 kgs/cm^2 for freight trains. Service braking is performed at the maximum discharge of the brake manifold to a value of 1.3-1.5 kgs/cm^2.

Service braking can also be controlled from automatic driving systems (USAVPE, USAVP, and ISAVP-RT) and the automatic brake command system (SAUT).

Slovakia

UIC 540

Ukraine

Service braking is controlled from the driver's brake valve in the operational cab. The driver's brake valve in the non-operational cab should be blocked.

In the event of pneumatic braking, it is necessary to envisage step braking and stepless release, and in the event of electro-pneumatic braking – step braking and step release. The minimum measure of decrease in pressure in the equalising brake valve tank (brake manifold) from the set charging pressure, in the event of service braking, should be 0.3 to 0.5 kgs/cm^2 for passenger trains and 0.4 to 0.5 kgs/cm^2 for freight trains. Service braking is performed at the maximum discharge of the brake manifold to a value of 1.3-1.5 kgs/cm^2.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.17.038 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
Latvia	No. 19/2000 LDz Instruction for the Operation of Rolling Stock Brakes (on the basis of the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277)
Lithuania	R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės) 173/T Šilumvežių ir savaeigių sąstatų stabdžių įrangos techninės priežiūros, remonto ir bandymo iunstrukcija (Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Diesel Locomotives and Self-Propelled Rolling Stock) LST EN 13452 Railway Applications. Braking. Mass transit brake systems. Part 1. Performance requirements LST EN 13452-1 Railway Applications. Braking. Mass transit brake systems. Part 1. Performance requirements LST EN 13452-2 Railway Applications. Braking. Mass transit brake systems. Part 2. Methods of test LST EN 14198:2005 Railway Applications. Braking. Requirements for the brake systems of trains
Poland	UIC 540
Russia	The Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapters 10 and 15)

Slovakia	Instructions of the UIC 540 Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport on the Broad-Gauge Line Matovce – Haniska pri Košiciach Instruction B15/1
Ukraine	TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	EVR Rules for the Operation of Brakes of Rolling Stock

5.3.4.3 Direct-action brake command

Currently, requirements for this parameter are the same in all the countries and are stipulated by the Instruction for the Operation of Brakes of Rolling Stock TsT-TsV-TsL-VNIIZhT/277 or by equivalent documents effective in each country.

The auxiliary (direct-action) brake should be installed on locomotives and is intended for controlling only locomotive brakes.

Belarus

An auxiliary (direct-action) brake should be envisaged on locomotives. The control of the auxiliary brake is regulated in STP 09150.17.038 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways.

Latvia

The valve of the auxiliary brake No. 254 is intended for the actuation of only the locomotive brakes.

It is prohibited to use the locomotive auxiliary brakes on all trains when carrying out the operation of brakes.

Lithuania

Locomotive braking by means of a direct-action brake means braking in the manner of periodical pressure increases in brake cylinders irrespective of the pressure in the brake manifold.

When using a direct-action brake valve, in order to avoid a sharp decrease in the locomotive speed and considerable longitudinal dynamic forces in the train, braking with the use of the valve should be performed in steps at a travelling speed of 50 km/h and less, except in the event of emergency braking.

When using the auxiliary brake of passenger and freight locomotives (with the exception of shunting locomotives), frequent effective braking by a simultaneous increase of pressure in brake cylinders by more than 1.5 kg/cm² should be avoided.

It is prohibited to use the locomotive auxiliary brake for the prevention of slippage.

Having applied the locomotive auxiliary brake, it should be released after the automatic brakes of the train are released.

Poland

Pneumatic signal

UIC 540

Russia

An auxiliary (direct-action) brake should be envisaged on locomotives. The control of the auxiliary brake is regulated in the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapters 10 and 15).

Slovakia

UIC 540

Ukraine

Locomotives should be equipped with an auxiliary (direct-action) brake, which is intended for the actuation of only locomotive brakes.

Locomotive braking by means of applying a direct-action brake means braking in the manner of incremental (5 increments) pressure increase in brake cylinders irrespective of the pressure in the brake manifold.

When using a direct-action brake valve, in order to avoid a sharp decrease in the locomotive speed and considerable longitudinal dynamic forces in the train, braking with the use of the valve should be performed in steps at a travelling speed of 50 km/h and less, except in of the event of emergency braking.

When using the auxiliary brake of passenger and freight locomotives (with the exception of shunting locomotives), frequent effective braking by a simultaneous increase of pressure in brake cylinders by more than 1.5 kg/cm² shall be avoided.

It is prohibited to use the locomotive auxiliary brake for the prevention of slippage.

Having applied the locomotive auxiliary brake, it should be released after the automatic brakes of the train are released.

Driver's brake valve; Instructions No. 254.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.17.038 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
Latvia	No. 19/2000 LDz Instruction for the Operation of Rolling Stock Brakes (on the basis of the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277), Paragraph 10.1.2
Lithuania	R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės)
Poland	UIC 540
Russia	The Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapter 10)

Slovakia	Instructions of the UIC 540 Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport on the Broad-Gauge Line Matovce – Haniska pri Košiciach Instruction B15/1
Ukraine	TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	EVR Rules for the Operation of Brakes of Rolling Stock

5.3.4.4 Dynamic brake command

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia and Russia).

It is necessary to provide for the possibility of the driver not using regenerative braking on electric rolling stock. On locomotives used for freight traffic, it is necessary to envisage the possibility of using pneumatic braking irrespective of dynamic braking.

It is necessary to envisage an automatic substitution of dynamic braking with pneumatic (electro-pneumatic) braking in the event of exhaustion or failure of dynamic braking.

Belarus

It is necessary to envisage an automatic substitution of electric braking with pneumatic (electro-pneumatic) braking in the event of the exhaustion or failure of electrical braking in accordance with the Safety Standards NB ZhT TsT 01-04.

Latvia

On electric trains, use of electric braking shall be allowed when the traction electric engine starts to operate in the generator mode and electric power is directed to:

1) Quenching rheostates (rheostate braking);

2) Power supply network (regenerative braking);

3) Both manners (mixed).

Lithuania

Instructions for the operation of specific locomotive types.

Poland

On existing locomotives – unavailable.

For newly built locomotives – if applicable, the requirements of the TSI LOC&PAS will apply.

Russia

It is necessary to envisage an automatic substitution of electric braking with pneumatic (electro-pneumatic) braking in the event of the exhaustion or failure of electrical braking in accordance with the Safety Standards NB ZhT TsT 01-04.

Slovakia

On existing locomotives – unavailable.

The instructions of the UIC for the design of an electrodynamic brake.

Ukraine

On locomotives and electric trains, use of electric braking shall be allowed when the traction electric engine starts to operate in the generator mode and electric power is directed to:

1) Quenching rheostats (rheostatic braking);

2) Power supply network (regenerative braking);

3) Both manners (mixed).

It is necessary to envisage an automatic substitution of electric braking with pneumatic (electro-pneumatic) braking in the event of the exhaustion or failure of electrical braking.

Control shall be performed from the driver's panel.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01-04 Diesel Trains
Latvia	Design documentation
Lithuania	Design documentation
Poland	TSI LOC&PAS
Russia	Safety Standards (NB ZhT TsT 01-04)
Slovakia	
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock Design documentation
Estonia	

5.3.4.5 Parking brake command

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with parking (manually-operated) brakes.

When braking, the handle or steering wheel of the manually-operated brakes should rotate clockwise until a force of not more than 350 N is applied. It is necessary to provide for a device that prevents self-rotation of the steering wheel counter-clockwise.

The use an automated parking brake shall be allowed, the requirements of which are contained in the technical assignment for the development of rolling stock.

Belarus

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with parking (manually-operated) brakes in accordance with the TOR, GOST 12.2.056 and GOST 30487.

When braking, the handle or steering wheel of the manually-operated brakes should rotate clockwise until a force of not more than 350 N is applied. It is necessary to provide for a device that prevents self-rotation of the steering wheel counter-clockwise.

Latvia

Parking (manually-operated) brakes shall be applied on locomotives, multi-unit rolling stock, and passenger cars.

Lithuania

(Instructions for the operation of specific locomotive types).

Manually-operated (parking) brakes of rolling stock should be maintained in accordance with the established standards, and braking effort thereof should comply with the calculations approved by the railway manager.

Poland

Manual

In upgraded ones – automatic

Russia

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with parking (manually-operated) brakes in accordance with the Instruction TsRB-756 (Chapter 11, Paragraph 11.3), GOST 12.2.056 Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements and GOST 30487 Electric Trains for Suburban Communication. General Safety Requirements.

When braking, the handle or steering wheel of the manually-operated brakes should rotate clockwise until a force of not more than 350 N is applied. It is necessary to provide for a device that prevents self-rotation of the steering wheel counter-clockwise.

Slovakia

Order No. 250/97 of the Minister for Transport. Code of Laws; 4 % for locomotives.

The PPG is acknowledged for freight cars.

Ukraine

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with parking (manually-operated) brakes. A parking (manually-operated) brake should ensure retention at a slope of 30 ‰.

When braking, the handle or steering wheel of the manually-operated brakes should rotate clockwise until a force of not more than 350 N is applied. It is necessary to provide for a device that prevents self-rotation of the steering wheel counter-clockwise.

The aforementioned requirements are approved by the following documents:

Belarus	TOR – Technical Operating Rules of Belarusian Railways GOST 12.2.056 Electric Locomotives and Diesel Locomotives for the 1 520 mm Gauge. Safety Requirements GOST 30487 Electric Trains for Suburban Communication. General Safety Requirements
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	ADV-001 REGULATION ON THE TECHNICAL OPERATION OF RAILWAYS Design documentation
Poland	UIC 540
Russia	TOR of the Russian Federation Railways GOST 12.2.056 Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 Electric Trains for Suburban Communication. General Safety Requirements
Slovakia	Order No. 250/97 of the Minister for Transport. Code of Laws TOR of the Slovak Railways. Part II – Rolling Stock and Repair Thereof
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	

5.3.5 Braking performance

5.3.5.1 General requirements

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

Obligatory minimum requirements for braking characteristics are stipulated by safety standards and checked by the established types of tests.

Latvia

In accordance with the design documentation.

The calculation methods set forth in the Rules for Traction Calculations for Train and Shunting Operation.

Lithuania

In accordance with the design documentation. Calculation methodology in accordance with LST EN 14531-1:2005.

For locomotives and multi-unit rolling stock built before 2006, the calculation methods and tolerances set forth in the Rules for Traction Calculations for Train and Shunting Operation were and are used.

Poland

In accordance with the design documentation.

UIC 540

Belarus and Russia

Braking calculations are performed in accordance with the Rules for Traction Calculations for Train Operation.

Slovakia

UIC 540

Braking weight indicated on cars in the OSJD system is admitted.

Ukraine

Braking equipment should ensure slip-free braking within the whole range of speeds and corresponding design pressure in braking cylinders when applying brakes on traction rolling stock provided that the operating rules are observed.

Braking calculations are performed in accordance with the Rules for Traction Calculations for Train Operation.

The aforementioned requirements are approved by the following documents:

Belarus	Rules for Traction Calculations for Train Operation, 1985
Latvia	Design documentation Rules for Traction Calculations for Train and Shunting Operation MINISTRY OF RAILWAYS, 1985
Lithuania	Design documentation

	LST EN 14531-1:2005 Rules for Traction Calculations for Train and Shunting Operation, the Ministry of Railways of the USSR, 1985
Poland	UIC 540
Russia	Rules for Traction Calculations for Train Operation, 1985
Slovakia	Instructions of the UIC 540, 541 TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock Rules for Traction Calculations for Train Operation
Estonia	

5.3.5.2 Emergency braking

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

Emergency braking means the type of braking used in cases when immediate stopping of a train is required, which is achieved by emergency discharging of the brake manifold for the implementation of the maximum braking force.

For multi-unit rolling stock, the maximum time of increasing of brake force from the moment of setting the emergency braking signal to the maximum value is established as not more than 7 s.

Standard values of the braking effort factor in case of the emergency braking of multi-unit rolling stock

Design speed, km/h	Braking effort factor, not less than
not more than 120	0.70 (0.60)*
120 to 160 inclusively	1.00
160 to 200 inclusively	1.15

200 to 250 inclusively	1.30
N o t e : *) The value for multi-unit rolling stock of old types is indicated in brackets	

Electric trains and diesel trains, the braking effort of the friction brake whereof is more than 1.0, should be equipped with a wheel slide protection system for friction braking in accordance with the Safety Standards NB ZhT TsT 01-98, 03-98 or equivalent documents effective in each country.

Standard values of the stopping distance in case of the emergency braking with the friction brake of locomotives

Speed, km/h	Stopping distance of the locomotive, m, not more than
not more than 80	550/505
more than 80 but not more than 90	710/655
more than 90 but not more than 100	830/770
more than 100 but not more than 110	900/840
more than 110 but not more than 120	1080/1010
more than 120 but not more than 140	1180/1100
more than 140 but not more than 160	1560/1470
more than 160 but not more than 180	2000/1900
more than 180 but not more than 200	2200/2100
Notes: the numerator indicates pneumatic braking; the denominator indicates electro-pneumatic braking	

The rate of decreasing pressure in the brake manifold (from 5.0 to 1.0 kgs/cm^2): not more than 3 s.

Latvia

In accordance with the Rules for Traction Calculations for Train Operation.

Lithuania

In accordance with the design documentation. Calculation methodology in accordance with LST EN 14531-1:2005.

For locomotives and multi-unit rolling stock built before 2006, the calculation methods and tolerances set forth in the Rules for Traction Calculations for Train and Shunting Operation were and are used.

Poland

UIC 540

Belarus and Russia

For multi-unit rolling stock, the maximum time of increasing of brake force from the moment of setting the emergency braking signal to the maximum value is established as not more than 7 s in accordance with the Safety Standards (NB ZhT TsT 01-04).

Standard values of the braking effort factor in case of the emergency braking of multi-unit rolling stock

Design speed, km/h	**Braking effort factor, not less than**
not more than 120	0.70 (0.60)*
120 to 160 inclusively	1.00
160 to 200 inclusively	1.15
200 to 250 inclusively	1.30
N o t e : *) The value for multi-unit rolling stock of old types is indicated in brackets	

Electric trains and diesel trains, the braking effort of the friction brake whereof is more than 1.0, should be equipped with a wheel slide protection system for friction braking in accordance with the Safety Standards NB ZhT TsT 01-98, 03-98.

Standard values of the stopping distance in the event of emergency braking with the friction brake of locomotives

Speed, km/h	Stopping distance of the locomotive, m, not more than
not more than 80	550/505
more than 80 but not more than 90	710/655
more than 90 but not more than 100	830/770
more than 100 but not more than 110	900/840

more than 110 but not more than 120	1 080/1 010
more than 120 but not more than 140	1 180/1 100
more than 140 but not more than 160	1 560/1 470
more than 160 but not more than 180	2 000/1 900
more than 180 but not more than 200	2 200/2 100
Notes: the numerator indicates pneumatic braking; the denominator indicates electro-pneumatic braking	

Slovakia

Speed limitations in accordance with the Instructions UIC 540.

Ukraine

Type of braking which is used for the immediate stopping of a train by means of an emergency discharging of the brake manifold for the implementation of the maximum braking force.

For multi-unit rolling stock, the maximum time of increasing of brake force from the moment of setting the emergency braking signal to the maximum value is established as not more than 7 s.

Standard values of the braking effort factor in the event of emergency braking of multi-unit rolling stock

Design speed, km/h	Braking effort factor, not less than
not more than 120	0.70 (0.60)*
120 to 160 inclusively	1.00
Note: *) The value for multi-unit rolling stock of old types is indicated in brackets	

Electric trains and diesel trains, the braking effort of the friction brake whereof is more than 1.0, should be equipped with a wheel slide protection system for friction braking.

Standard values of the stopping distance in the event of emergency braking with the friction brake of locomotives

Speed, km/h	Stopping distance of the locomotive, m, not more than
not more than 80	550/505
more than 80 but not more than 90	710/655
more than 90 but not more than 100	830/770
more than 100 but not more than 110	900/840

more than 110 but not more than 120	1 080/1 010
more than 120 but not more than 140	1 180/1 100
more than 140 but not more than 160	1 560/1 470
more than 160 but not more than 180	2 000/1 900
Notes: the numerator indicates pneumatic braking; the denominator indicates electro-pneumatic braking	

The rate of decreasing pressure in the brake manifold (from 5.0 to 1.0 kgs/cm^2): not more than 3 s.

The aforementioned requirements are approved by the following documents:

Belarus	Safety Standards NB ZhT TsT 01-04 Diesel Trains
Latvia	Rules for Traction Calculations for Train and Shunting Operation, Ministry of Railways of the USSR, 1985 Instruction for the Operation of Rolling Stock Brakes, No. 19/2000
Lithuania	Design documentation LST EN 14531-1:2005 Rules for Traction Calculations for Train and Shunting Operation, the Ministry of Railways of the USSR, 1985
Poland	UIC 540
Russia	Safety standards (NB ZhT TsT 01-04)
Slovakia	Instructions of the UIC 540, 541…
Ukraine	TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock Rules for Traction Calculations for Train and Shunting Operation
Estonia	

5.3.5.3 Service braking

Currently, requirements for this parameter are the same in all the countries and are stipulated by the Instruction for the Operation of Brakes of Rolling Stock TsT-TsV-TsL-VNIIZhT/277 or by equivalent documents effective in each country.

Belarus

Service braking in trains is regulated in STP 09150.17.038.

Latvia

In accordance with the Rules for Traction Calculations for Train Operation.

Lithuania

In accordance with the design documentation. Calculation methodology in accordance with LST EN 14531-1:2005.

For locomotives and multi-unit rolling stock built before 2006, the calculation methods and tolerances set forth in the Rules for Traction Calculations for Train and Shunting Operation were and are used.

Poland

UIC 540

Russia

Service braking in trains is regulated in The Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapters 10 and 15).

Slovakia

Instructions of the UIC 540…

The parameters declared by the OSJD system are admitted.

Ukraine

Braking in steps to the allowed extent to be achieved by the decreasing of pressure in the manifold at the service braking rate for the smooth reduction of speed or stopping of the train.

The rate of pressure decrease in the brake manifold (from 5.0 to 4.0 kgs/cm²) shall be within the range of 4.5 ± 0.5 s.

Auxiliary braking

Braking which is achieved by means of incremental increase in brake cylinders irrespective of the pressure in the brake manifold.

The rate of filling the brake cylinders (from 0.0 to 3.5 kgs/cm²): not more than 4 s.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.17.038 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
Latvia	Rules for Traction Calculations for Train Operation Instruction for the Operation of Rolling Stock Brakes, No. DR-19/2000
Lithuania	Design documentation LST EN 14531-1:2005 Rules for Traction Calculations for Train and Shunting Operation, Ministry of Railways of the USSR, 1985
Poland	UIC 540
Russia	The Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapters 10 and 15)
Slovakia	Instructions of the UIC 540, 541…
Ukraine	TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and

	Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	

5.3.5.4 Calculations of thermo-cyclic capacity

Currently, the requirements for this parameter in Belarus, Russia, and Ukraine are the same; in other countries, they are not regulated.

In Russia, calculations for the force of the friction couple are performed in accordance with the Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways.

Belarus

Calculations for the force of the friction couple are performed in accordance with Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways.

Latvia

Such calculations are not available for the operation of brakes.

Lithuania

Such calculations are not available for the operation of brakes.

Poland

Such calculations are not available for the operation of brakes.

Russia

Calculations for the force of the friction couple are performed in accordance with Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways.

Slovakia

Such calculations are not available for the operation of brakes. To be resolved by the Rules for the Operation of Locomotives. Parameters for cars of the OSJD are admitted.

Ukraine

Calculations for the force of the friction couple are performed in accordance with Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways.

The aforementioned requirements are approved by the following documents:

Belarus	Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways
Latvia	
Lithuania	
Poland	
Russia	Standards for the Calculation and Design of Cars of 1 520 mm Gauge

	Railways of the Ministry of Railways
Slovakia	
Ukraine	Standards for the Calculation and Design of Cars of 1 520 mm Gauge Railways of the Ministry of Railways
Estonia	

5.3.5.5 Parking brake

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Poland, Russia, Slovakia, and Ukraine).

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with parking (manually-operated) brakes.

A parking brake (manually-operated or automatic) should ensure the retention of a vehicle at a slope of at least 30 ‰ (35 ‰ for Poland). Calculations are performed in accordance with the Rules for Traction Calculations. Compliance with this requirement should be proved by tests.

Belarus

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with parking (manually-operated) brakes.

Parking brakes of electric locomotives and diesel locomotives should retain them at a slope of 30 ‰ in accordance with the design factor of the wheel-rail adhesion agreed upon with the customer.

Braking of the locomotive should be performed by rotating the steering wheel (handle) clockwise with a force of not more than 350 N.

A steering wheel of the manually-operated brake should be installed on each section of the locomotive: in the driver's cab and vestibule (body) of the locomotive. On locomotives with indivisible sections, installation of the manually-operated brake steering wheel shall be allowed in one of the sections. The steering wheel of the manually-operated brake should be equipped with a device preventing self-rotation of the steering wheel counter-clockwise.

Latvia

Retention with the manually-operated (parking) brake at a standardised slope in accordance with the standard value of certification indicators – 30 ‰ (of referential character, in accordance with the Technical Regulation FTS ZhT TsT 01-98 Diesel Trains).

Lithuania

For locomotives built before 2006: manually-operated (parking) brakes of electric locomotives and diesel locomotives should retain them at a slope of 30 ‰ in accordance with the design factor of the wheel-rail adhesion agreed upon with the customer.

For new and newly designed locomotives, requirements in accordance with LST EN 14531-1:2005.

Poland

Slope of 35 ‰

UIC 540

Russia

Locomotives, passenger cars, and multi-unit rolling stock shall be equipped with parking brakes in accordance with Instruction TsRB-756 (Chapter 11, Paragraph 11.3.).

A parking brake (manually-operated or automatic) for electric trains intended for operation within the whole network of railways of the Russian Federation should ensure retention as follows:

of an electric train in the basic configuration with the maximum load at a slope of at least 30 ‰;

of a separate empty head car at a slope of at least 30 ‰;

of an empty section at a slope of at least 30 ‰;

of a separate empty car at a slope of at least 15 ‰.

For electric trains with a limited operating region specified in the technical documentation, the value of the maximum standardised slope for the retention of an electric train with a parking brake shall be established in accordance with the technical documentation for the electric train.

A parking brake (manually-operated or automatic) for locomotives intended for operation throughout the whole network of railways of the Russian Federation should ensure retention at a slope of at least 30 ‰.

Slovakia

Slope of 30 ‰

UIC 540

Ukraine

A parking brake should ensure the retention of a single non-moving locomotive or multi-unit rolling stock at a grade with a slope of 0 to 30 ‰ when the factor of friction between the wheel and rail is at least 0.25.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056 Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	Of referential character, in accordance with the Technical Regulation FTS ZhT TsL 01-98 Diesel Trains
Lithuania	R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės) GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements LST EN 14531-1:2005
Poland	UIC 540

Russia	TOR of the Russian Federation Railways
Slovakia	Instructions of the UIC 540, 541…
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	

5.3.6 Wheel-rail adhesion – Wheel slide protection system

5.3.6.1 Limit value of the wheel-rail adhesion factor

Currently, the requirements for this parameter in all the countries are not regulated. In practice, the Rules for Traction Calculations are used as information material.

Belarus

The wheel-rail adhesion factor is not regulated.

Latvia

It is not regulated.

Lithuania

It is not regulated.

For newly designed rolling stock – the requirements of the TSI LOC&PAS.

Poland

It is not regulated.

Russia

The wheel-rail adhesion factor is not regulated.

When designing a braking system, it is recommended to apply a value of the adhesion factor of not more than 0.13.

Slovakia

It is not regulated.

Ukraine

The value of the adhesion factor for each type of traction rolling stock shall be calculated in accordance with the Rules for Traction Calculations for Train Operation.

When designing a braking system, it is recommended to apply a value of the adhesion factor of not more than 0.13.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	
Poland	
Russia	
Slovakia	
Ukraine	Rules for Traction Calculations for Train Operation
Estonia	

5.3.6.2 Wheel slide protection system

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Poland, Russia, and Ukraine).

Rolling stock, the factor of braking effort whereof is above 1.0, shall be equipped with wheel slide protection devices.

The wheel slide protection system should ensure prevention of the blocking of wheelsets when braking and should not allow uncontrolled sliding. The wheel protection system should ensure protection for all types of friction braking.

The extension of the stopping distance when the wheel slide protection system operates in conditions of a decreased level of wheel-rail adhesion should not exceed 100 m.

It is necessary to envisage automatic deactivation of the wheel slide protection of a wheelset in the event of a single failure of its control circuits.

Compliance with the requirements shall be proved by tests.

Latvia

In accordance with the Rules for Traction Calculations for Train Operation.

Lithuania

See Chapter 5.3.9, reference to the Interstate Standard, which refers to the technical assignment for the diesel locomotive. For newly designed rolling stock – the requirements of the TSI LOC&PAS.

Poland

In upgraded ones – automatic.

For newly built locomotives – where applicable, requirements in accordance with the TSI LOC&PAS.

Belarus and Russia

Rolling stock, the factor of braking effort whereof is above 1.0, shall be equipped with wheel slide protection devices (NB ZhT TsT).

The wheel slide protection system should ensure prevention of the blocking of wheelsets when braking and should not allow uncontrolled sliding. The wheel protection system should ensure protection for all types of friction braking.

The extension of the stopping distance when the wheel slide protection system operates in conditions of a decreased level of wheel-rail adhesion should not exceed 100 m.

It is necessary to envisage automatic deactivation of the wheel slide protection of a wheelset in the event of a single failure of its control circuits.

Compliance with the requirements shall be proved by tests.

Slovakia

For newly built locomotives – where applicable, requirements in accordance with the TSI LOC&PAS.

Currently, locomotives of the 1 520 mm gauge system are not equipped with this system (low speeds; low braking and adhesion parameters).

Ukraine

Rolling stock, the factor of braking effort whereof is above 1.0, shall be equipped with wheel slide protection devices.

The wheel slide protection system should ensure prevention of the blocking of wheelsets when braking and should not allow uncontrolled sliding. The wheel protection system should ensure protection for all types of friction braking.

The extension of the stopping distance when the wheel slide protection system operates in the conditions of a decreased level of wheel-rail adhesion should not exceed 100 m.

It is necessary to envisage automatic deactivation of the wheel slide protection of a wheelset in case of a single failure of its control circuits.

Compliance with the requirements shall be proved by tests.

The aforementioned requirements are approved by the following documents:

Belarus	Safety Standards NB ZhT TsT 01-04 Diesel Trains
Latvia	Design documentation Rules for Traction Calculations for Train Operation of the Ministry of Railways, 1985
Lithuania	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements (For informatory use) Design documentation
Poland	TSI LOC&PAS
Russia	Safety standards (NB ZhT TsT 01-04)
Slovakia	TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)

	Instruction UIC 541-5
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	

5.3.7 Dynamic braking systems (use of dynamic braking systems for the improvement of emergency braking performance)

Currently, requirements for this parameter are not regulated in all the countries. In the 1 520 mm gauge system, dynamic braking is not included in the characteristics of emergency braking.

Poland

On existing locomotives, it is not available.

For newly built locomotives – where applicable, requirements in accordance with the TSI LOC&PAS.

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

Joint action of the friction and dynamic brake in the event of emergency braking is not regulated.

Slovakia

Not applicable. Currently, the use of regenerative braking is not allowed. Conditions of use shall be determined by the infrastructure manager.

The aforementioned requirements are approved by the following documents:

Belarus	Not regulated
Latvia	Design documentation
Lithuania	GOST31187-2003 (Informatory) Design documentation
Poland	Not regulated
Russia	Not regulated
Slovakia	Not regulated
Ukraine	Design documentation
Estonia	

5.3.8 Braking system independent of wheel-rail adhesion conditions

5.3.8.1 General provisions

Belarus

Requirements are not regulated.

Latvia and Lithuania

See Chapter 5.3.7.

Poland

Not defined.

Magnetic track and rheostatic (dynamic) brakes are not available.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	
Poland	
Russia	
Slovakia	
Ukraine	
Estonia	

5.3.8.2 Magnetic track brake

Currently, requirements for this parameter are not regulated in all the countries. It is not currently used in the 1 520 mm gauge system.

Belarus

Requirements are not regulated.

Latvia

Not applicable.

Lithuania

Not applicable.

Poland

On existing locomotives, it is not available.

For newly built locomotives – where applicable, requirements in accordance with the TSI LOC&PAS.

Russia

Applicable on fast-speed and high-speed rolling stock in accordance with the demand of the infrastructure owner.

The rules for the maintenance of magnetic track brakes and control thereof in trains are set forth in the Instruction for the Operation of Brakes of Passenger Trains Running at Speeds of up to 200 km/h Inclusively.

Slovakia

Not applicable.

Ukraine

Not applicable.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	
Poland	TSI LOC&PAS
Russia	
Slovakia	
Ukraine	
Estonia	

5.3.8.3 Eddy current track brake

Currently, requirements for this parameter are not regulated in all the countries. It is not currently used in the 1 520 mm gauge system.

Belarus, Latvia, Lithuania, Russia, Slovakia, Ukraine, and Estonia

Poland

On existing locomotives, it is not available.

For newly built locomotives – where applicable, requirements in accordance with the TSI LOC&PAS.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	
Poland	
Russia	
Slovakia	
Ukraine	
Estonia	

5.3.9 Brake state monitoring and fault indication

Currently, requirements for this parameter are different in all the countries or are not regulated. A common constituent may be identified for these requirements for Belarus, Latvia, Lithuania, Russia, and Ukraine.

The availability of measuring devices in the driver's cab is regulated by the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 or by equivalent documents effective in each country.

The control panel in the cab of the driver of multi-unit rolling stock should provide for a system signalling the condition of the brakes of the train as a whole and of the tail car separately. The signalling activation pressure should be 20-30 kPa for the "train release signalling" and 50-80 kPa for the "tail car release signalling".

Brake manifold breakaway control for locomotives is performed by the indications of the brake manifold condition sensor.

Belarus

The operating rules are regulated by STP 09150.17.038.

Latvia

Freight diesel locomotives should be equipped with a brake manifold breakaway control system, brake release signalling, and manometers at the driver's desk.

Passenger locomotives and multi-unit rolling stock should be equipped with an electro-pneumatic braking circuit control lamp, brake release signalling, and manometers at the driver's desk.

Lithuania

"The List of Control, Adjustment, Protection, and Diagnostics Systems and Devices (hereinafter referred to as "the Control and Diagnostics System") shall be specified in the Technical Specifications (TU) for diesel locomotives of the particular type.

The following should be installed on a diesel locomotive:

- Control and Diagnostics System complex;

- . . .

- locomotive traffic safety device complex with registration of train movement parameters;

- brake manifold breakaway control system;

- brake release signalling.

The Control and Diagnostics System complex should ensure the following:

- signalling and protection against slippage and wheel slide within the whole range of travelling speeds."

Poland

For newly built locomotives – where applicable, requirements in accordance with the TSI LOC&PAS.

Russia

The availability of measuring devices in the driver's cab is regulated by the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Chapter 3).

The testing of automatic brakes in trains is regulated in accordance with Instruction TsRB-756 (Chapter 15, Paragraph 15.41).

The testing of automatic brakes in trains is divided into "Complete", with an inspection of the condition of the brake manifold and performance of brakes on all cars, and "Reduced", with an inspection of the condition of the brake manifold by the performance of brakes on the two tail cars or, in multi-unit trains, by the performance of the brakes on the tail car.

The control panel in the cab of the driver of multi-unit rolling stock should provide for a system signalling the condition of the brakes of the train as a whole and of the tail car separately. The signalling activation pressure should be 20-30 kPa for the "train release signal" and 50-80 kPa for the "tail car release signal".

Brake manifold breakaway control for locomotives is performed by the indications of the brake manifold condition sensor in accordance with the Safety Standards NB ZhT TsT 01-04.

Slovakia

On existing locomotives, it is not available.

For newly built locomotives – where applicable, requirements in accordance with the TSI LOC&PAS.

The condition of brakes is controlled by means of testing as well as by using manometers and other signalling devices on the driver's desk.

Ukraine

The condition of brakes is controlled by means of testing as well as by using manometers and other signalling devices (on passenger locomotives – electro-pneumatic braking circuit control lamp; on freight locomotives – braking circuit condition control sensor; on electric trains – brake condition signalling for the electric train as a whole and of the tail car separately) on the driver's desk.

The testing of automatic brakes in trains is divided into "Complete", with an inspection of the condition of the brake manifold and performance of brakes on all cars, and "Reduced", with an inspection of the condition of the brake manifold by the performance of brakes on the two tail cars or, in multi-unit trains, by the performance of the brakes on the tail car.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.17.038-2006 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
Latvia	Design documentation 03.08.2010 KM LR Railway Technical Operating Rules, No. 724 Instruction for the Operation of Rolling Stock Brakes, No. DR-19/2000

Lithuania	GOST31187-2003 (Informatory) R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės)
Poland	TSI LOC&PAS
Russia	Safety standards (NB ZHT TST 01-04)
Slovakia	Instructions of the UIC 540… TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways TsT-0058. Instruction for the Technical Maintenance, Repair, and Testing of Braking Equipment of Locomotives and Multi-Unit Rolling Stock
Estonia	

5.3.10 Brake requirements for rescue purposes

Currently, requirements for this parameter are the same in all the countries.

The obligatory parameters determining the braking efficiency and procedure for the arrangement and activation of brakes on non-operational locomotives and cars of multi-unit rolling stock is determined by the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 or by equivalent documents effective in each country.

Belarus

The requirements are stipulated by STP 09150.17.038.

Latvia

Locomotives can be forwarded both as single units in trains and in bundlings. Multi-unit rolling stock shall be forwarded in trains, sections, and separate cars. When forwarding, hoses of the brake manifold of locomotives and cars of multi-unit rolling stock shall be connected to the common brake manifold of the train; all non-connected end hoses of feed air pipes should be dismantled from the rolling stock, and their end valves should be closed.

The electric power supply source shall be disconnected from the circuits of the electro-pneumatic brake.

On a non-operational locomotive, the valve on the air pipe connecting the brake manifold with the feed manifold through a check valve should be opened when one main tank or group of tanks are opened. On multi-unit rolling stock, on which the brake cylinders are

filled through pressure relays, the device for forwarding the rolling stock in the non-operational ("cold") condition should be activated.

All valve handles on a non-operational locomotive should be sealed.

When forwarding one multi-unit train or a bundling formed of cars of such trains, the No. 292 air distributors shall be set to the short-train mode if the bundling consists of not more than 20 cars. If the bundling consists of more than 20 cars, or if the bundling is included in a freight train, irrespective of the number of cars, the No. 292 air distributors shall be set to the long-train mode.

Bundlings with deactivated brakes may be dispatched only when it is impossible to activate the automatic brakes. In such cases, two empty eight-wheel cars with operational and activated automatic brakes should be attached at the tail of the bundling.

In this case, the number of locomotives, cars of multi-unit trains, and tenders in a bundling shall be determined in order to ensure the required braking effort which, with regard to the weight of the hauling locomotive and cars as well as their brakes, should be (for 100 t of the weight of the bundling) not less than 6 t for slopes with a gradient of up to 0.010 inclusively, not less than 9 t for slopes with a gradient of up to 0.015, and not less 12 t for slopes with a gradient of up to 0.020 inclusively.

A bundling should be fitted with manually-operated brakes in accordance with standard regulations. The travelling speed of a bundling, in the event of deactivated automatic brakes on locomotives in the non-operational mode should not exceed 25 km/h.

Lithuania

When forwarding non-operational locomotives and multi-unit rolling stock, the hoses of their brake systems shall be connected with the brake system of the train; the hoses of the feed manifold should be dismantled from the rolling stock, and their end valves should be closed.

Brake command devices shall be activated in accordance with the procedure stipulated for the particular type of device and circuit of the braking system.

Electric power supply sources should be disconnected.

Bundlings with deactivated brakes shall be allowed for dispatching only when it is impossible to fix the automatic brakes. In this case, two empty eight-wheel cars with operational and activated automatic brakes should be attached at the tail of the bundling.

Additionally, the number of non-operational locomotives and cars of multi-unit rolling stock in a bundling shall be determined with regard to the required braking effort.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

On existing locomotives, it is not available.

For newly built locomotives – if applicable, should be in accordance with the TSI LOC&PAS.

For newly built locomotives, in accordance with the TSI LOC&PAS.

Russia

The procedure for the forwarding of rolling stock in the non-operational ("cold") condition is stipulated by the Instruction for the Procedure for the Forwarding of Locomotives and Multi-Unit Rolling Stock, TsT-310.

The obligatory parameters determining the braking efficiency and procedure for the arrangement and activation of brakes at non-operational locomotives and cars of multi-unit rolling stock is determined by the Instruction for the Operation of Rolling Stock Brakes of the Ministry of Railways of the Russian Federation TsT-TsV-TsL-VNIIZhT/277 (Paragraph 7.3).

Slovakia

Instructions in UIC 540…

Ukraine

When forwarding non-operational locomotives and multi-unit rolling stock, the hoses of their brake systems shall be connected with the brake system of the train; the hoses of the feed manifold should be dismantled from the rolling stock, and their end valves should be closed.

Brake command devices shall be activated in accordance with the procedure stipulated for the particular type of device and circuit of the braking system.

Electric power supply sources should be disconnected.

Bundlings with deactivated brakes shall be allowed for dispatching only when it is impossible to fix the automatic brakes. In this case, two empty eight-wheel cars with operational and activated automatic brakes should be attached at the tail of the bundling.

Additionally, the number of non-operational locomotives and cars of multi-unit rolling stock in a bundling shall be determined with regard to the required braking effort.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.17.038 Rules for the Operation of Brakes of Rolling Stock at Belarusian Railways
Latvia	Instruction for the Operation of Rolling Stock Brakes, DR-19/2000, Paragraph 7.3
Lithuania	R/86 Rules for the Operation of Brakes of Rolling Stock (Geležinkelio riedmenų stabdžių naudojimo taisyklės) Design documentation
Poland	TSI LOC&PAS
Russia	Instruction for the Procedure for the Forwarding of Locomotives and Multi-Unit Rolling Stock, TsT-310, 1995 Instruction for the Operation of Rolling Stock Brakes, TsT-TsV-TsL-VNIIZhT/277, Paragraph 7.3
Slovakia	Instructions of the UIC 540… Official Directive Sm 50 – Additional Provisions to the Rules for the Operation of Transport on the Broad-Gauge Line Matovce – Haniska pri Košiciach TP – 10-28/1345/73 Technical Specifications for Electric Two-Unit Locomotives 67E1 (125.8)

Ukraine	TsT-0057 – Instruction for the Procedure for the Forwarding of Locomotives and Multi-Unit Rolling Stock TsT-TsV-TsL-0015. Instruction for the Operation of Brakes of Rolling Stock on Ukrainian Railways
Estonia	

5.4 PASSENGER SERVICING

It is necessary to develop a mechanism for the adaptation of the PRM Rules for the 1 520 mm gauge system.

5.4.1 Sanitary systems

Currently, requirements for this parameter are different in all the countries. The common constituent for these requirements is covered by the requirements of UIC 563 or by the Sanitary and Hygiene Requirements for Sanitary Systems (information is segmentary).

There are instructions, O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock.

Belarus

Hygiene requirements for the control and assessment of levels of vibration in cars of rolling stock, hygiene requirements for the organisation of passenger traffic, and hygiene requirements are stipulated in SanPiN 2.2.4.13-7, SanPiN 2.5.4.13-35, and SanPiN 2.5.4.13-36, correspondingly.

Latvia and Ukraine

UIC 563 shall apply to the designing of electric trains and diesel trains.

In international passenger traffic, LDz is guided by the Sanitary Rules for Passenger Transportation in International Railway Traffic and performs the following requirements:

Paragraph 2.2.3. The quality of water in tanks and water supply points should comply with the hygiene requirements set for the quality of drinking water.

by microbiological indicators:

– the number of microorganisms in 1 ml – not more than 100;

– the number of coliform bacteria in 1 l of water (coli index) – not more than 3.

by organoleptic indicators:

– odour – not more than 2 points;

– colour index – not more than 35;

– flavour – not more than 2 points;

– turbidity – not more than 3.5 Formazin Units.

by the concentration of chemicals:

– total hardness – not more than 7.0 mg-eq/l (19 mmol/l) <*>;

– iron – not more than 1.0 mg/l;

– copper – not more than 1.0 mg/l;

– zinc – 5 mg/l;

– sulphites – 500.0 mg/l;

– chlorides – 350 mg/l.

<*> The value indicated within brackets can be established by the railways on the basis of the hygiene standards of a Member State of the Commonwealth.

Note: There is only one water tank in a long-distance passenger car. This tank serves for filling the heating system of the car, ensures water supply to washing facilities and toilets, and refilling the water storage and heating unit ("Titan"). Titan means the apparatus which boils water and is used by the conductor for making tea and coffee for passengers. Therefore, there are no separate concepts of "technical water" and "drinking water" for car facilities. The only requirement is that water for drinking should be boiled. Since practice showed the inefficiency of boiled water coolers for passengers, they were dismantled. This is why, in order to provide passengers of compartment cars and two-berth compartment cars with cold drinking water, the ticket price includes a 0.5 l bottle of drinking water, which is already placed on the table when a passenger arrives.

The quality of drinking water in Latvia is regulated by Rules No. 235 of the Cabinet of Ministers dated 29 April 2003 – Requirements for the Quality and Obligatory Harmlessness of Drinking Water; Procedure for Checking and Control.

Used water and sewage are discharged mostly onto the track.

However, closed-type compost toilets were installed on some cars of passenger rolling stock during upgrading, and they are specially maintained. Maintenance of compost toilets is performed during the technical maintenance of cars by withdrawing sewage and loading bio-solution. Cars for international communication were equipped with type EVAK-2000 R compost toilets (http://pillor.ru/evac/train.html).

On electric trains in service, toilets are blocked and are not operated.

On diesel trains in service, water is used only for the needs of toilets and washing facilities. The requirements for water are similar to those described above.

Latvia (additionally)

TSI PRM is obligatory for application in Europe. Currently, in Latvia, in accordance with the local legislation, it is legally required to transpose TSI PRM to the legislation of the Republic of Latvia with approval at the level of the Cabinet of Ministers, and it is planned to be done.

For the organisation of passenger traffic, LDz is guided by the following:

— Rules of the Council for Railway Transport dated 07 March 2001 – Sanitary Rules for Passenger Railway Transport in International Traffic (approved at the 28th Session of the Council for Railway Transport of the CIS in Yerevan on 07 March 2001);

— Regulation on Primary Service Trains in Interstate Passenger Traffic (approved at the X Session of the Council for Railway Transport of the CIS in Voronezh on 21 January 1994).

When designing electric and diesel trains, Riga Railcar Factory (RRF) is guided by the following:

— UIC 563 Fittings provided in coaches in the interest of hygiene and cleanliness;

— LVS EN 50125-1:2002 Railway Applications – Environmental conditions for equipment – Part 1: Equipment on board rolling stock;

— LVS EN 50121-1:2006 Railway Applications – Electromagnetic compatibility – Part 1: General;

— LVS EN 50121-2:2006 Railway Applications – Electromagnetic compatibility – Part 2: Emission of the whole railway system to the outside world;

— LVS EN 50121-3-2:2006 Railway Applications – Electromagnetic compatibility – Part 3-2: Rolling stock – Apparatus;

— LVS EN 50155:2002 Railway Applications – Electronic equipment used on rolling stock;

— LVS ENV 12694:2002 Public transport – Road vehicles – Dimensional requirements for variable electronic external signs;

— LVS EN 50153:2002 Railway Applications – Rolling stock – Protective provisions relating to electrical hazards;

— LVS EN 14752:2006 Railway Applications – Bodyside entrance systems;

— LVS EN 13129-1:2003 Railway Applications – Air conditioning for main line rolling stock;

— LVS EN 13129-2:2004 Railway Applications – Air conditioning for main line rolling stock – Part 2: Type tests;

— LVS EN 14750-1:2006 Railway Applications – Air conditioning for urban and suburban rolling stock – Part 1: Comfort parameters;

— LVS EN 14750-2:2006 Railway Applications – Air conditioning for urban and suburban rolling stock – Part 2: Type tests;

— LVS EN 14813-1:2006 Railway Applications – Air conditioning for driving cabs – Part 1: Comfort parameters;

— LVS EN 14813-2:2006 Railway Applications – Air conditioning for driving cabs – Part 2: Type tests;

— for the designing of products for the SIC Member States – GOST R 51690-2000 Passenger Cars of Main-Line 1 520 mm Gauge Railways. General Technical Conditions.

Lithuania

UIC 563.

Requirements for water in accordance with HN24:2003 Safety and Quality Requirements for Drinking Water.

Poland

Passenger-type rolling stock is not available.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS.

PN-EN-50125-1:2002/AC:2010

Russia and Ukraine

Water supply system – SP 2.5.1198-03.

Sanitary and hygiene requirements for sanitary systems – SP 2.5.1198-03 and SNiET TsUVS-6/1 (sanitary standards and ergonomic requirements).

Requirements for materials – GN 2.1.6.695 and MR4252 (tolerances for materials).

NB ZhT TsT 01-98 and NB ZhT TsT 03-98 establish obligatory requirements.

Slovakia

Not applicable.

The aforementioned requirements are approved by the following documents:

Belarus	SanPiN 2.2.4.13-7-2006 Sanitary Rules and Standards. Hygiene Requirements for the Control and Assessment of Vibration Levels in Cars of Rolling Stock SanPiN 2.5.4.13-35-2006 Sanitary Rules and Standards. Hygiene Requirements for the Organisation of Passenger Traffic on Railway Transport SanPiN 2.5.4.13-36-2006 Sanitary Rules and Standards. Hygiene Requirements for the Organisation of Freight Traffic on Public Railway Transport
Latvia	Rules of the Council for Railway Transport dated 07 March 2001 – Sanitary Rules for Passenger Railway Transport in International Traffic Sanitary Rules for Passenger Transportation in International Railway Traffic UIC 563
Lithuania	UIC 563 HN24:2003 Safety and Quality Requirements for Drinking Water GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People GOST R 50957-96 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People GOST R 50955-96 Cars of Electric Trains. Technical Requirements for the Carriage of Handicapped People GOST 30487-97 Electric Trains for Suburban Communication.

	General Safety Requirements Safety standards, 2 standards – electric trains and diesel trains TSI PRM
Poland	TSI LOC&PAS TSI PRM PN-EN-50125-1:2002/AC:2010
Russia	SP 2.5.1198-03 SP 2.5.1198-03, SNiET TsUVS-6/1 GN 2.1.6.695, MR4252 NB ZhT TsT 01-98 NB ZhT TsT 03-98 GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People GOST R 50957-96 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People GOST R 50955-96 Cars of Electric Trains. Technical Requirements for the Carriage of Handicapped People GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements Safety standards, 2 standards – electric trains and diesel trains
Slovakia	TSI PRM
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People DSTU 4049-2001 Main-Line Locomotive-Hauled Passenger Cars Rules of the Council for Railway Transport dated 07 March 2001 – Sanitary Rules for Passenger Railway Transport in International Traffic Instruction UIC O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock
Estonia	

5.4.2 Public address and communication systems

Currently, requirements for this parameter are different in all the countries or are not regulated. In the 1 520 mm gauge system, public address and communication are not arranged as a united system, and three independent communication systems are used: driver-passenger (wired communication), driver-dispatcher or driver-driver (radio communication), and driver-train personnel (radio communication). It is not possible to identify a common constituent for these requirements. The TSI LOC requirements can be applied for rolling stock of the 1 520 mm gauge system.

Belarus

Requirements for public address and communication systems are stipulated by GOST 30487, NB ZhT TsT 01-98, NB ZhT TsT 03-98, STP 09150.19.019, and GOST 30796.

Latvia

Cars of electric trains and diesel trains are equipped with passenger-driver communication panels located in the passenger compartment of the car. A passenger can address the driver by voice communication. The driver's reply will be heard by all passengers because the driver can reply only using the public address communication system.

Train public address communication is used for making announcements to passengers. Communication between train cabs for members of the locomotive crew forms a part of this system.

Radio communication is used for communication between the train driver and the personnel of railway infrastructure (station officer-on-duty, train dispatcher, depot officer-on-duty) and between train drivers. For this purpose, driver's cabs of electric trains and diesel trains are equipped with stationary radio transmitters with the required number of channels. Radio transmitters operate within the short-wave band (2.13mHz) and ultra-short-wave band (151.775-151.825 mHz). In accordance with the TOR, Paragraph 222, any traction rolling stock should be equipped with a radio transmitter.

In Latvia, approximately 80 % of electric trains are currently operated by one person (without the assistant driver); this is why portable ultra-short-wave radio transmitters, which are not related to the equipment of the rolling stock, are used for communication between the driver and train conductor who examines tickets and stays in the passenger compartment of the train.

When designing electric trains and diesel trains, LVS EN 50125-1:2002 is applied in order to determine the requirements for power supply for communication facilities. Electric trains and diesel trains are equipped with electric accumulator batteries which supply power to communication systems in case of the absence of a main power supply as well as to other systems of the train. No separate accumulator batteries are envisaged for communication facilities.

In international passenger traffic, a train must have one car equipped with a radio broadcasting centre (the staff car where the train master is based). The radio broadcasting centre can:

- to broadcast announcements for passengers in the train through loudspeakers installed in the ceilings of cars;

- ensure communication with the driver of the locomotive of the train;

- call the station officer-on-duty within the boundaries of the station.

Portable ultra-short-wave radio transmitters, which are not related to the equipment of the rolling stock, are used for communication between train conductors.

Compartments of the SV class (double-berth compartments) are equipped with a conductor call button (a button in a passenger compartment corresponds to a lamp indicating the number of the passenger compartment in the conductor's compartment).

In international passenger traffic, cars are equipped with electric accumulator batteries which supply power to communication systems in case of the absence of a main power supply as well as to other systems of the car (e.g. illumination). No separate accumulator batteries are envisaged for communication facilities.

Lithuania

The requirements in accordance with LST L ENV 12299 Railway Applications – Ride comfort for passengers – Measurement and evaluation as well as other specified documents.

Poland

Passenger-type rolling stock is not available.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS.

Slovakia

Not applicable.

Ukraine

Cars of electric trains and diesel trains are equipped with passenger-driver communication panels located in the passenger compartment of the car. A passenger can address the driver by voice communication.

Short-wave and ultra-short-wave band radio communication is used for communication between the train driver and the personnel of railway infrastructure (station officer-on-duty, train dispatcher, depot officer-on-duty) and between train drivers.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01-98 Diesel Trains. Safety Standards NB ZhT TsT 03-98 Electric Trains. Safety Standards STP 09150.19.019 Requirements for the Operation of Train Radio Communication GOST 30796 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People GOST 30487 Electric Trains for Suburban Communication. General Safety Requirements
Latvia	TOR of the Latvian Railways EN 50125-2:2002 TSI PRM
Lithuania	LST 12299L ENV Railway Applications – Ride comfort for passengers – Measurement and evaluation UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs GOST R 50955-96 Cars of Electric Trains. Technical Requirements for the Carriage of Handicapped People (Informatory) GOST R 50957-96 Cars of Diesel Trains. Technical Requirements for

	the Carriage of Handicapped People (Informatory) TSI PRM
Poland	TSI LOC&PAS TSI PRM
Russia	NB ZHT TST 01-98 NB ZHT TST 03-98 GOST R 50957-96 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People GOST R 50955-96 Cars of Electric Trains. Technical Requirements for the Carriage of Handicapped People
Slovakia	TOR TSI PRM
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People TsRB-004. Technical Operating Rules for Ukrainian Railways TsSh-0058
Estonia	

5.4.3 Possibility of sending an alarm signal from passengers to the driver: functional requirements

Currently, requirements for this parameter are the same in all the countries (except for Poland). A common constituent for these requirements can be identified (on the basis of information on Latvia, Lithuania, Russia, and Ukraine).

Multi-unit rolling stock shall be equipped with passenger-driver communication, which serves as the main alarm signal.

The emergency stop valve serves as an additional alarm signal used by passengers to alert the driver.

Latvia

The train public address communication system is used for making announcements to passengers in electric trains and diesel trains. The requirements for the designing of the train public address communication system in terms of electromagnetic compatibility are specified in LVS EN 50121-1:2006, LVS EN 50121-2:2006, and LVS EN 50121-3-2:2006 and those for the electronics of rolling stock are specified in LVS EN 50155:2002.

In international passenger traffic, broadcasting from the radio broadcasting centre is also used.

Lithuania

The two-way train public address communication system is used for making announcements to passengers in electric trains and diesel trains.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

Passenger-type rolling stock is not available.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS.

Belarus, Russia, and Ukraine

Multi-unit rolling stock shall be equipped with passenger-driver communication, which serves as the main alarm signal.

The emergency stop valve serves as an additional alarm signal given by passengers to the driver.

Slovakia

Not applicable.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01-98 Diesel Trains. Safety Standards NB ZhT TsT 03-98 Electric Trains. Safety Standards
Latvia	LVS EN 50121-1:2006 LVS EN 50121-2:2006 LVS EN 50121-3-2:2006 LVS EN 50155:2002
Lithuania	LST 12299L ENV Railway Applications – Ride comfort for passengers – Measurement and evaluation UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs GOST R 50955-96 Cars of Electric Trains. Technical Requirements for the Carriage of Handicapped People (Informatory) GOST R 50957-96 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People (Informatory)
Poland	TSI LOC&PAS
Russia	NB ZHT TST 01-98 NB ZHT TST 03-98
Slovakia	TOR
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 30796-2001 Cars of Diesel Trains. Technical Requirements for the Carriage of Handicapped People TsSh-0001 – Instruction for Signalling and Communication on Ukrainian Railways
Estonia	

5.4.4 Safety instructions and signs for passengers

Currently, requirements for this parameter are the same in all the countries (except for Poland). A common constituent for these requirements can be identified (on the basis of information on Latvia, Lithuania, and Russia).

On rolling stock, safety inscriptions and signs for passengers shall be used in accordance with the requirements of the GOST standards and Instruction TsV 473 – Signs and Inscriptions on Cars of the 1 520 mm Gauge Passenger Fleet or effective documents effective in each country.

For Latvia, Lithuania, Poland, Slovakia, and Estonia, the requirements of the PRM TSI shall also be obligatory.

Belarus

On rolling stock, safety inscriptions and signs for passengers shall be used in accordance with the requirements of GOST 12.2.056, GOST 30487, and TsRB/4676.

Latvia

In the designing of electric trains and diesel trains, requirements for safety inscriptions and signs for passengers shall be regulated by LVS ENV 12694:2002, LVS EN 50153:2002, and TSI PRM.

In Russia-bound international passenger traffic, LDz shall be guided by the Regulation on Primary Service Trains in Interstate Passenger Traffic.

7.1. In passenger compartments of cars, information shall be posted in the Russian language and in the language of the making-up of the train…

Lithuania

For newly designed rolling stock, the requirements of the TSI LOC&PAS shall also apply.

Poland

Passenger-type rolling stock is not available.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS.

Russia

On rolling stock, safety inscriptions and signs for passengers shall be used in accordance with the requirements of GOST 12.2.056, GOST 30487, GOST R 12.4.026, and Instruction TsV 473 – Signs and Inscriptions on Cars of the 1 520 mm Gauge Passenger Fleet.

Slovakia

Not applicable.

Ukraine

On rolling stock, safety inscriptions and signs for passengers shall be used in accordance with the requirements of GOST 12.2.056, DSTU 4493:2005, GOST 12.4.026-76 SSBT (Occupational Safety Standards System), OST 32.4-76 SSBT (Occupational Safety

Standards System), TsV-0072 – Regulation on the Approval of the Place and Method of the Application of Signs and Inscriptions on Cars of the Passenger Fleet of Ukrainian 1 520 mm Gauge Railways.

In compartments of international traffic cars, information shall be posted in the Ukrainian and Russian languages.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). 1 520 mm Gauge Electric Locomotives and Diesel Locomotives. Safety Requirements GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements TsRB/4676 Regulation on Safety Signs at Railway Transport Facilities
Latvia	LVS ENV 12694:2002 LVS EN 50153:2002 TSI PRM Regulation on Primary Service Trains in Interstate Passenger Traffic
Lithuania	TSI PRM
Poland	TSI LOC&PAS TSI PRM
Russia	GOST 12.2.056 GOST 30487 GOST R 12.4.026 Instruction TsV 473 – Signs and Inscriptions on Cars of the 1 520 mm Gauge Passenger Fleet
Slovakia	TSI PRM
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 12.4.026-76 SSBT (Occupational Safety Standards System). Signal Colours and Safety Signs OST 32.4-76 SSBT (Occupational Safety Standards System). Safety Signs at Railway Transport Facilities TsV-0072. Regulation on the Approval of the Place and Method of the Application of Signs and Inscriptions on Cars of the Passenger Fleet of Ukrainian 1 520 mm Gauge Railways TsRP-0002. Regulation of Enhanced-Comfort Electric Trains and Diesel Trains
Estonia	

5.4.5 Covered by the requirements of Paragraph 5.4.2 *(Public address and communication systems)*

Latvia

The help call button for line passenger service shall be used in international traffic.

Lithuania

Poland

Passenger-type rolling stock is not available.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS.

Belarus and Russia

Places for line passenger service should be equipped with a help call button. Entrance doors, toilets, places for handicapped passengers, and lifts for wheelchairs.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01-98 Diesel Trains. Safety Standards NB ZhT TsT 03-98 Electric Trains. Safety Standards
Latvia	TSI PRM
Lithuania	TSI PRM
Poland	TSI LOC&PAS TSI PRM
Russia	NB ZhT TsT 01-98 NB ZhT TsT 03-98
Slovakia	TSI LOC&PAS TSI PRM
Ukraine	
Estonia	

5.4.6 Exterior doors: passenger access to and egress from rolling stock

Currently, requirements for this parameter are the same in all the countries. In order to identify a common constituent, additional research is required including in regard to the requirements of the TSI PRM. Supplementary information is presented in the table.

Latvia, Lithuania, Russia, Ukraine, and Estonia

Automatic passenger entrance doors should be activated by the centrally controlled activator in the driver's cab. Doors should open and close without binding or sticking and be blocked in the closed position. Blocking may be manual or automatic. Automatic braking should prevent the sending of a signal to open the doors when the travelling speed of an

electric train exceeds 5 km/h. The condition of doors in the closed position should be confirmed by a signal on the control panel. The blocking of doors of the non-operating side should be ensured at stops. Doors should be equipped with devices for locking them during parking. The design of a car shall envisage elements for opening of doors in an emergency. Some cars should be equipped with lifts and broadened doorways for servicing persons with limited mobility.

Belarus

The requirements are stipulated by NB ZhT TsT 03-98, NB ZhT TsT 01-98, and GOST 12.2.056.

Latvia

When designing electric trains and diesel trains, the requirements for external doors shall be specified by the standard LVS EN 14752:2006 (Paragraph 5.5, Paragraph 4.7.)

In Russia-bound international passenger traffic, LDz shall be guided by the Sanitary Rules for Passenger Transportation in International Railway Traffic and shall perform the following requirements:

2.1.8. Doors of passenger cars should ensure free passage for passengers carrying luggage. External doors should open inward (without applying effort), sealed tight to prevent the penetration of water and snow inside the car vestibule and locks, and have a glass piece in the upper part in order to ensure natural illumination of the car vestibule and vestibule platform. Metal-and-plastic handrails should be installed on both sides of the doors. External doors shall open inward and be covered with a protective grating at the lower part of the glass piece.

Lithuania

The requirements of standard LST EN 14752:2006.

UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans.

UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs.

For newly designed rolling stock, the requirements of the TSI LOC&PAS shall also apply.

Poland

Passenger-type rolling stock is not available. The requirements of standard

PN EN 14752:2006, UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans, and UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS and TSI PRM.

Slovakia

Not applicable.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System) Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements NB ZhT TsT 01-98 Diesel Trains. Safety Standards NB ZhT TsT 03-98 Electric Trains. Safety Standards
Latvia	LVS EN 14752:2006 (Paragraph 5.5, Paragraph 4.7.) Sanitary Rules for Passenger Transportation in International Railway Traffic
Lithuania	LST EN 14752:2006 UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs
Poland	PN EN 14752:2006 UIC 560 UIC 565-3 TSI LOC&PAS TSI PRM
Russia	SP 2.5.1198 NB ZhT TsT 03-98 NB ZhT TsT 01-98
Slovakia	TSI PRM
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements Instruction UIC O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock
Estonia	

5.4.7 Door system construction

Currently, requirements for this parameter are different in all the countries. In order to identify a common constituent, additional research is required including in regard to the requirements of the TSI PRM.

Latvia

When designing electric trains and diesel trains, the requirements for the design of door systems shall be defined by the standard LVS EN 14752:2006 (Paragraph 4.1.7 and Paragraph 4.2).

Lithuania

The requirements of standard LST EN 14752:2006.

UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans.

UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs.

For newly designed rolling stock, the requirements of the TSI LOC&PAS shall also apply.

Poland

Passenger-type rolling stock is not available. The requirements of standard

PN EN 14752:2006, UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans, and UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS and TSI PRM.

Russia and Ukraine

The items standardised include the following: availability and sizes of doors, footboards, and handrails for ensuring entrance into/exit from multi-unit rolling stock to low and high platforms, and the surface of steps and footboards should be slip-proof. Doors of the vestibule platforms and service vestibule of the head car should open inward into the car. The design of entrance doors and passenger vestibule should ensure unhindered movement of wheelchair passengers.

The fastening of boards, steps, and handrails should be designed for forces of at least 2 kN.

Belarus and Russia (supplementary information)

The forces to be applied for the emergency opening of entrance passenger doors should be not more than 200 N for sliding doors. For sliding plug doors, forces for withdrawing the sheet from the plane of the car wall should be not more than 250 N.

Slovakia

Not applicable.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements GOST 12.2.056-81 SSBT (Occupational Safety Standards System). 1 520 mm Gauge Electric Locomotives and Diesel Locomotives. Safety Requirements NB ZhT TsT 01-98 Diesel Trains. Safety Standards NB ZhT TsT 03-98 Electric Trains. Safety Standards
Latvia	LVS EN 14752:2006
Lithuania	LST EN 14752:2006 UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs

Poland	PN EN 14752:2006 UIC 560 UIC 565-3 TSI LOC&PAS TSI PRM
Russia	GOST 30487 NB ZhT TsT 03-98 NB ZhT TsT 01-98
Slovakia	TSI PRM
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements Instruction UIC O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock
Estonia	

5.4.8 Inter-car doors

Currently, requirements for this parameter are the same in all the countries. In order to identify a common constituent, additional research is required including in regard to the requirements of the TSI PRM. Supplementary information is presented in the table enclosed with the document.

Belarus, Latvia, Lithuania, Ukraine, and Russia

For pass-through in a train of multi-unit rolling stock, it is necessary to provide for inter-car gangways. The design of inter-car gangways of multi-unit rolling stock should ensure the following:

reliable water- and air-tightness as well as thermal and sound insulation of the gangway preventing any possibility of sharp fluctuations in temperature and air pressure;

practical unchangeability of the inner sizes of the gangway cross-section when the train passes various curves;

nominal dimensions of the inter-car gangway cross-section (clear opening) – in accordance with the normative documentation effective in each country;

safe and convenient passage for passengers.

Doors of vestibule platforms and of the service vestibule should open inward into the car.

Inter-car doors (where installed) should be equipped with a locking device in order to prevent passage by passengers when cars are uncoupled.

Latvia

When designing electric trains and diesel trains, the requirements for the electronics of inter-car doors shall be in accordance with the standard LVS EN 50155:2002.

Lithuania

UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans.

UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs.

For newly designed rolling stock, the requirements of the TSI LOC&PAS shall also apply.

Poland

Passenger-type rolling stock is not available.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS.

PN-K-88208:1997.

Ukraine and Russia

For passage in a train of multi-unit rolling stock, it is necessary to provide for inter-car gangways. The design of inter-car gangways of multi-unit rolling stock should ensure the following:

reliable water- and air-tightness as well as thermal and sound insulation of the gangway preventing any possibility of sharp fluctuations in temperature and air pressure;

practical unchangeability of the inner sizes of the gangway cross-section when the train passes various curves;

nominal dimensions of the inter-car gangway cross-section (clear opening) – in accordance with the normative documentation effective in each country;

safe and convenient passage for passengers.

Doors of vestibule platforms and of the service vestibule should open inward into the car.

Inter-car doors (where installed) should be equipped with a locking device in order to prevent passage by passengers when cars are uncoupled.

Slovakia

Not applicable.

Ukraine (supplementary information)

In order to ensure pass-through by servicing personnel and passengers in a train, each car of multi-unit stock should be equipped with two gangway doors and closed (balloon-type) vestibule platforms with handrails and handles. The design of an inter-car gangway of multi-unit rolling stock should ensure the following:

reliable water- and air-tightness as well as thermal and sound insulation of the gangway preventing any possibility of sharp fluctuations in temperature and air pressure;

practical unchangeability of the inner sizes of the gangway cross-section when the train passes various curves:

- Length, minimum – 900 mm;
- Width, minimum – 700 mm;

- Height, minimum – 1800 mm.

The design of doors should ensure free, safe, and convenient passage for passengers and service bogies.

- Width, minimum – 750 mm;
- Height, minimum – 1900 mm.

Doors of vestibule platforms should open inward into the car and be equipped with a locking device in order to prevent passage by passengers when cars are uncoupled as well as with mechanisms for fixing them to the open position.

Methods of compliance assessment: linear measurements.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 30487-97 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements NB ZhT TsT 01-98 Diesel Trains. Safety Standards NB ZhT TsT 03-98 Electric Trains. Safety Standards
Latvia	LVS EN 50155:2002 Sanitary Rules for Passenger Transportation in International Railway Traffic
Lithuania	UIC 560 Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans UIC 565-3 Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs
Poland	PN-K-88208:1997 UIC 560 TSI LOC&PAS
Russia	GOST 30487-97 SP 2.5.1198 NB ZhT TsT 03-98 NB ZhT TsT 01-98
Slovakia	TSI PRM
Ukraine	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements Instruction UIC O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock
Estonia	

5.4.9 Internal air quality in rolling stock

Currently, requirements for this parameter are the same in all the countries (except for Poland). A common constituent for these requirements can be identified (on the basis of information on Latvia, Lithuania, and Russia).

In the 1 520 mm gauge system, sanitary and hygiene requirements are interpreted in broader terms and are regulated in accordance with the following main indicators:

- micro-climate (air temperature in rooms of cars, precision of the maintenance of temperature, difference in temperatures vertically and longwise, difference in temperatures of air and enclosures, temperature of the floor and walls, speed of air movement, and relative air humidity);

- quantity and quality of outside air supplied to the car; afflux;

- chemical composition of the air environment (concentration of CO^2).

The items to be evaluated shall include the biological hazard of by-products from the destruction of internal equipment materials and potential hazard of internal equipment materials in the event of fire.

The requirements for the air environment of rooms of multi-unit rolling stock shall be determined by normative documents of binding nature, the nomenclature whereof differs from country to country and is broader than the TSI Loc&Pas referred to in Paragraph 5.4.9.

There is an instruction, O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock.

Belarus

These requirements are stipulated by SanPiN 2.5.4.13-35, SanPiN 2.5.4.13-36, NB ZhT TsT 03-98, NB ZhT TsL 01-98, and GOST 12.1.044.

Latvia

When designing electric trains and diesel trains, the requirements for the quality of air inside rolling stock shall be determined by the following:

for main-line (inter-city) and regional rolling stock: LVS EN 13129-1:2003; LVS EN 13129-2:2004.

for urban and suburban rolling stock: LVS EN 14750-1:2006; LVS EN 14750-2:2006.

for the driver's cab of rolling stock: LVS EN 14813-1:2006; LVS EN 14813-2:2006.

In Russia-bound international passenger traffic, LDz shall be guided by the Sanitary Rules for Passenger Transportation in International Railway Traffic and perform the following requirements:

2.4.2. The ventilation system should be designed for uninterrupted operation for ensuring the supply of outside air to each seat/berth in a car of at least 20 m^3/h in summertime and of at least 10 m^3/h in wintertime. The concentration of carbon dioxide (CO^2) in a car should not exceed 0.1 %.

Depending on the outer temperature, the supply of outside air to each seat/berth should be ensured in the following volumes:

10 m^3/h at outer air temperature below -20 ºC;

15 m^3/h at outer air temperature of -20 ºC to -5 ºC;

20 m^3/h at outer air temperature of -5 ºC to +26 ºC;

15 m^3/h at outer air temperature of above +26 ºC.

2.4.3. The speed of air movement in locations of passengers should not exceed 0.2 m/s in wintertime and 0.25 m/s in wintertime with an operating air conditioner. In cars without air conditioners, the speed of air movement of 0.4 m/s shall be permitted.

2.4.4. Air supplied to cars should be cleaned by means of filters. The dust content of supplied air after cleaning should not exceed 0.5 mg/m^3.

2.4.5. The car cooling system should ensure even cooling.

2.4.6. The temperature of air supplied to a car after cooling should not be below +16ºC.

2.4.7. Outside air supplied to a car should be drawn from the least contaminated place. The volume of recirculated air may not exceed 30 %.

2.4.8. Ventilation chambers should be thoroughly insulated, especially against boiler compartments and kitchen, in order to prevent air leaks from those rooms.

From academic literature:

The book "Техническое обслуживание грузовых и пассажирских вагонов (пособие для слесарей и осмотрщиков-ремонтников вагонов)", Е. А. Мазуров (Трансинфо, 2000) (Technical Maintenance of Freight and Passenger Cars (Handbook for Locksmiths and Car Inspection/Repair Personnel), Ye. A. Mazurov (Transinfo, 2000)), the Chapter "Ventilation of Passenger Cars", Paragraph 17.1 "Ventilation Systems" refers to the following parameter: the supply intensity of a suction-and-exhaust ventilation system for incomplete air conditioning shall be 4 500 to 5 000 m^3/h in the summertime operating mode and 1 200 ± 60 m^3/h in the wintertime operating mode.

Lithuania

The requirements of the following standards: LST EN 13129-1:2003 Railway Applications. Air conditioning for main line rolling stock. Part 1. Comfort parameters.

LST EN 14750-1:2006 Air Conditioning for Urban and Suburban Rolling Stock. Part 1. Comfort Parameters.

UIC 553 Heating, ventilation and air-conditioning in coaches.

For newly designed rolling stock, the requirements of the TSI LOC&PAS shall also apply.

Poland

Passenger-type rolling stock is not available.

For passenger rolling stock – if purchased, requirements will apply in accordance with the TSI LOC&PAS.

PN-EN-14813-1:2006

PN-EN-13129-1:2004

PN-EN-14750-2:2006

Russia

The sanitary and hygiene requirements are interpreted in broader terms and are regulated by SP 2.5.1198, SN TsUVSS-6/27, NB ZhT TsT 03-98, NB ZhT TsL 01-98, and GN 2.1.6.1338-03 according the following main indicators:

- micro-climate (air temperature in rooms of cars, precision of the maintenance of temperature, difference in temperatures vertically and longwise, difference in temperatures of air and enclosures, temperature of the floor and walls, speed of air movement, and relative air humidity);

- quantity and quality of outside air supplied to the car; afflux;

- chemical composition of the air environment.

The items to be evaluated shall include the biological hazard of by-products from the destruction of internal equipment materials (SP 2.5.1198, MR4252, and GN 2.1.6.695) and potential hazard of internal equipment materials in the event of fire (GOST R 51690, MR4252, and GOST 12.1.044).

The requirements for the air environment of rooms of multi-unit rolling stock shall be determined in accordance with SP 2.5.1198.

The list of sanitary and hygiene requirements obligatory in the territory of the Russian Federation is broader than the TSI Loc&Pas referred to in Paragraph 5.4.9.

Slovakia

Not applicable.

Ukraine

The sanitary and hygiene requirements are interpreted in broader terms and are regulated in accordance with the following main indicators:

- micro-climate (air temperature in rooms of cars, precision of the maintenance of temperature, difference in temperatures vertically and longwise, difference in temperatures of air and enclosures, temperature of the floor and walls, speed of air movement, and relative air humidity);

- quantity and quality of outside air supplied to the car/cab and distribution thereof;

- chemical composition of the air environment.

Name of the parameter	**Standard value at temperatures of the ambient air, ^{o}C**		
	below +10	**+10 to +20**	**above +20**
Passenger compartments of cars of business (1) class and tourist (2) class			
Air temperature at a height of 1 100 mm from the floor, ^{o}C	20 to 24	20 to 24	$22 + 0.25(t_n-19)\pm2$
Air temperature difference at a height of 100/1 700 mm, ^{o}C	not more than 3	-	-
Air temperature difference at level cross-section (across the width of the passenger compartment) at a height of 1 100 mm from the floor, ^{o}C	not more than 2	-	-
Air temperature difference between the enclosure and air at a distance of 100 mm from the enclosure, ^{o}C	not more than 3	-	-
Air temperature difference at level cross-section (across the length of the passenger compartment), ^{o}C	not more than 3	-	-
Floor temperature, ^{o}C	not less than +15	-	-
Wall temperature, ^{o}C	not less than	-	-

Name of the parameter	Standard value at temperatures of the ambient air, °C		
	below +10	**+10 to +20**	**above +20**
	+15		
Relative air humidity, %	30-70	30-70	30-70
Air movement speed, m/s	not more than 0.2	not more than 0.4	not more than 0.4
Passenger compartments of cars of the 3rd class			
Air temperature at a height of 1 100 mm from the floor, °C	14 to 18	14 to 20	not more than 28
Air temperature difference at a height of 100/1 700 mm, °C	not more than 3	-	-
Air temperature difference at level cross-section (across the width of the passenger compartment) at a height of 1 100 mm from the floor, °C	not more than 2	-	-
Air temperature difference between the enclosure and air at a distance of 1 100 mm from the enclosure, °C	not more than 3	-	-
Air temperature difference at level cross-section (across the length of the passenger compartment), °C	not more than 3	-	-
Floor temperature, °C	not less than +10	-	-
Wall temperature, °C	not less than +10	-	-
Relative air humidity, %	30-70	30-70	30-70
Air movement speed, m/s	not more than 0.2	not more than 0.4	not more than 0.4

Minimum quantity of outside air to be supplied to the room for 1 person, m^3/h, at outer temperatures of			
below minus 20 °C	minus 20 °C to minus 5 °C	minus 5°C to plus 26°C	above plus 26 °C
10	15	20	15

The items to be evaluated shall include the biological hazard of by-products from the destruction of internal equipment materials and potential hazard of internal equipment materials in the event of fire.

The aforementioned requirements are approved by the following documents:

Belarus	SanPiN 2.5.4.13-35-2006 Sanitary Rules and Standards. Hygiene Requirements for the Organisation of Passenger Traffic at Railway Transport SanPiN 2.5.4.13-36-2006 Sanitary Rules and Standards. Hygiene Requirements for the Organisation of Freight Traffic on Public Railway Transport NB ZhT TST 03-98 NB ZhT TsL 01-98 Diesel Trains. Safety Standards GOST 12.1.044-89 SSBT (Occupational Safety Standards System). Fire-and-Explosives Safety of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof
Latvia	LVS EN 13129-1:2003

	LVS EN 13129-2:2004 LVS EN 14750-1:2006 LVS EN 14750-2:2006 LVS EN 14813-1:2006 LVS EN 14813-2:2006 Sanitary Rules for Passenger Transportation in International Railway Traffic
Lithuania	LVS EN 13129-1:2003 Railway Applications – Air Conditioning for Main-Line Rolling Stock – Part 1: Comfort Parameters LST EN 14750-1:2006 Air Conditioning for Urban and Suburban Rolling Stock. Part 1. Comfort Parameters UIC 553 Heating, ventilation and air-conditioning in coaches
Poland	PN-EN-14813-1:2006 PN-EN-13129-1:2004 PN-EN-14750-2:2006 TSI LOC&PAS
Russia	SP 2.5.1198 SN TsUVSS-6/27 NB ZhT TsT 03-98 NB ZhT TsL 01-98 GN 2.1.6.1338-03 SP 2.5.1198 MR 4252 GN 2.1.6.695 GOST R 51690 MR 4252 GOST 12.1.044
Slovakia	TSI LOC&PAS
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements Instruction UIC O+R 652/5 Sanitary and Hygiene Requirements for Passenger Cabins of Motored Rolling Stock GOST 12.1.005 SSBT (Occupational Safety Standards System). General Sanitary and Hygiene Requirements for Working Area Air GOST 12.1.044 SSBT (Occupational Safety Standards System). Fire-and-Explosive Hazard of Substances and Materials. Nomenclature of

	Indices and Determination Methods
Estonia	

5.5 ENVIRONMENTAL CONDITIONS AND AERODYNAMIC EFFECTS

5.5.1 Environmental conditions

Currently, requirements for this parameter are the same in all the countries; however, specific values of parameters will vary depending on the climatic zone in which the country is located. These requirements are described by GOST 15150-69 or by other equivalent documents in each country.

Belarus

Rolling stock and equipment thereof should be manufactured in the climatic modification (N) in accordance with GOST 15150.

Latvia

Lithuania

For newly designed rolling stock: the requirements of the TSI LOC&PAS apply.

In-service rolling stock shall be subject to the following standards:

GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements. (Informatory).

GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment.

GOST 17516-72 Electrical Products. Operating Conditions in Terms of the Impact of External Mechanical Environmental Factors.

GOST 17516.1-90 Electrical Products. General Requirements in Terms of Resistance to External Mechanical Influencing Factors (Informatory).

For newly built rolling stock (after entry into force of the corresponding standards):

LST EN 50125-1:2002 Railway Applications. Environmental conditions for equipment. Part 1. Equipment on board rolling stock.

LST EN 60721-3-5:2001 Classification of environmental conditions. Part 3. Classification of environmental parameters and aggressiveness groups thereof. Sub-group 5. Ground vehicle installations (IEC 60721-3-5:1997).

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

The type of the climatic modification in accordance with GOST 15150-69 should be specified in the technical specifications for diesel locomotives of the particular type.

Diesel locomotives should ensure the traction parameters at an altitude above sea-level of up to 1 000 m, and if the customer requires so – of up to 1 400 m.

Poland

PN-EN-50125-1:2002

PN-EN-60721-3-5:2010

Russia

Rolling stock and equipment thereof should be manufactured in the climatic modification (N) in accordance with GOST 15150 with a limiting range of operating temperatures of outside air from minus 50 to plus 45 ºC. The following categories of the arrangement of equipment in accordance with GOST 15150 should be applied:

- Rolling stock and equipment installed outside the body should be made in the modification (N1);
- Working temperatures for the equipment of the safety systems and radio communication facilities located openly outside the body and without heating: minus 50 ºC to plus 50 ºC;
- Limit for working temperatures for the equipment of the safety systems and radio communication facilities located openly outside the body and without heating: minus 50 ºC to plus 55 ºC;
- Equipment to be installed inside the body should be made in the modification (N2), while the operating upper value of working temperature of outside air shall be established at plus 60 ºC;
- Equipment to be installed in the driver's cab should be made in the modification (N3), while the operating upper value of working temperature of outside air shall be established at plus 60 ºC;
- Maximum altitude above sea-level: for diesel locomotives – 1 000 m in ordinary modification and 1 400 m at the request of the customer; for electric locomotives – 1 300 m in ordinary modification and 1 400 m at the request of the customer.

Slovakia

The standards of EN 15125-1 for each type of locomotives, correspondingly.

Ukraine

Rolling stock and equipment thereof should be manufactured in the climatic modification (N) in accordance with GOST 15150 with a limiting range of operating temperatures of outside air from minus 50 to plus 40 ºC. The following categories of the arrangement of equipment in accordance with GOST 15150 should be applied:

- Rolling stock and equipment installed outside the body should be made in the modification (N1);
- Working temperatures for the equipment of the safety systems and radio communication facilities located openly outside the body and without heating: minus 50 ºC to plus 50 ºC;
- Limit for working temperatures for the equipment of the safety systems and radio communication facilities located openly outside the body and without heating: minus 50 ºC to plus 55 ºC;

- Equipment to be installed inside the body should be made in the modification (N2), while the operating upper value of working temperature of outside air shall be established at plus 60 ºC;
- Equipment to be installed in the driver's cab should be made in the modification (N3), while the operating upper value of working temperature of outside air shall be established at plus 60 ºC;
- Maximum altitude above sea-level – 1 200 m.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment
Latvia	GOST 15150 (Informatory)
Lithuania	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements (Informatory) GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment GOST 17516-72 Electrical Products. Operating Conditions in Terms of the Impact of External Mechanical Environmental Factors GOST 17516.1-90 Electrical Products. General Requirements in Terms of Resistance to External Mechanical Influencing Factors (Informatory) LST EN 50125-1:2002 Railway Applications. Environmental conditions for equipment. Part 1. Equipment on board rolling stock LST EN 60721-3-5:2001 Classification of environmental conditions. Part 3. Classification of environmental parameters and aggressiveness groups thereof. Sub-group 5. Ground vehicle installations (IEC 60721-3-5:1997)
Poland	PN-EN-50125-1:2002 PN-EN-60721-3-5:2010
Russia	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment
Slovakia	EN 15125-1
Ukraine	GOST 15150-69 Machinery, Devices, and other Technical Products. Modifications for Different Climatic Regions. Categories and Operation, Storage, and Transportation Conditions in Terms of the Impact of Climatic Factors of the Environment GOST 17516.1-90 Electrical Products. General Requirements in Terms

	of Resistance to External Mechanical Influencing Factors GOST 15543.1-89 Electrical Products. General Requirements in Terms of Resistance to External Climatic Influencing Factors
Estonia	

5.5.2 Aerodynamic effects

Currently, requirements for this parameter (and sub-parameters) are different in all the countries. The requirements for the 1 520 mm gauge system are defined in NB ZhT TsT 03-98 (applicable only to electric trains). When introducing the 1 520 mm gauge system to the TSI, additional research concerning this parameter will be required.

Belarus, Russia, and Ukraine

For electric trains with a design speed of 160 to 250 km/h, overpressure and underpressure of the head shock wave, when travelling at the design speed, in respect of the vertical surface located parallel to the track centreline at a distance of 2.35 m from it should not exceed 1 800 Pa, and at a distance of 4 m from the track centreline – should not exceed 200 Pa in accordance with NB ZhT TsT 03-98.

Slovakia

Not regulated (freight traffic; low speeds).

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	LST EN 14067-1 Railway Applications. Aerodynamics. Part 1. Symbols and units LST EN 14067-2 Railway Applications. Aerodynamics. Part 2. Aerodynamics on open track LST EN 14067-3 Railway Applications. Aerodynamics. Part 3. Aerodynamics in tunnels LST EN 14067-4 Railway Applications. Aerodynamics. Part 4. Requirements and test procedures for aerodynamics on open track
Poland	PN-EN-14067-1:XIXX (WSZYSTKIE WYDANIA)
Russia	NB ZhT TsT 03-98 (the standards cover the first three parameters, while the other two parameters are not covered in the 1 520 mm gauge system and additional research is required)
Slovakia	
Ukraine	NB ZhT TsT 03-98 (Informatory) (the standards cover the first three parameters, while the other two parameters are not covered in the

	1 520 mm gauge system and additional research is required)
Estonia	

5.6 SYSTEM PROTECTION

5.6.1 Electrical safety *(new Paragraph 4.2.8.4 in TSI Revision 4.0)*

Currently, requirements for this parameter are the same in all the countries. The requirements for the 1 520 mm gauge system shall be described by GOST 12.2.056 и GOST 12.1.019-79, as well as by other normative safety documents, or by equivalent documents in each country.

The requirements for the 1 520 mm gauge system are defined in GOST 12.2.056 and GOST 12.1.019-79 as well as other normative documents.

Belarus

The requirements for the assurance of electrical safety on locomotives and multi-unit rolling stock and the application of safety signs are set forth in GOST 12.2.056, Paragraph 1.6, Chapter 2, GOST 30487, Paragraphs 5.1 and 5.4, GOST 12.1.019, GOST 12.4.026, NB ZhT TsT 01-98, NB ZhT TsT 02-98, NB ZhT TsT 03-98, and NB ZhT TsT 04-98.

Lithuania

The requirements in accordance with the standards.

GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements.

LST EN 50153:2003 Railway Applications. Rolling stock. Protective provisions relating to electrical hazards.

Poland

PN-EN-50153:2004

Russia

Cables of the power circuit laid in the driver's cab and machinery compartment (outside the high-voltage chamber) should have enclosures protecting them against mechanical damage and ingress of moisture and lubricants.

It is necessary to prevent access to live power equipment installed in high-voltage chambers, cabinets, and boxes by using blocking devices also preventing any possibility of supplying voltage to power equipment when doors, curtains, and covers of high-voltage chambers, cabinets, and boxes are open.

High-voltage chambers of diesel locomotives should have one blocking unit preventing access to the chamber without de-energising the traction generator.

Electrical power metering devices operated under high voltage should be installed in places preventing access to current-conducting parts when energised. The aforementioned devices installed closely to enclosing grilles should have a solid covering of current-conducting parts preventing access from the side of the passage in the machinery compartment.

When supplying voltage to a locomotive from a constant source (from the circuit of a depot) in the case when voltage of over 42 V alternating current and 110 V direct current is supplied to these devices, it is necessary to ensure protection of the servicing personnel against being affected by voltage by means of using blocking devices of curtains, doors, and covers of high-voltage chambers, cabinets, and electrical equipment boxes.

The following safety symbols and signs should be applied on locomotives:

"Use of open fire and smoking are prohibited" – on covers of accumulator boxes (sections).

"Do not climb onto the roof without grounding the contact wire" – on covers of manholes or near manholes and bridges leading to the roof of an electric locomotive.

"Do not open when the pantograph is in the upper position" – on boxes of electric apparatus installed outside the high-voltage chamber, on walls of boards of measuring devices, and on panels of the control desk not equipped with blocking devices in the event of voltage over 42 V alternating current and 110 V direct current.

"Electrical shock hazard" – on commutator covers, on the frame of auxiliary equipment installed outside the high-voltage chamber as well as on doors and boards of the high-voltage chamber and panels of the control desk which do not have blocking devices in the pantograph control circuits.

On electric trains, covers of high-voltage underbody boxes, power transformers, rectifier units, doors of cabinets containing high-voltage equipment, inter-car high-voltage connections, and bridges leading to the roof should be equipped with blocking devices ensuring the lowering of the pantograph of the corresponding section when they are opened.

The requirements for the assurance of electrical safety on locomotives and multi-unit rolling stock and the application of safety signs are set forth in GOST 12.2.056, Paragraph 1.6, Chapter 2, GOST 30487, Paragraphs 5.1 and 5.4, GOST 12.1.019, GOST 12.4.026, NB ZhT TsT 01-98, NB ZhT TsT 02-98, NB ZhT TsT 03-98, and NB ZhT TsT 04-98.

Slovakia

The standard EN 50153 for locomotives and instructions OSJD or standards GOST for cars.

Ukraine

The electrical safety of locomotives and multi-unit rolling stock should comply with the requirements of GOST 12.1.019, GOST 12.2.056-81, and DSTU 4493:2005.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 – 97 Electric Trains for Suburban Communication. General Safety Requirements GOST 12.1.019-79 SSBT (Occupational Safety Standards System). Electrical Safety. General Requirements and Nomenclature of Types of Protection GOST 12.4.026-76 SSBT (Occupational Safety Standards System).

	Signal Colours and Safety Signs GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Informatory – GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements LST EN 50153:2003 Railway Applications. Rolling stock. Protective provisions relating to electrical hazards
Poland	PN-EN-50153:2004
Russia	GOST 12.2.056, Paragraph 1.6, Chapter 2 GOST 30487, Paragraphs 5.1 and 5.4 GOST 12.1.019-79 SSBT (Occupational Safety Standards System). Electrical Safety. General Requirements and Nomenclature of Types of Protection GOST 12.4.026 GOST 31187-2003 NB ZhT TsT 01-98 NB ZhT TsT 02-98 NB ZhT TsT 03-98 NB ZhT TsT 04-98
Slovakia	Standard EN 50153 GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 12.1.019-79 (2001) SSBT (Occupational Safety Standards

	System). Electrical Safety. General Requirements and Nomenclature of Types of Protection
Estonia	

5.6.2 Diagnostics; Software *(new Paragraph 4.2.1 in TSI Revision 4.0)*

Currently, the requirements for this parameter (and sub-parameters) are regulated in all the countries. In accordance with the new version of the TSI 4.0, the description of these parameters is distributed over other chapters. The requirements are stipulated by the normative documents for each type of rolling stock as well as by supplementary requirements of design documentation to be agreed upon with the customer. It is not possible to identify a common constituent because of the aforementioned reasons.

5.6.2.1 Diagnostics

Belarus

The procedure for the diagnostics of separate systems, assemblies, and parts of rolling stock is set forth in operating instructions, the Rules for Repair, and other technical and technological documents for the particular type of rolling stock.

Lithuania

Diesel locomotives should be equipped with a microprocessor control, adjustment, and diagnostics system.

Additionally, the procedure for the diagnostics of separate systems, assemblies, and parts of rolling stock is set forth in operating instructions, the Rules for Repair, and other technical and technological documents for the particular type of rolling stock.

Russia

The requirements for diagnostics systems, composition of diagnostics information on the technical condition and break-downs of equipment and the locomotive as a whole for particular rolling stock and methods of the provision of such information to the locomotive crew should be contained in the technical requirements and technical assignment for the designing thereof.

Currently, the following standards are effective: GOST 26656-85 Technical Diagnostics. Controllability. General Requirements, GOST 27518-87 Diagnostics of Products. General Requirements, GOST 20911-89 Technical Diagnostics. Terms and Definitions, GOST R 52120-2003 Technical Diagnostics. Main-Line Locomotives. General Requirements for Diagnosability, and GOST R 52122-2003 Technical Diagnostics. Main-Line Locomotives. In-Built Diagnostics Systems. General Requirements.

Ukraine

The requirements for diagnostics systems, composition of diagnostics information on the technical condition and break-downs of equipment and the locomotive as a whole for particular rolling stock and methods of the provision of such information to the locomotive crew should be contained in the technical requirements and technical assignment for the designing thereof.

Additionally, the procedure for the diagnostics of separate systems, assemblies, and parts of rolling stock is set forth in operating instructions, the Rules for Repair, and other technical and technological documents for the particular type of rolling stock.

Currently, the following standards are effective: GOST 26656-85 Technical Diagnostics. Controllability. General Requirements, GOST 27518-87 Diagnostics of Products. General Requirements, and GOST 20911-89 Technical Diagnostics. Terms and Definitions.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements (Informatory) Design and technological documentation
Poland	
Russia	GOST 26656-85 Technical Diagnostics. Controllability. General Requirements GOST 27518-87 Diagnostics of Products. General Requirements GOST 20911-89 Technical Diagnostics. Terms and Definitions GOST R 52120-2003 Technical Diagnostics. Main-Line Locomotives. General Requirements for Diagnosability GOST R 52122-2003 Technical Diagnostics. Main-Line Locomotives. In-Built Diagnostics Systems. General Requirements
Slovakia	
Ukraine	GOST 26656-85 Technical Diagnostics. Controllability. General Requirements GOST 27518-87 Diagnostics of Products. General Requirements GOST 20911-89 Technical Diagnostics. Terms and Definitions
Estonia	

5.6.2.2 Software

Lithuania

The requirements in accordance with the standards.

LST EN 50128:2002 Railway Applications. Communications, signalling and processing systems. Software for railway control and protection systems.

LST EN 50155:2002/A1:2003 Railway Applications. Electronic equipment used on rolling stock.

Poland

PN-EN-50128:2002/AC :2010

PN-EN-50155:2007/AC :2010

Belarus, Russia, and Ukraine

The general requirements for the software of onboard microprocessor systems of locomotives and multi-unit rolling stock are contained in technical requirements and technical assignment for the designing of the rolling stock. The complete requirements for the software of onboard microprocessor systems, assemblies, and units are contained in specific technical assignments.

Slovakia

The standards EN 50128:2002 and EN 50155:2002/A1:2003.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.11.088-2008 Information Technologies. Development, Operation, and Maintenance of Computer-Controlled Systems. Phases and Stages
Latvia	
Lithuania	LST EN 50128:2002 Railway Applications. Communications, signalling and processing systems. Software for railway control and protection systems LST EN 50155:2002/A1:2003 Railway Applications. Electronic equipment used on rolling stock
Poland	PN-EN-50128:2002/AC :2010 PN-EN-50155:2007/AC :2010
Russia	
Slovakia	EN 50128:2002 EN 50155:2002/A1:2003
Ukraine	Technical specifications
Estonia	

5.6.3 External lights, head and tail lights, and audible signals *(new Paragraph 4.2.7 in TSI Revision 4.0)*

5.6.3.1 External lights; head and tail lights

5.6.3.1.1 External lights

Currently, requirements for this parameter are the same in all the countries.

Both frontal parts of a locomotive with a coach-type body and end parts of a locomotive with a hood-type body should be equipped with a headlight and two signalling tail lights (from the right and left sides). Signalling lights should also be installed at the end wall of each locomotive section, which may be used as an independent unit.

The headlight should be installed alongside the longitudinal symmetry axis of the locomotive. The headlight switching system should provide for the possibility of switching-on of bright light ensuring nominal axial lighting force and low light.

The requirements for the 1 520 mm gauge system shall be described by GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements for all the counties and by other normative documents, rules, and instructions or by equivalent documents in each country.

Lithuania

Both frontal parts of a locomotive with a coach-type body and end parts of a locomotive with a hood-type body should be equipped with a headlight and two signalling tail lights (from the right and left sides).

The headlight should be installed alongside the longitudinal symmetry axis of the locomotive.

The lighting force for in-service locomotives shall be in accordance with GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements.

Poland

PN-EN-15153-1:2007

Belarus and Russia

The requirements for the parameters of the headlight and methods of control are specified in GOST 12.2.056, NB ZhT TsT 01-98, NB ZhT TsT 02-98, NB ZhT TsT 03-98, and NB ZhT TsT 04-98. The axial lighting force of the frontal headlight shall be determined in accordance with GOST 30487 and GOST 12.2.056.

Slovakia

The requirements of the national standards, which correspond to the requirements of GOST. They will be revised in accordance with the requirements of the EN standards.

Ukraine

Both frontal parts of a locomotive with a coach-type body and end parts of a locomotive with a hood-type body should be equipped with a headlight and two signalling tail lights (from the right and left sides). Signalling lights should also be installed at the end wall of each locomotive section, which may be used as an independent unit.

The headlight should be installed alongside the longitudinal symmetry axis of the locomotive. The headlight switching system should provide for the possibility of switching-on of bright light ensuring nominal axial lighting force and low light.

The lighting force for in-service locomotives shall be in accordance with GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements.

The requirements for the parameters of the headlight and methods of control are specified in GOST 12.2.056. The axial lighting force of the frontal headlight shall be determined in accordance with GOST 12.2.056 and DSTU 4493:2005.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056 – 81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 – 97 Electric Trains for Suburban Communication. General Safety Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (Informatory)
Lithuania	LST EN 15153-1:2007 Railway Applications. External visible and audible warning devices for high-speed trains. Part 1. Head, marker and tail lamps GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements ADV-002 Rules for Railway Signalling (Geležinkelių signalizacijos taisyklės)
Poland	PN-EN-50153-1:2007
Russia	GOST 12.2.056 NB ZhT TsT 01-98 NB ZhT TsT 02-98 NB ZhT TsT 03-98 NB ZhT TsT 04-98 GOST 30487
Slovakia	National technical standards
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.6.3.1.2 Head (marker) lights

Currently, requirements for this parameter are the same in all the countries. For the 1 520 mm gauge system, the requirements are described by national rules and instructions for signalling in each country.

Belarus

The marking of the train head with light signals shall be regulated by the Instruction for Signalling at Belarusian Railways, GOST 12.2.056, Paragraphs 1.3.8-1.3.10, and GOST 30487, Paragraphs 3.6.1 and 3.6.2. The requirements for the colour grades of signals shall be in accordance with GOST 24179.

Lithuania

The head of a train running on a single-track line or on the regular track of a double-track line shall not be marked at daytime and shall be marked with the white lights of two buffer-beam lamps at night time.

In addition, the white light of the headlight of a single locomotive or train headed by a locomotive should also illuminate at night time. At the front of a diesel train or electric train, only the white light of the headlight may illuminate at night time.

The other specific features of the marking of the train head shall be specified in ADV-002 Rules for Railway Signalling.

Poland

PN-EN-15153-1:2007

Russia

The marking of the train head with light signals shall be regulated by the Instruction TsRB-757 for Signalling, TsRB-756, Paragraphs 6.2 and 6.3, GOST 12.2.056, Paragraphs 1.3.8-1.3.10, and GOST 30487, Paragraphs 3.6.1 and 3.6.2. The requirements for the colour grades of signals shall be in accordance with GOST 24179. The requirements for the lighting force and lighting force distribution shall be in accordance with the Lighting Requirements for Light Signalling Devices of Traction Rolling Stock, Passenger Cars, Track Self-Propelled Machines and Other Mobile Units of Railway Transport approved by the Ministry of Railways of Russia on 16 September 1998.

Slovakia

The requirements of standard EN 15153-1. The requirements of GOST shall be acknowledged when operating at border-crossing stations.

Ukraine

The head of a train running by a single-track line or by the regular track of a double-track line shall not be marked at daytime and shall be marked with the white lights of two buffer-beam lamps and the headlight at night time.

The head of a train running by an irregular track of a double-track line shall be marked with the red light of the buffer-beam lamp at the left side at daytime, which shall be supplemented with the headlight at night time.

The head of a freight train running with cars foremost by a single-track line or by the regular track of a double-track line shall not be marked at daytime and shall be marked with the white light of a lamp near the car buffer beam at night time.

The head of a freight train running with cars foremost by an irregular track of a double-track line shall be marked with a red flag at the left side at daytime and shall be

marked with the red light of the lamp held by the accompanying person on the left side at night time.

The requirements for the colour grades of signals shall be in accordance with GOST 24179.

The aforementioned requirements are approved by the following documents:

Belarus	Instruction for Signalling at Belarusian Railways GOST 12.2.056 – 81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 – 97 Electric Trains for Suburban Communication. General Safety Requirements GOST 24179 – 80 Optical Filters, Lens Optical Filters, Lenses, Diffusers, and Deflecting Glass Inserts for Signalling Devices of Railway Transport. Technical Conditions
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	ADV-002 Rules for Railway Signalling (Geležinkelių signalizacijos taisyklės)
Poland	PN-EN-15153-1:2007
Russia	Instruction TsRB-757 for Signalling TsRB-756, Paragraphs 6.2 and 6.3 GOST 12.2.056, Paragraphs 1.3.8-1.3.10 GOST 30487, Paragraphs 3.6.1 and 3.6.2 The requirements for the colour grades of signals shall be in accordance with GOST 24179 Lighting Requirements for Light Signalling Devices of Traction Rolling Stock, Passenger Cars, Track Self-Propelled Machines and Other Mobile Units of Railway Transport approved by the Ministry of Railways of Russia on 16 September 1998
Slovakia	EN 15153-1
Ukraine	TsSh-0001 – Instruction for Signalling and Communication at Ukrainian Railways GOST 24179 Optical Filters, Lens Optical Filters, Lenses, Diffusers, and Deflecting Glass Inserts for Signalling Devices of Railway Transport. Technical Conditions
Estonia	Instruction for Signalling, Appendix to the TOR

5.6.3.1.3 Tail lights

Currently, requirements for this parameter are the same in all the countries. For the 1 520 mm gauge system, the requirements are described by national rules and instructions for signalling in each country.

Belarus

The marking of the train tail with light signals shall be regulated by the Instruction for Signalling at Belarusian Railways, GOST 12.2.056, Paragraphs 1.3.8-1.3.10, and GOST 30487, Paragraph 3.6.1. The requirements for the colour grades of signals shall be in accordance with GOST 24179.

Lithuania

The tail of a train running on a single-track line or on the regular or irregular track of a double-track line shall be marked as follows:

- for a passenger train and freight train at daytime and night time – with a red disc with reflectors near the buffer beam at the right side;
- for a passenger, mail, and luggage train both at daytime and night time – with three red lights.

If a locomotive runs at the end of a freight train or a locomotive runs without cars – with the red light of the buffer-beam lamp on the right side.

The other specific features of the marking of the train head shall be specified in ADV-002 Rules for Railway Signalling.

Poland

PN-EN-15153-1:2007

Russia

The marking of the train tail with signal lights shall be regulated by the Instruction TsRB-757 for Signalling, TsRB-756, Paragraphs 6.2 and 6.3, GOST 12.2.056, Paragraphs 1.3.8-1.3.10, and GOST 30487, Paragraph 3.6.1. The requirements for the colour grades of signals shall be in accordance with GOST 24179. The requirements for the lighting force and lighting force distribution shall be in accordance with the Lighting Requirements for Light Signalling Devices of Traction Rolling Stock, Passenger Cars, Track Self-Propelled Machines and Other Mobile Units of Railway Transport.

Slovakia

The requirements of standard EN 15153-1. The requirements of GOST shall be employed when operating at border-crossing stations.

Ukraine

The tail of a train running by a single-track line or by the regular or irregular track of a double-track line shall be marked as follows:

- of a passenger train and freight train at daytime and night time – with a red disc with reflectors near the buffer beam at the right side;
- of a passenger, mail, and luggage train both at daytime and night time – with three red lights.

When attaching a freight car which is not fitted with permanent signalling lights, the tail shall be marked with a red disc or red flag on the right side near the buffer beam of the car at daytime, and with a red light of the buffer-beam lamp on the right side at night time.

If a locomotive runs at the end of a freight train or a locomotive runs without cars, then with the red light of the buffer-beam lamp at the right side.

The requirements for the colour grades of signals shall be in accordance with GOST 24179.

The aforementioned requirements are approved by the following documents:

Belarus	Instruction for Signalling on Belarusian Railways GOST 12.2.056 – 81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 – 97 Electric Trains for Suburban Communication. General Safety Requirements GOST 24179 – 80 Optical Filters, Lens Optical Filters, Lenses, Diffusers, and Deflecting Glass Inserts for Signalling Devices of Railway Transport. Technical Conditions
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	ADV-002 Rules for Railway Signalling (Geležinkelių signalizacijos taisyklės)
Poland	PN-EN-15153-1:2007
Russia	Instruction TsRB-757 for Signalling TsRB-756, Paragraphs 6.2 and 6.3 GOST 12.2.056, Paragraphs 1.3.8-1.3.10 GOST 30487, Paragraphs 3.6.1. The requirements for the colour grades of signals shall be in accordance with GOST 24179 The requirements for the lighting force and lighting force distribution shall be in accordance with the Lighting Requirements for Light Signalling Devices of Traction Rolling Stock, Passenger Cars, Track Self-Propelled Machines and Other Mobile Units of Railway Transport
Slovakia	EN 15153-1
Ukraine	TsSh-0001 – Instruction for Signalling and Communication on Ukrainian Railways GOST 24179 Optical Filters, Lens Optical Filters, Lenses, Diffusers, and Deflecting Glass Inserts for Signalling Devices of Railway Transport. Technical Conditions
Estonia	Instruction for Signalling, Appendix to the TOR

5.6.3.1.4 **Lamp control**

Currently, requirements for this parameter are the same in all the countries.

Locomotives as well as head and tail cars of electric trains should be equipped with light signals and controls thereof allowing the implementation of the following schemes for the marking of rolling stock. The activation shall be controlled from the position of the switch

and visually. The arrangement of the controls of light signals should comply with the requirements set for control panels of the driver's cab.

The driver should be able to promptly replace the lamp of the headlight, or the design of the locomotive should provide for back-up illumination plans.

The requirements for the 1 520 mm gauge system shall be described by GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements and the Instruction OSJD R 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock.

Lithuania

The arrangement of the controls of signal lights should comply with the requirements set for control panels of the driver's cab.

The headlight switching-on plan should provide for the possibility of switching on the bright and low light.

Poland

The arrangement of the controls of signal lights should comply with the requirements set for control panels of the driver's cab.

The plans for the marking of rolling stock specified in Instruction for Signalling Ie-1.

Belarus and Russia

Locomotives as well as head and tail cars of electric trains should be equipped with signal lights and controls thereof allowing the implementation of the following schemes for the marking of rolling stock specified in the Instruction for Signalling (TsRB-757 for Russia). The activation shall be controlled from the position of the switch and visually.

The driver should be able to promptly replace the lamp of the headlight, or the design of the locomotive should provide for back-up illumination plans.

Slovakia

The marking of the locomotive head and tail should have independent control for each headlight or lamp.

Ukraine

The signal lights of a locomotive and multi-unit rolling stock shall be controlled from the driver's desk. The activation shall be controlled from the position of the switch and visually. The arrangement of the controls of signal lights should comply with the requirements set for control panels of the driver's cab.

The aforementioned requirements are approved by the following documents:

Belarus	Instruction for Signalling on Belarusian Railways GOST 12.2.056 – 81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 – 97 Electric Trains for Suburban Communication. General Safety Requirements

	NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Informatory – GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	Ie-1 Instruction for Signalling
Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487-97 Instructions for Signalling TsRB-757 NB ZhT TsT 01-98 NB ZhT TsT 02-98 NB ZhT TsT 03-98 NB ZhT TsT 04-98
Slovakia	TOR
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements Instruction OSJD R 652
Estonia	

5.6.3.2 Audible signals (warning horn and whistle)

5.6.3.2.1 General provisions

Currently, requirements for this parameter are the same in all the countries (except for Poland).

Locomotives and head cars of multi-unit trains should be equipped with two audible signals: high-volume signals (warning horns) and low-volume signals (whistles).

The back-up requirement: in case of failure, the driver must have the possibility to set an audible signal.

One warning horn and whistle should be installed at each frontal part. The activation of warning horns and whistles installed at the opposite frontal parts should be controlled separately and duplicated in the workplaces of both the driver and assistant driver. The

activation of the warning horns of both frontal parts from each driver's cab can be ensured pneumatically or electrically. It shall be allowed to install one whistle and one warning horn on the roof of the driver's cab on hood-type locomotives provided that the required volume level is ensured on both sides of the movement of the locomotive.

The requirements for the characteristics of audible signals installed on rolling stock and methods of tests thereof are specified in GOST 12.2.056, Paragraph 1.3.4-1.3.7 and standard safety documents in each country.

Warning horns and whistles should comply with GOST 28466-90.

Latvia

GOST 12.2.056-81

Paragraph 1.3.4. Locomotives and head cars of multi-unit trains should be equipped with two audible signals: high-volume signals (warning horns) and low-volume signals (whistles).

Paragraph 1.3.5. At a pressure of the supplied air of 0.8 MPa, warning horns should generate an audible signal with the principle tone frequency of 360 – 380 Hz and volume level of (120 ± 5) dB (lin) at a distance of 5 m from the frontal face of the warning horn mouth alongside its longitudinal axis. Warning horns may be used if the aforementioned volume level with a frequency of the primary tone of 645 – 675 Hz is maintained.

Paragraph 1.3.6. At a pressure of the supplied air of 0.8 MPa, whistles should generate an audible signal with the principle tone frequency of 600 – 700 Hz and volume level of at least 105 dB (lin) at a distance of 5 m from the signalling device.

Paragraph 1.3.7. One warning horn and whistle should be installed on each frontal part. The activation of warning horns and whistles installed on opposite frontal parts should be controlled separately and duplicated in the workplaces of both the driver and assistant driver. The switching-on of the warning horns of both frontal parts from each driver's cab can be ensured pneumatically or electrically. It shall be allowed to install one whistle and one warning horn on the roof of the driver's cab on hood-type locomotives provided that the required volume level is ensured on both sides of the movement of the locomotive.

Lithuania

Locomotives and head cars of multi-unit trains should be equipped with two audible signals: high-volume signals (warning horns) and low-volume signals (whistles).

Warning horns should generate an audible signal with the principle tone frequency of 360 – 380 Hz (warning horns with a frequency of the primary tone of 645 – 675 Hz may be used if the established volume level is maintained).

Whistles should generate an audible signal with the principle tone frequency of 600 – 700 Hz.

Poland

PN-EN-15153-1:2007

PN-K-88100:1991

Belarus and Russia

Locomotives and head cars of multi-unit trains should be equipped with two audible signals: high-volume signals (warning horns) and low-volume signals (whistles).

The requirements for the characteristics of audible signals installed on rolling stock and methods of tests thereof are specified in GOST 12.2.056, Paragraphs 1.3.4-1.3.7, GOST 30487, Paragraph 3.6.3, NB ZhT TsT 03-98, NB ZhT TsT 01-98, NB ZhT TsT 02-98, and NB ZhT TsT 04-98.

The back-up requirement: in of the event of failure, the driver must have the possibility to set an audible signal.

Slovakia

The requirements of Instruction UIC 644.

Ukraine

Locomotives and head cars of multi-unit trains should be equipped with two audible signals: high-volume signals (warning horns) and low-volume signals (whistles).

One warning horn and whistle should be installed on each frontal part. The activation of warning horns and whistles installed on opposite frontal parts should be controlled separately and duplicated in the workplaces of both the driver and assistant driver. The activation of the warning horns of both frontal parts from each driver's cab can be ensured pneumatically or electrically. It shall be allowed to install one whistle and one warning horn on the roof of the driver's cab on hood-type locomotives provided that the required volume level is ensured on both sides of the movement of the locomotive.

Warning horns and whistles should comply with GOST 28466-90.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056 – 81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 – 97 Electric Trains for Suburban Communication. General Safety Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements is used as a standard of referential character
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	PN-EN-15153-1:2007 PN-K-88100:1991
Russia	GOST 12.2.056, Paragraphs 1.3.4-1.3.7 GOST 30487, Paragraph 3.6.3

	NB ZhT TsT 03-98 NB ZhT TsT 01-98 NB ZhT TsT 02-98 NB ZhT TsT 04-98
Slovakia	UIC 644
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions
Estonia	

5.6.3.2.2 Warning horn sound pressure levels

Currently, requirements for this parameter are the same in all the countries (except for Poland).

At a pressure of the supplied air of 0.8 MPa, warning horns should generate an audible signal with the principle tone frequency of 360 – 380 Hz and volume level of (120 ± 5) dB at a distance of 5 m from the frontal face of the warning horn mouth alongside its longitudinal axis. Warning horns may be used if the aforementioned volume level with a frequency of the primary tone of 645 – 675 Hz is maintained.

At a pressure of the supplied air of 0.8 MPa, whistles should generate an audible signal with the principle tone frequency of 600 – 700 Hz and volume level of at least 105 dB at a distance of 5 m from the signalling device.

Warning horns and whistles should comply with GOST 28466-90.

Latvia

The requirements of GOST 12.2.056-81:

Paragraph 1.3.5. At a pressure of the supplied air of 0.8 MPa, warning horns should generate an audible signal with the principle tone frequency of 360 – 380 Hz and volume level of (120 ± 5) dB (lin) at a distance of 5 m from the frontal face of the warning horn mouth alongside its longitudinal axis. Warning horns may be used if the aforementioned volume level with a frequency of the primary tone of 645 – 675 Hz is maintained.

Paragraph 1.3.6. At a pressure of the supplied air of 0.8 MPa, whistles should generate an audible signal with the principle tone frequency of 600 – 700 Hz and volume level of at least 105 dB (lin) at a distance of 5 m from the signalling device.

Lithuania

Warning horns should generate an audible signal with a volume level of 120 ± 5 dB (lin) at a distance of 5 m from the frontal face of the warning horn mouth alongside its longitudinal axis.

Poland

UIC 644

PN-K-88100:1991

PN-EN-15153-1:2007

Belarus and Russia

Warning horns and whistles should comply with GOST 28466-90.

Warning horns should generate an audible signal with the principle tone frequency of 360 – 380 Hz and volume level of (120 ± 5) dB (lin) at a distance of 5 m. The use of warning horns with a frequency of the primary tone of 645 – 675 Hz shall be permitted.

Whistles should generate an audible signal with the principle tone frequency of 600 – 700 Hz and volume level of at least 105+10 dB at a distance of 5 m.

Slovakia

UIC 644

Ukraine

At a pressure of the supplied air of 0.8 MPa, warning horns should generate an audible signal with the principle tone frequency of 360 – 380 Hz and volume level of (120 ± 5) dB at a distance of 5 m from the frontal face of the warning horn mouth alongside its longitudinal axis. Warning horns may be used if the aforementioned volume level with a frequency of the primary tone of 645 – 675 Hz is maintained.

At a pressure of the supplied air of 0.8 MPa, whistles should generate an audible signal with the principle tone frequency of 600 – 700 Hz and volume level of at least 105 dB at a distance of 5 m from the signalling device.

Warning horns and whistles should comply with GOST 28466-90.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions GOST 12.2.056 – 81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 – 97 Electric Trains for Suburban Communication. General Safety Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Informatory – GOST 12.2.056-81
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	UIC 644

	PN-K-88100:1991 PN-EN-15153-1:2007
Russia	GOST 28466-90 GOST 12.2.056 GOST 30487 NB ZhT TsT 03-98 NB ZhT TsT 01-98 NB ZhT TsT 02-98 NB ZhT TsT 04-98
Slovakia	UIC 644
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions
Estonia	

5.6.3.2.3 Protection against external impact

Currently, requirements for this parameter are the same in all the countries.

Sound signalling devices shall be protected against dust and atmospheric precipitation by being installed on rolling stock in accordance with the technical specifications and design documentation. The requirements for the materials for the manufacturing of warning horns and whistles shall be in accordance with GOST 28466-90 (for Poland and Slovakia, in accordance with the design documentation).

Latvia

Not regulated.

Lithuania

The availability of protective arrangements for signalling devices shall be regulated only by the design documentation for rolling stock.

Poland and Slovakia

Design documentation; TSI Noise (noise level in the driver's cab)

Belarus, Russia, and Ukraine

Sound signalling devices shall be protected against dust and atmospheric precipitation by being installed on rolling stock in accordance with the technical specifications and design documentation. The requirements for the materials for the manufacturing of warning horns and whistles shall be in accordance with GOST 28466-90.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions Design documentation
Latvia	Not regulated, to be determined by the design documentation
Lithuania	Not regulated, to be determined by the design documentation
Poland	TSI Noise Design documentation
Russia	GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions Design documentation
Slovakia	TSI Noise Design documentation
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 28466-90 Warning Horns and Signalling Whistles. General Technical Conditions Design documentation
Estonia	Not regulated, to be determined by the design documentation

5.6.4 Train and car identification – External marking *(Deleted in TSI Revision 4.0)*

Currently, the requirements for external marking are the same in all the countries and are regulated by the TOR and other normative documents.

Locomotives and multi-unit rolling stock should be registered and have a number assigned in accordance with the established procedure.

Belarus

The identification of a train and car – external marking shall be made in accordance with STP 09150.50.133 (draft) and 632-2000 PKB TsV.

Latvia

Each vehicle should carry the following distinctly legible identification signs and inscriptions:

- the logotype of the carrier or owner (operator) of the rolling stock;

- number;

- plate with the logotype of the manufacturing plant with indication of the date and place of building;

- type, date, and place of repair (except for the locomotive);

- weight of the tare (except for the locomotive);

- number of seats/berths (for passenger cars);

- transportation speed (for track-repair machines).

The following shall be indicated on a traction vehicle:

- design speed;

- series;

- marking concerning the examination of tanks, controlling devices, and boiler;

- number of seats/berths (at multi-unit rolling stock);

- series and number (on a tender).

Lithuania

In accordance with the requirements of the national Register with regard to the requirements of the TSI OPE.

Design in accordance with the requirements of UIC 640.

Poland

Resolution of the Minister for Transport dated 7 November 2007 amending the Resolution regarding the Basic Technical Requirements for the Operation of Rolling Stock.

Russia

In accordance with Paragraph 9.7 of TsRB-756, each vehicle should carry the following distinctive identification signs and inscriptions:

- name of the owner of the rolling stock;

- number (for passenger cars, it shall contain the code of the home railway);

- plate of the manufacturing plant with indication of the date and place of building;

- date and place of the established types of repair.

In addition, the following inscriptions shall be attached: on locomotives and multi-unit rolling stock – design speed, series, name of the depot or other home enterprise, plates and inscriptions concerning the examination of tanks, controlling devices, and boiler; on passenger cars and multi-unit rolling stock – the number of seats/berths.

Locomotives and multi-unit rolling stock should be registered and have a number assigned in accordance with the established procedure.

Other signs and inscriptions on rolling stock shall be attached with the approval of the infrastructure owner/owner of the non-public railway tracks in accordance with the procedure stipulated by the federal executive body in charge of railway transport.

Ukraine

Each vehicle should carry the following distinctive identification signs and inscriptions: the state emblem, sign of the State Railways Administration of Ukraine, initials

of the railway, plate of the manufacturing plant with indication of the date and place of building, and date and place of the established types of repair.

In addition, the following inscriptions shall be attached: on locomotives and multi-unit rolling stock – design speed, series, name of the depot or other home enterprise, plates and inscriptions concerning the examination of tanks, controlling devices, and boiler; on passenger cars and multi-unit rolling stock – the number of seats/berths.

Locomotives and multi-unit rolling stock should be registered and have a number assigned in accordance with the established procedure.

Other signs and inscriptions on rolling stock shall be attached in accordance with the procedure stipulated by State Railways Administration of Ukraine.

The aforementioned requirements are approved by the following documents:

Belarus	STP 09150.50.133 (draft) Trade Mark and Service Mark of the Belarusian Railways. Application Procedure 632-2000 PKB TsV Signs and Inscriptions on Cars of the 1 520 mm Gauge Freight Fleet
Latvia	TOR of Latvian Railways
Lithuania	TSI OPE UIC 640 TOR of Lithuanian Railways
Poland	Resolution of the Minister for Transport dated 7 November 2007 amending the Resolution regarding the Basic Technical Requirements for the Operation of Rolling Stock
Russia	TsBR-756 TOR
Slovakia	TSI OPE
Ukraine	TsRB-0004. Technical Operating Rules for Ukrainian Railways TsV-0072. Regulation on the Approval of the Place and Method of the Application of Signs and Inscriptions on Cars of the Passenger Fleet of Ukrainian 1 520 mm Gauge Railways
Estonia	

5.6.5 Electronic identification of rolling stock *(Deleted in TSI Revision 4.0)*

Currently, requirements for this parameter are not regulated in all the countries.

Belarus, Latvia and Lithuania

Not regulated.

Russia

In Russia, an automatic identification system for rolling stock Palma (SAI Palma) has been developed and is used. Rolling stock is identified automatically by means of scanning the identification number of a vehicle when it passes stationary scanning points.

Ukraine

In Ukraine, the automatic identification system for rolling stock SAIRS-UZ was developed and is used. Rolling stock is identified automatically by means of scanning the identification number of a vehicle when it passes stationary scanning points.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	
Poland	
Russia	
Slovakia	
Ukraine	TsSh-0038 Instruction for the Technical Maintenance of Devices of Scanning Points of the Rolling Stock Automatic Identification System
Estonia	

5.7 TRACTION AND ELECTRICAL EQUIPMENT

5.7.1 Traction performance

5.7.1.1 General provisions

Currently, requirements for this parameter are the same in all the countries. The requirements for the 1 520 mm gauge system shall be described by the Rules for Traction Calculations for Train Operation and technical (design and operating) documentation for the rolling stock, the characteristics whereof are not specified in the Rules, or by equivalent documents in each country.

Lithuania

The traction force of diesel locomotives, electric locomotives, and motored cars of electric trains, depending on the speed, shall be determined in accordance with the traction characteristics determined for new tyres in accordance with the electrical and mechanical characteristics of traction electric engines determined for these electric engines on the testing bench or by the design characteristics guaranteed by the manufacturing plant.

The weight of a train and the travelling speed shall be determined using the condition of complete utilisation of the capacity and traction properties of the locomotives and kinetic energy in accordance with the standards stipulated by the Rules for Traction Calculations for Train Operation (PTR).

It is necessary to take into account the tractive resistance of the track slope, curves, low temperature of outside air, wind, underbody generators, etc. in accordance with the standards stipulated by the Rules for Traction Calculations for Train Operation (PTR).

Poland and Slovakia

The technical documentation for the operation and technical maintenance of rolling stock.

Belarus, Russia, and Latvia

The traction characteristics of traction rolling stock operated within the network are specified in the Rules for Traction Calculations for Train Operation (PTR). The PTR is the basic document determining the procedure and methodology for the performance of traction calculations for operational and design sections of railways.

Ukraine

The traction characteristics of in-service traction rolling stock shall be specified in the Rules for Traction Calculations for Train Operation, which is the basic document determining the procedure and methodology for the performance of traction calculations for operational and design sections of railways.

The aforementioned requirements are approved by the following documents:

Belarus	Rules for Traction Calculations for Train Operation (PTR)
Latvia	Rules for Traction Calculations for Train Operation (PTR)
Lithuania	Rules for Traction Calculations for Train and Shunting Operation, the Ministry of Railways of the USSR, 1985 Design documentation
Poland	The technical documentation for the operation and technical maintenance of rolling stock
Russia	Rules for Traction Calculations for Train Operation (PTR)
Slovakia	The technical documentation for the operation and technical maintenance of rolling stock
Ukraine	Rules for Traction Calculations for Train Operation
Estonia	

5.7.1.2 Requirements for traction performance

Currently, requirements for this parameter in all the countries are not regulated by normative documents. The traction characteristics for the 1 520 mm gauge system shall be contained in the design documentation for rolling stock and thereafter shall be included in the Rules for Traction Calculations for Train Operation or equivalent documents in each country.

Lithuania

The capacity utilisation factor of the diesel engine for traction in the event of utilisation of the full capacity of the diesel engine within the range of travelling speeds from the continuous (estimated) to design speed should be at least 0.78.

Poland and Slovakia

The design documentation for rolling stock.

Belarus and Russia

The requirements for traction characteristics shall be determined by the technical assignment for the designing of new rolling stock.

The actual traction characteristics shall be determined in the course of the process of approval tests. The traction characteristics determined during tests shall be used for traction calculations. The characteristics of new rolling stock shall be included in the Rules for Traction Calculations for Train Operation (PTR).

Ukraine

The requirements for traction characteristics shall be determined by the technical assignment for the designing of new rolling stock.

The nominal capacity utilisation factor of the diesel engine for traction in the event of utilisation of the full capacity of the diesel engine within the range of travelling speeds from the continuous (estimated) to design speed should be at least 0.78 for main-line diesel locomotives and 0.68 for shunting locomotives. The nominal capacity utilisation factor for the operation of devices:

- of electric locomotives: 0.84 – 0.86 for alternating current and 0.85 – 0.9 for direct current;
- of electric trains: 0.82 – 0.84 for alternating current and 0.84 – 0.88 for direct current.

The actual traction characteristics shall be determined in the course of the process of acceptance tests. The traction characteristics determined during tests shall be used for traction calculations. The characteristics of new rolling stock shall be included in the Rules for Traction Calculations for Train Operation.

The aforementioned requirements are approved by the following documents:

Belarus	Rules for Traction Calculations for Train Operation (PTR)
Latvia	Rules for Traction Calculations for Train Operation (PTR)
Lithuania	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements (Informatory)
Poland	The design documentation for rolling stock
Russia	Rules for Traction Calculations for Train Operation (PTR)
Slovakia	The design documentation for rolling stock
Ukraine	GOST 25463-2001 Diesel Locomotives of 1 520 mm Gauge Main-Line Railways. General Technical Requirements Rules for Traction Calculations for Train Operation TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	

5.7.2 Power supply

5.7.2.1 General provisions

Currently, requirements for this parameter are the same in all the countries. In the 1 520 mm gauge system, two electric power supply system are used: 3 kV direct current and 25 kV 50 Hz alternating current with the upper position of the contact wire. Both systems use rails as the reverse current conductor.

Belarus

On Belarusian railways, two traction electric power supply systems in terms of nominal voltage and type of current are used:

- Single-phase alternating current traction electric power supply system 27.5 kV, frequency 50 Hz;

- Two-phase alternating current traction electric power supply system 25 kV, frequency 50 Hz.

Latvia

In Latvia, the overhead contact system is powered with direct current (DC) 3kV.

Lithuania

Single-phase alternating current traction electric power supply system 25 kV, frequency 50 Hz

Poland and Slovakia

On 1 520 mm lines, the overhead contact system is powered with direct current (DC) 3kV.

EN 50163:2006/AC: 2010

Russia

On Russian railways, two traction electric power supply systems in terms of nominal voltage and type of current are used:

- Direct current traction electric power supply system 3 kV;

- single-phase alternating current traction electric power supply system 25 kV, frequency 50 Hz.

Both systems use rails as the reverse current conductor.

The operability of electric rolling stock should be ensured in all the operating modes of the traction electric power supply system.

Ukraine

On Ukrainian railways, two traction electric power supply systems in terms of nominal voltage and type of current are used:

- direct current traction electric power supply system 3 kV;

- single-phase alternating current traction electric power supply system 25 kV, frequency 50 Hz.

Both systems use rails as the reverse current conductor.

The operability of electric rolling stock should be ensured in all the operating modes of the traction electric power supply system. The overhead contact suspension type for track sides and stations shall be selected depending on the established travelling speed, current load, and climatic and other local conditions on the basis of technical and economic comparison of the options which shall take into account potential increase in speeds and weight standards of freight trains.

Estonia

In Estonia, the overhead contact system is powered with direct current (DC) 3kV.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	TOR
Lithuania	Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways AE/41
Poland	EN 50163:2006/AC:2010
Russia	
Slovakia	EN 50163:2007
Ukraine	DBN V.2.3-19-2008 Transport Structures. 1 520 mm Gauge Railways. Design Standards TsRB-004. Technical Operating Rules for the Ukrainian Railways TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	

5.7.2.2 Range of operating voltages and frequencies

Currently, requirements for this parameter are the same in all the countries. The requirements for the 1 520 mm gauge system shall be described by the documents of GOST 6962 and TOR or by equivalent documents in each country.

Belarus

The voltage level in the pantograph of electric rolling stock should be not less than 21 kV in the event of alternating current and 2.7 kV in the event of direct current, and not more than 29 kV in the event of alternating current and 4 kV in the event of direct current.

On separate sections of the railway, subject to approval by Belarusian Railways, the voltage level of 19 kV in case of alternating current and 2.4 kV in the event of direct current shall be permitted.

Latvia

The voltage level within 2.7 kV to 4 kV; reduction to 2.4 kV shall be permitted on separate sections.

Lithuania

Voltage should be within the range from 21 kV to 29 kV. In some cases, subject to approval by the infrastructure manager, voltage may be reduced to 19 kV.

Poland and Slovakia

The requirements of the EN 50163:2006/AC:2010 standard apply.

Russia

In accordance with GOST 6962—75, voltages at busbars of the traction substation and at the pantograph of electric rolling stock should correspond to those specified in the table.

Type of electrified transport	Voltage, V				
	at busbars of the traction substation		at the pantograph of electric rolling stock		
	nominal	maximum	nominal	maximum	minimum
Main-line railways:					
alternating current	27 500	29 000	25 000	2 9000	19 000
direct current	3 300	3 850	3 000	3 850*	2 200

*In accordance with GOST-6962, the maximum voltage at the pantograph of electric rolling stock on those track sections where regenerative braking is used may reach 4 000 V.

Electric power supply systems on Russian railways ensure the following voltage levels, in accordance with the table, at the pantograph of electric rolling stock in the normal and forced modes (for the alternating current system, the effective values are indicated).

Indicator name	Indicator value in case of electric power supply system of	
	3 kV	25 kV
Nominal voltage, kV	3.0	25
Maximum voltage, kV	4.0	29
Minimum operating voltage, kV	2.7/2.9*	21/24*
Minimum operating voltage (continuous in the forced mode), kV	2.2	19

Note: The first value is indicated for ordinary lines of up to 160 km/h (the average value for 3 min); the second value is indicated for lines with a maximum travelling speed of 161-250 km/h (the average value for 1 min).

The voltage level at the pantograph of rolling stock on high-speed lines shall be stipulated by the Instruction TsRB-393.

The frequency of feed voltage in the 25 kV alternating current electric power supply system shall be 50 ± 0.4 Hz.

Ukraine

In accordance with GOST 6962—75, voltages at busbars of the traction substation and at the pantograph of electric rolling stock should correspond to those specified in the table.

Type of electrified transport	Voltage, V				
	at busbars of the traction substation		at the pantograph of electric rolling stock		
	nominal	maximum	nominal	maximum	minimum
Main-line railways: alternating current direct current	 27 500 3 300	 29 000 3 850	 25 000 3 000	 29 000 3 850*	 19 000 2 200

* In accordance with GOST-6962, the maximum voltage at the pantograph of electric rolling stock on those track sections where regenerative braking is used may reach 4 000 V.

The frequency of feed voltage in the 25 kV alternating current electric power supply system shall be 50 ± 0.4 Hz.

Electric power supply systems on Ukrainian railways ensure the following voltage levels, in accordance with the table, at the pantograph of electric rolling stock in the normal and forced modes (for the alternating current system, the effective values are indicated).

Indicator name	Indicator value in case of electric power supply system of	
	3 kV	25 kV
Nominal voltage, kV	3.0	25
Maximum voltage, kV	4.0	29
Minimum operating voltage, kV	2.7/2.9*	21/24*
Minimum operating voltage (continuous in the forced mode), kV	2.4	19

Note*: The first value is indicated for ordinary lines of up to 160 km/h; the second value is indicated for lines with travelling speeds over 160 km/h.

The aforementioned requirements are approved by the following documents:

Belarus	TOR
Latvia	TOR of Latvia
Lithuania	TOR of Lithuania
Poland	PN-EN 50163:2007

Russia	GOST 6962—75 TsRB-393 Instruction for the Technical Maintenance and Operation of Structures, Facilities, and Rolling Stock and Organisation of Traffic on Fast-Speed Passenger Train Turn-Around Sections (for Train Speeds 141-200 km/h) TOR
Slovakia	EN 50163:2007
Ukraine	DBN V.2.3-19-2008 Transport Structures. 1 520 mm Gauge Railways. Design Standards TsRB-004. Technical Operating Rules for Ukrainian Railways VND 31.1.07.000-02 Temporary Instruction for the Organisation of Fast Traffic of Passenger Trains. Requirements for Infrastructure and Rolling Stock TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	TOR Instruction of the Infrastructure Manager (Rules for the Technical Operation and Construction of the Overhead Contact System on Electrified Railways)

5.7.2.3 Regenerative braking with energy to the overhead contact line

Currently, requirements for this parameter are different in all the countries. The requirements for Belarus, Russia, and Ukraine are described by the documents GOST 6962 and other normative documents.

The procedure for the use of regenerative braking and limitations for the application thereof on particular sections of railways shall be regulated by local instructions.

Latvia

In Latvia, electric trains with regenerative braking are operated; however, substations are not equipped for collecting generated power from the overhead contact system.

Lithuania

Not operated.

Poland and Slovakia

Should be agreed upon with the infrastructure manager.

Belarus and Russia

In accordance with GOST-6962, the maximum voltage at the pantograph of electric rolling stock on those track sections where regenerative braking is used may reach 4 000 V.

During periods of freezing precipitation, the use of regenerative braking shall be prohibited in accordance with TsT-721 Instruction for the Winterisation of Locomotive Facilities.

The procedure for the use of regenerative braking and limitations for the application thereof on specific sections of railways shall be regulated by local instructions.

ON 25 kV lines, regenerative braking is used and is recovered by other locomotives or returned to the network for common use.

Ukraine

In accordance with GOST-6962, the maximum voltage at the pantograph of electric rolling stock on those track sections where regenerative braking is used may reach 4 kV.

On Ukrainian railways, regenerative braking is used in the cases of both direct current and alternating current.

Fulfilment of one of the three conditions listed below shall be obligatory for the use of regenerative braking in the event of direct current.

a) availability of electric rolling stock in the traction mode, which can accept the regenerative power, at the feeder area;

b) availability of inverter units at substations for supplying regenerative power to the power system;

c) availability of units (rheostats) at substations for absorbing regenerative power.

It is recommended to maintain voltage at busbars of the 3 kV direct current system traction substations within the areas of the use of regeneration at a level of 3.3-3.5 kV provided that it does not affect the mode of train traffic in the traction mode.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 6962 Electrified Transport with Overhead Contact System Power Supply. Voltage Row NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	
Lithuania	
Poland	
Russia	GOST 6962 TsT-721 NB ZhT TsT 03 and 04 Local instructions
Slovakia	
Ukraine	GOST 6962 TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	

5.7.2.4 Maximum power and current from the overhead contact line

The power and strength of current from the overhead contact system should guarantee that electric rolling stock can pass the section at the established speed. This requirement shall be taken into account at the design stage and is partially regulated. The requirements for the 1 520 mm gauge system are described by the Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railway Sections and other normative documents.

The equipment of electric rolling stock should ensure normal operation under the parameters of the feed electric network.

Latvia

In Latvia, the power in the overhead contact system at electric substations is 3.7 – 11.4 MW, and the current strength on sections is 1 500-2 500A. The power of electric substations is designed so that protective equipment would be activated at loads exceeding the permitted level.

Lithuania

The power and strength of current from the overhead contact system should guarantee that electric rolling stock can pass the section at the established speed. This requirement shall be taken into account at the design stage and is not specifically regulated.

Poland and Slovakia

The requirements of the EN 50388:2008/AC:2010 standard apply.

This should be agreed upon with the infrastructure manager.

Russia

Permissible currents in overhead contact suspensions depending on the type of suspension, type of current, and rate of ware of the contact wire shall be specified in Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways, TsE-868, 2001 (Paragraph 2.3.3).

Ukraine

Permissible currents in overhead contact suspensions shall be determined individually for each track section depending on the type of suspension, type of current, and rate of ware of the contact wire, distance between adjacent traction substations, track profile, extent of traffic, train weight and traffic speed, under the condition that the maximum permissible current of the overhead contact suspension must not be exceeded, shall be specified in the Rules for Devices of Traction Electric Power Supply Systems of the Ukrainian Railways. The maximum permissible current of an overhead contact suspension shall be 3 460 A in case of direct current and 1 450 A in case of alternating current.

The aforementioned requirements are approved by the following documents:

Belarus	TOR
Latvia	Instruction of the Infrastructure Manager – List of Protection Facilities at Feeders of Sectionalising Points and Traction Substations (to be revised once every five years; latest approval: 15 June 2006)

Lithuania	TOR
Poland	PN-EN 50388:2008/AC:2010
Russia	Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways, TsE-868, 2001(Paragraph 2.3.3)
Slovakia	EN 50388:2008
Ukraine	TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	Instruction for the Infrastructure Manager (Rules for the Technical Operation and Construction of the Overhead Contact System on Electrified Railways)

5.7.2.5 Maximum current at standstill for DC systems

Currently, requirements for this parameter are the same in all the countries. The maximum current strength shall be limited by the permissible level of temperature increase for current-conducting elements and contact materials of the pantograph and overhead contact system. As a rule, the maximum value of current through one pantograph on standing rolling stock is limited by the permissible current through a contact wire of the minimum cross-section. The permissible current in this case shall be established at 390 A. At stops, power is not supplied to passenger cars from the locomotive. In the case of multi-unit rolling stock, power is supplied from several pantographs. This is why no problems related to over-heating of the contact wire arise, and this parameter is not regulated.

The requirements for the 1 520 mm gauge system shall be described by Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways or by equivalent documents in each country.

Latvia, Lithuania, and Estonia

Not regulated.

Poland and Slovakia

The requirements of the TSI ENE.

Belarus and Russia

The maximum current strength shall be limited by the permissible level of temperature increase for current-conducting elements and contact materials of the pantograph and overhead contact system. As a rule, the maximum value of current through one pantograph on standing rolling stock is limited by the permissible current through a contact wire of the minimum cross-section. TsE-868 stipulates the permissible current in this case at 390 A.

Ukraine

The maximum current strength shall be limited by the permissible level of temperature increase for current-conducting elements and contact materials of the pantograph and overhead contact system. It is necessary to take into account the operation of auxiliary equipment and availability of centralised power supply to passenger cars at the stop. As a rule, the maximum value of current through one pantograph on standing rolling stock is limited by the permissible current through a contact wire of the minimum cross-section.

At stops, power is not supplied to passenger cars from the locomotive. In the case of multi-unit rolling stock, power is supplied from several pantographs. This is why no problems related to over-heating of the contact wire arise, and this parameter is not regulated.

The aforementioned requirements are approved by the following documents:

Belarus	TsE-868
Latvia	Not regulated
Lithuania	Not regulated
Poland	PN-EN 50388:2008/AC:2010 TSI ENE
Russia	TsE-868
Slovakia	TSI ENE
Ukraine	TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	

5.7.2.6 Power factor

Currently, requirements for this parameter are not regulated in the 1 520 mm gauge system.

In Russia, the introduction of the standardisation of this parameter (GOST R) is planned.

Belarus

The value of the power factor is not regulated.

Latvia, Lithuania, and Estonia

Not regulated.

Poland and Slovakia

The requirements of the TSI ENE.

Russia

The value of the power factor is not regulated. The requirements for the value of the power factor shall be specified in the technical assignment for the designing of electric rolling stock.

Reactive capacity compensators to be installed both on electric rolling stock and traction substations are to be used for increasing the power factor.

Ukraine

The value of the power factor is not regulated. The requirements for the value of the power factor shall be specified in the technical assignment for the designing of electric rolling stock.

Reactive capacity compensators to be installed both on electric rolling stock and traction substations are to be used for increasing the power factor.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	
Poland	TSI ENE
Russia	
Slovakia	TSI ENE
Ukraine	
Estonia	

5.7.2.7 Electromagnetic compatibility (CCS and communication, including disturbances generated by rolling stock to the overhead contact line)

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements on the basis of the requirements applicable in Lithuania and Russia.

The level of interfering effect of the electrical equipment of electric rolling stock on rail track circuits, track signalling devices, and communication wirelines as well as the level of radio-frequency interferences shall be regulated by safety requirements, the Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways, GOST 29205, and the Rules and Standards for the Equipping of Main-Line and Shunting Locomotives, Electric Trains, and Diesel Trains with Radio Communication and Interference Suppression Equipment or by equivalent documents in each country.

The permissible level of interfering effect of the equipment of electric rolling stock should not exceed the values indicated in the table.

Electric power supply system	**Permissible levels of interferences of the traction current of electric rolling stock**		
	Nominal frequency of signal current, Hz	**Frequency band, Hz**	**Effective value of harmonic current in case of continuous impact (more than 0.3 s), A, not more than**
1. Direct current, voltage 3 kV	50	46-54 40-46 54-60	1.3 5.0 5.0
	25	21-29 19-21 29-31	1.0 (1.9)* 11.6 11.6
2. Alternating current,	25	21-29 15-21 29-35	1.0 4.1 4.1

voltage 25 kV, frequency 50 Hz	75	65-85	4.1
	4 500	4 462.5-4 537.5	0.2
	5 500	5 462.5-5 537.5	0.2
3. Direct current, voltage 3 kV and alternating current, voltage 25 kV, frequency 50 Hz	175	167-184	0.4
	420	408-432	0.35
	480	468-492	0.35
	580	568-592	0.35
	720	708-732	0.35
	780	768-792	0.35
	4 545**	4 507.5-4 582.5	0.2
	5 000	4 962.5-5 037.5	0.2
	5 555**	5 517.5-5 592.5	0.2

N o t e :

*) The values within brackets are indicated for electric trains and electric locomotives equipped with a controller of the harmonic component with a frequency of 25 Hz, which have the function of evenly decreasing the traction power in case of surpassing the limit value;

**) For alternating current electric trains and electric locomotives, the compliance check in the frequency bands of 4 555 and 5 555 Hz shall be performed provided that corresponding entries are contained in the technical documentation and that the official confirmation of the availability of rail track circuits with the corresponding operating frequency bands on the testing site has been issued by the operating entity.

Interfering voltage induced in the control communication circuit should not exceed 1.2 mV.

The strength of the industrial interference field generated by electric rolling stock should be in compliance with GOST 29205-91.

The permissible levels of radio-frequency interferences caused by locomotives and multi-unit rolling stock during movement and at a stop should not exceed the values indicated in the table:

Rolling stock	**Level of radio-frequency interferences, dB, at the frequency**			
	2.1 MHz	**153 MHz**	**2.1 MHz**	**153 MHz**
	At a stop		During movement	
Direct current electric rolling stock	45	18	58	30
Alternating current electric rolling stock	46	26	60	46
Main-line and shunting diesel locomotives and diesel trains	30	14	40	26
N o t e : 1 mkV is assumed as 0 dB.				

Values of the common component for direct current are effective for Latvia.

Lithuania

Table 1. Rates of permissible levels of electromagnetic interferences in rail track circuits:

Signal current frequency, Hz	**Permissible parameters of current**					
	Frequency band, Hz	**In the event of continuous impact (more than 0.3 c)**		**In the event of pulse impact**		
		Ieff, A	**Character of influence**	**Ieff, A**	**Pulse duration, s**	**Pulse repetition period, s**
25	15..35 15..35 15..21 21..29 29..35	 4.1 1.0 4.1	 interfering dangerous interfering	4.1 9.6	< 0.1 < 0.1	0.1..6.0 more than 6.0
50	40..60 40..60 46..54 40..46 54..60 19..31 19..31 21..29 19..21 29..31	 2.0 5.0 5.0 11.9 11.6 11.6	 dangerous interfering interfering dangerous interfering interfering	5.0 9.6 11.6 26.6	< 0.1 < 0.1 < 0.3 < 0.3	0.1..6.0 more than 6.0 0.3..0.9 more than 0.9
420	408..432	0.3	interfering	0.3	< 0.2	0.25 and more
480	468..492	0.3	interfering	1.2	< 0.2	1.5 and more
580	568..592	0.3	interfering			
720	708..732	0.3	interfering			
780	768..792	0.3	interfering			
4545	4508..4583	0.18	interfering	0.2	<0.2	0.25..1.5
5000	4963..5038	0.18	interfering	0.8	<0.2	more than 1.5
5555	5518..5593	0.18	interfering			
		0.18	interfering			

Table 2. The permissible levels of radio-frequency interferences caused by locomotives and multi-unit rolling stock during movement and at a stop should not exceed the values indicated in the table:

Rolling stock	Level of radio-frequency interferences, dB, at the frequency			
	2.1 MHz	153 MHz	2.1 MHz	153 MHz
	At a stop		During movement	
Direct current electric rolling stock	45	18	58	30
Alternating current electric rolling stock	46	26	60	46
Main-line and shunting diesel locomotives and diesel trains	30	14	40	26
N o t e : 1 mkV is assumed as 0 dB.				

Table 3. Limit value of the harmonic components factor

Harmonic number	Frequency (Hz)	KN %	Harmonic number	Frequency (Hz)	KN %
3	150	10.0	23	1 150	1.2
5	250	6.0	25	1 250	1.2
7	350	2.0	27	1 350	1.2
9	450	0.2	29	1 450	1.2
11	550	0.2	31	1 550	1.1
13	650	0.5	33	1 650	1.0
15	750	0.7	35	1 750	1.0
17	850	0.8	37	1 850	0.8
19	950	1.0	39	1 950	0.7
21	1 050	1.1	41	2 050	0.6

Poland and Slovakia

The requirements of standards series EN-50121 apply.

Belarus and Russia

The level of interfering effect of the electrical equipment of electric rolling stock on rail track circuits and track signalling devices shall be regulated by the Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways approved by the Ministry of Railways in 1969 as well as by NB ZhT TsT 03-98 (Amendment 2) and NB ZhT TsT 04-98 (Amendment 2).

The permissible level of interfering effect of the equipment of electric rolling stock should not exceed the values indicated in the table.

Electric power supply system	**Permissible levels of interferences of the traction current of electric rolling stock**		
	Nominal frequency of signal current, Hz	**Frequency band, Hz**	**Effective value of harmonic current in the event of continuous impact (more than 0.3 s), A, not more than**
1. Direct current, voltage 3 kV	50	46-54 40-46 54-60	1.3 5.0 5.0
	25	21-29 19-21 29-31	1.0 (1.9)* 11.6 11.6
2. Alternating current, voltage 25 kV, frequency 50 Hz	25	21-29 15-21 29-35	1.0 4.1 4.1
	75	65-85	4.1
	4500	4462.5- 4537.5	0.2
	5500	5462.5- 5537.5	0.2
3. Direct current, voltage 3 kV and alternating current, voltage 25 kV, frequency 50 Hz	175	167-184	0.4
	420	408-432	0.35
	480	468-492	0.35
	580	568-592	0.35
	720	708-732	0.35
	780	768-792	0.35
	4 545**	4 507.5- 4 582.5	0.2
	5 000	4 962.5- 5 037.5	0.2
	5 555**	5 517.5- 5 592.5	0.2

N o t e :

*) The values within brackets are indicated for electric trains and electric locomotives equipped with a controller of the harmonic component with a frequency of 25 Hz, which have the function of evenly decreasing the traction power in the event of surpassing the limit value;

**) For alternating current electric trains and electric locomotives, the compliance check in the frequency bands of 4 555 and 5 555 Hz shall be performed provided that corresponding entries are contained in the technical documentation and that the official confirmation of the availability of rail track circuits with the corresponding operating frequency bands on the testing site has been issued by the operating entity.

Interfering voltage induced in the control communication circuit should not exceed 1 mV and shall be determined in accordance with Paragraph A.39 of NB ZhT TsT 03-98 (Amendment 2) and Paragraph A.36 of NB ZhT TsT 04-98 "Protection of Communication Wirelines…."

The strength of the industrial interference field generated by electric rolling stock should be in compliance with GOST 29205-91.

The intensity of the field of radio interferences generated by electric rolling stock at frequencies of technological and radio communication during movement and at a stop should not exceed the values specified in Paragraph 2.4 of the Rules and Standards for the Equipping of Main-Line and Shunting Locomotives, Electric Trains, and Diesel Trains with Radio Communication and Interference Suppression Equipment, TsSh4783-91.

Type of moving object	**Level of radio-frequency interferences, dB, at the frequency**			
	2.1 MHz	**153.0 MHz**	**2.1 MHz**	**153.0 MHz**
	At a stop		**During movement**	
Electric locomotive:				
- direct current 3 kV	45	18	58	30
- alternating current 25 kV 50 Hz	46	26	60	46
N o t e : 1 mkV is assumed as 0 dB.				

Ukraine

Rolling stock should not generate any interfering effect on the performance of signalling, interlocking and blocking devices, automatic locomotive signalling (ALSN), radio communication systems, and radio. In order to prevent false activation of controls of moving rolling stock, it shall be prohibited to use in the design of rolling stock any assemblies and

systems located at the level of axleboxes, the normal operating temperature whereof:

- does not exceed the outside air temperature by at least 35 °C – at outside air temperatures below 0 °C;
- does not exceed the outside air temperature by at least 30 °C – at outside air temperatures above 0 °C.

The intensity of the field of industrial radio interferences generated by electric rolling stock should comply with GOST 29205-91. The level of interfering effect of the electrical equipment of electric rolling stock on rail track circuits and track signalling devices shall be regulated by the Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways Electrified Railways and the Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Alternating Current Electrified Railways. The permissible interfering effect of the equipment of electric rolling stock should not exceed the values indicated in the table.

Electric power supply system	**Permissible levels of interferences of the traction current of electric rolling stock**		
	Nominal frequency of signal current, Hz	**Frequency band, Hz**	**Effective value of harmonic current in the event of continuous impact (more than 0.3 s), A, not more than**
1. Direct current, voltage 3 kV	50	46-54 40-46 54-60	1.3 5.0 5.0
	25	21-29 19-21 29-31	1.0 (1.9)* 11.6 11.6
2. Alternating current, voltage 25 kV, frequency 50 Hz	25	21-29 15-21 29-35	1.0 4.1 4.1
	75	65-85	4.1
	4 500	4 462.5-4 537.5	0.2
	5 500	5 462.5-5 537.5	0.2
3. Direct current, voltage 3 kV and alternating current, voltage 25 kV, frequency 50 Hz	175	167-184	0.4
	420	408-432	0.35
	480	468-492	0.35
	580	568-592	0.35
	720	708-732	0.35
	780	768-792	0.35
	4 545**	4 507.5-4 582.5	0.2
	5 000	4 962.5-5 037.5	0.2
	5 555**	5 517.5-5 592.5	0.2

N o t e :

*) The values within brackets are indicated for electric trains and electric locomotives equipped with a controller of the harmonic component with a frequency of 25 Hz, which have the function of evenly decreasing the traction power in case of surpassing the limit value;

**) For alternating current electric trains and electric locomotives, the compliance check in the frequency bands of 4 555 and 5 555 Hz shall be performed provided that corresponding entries are contained in the technical documentation and that the official confirmation of the availability of rail track circuits with the corresponding operating frequency bands on the testing site has been issued by the operating entity.

The permissible levels of radio-frequency interferences caused by locomotives and multi-unit rolling stock during movement and at a stop should not exceed the values indicated in the table:

Rolling stock	**Level of radio-frequency interferences, dB, at the frequency**			
	2.1 MHz	**153 MHz**	**2.1 MHz**	**153 MHz**
	At a stop		During movement	
Direct current electric rolling stock	45	18	58	30
Alternating current electric rolling stock	46	26	60	46
Main-line and shunting diesel locomotives and diesel trains	30	14	40	26
N o t e : 1 mkV is assumed as 0 dB.				

Limit value of the harmonic components factor

Harmonic number	**Frequency (Hz)**	**KN %**	**Harmonic number**	**Frequency (Hz)**	**KN %**
3	150	10.0	23	1 150	1.2
5	250	6.0	25	1 250	1.2
7	350	2.0	27	1 350	1.2
9	450	0.2	29	1 450	1.2
11	550	0.2	31	1 550	1.1
13	650	0.5	33	1 650	1.0
15	750	0.7	35	1 750	1.0
17	850	0.8	37	1 850	0.8
19	950	1.0	39	1 950	0.7
21	1 050	1.1	41	2 050	0.6

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 03-98 Electric Trains, Paragraph A.39 NB ZhT TsT 04-98 Electric Locomotives, Paragraph A.36 GOST 29205-91 Electromagnetic Compatibility of Technical Units. Industrial Radio Interferences Induced by Electric Transport. Test Standards and Methods

Latvia	GOST 29205-91 (Informatory)
Lithuania	LST EN 50238 Railway Applications. Compatibility between rolling stock and train detection systems Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways approved by the Ministry of Railways in 1969 NB ZhT TsT 03-98 (Amendment 2), NB ZhT TsT 04-98 (Amendment 2), Table 1 and 2 TsSh4783-91
Poland	Standards of the series EN-50121
Russia	Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways approved by the Ministry of Railways in 1969 Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Alternating Current Electrified Railways approved by the Ministry of Railways in 1989 NB ZhT TsT 03-98, Paragraph A.39 NB ZhT TsT 04-98, Paragraph A.36 GOST 29205-91 Rules and Standards for the Equipping of Main-Line and Shunting Locomotives, Electric Trains, and Diesel Trains with Radio Communication and Interference Suppression Equipment, TsSh4783-91, Paragraph 2.4
Slovakia	Standards of the series EN-50121
Ukraine	Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Direct Current Electrified Railways approved by the Ministry of Railways in 1969 Rules for the Protection of Wireline Communication Devices against the Impact of the Traction Network of Alternating Current Electrified Railways approved by the Ministry of Railways in 1989 GOST 29205-91 Electromagnetic Compatibility of Technical Units. Industrial Radio Interferences Induced by Electric Transport. Test Standards and Methods
Estonia	

5.7.2.8 Energy consumption measuring

Currently, requirements for this parameter are not regulated in all the countries. Commercial metering of electric power is performed by means of meters installed at substations. Meters installed on rolling stock are used for technological metering and analysis.

Lithuania

Electric power consumption metering shall be performed with the use of electricity meters installed on electric rolling stock.

Belarus and Russia

Electric power consumption (kW/h) depends on the type of electric rolling stock, composition and weight of the train, and traffic section profile. Electric power consumption metering shall be performed with the use of electricity meters.

The following types of electricity meters shall be installed on electric rolling stock:

- metering both electric power consumption for traction and return of electric power from regeneration;
- metering independent electric power consumption for traction and return of electric power from regeneration;
- metering electric power consumption for electric power supply to the train (for passenger locomotives).

Ukraine

Metering of electric power consumption (kW/h) shall be performed with the use of electricity meters installed on electric rolling stock. Depending on the type, the following electricity meters shall be installed on rolling stock:

- metering both electric power consumption for traction and return of electric power from regeneration;
- metering independent electric power consumption for traction and return of electric power from regeneration;
- metering electric power consumption used for the heating of the train (for passenger locomotives).

Electric metering devices fed from voltages above 42 V alternating current and above 110 V direct current should be installed in places preventing access to current-conducting parts in the case when the current receiver is energised.

At electric rolling stock, electricity meters perform technical metering, while commercial metering is performed by meters installed at traction substations and other places of balanced division of electric networks.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	
Lithuania	Not regulated
Poland	
Russia	

Slovakia	
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Estonia	

5.7.2.9 Requirements for pantograph

5.7.2.9.1 Working range in height of pantograph

5.7.2.9.1.1 Height of interaction of rolling stock with contact wires

Currently, requirements for this parameter are the same in all the countries. A common constituent for these requirements can be identified.

A pantograph shall be installed on the roof of traction rolling stock and shall be in contact with the contact wire at a height of 5 550 mm to 6 800 mm (for direct current), and 5 675 mm to 6 800 mm (for alternating current) from the rail head levels.

Belarus, Latvia, and Lithuania

In Latvia, the height of the contact wire suspension above the top level of the rail head should be not less than 5 750 mm at track sides and stations, and not less than 6 000 mm at crossings. In extraordinary circumstances, subject to the permission of the railway infrastructure manager, this distance may be reduced to 5 550 mm within artificial structures located on tracks of stations where the stopping of rolling stock is not provided for. The height of the contact wire suspension should not exceed 6 800 mm.

Poland and Slovakia

The requirements of the TSI ENE.

Russia

A pantograph shall be installed on the roof of traction rolling stock and shall contact the contact wire at a height of 5 550 mm to 6 800 mm from the rail head levels in accordance with TsE-868. For travelling speeds exceeding 140 km/h, in accordance with Paragraph 5.5.9 of the Instruction TsRB-393, the height of the contact wire suspension should be not less than 5 750 mm at track sides and stations, and not less than 6 000 mm at railway crossings. Before upgrading, it shall be permitted to reduce the height of the contact wire suspension to 5 675 mm for alternating current lines and to 5 550 mm for direct current lines. The height of the contact wire suspension should not exceed 6 500 mm.

Ukraine

As a rule, the height of the contact wire suspension without sags above the top level of the rail head should be equal to 6 250 mm at track sides and stations in order to ensure the possibility of lifting the track. The height of the contact wire suspension above the top level of the rail head should not be less than 5 750 mm and not more than 6 800 mm at track sides and stations, and not less than 6 000 mm at crossings. In extraordinary circumstances, subject to the relevant substantiation and permission of Ukrainian Railways, this distance may be reduced to 5 675 mm for alternating current lines and to 5 550 mm for direct current lines within artificial structures located on tracks of stations where the stopping of rolling stock is not provided for as well as at track sides.

The aforementioned requirements are approved by the following documents:

Belarus	TOR
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	TOR of Lithuanian Railways
Poland	TSI ENE
Russia	TOR TsE-868 TsRB-393, Paragraph 5.5.9
Slovakia	TSI ENE
Ukraine	TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of the Ukrainian Railways TsE -0023 Rules for Installations and Technical Maintenance of the Overhead Contact System of Electrified Railways DBN V.2.3-19-2008 Transport Structures. 1 520 mm Gauge Railways. Designing Standards TsRB-004. Technical Operating Rules for Ukrainian Railways VND 31.1.07.000-02 Temporary Instruction for the Organisation of Fast Traffic of Passenger Trains. Requirements for the Infrastructure and Rolling Stock
Estonia	

5.7.2.9.1.2 Working range in height of pantograph as a component part

Currently, requirements for this parameter are different in all the countries.

The operating range of the height of a pantograph shall be not less than 2 000 mm (for Ukraine), 100 to 2 500 mm and 400 to 1 900 mm (for Lithuania), and 400 to 1 900 mm and 200 to 2 450 mm (for Latvia) depending on the pantograph type.

For Russia: the operating height should be adjustable within the range from 400 to 1 900 mm in respect of the contact surfaces of the strips of a fully lowered pantograph. The biggest lifting height of the contact skate should not be less than 2 100 mm.

Belarus

The geometrical dimensions of a pantograph should ensure normal conditions of current collection and be located within the contours separated from the clearance gauge of the rolling stock and from grounded parts by permissible electrically insulating air gaps.

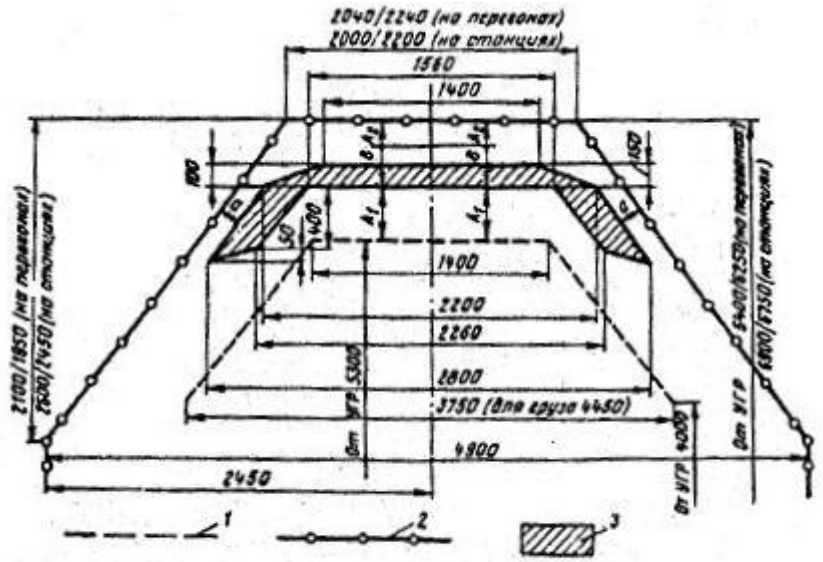


Рис. 1. Расстояние между сооружениями, устройствами контактной сети, токоприемниками и подвижным составом:
1 — габарит подвижного состава; 2 — габарит искусственных сооружений; 3 — положение токоприемника с учетом его смещения

Рис 1. Расстояние между сооружениями, устройствами контактной сети, токоприемниками и подвижным составом:	Fig. 1. Distance between structures and facilities of the overhead system, pantographs and rolling stock:
1 – габарит подвижного состава	1 – clearance gauge of rolling stock
2 – габарит искусственных сооружений	2 – clearance gauge of artificial structures
3 – положение токоприемника с учетом его смещения	3 – position of the pantograph with regard to the shift thereof
(на перегонах)	(at track sides)
(на станциях)	(at stations)
(для груза 4450)	(for load 4 450)
(от УГР)	(from the level of the rail head)

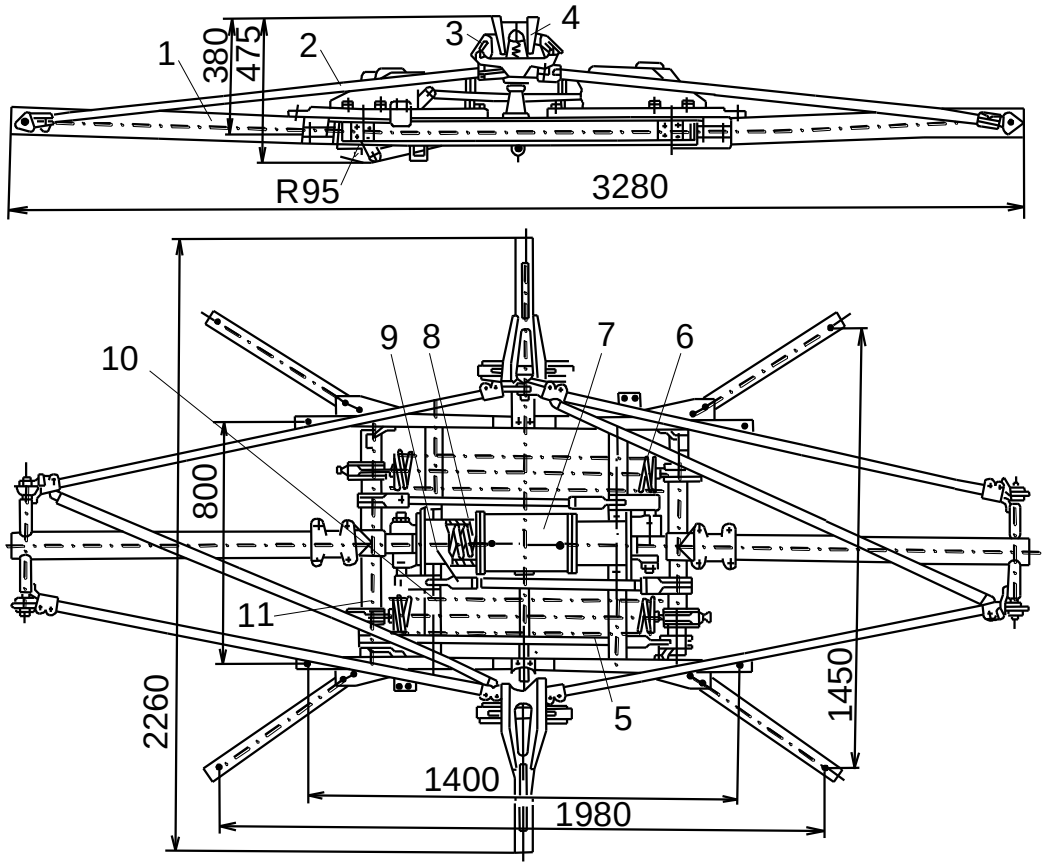
Latvia

In Latvia, two types of pantographs are used on electric trains: WBL 85 and TL-13U. The range of the operating height of pantographs shall be 2 350 +/-50 mm for WBL 85 and 1 900 mm for TL-13U. The operating range shall be set by the manufacturing plant.

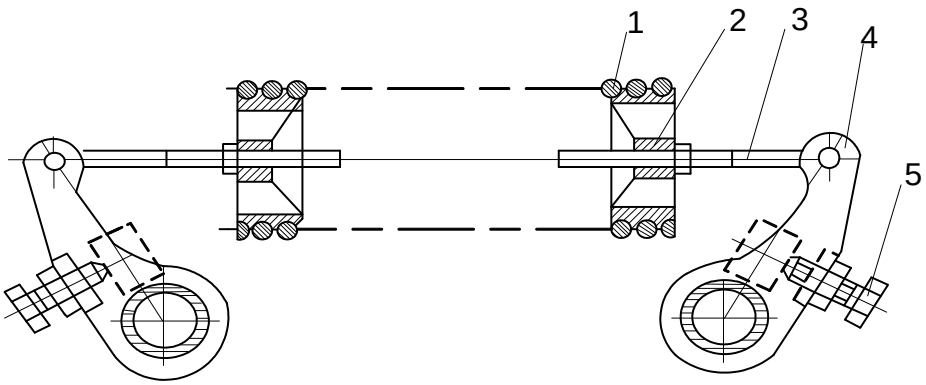
Main technical details of pantographs

Indicators	Main technical characteristics of the pantographs	
	WBL 85	TL-13U
Continuously permissible current when moving, A	800	610
Maximum operating height (above the lowered contact skate), mm	2 350	1 900

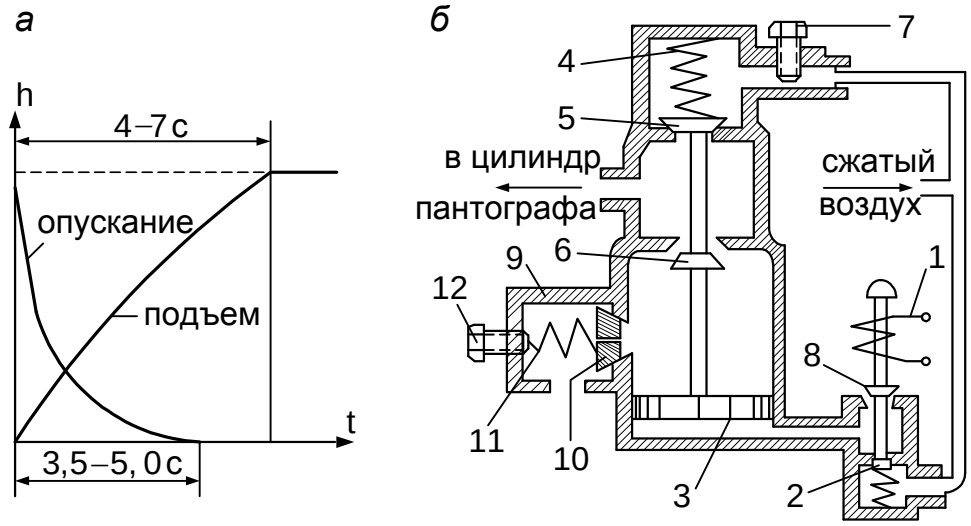
Minimum operating height (above the lowered contact skate), mm	100	400
Lifting time of the moving system to the maximum operating height, s	8 +/-2	4–7
Lowering time of the moving system from the maximum operating height, s	8 +/-2	3.5–5
Nominal pressure of compressed air, kg/cm^2	5	5
Minimum pressure of compressed air, kg/cm^2	4	3.5
Pressure of the contact skate on the contact wire, N/m	7.4 +/- 10 %	7-9
Height of the pantograph in the lowered position, mm	600	465
Length of the contact skate, mm	1 300	2 260
Installation (mounting) dimensions, mm	2 561-1 800	1 980–1 450
Total weight with insulators, kg	140	315
Maximum permissible travelling speed, km/h	160	160



Pantograph TL-13U

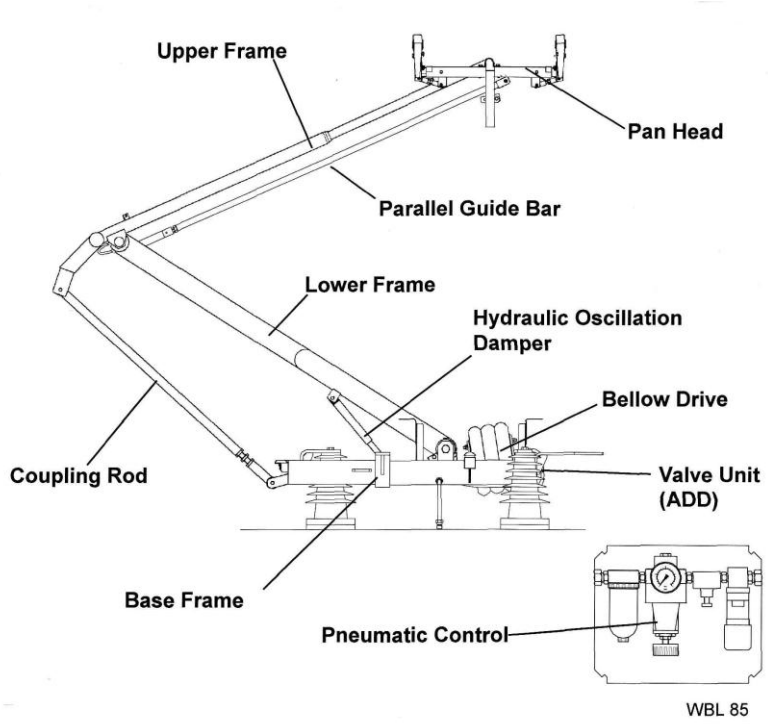


Contact pressure adjusting device: *1* – lifting spring; *2* – plate; *3* – guide bar; *4* – bracket; *5* – adjusting bolt



Pantograph valve: a – dependence of the contact skate lifting on time; b (б) – pantograph valve arrangement

Опускание	Lowering
Подъем	Lifting
в цилиндр пантографа	to the pantograph cylinder
сжатый воздух	compressed air



Pantograph WBL 85

Lithuania

In Lithuania, two types of pantographs are used on electric trains: AX-NG 026 BU 25 kV and TL-13U. The range of the operating height of pantographs shall be 2 500 for AX-NG 026 BU and 1 900 mm for TL-13U. The operating range shall be set by the manufacturing plant.

Indicators	Main technical characteristics of the pantographs	
	AX-NG 026 BU 25 kV	TL-13U
Continuously permissible current when moving, A		610
Maximum operating height (above the lowered contact skate), mm	2 500	1 900
Minimum operating height (above the lowered contact skate), mm	100	400
Lifting time of the moving system to the maximum operating height, s	<10	4–7
Lowering time of the moving system from the maximum operating height, s	<8	3.5–5
Nominal pressure of compressed air, kg/cm^2	5-10	5

Minimum pressure of compressed air, kg/cm^2	5	3.5
Pressure of the contact skate on the contact wire, N/m	6-9	7-9
Height of the pantograph in the lowered position, mm	562	465
Length of the contact skate, mm	2 260±12	2 260
Installation (mounting) dimensions, mm		1 980–1 450
Total weight with insulators, kg	178	315
Maximum permissible travelling speed, km/h	160	160

Poland and Slovakia

The requirements of the EN-50367:2006/AC:2010 standard apply.

Russia

The operating height should be adjustable within the range from 400 to 1 900 mm in respect of the contact surfaces of the strips of a fully lowered pantograph. The biggest lifting height of the contact skate should not be less than 2 100 mm.

Ukraine

The operating range of the height of a pantograph shall be set by the manufacturing plant and shall be not less than 2 000 mm.

The aforementioned requirements are approved by the following documents:

Belarus	BCh E 009-96 Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railway Sections GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways
Latvia	Design documentation
Lithuania	Design documentation
Poland	EN-50367:2006/AC:2010
Russia	Draft GOST R
Slovakia	EN-50367
Ukraine	Design documentation
Estonia	

5.7.2.9.2 Pantograph slide geometry

Currently, requirements for this parameter are the same in all the countries; however, they are expressed by different approaches and, correspondingly, are described by different documents.

For Latvia, Lithuania, Ukraine, and Estonia: The geometrical dimensions of a pantograph should ensure normal conditions of current collection and be located within the

contours separated from the clearance gauge of the rolling stock and from grounded parts by permissible electrically insulating air gaps.

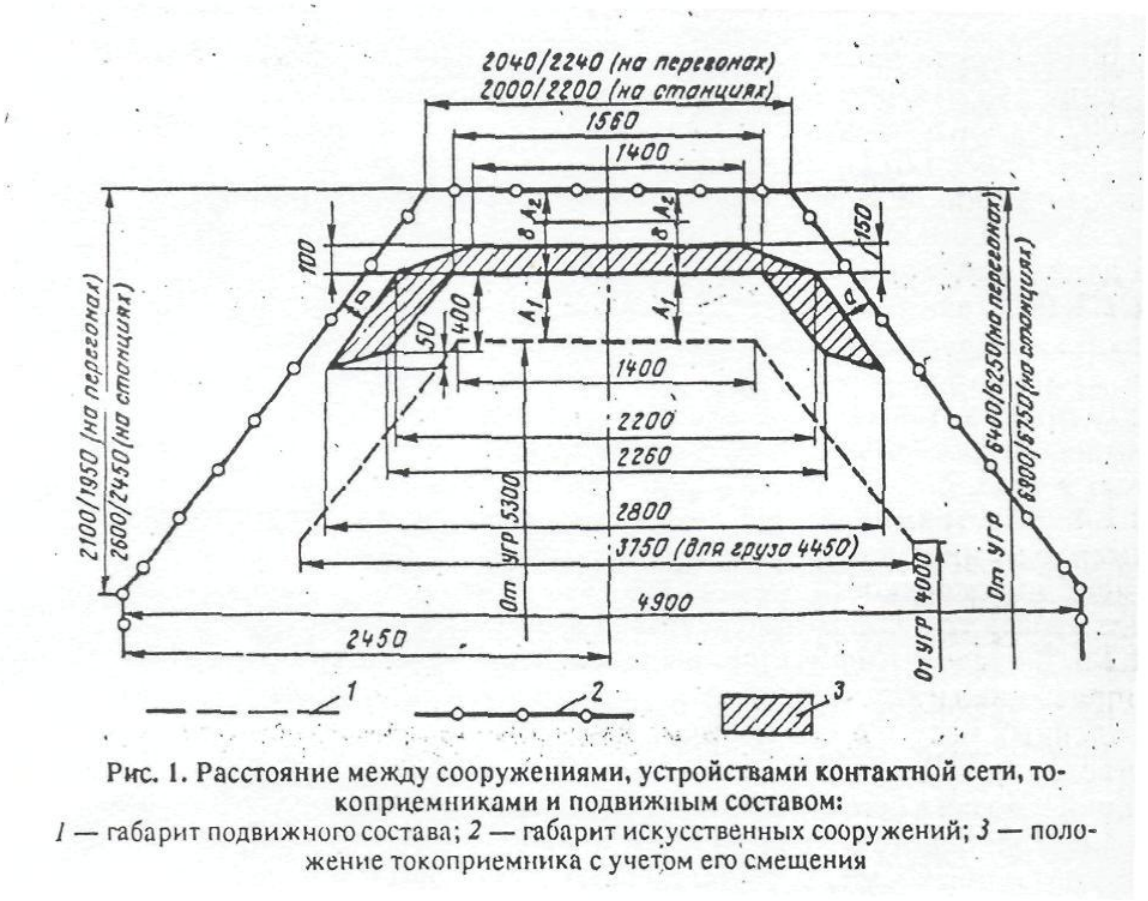


Рис. 1. Расстояние между сооружениями, устройствами контактной сети, токоприемниками и подвижным составом:
1 — габарит подвижного состава; *2* — габарит искусственных сооружений; *3* — положение токоприемника с учетом его смещения

1 –clearance gauge of rolling stock; 2 – clearance gauge of artificial structures; 3 – position of the pantograph with regard to the shift thereof.

Рис 1. Расстояние между сооружениями, устройствами контактной сети, токоприемниками и подвижным составом:	Fig. 1. Distance between structures and facilities of the overhead system, pantographs and rolling stock:
1 – габарит подвижного состава	1 – clearance gauge of rolling stock
2 – габарит искусственных сооружений	2 – clearance gauge of artificial structures
3 – положение токоприемника с учетом его смещения	3 – position of the pantograph with regard to the shift thereof
(на перегонах)	(at track sides)
(на станциях)	(at stations)
(для груза 4450)	(for load 4 450)
(от УГР)	(from the level of the rail head)

For Russia. The width of the pantograph slide: 2 000-2 260 mm. The profile of the pantograph slide in accordance with the draft standard GOST R Pantographs of Electrified Rolling Stock is presented on the figure.

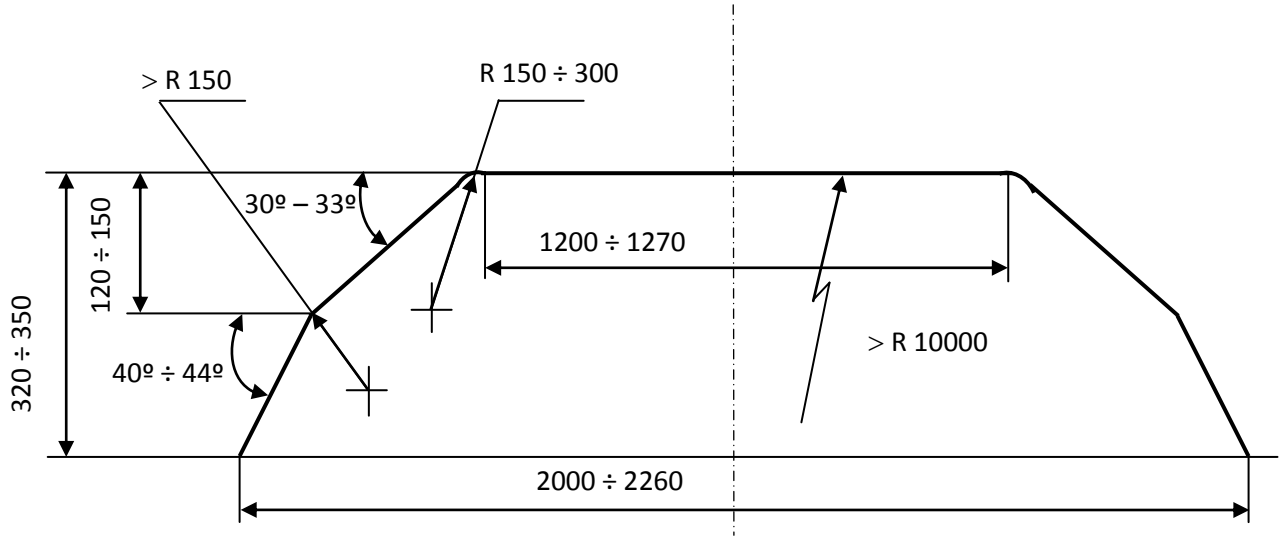


Fig. Configuration and dimensions of contact skates

Belarus

Indicators	Pantograph type	
	TL-13U	2SLS-2
1	2	3
Applicability	VL80s, ER9v/i	ChS4t
Material of the contact elements of the contact skate	coal	coal
Operating height, mm: maximum minimum	 1 900 400	 2 420 950
Maximum lifting height from the retracted position, mm	2 100	2 570
Static pressure effort on the contact wire within the operating height range, N: - active, not less than - passive, not more than, in summertime - passive, not more than, in wintertime	 60 90 110	 65 80-105 110
Difference between the maximum and minimum pressure efforts in the event of one-sided movement of the pantograph within the operating height range, N, not more than	10	-
Double value of pivot friction reduced to the upper assembly, N, not more than	20	20
Lowering force within the operating height range, N, not less than	120	120
Maximum lifting height from the retracted position, mm	2 100	2 570
Lifting time to the maximum operating height at nominal pressure of compressed air, s	7 – 10	
Lowering time of the contact skate from the maximum operating height to the lowered position, s	3.5 – 6	
Nominal pressure of compressed air in the pneumatic system, MPa	0.5	
Minimum pressure of compressed air required for the operation of the lifting mechanism, MPa	0.35	
Testing pressure of compressed air for checking of the pneumatic drive for air-tightness, MPa	0.675	
Overall dimensions of the contact skate: - length, mm - width, mm	 2 260 150	 2 180 188
Installation (mounting) dimensions, mm	1 400 x 800	1 540 x 1 380

Latvia

Lithuania

It should be in accordance with the clearance gauge. See the figure.

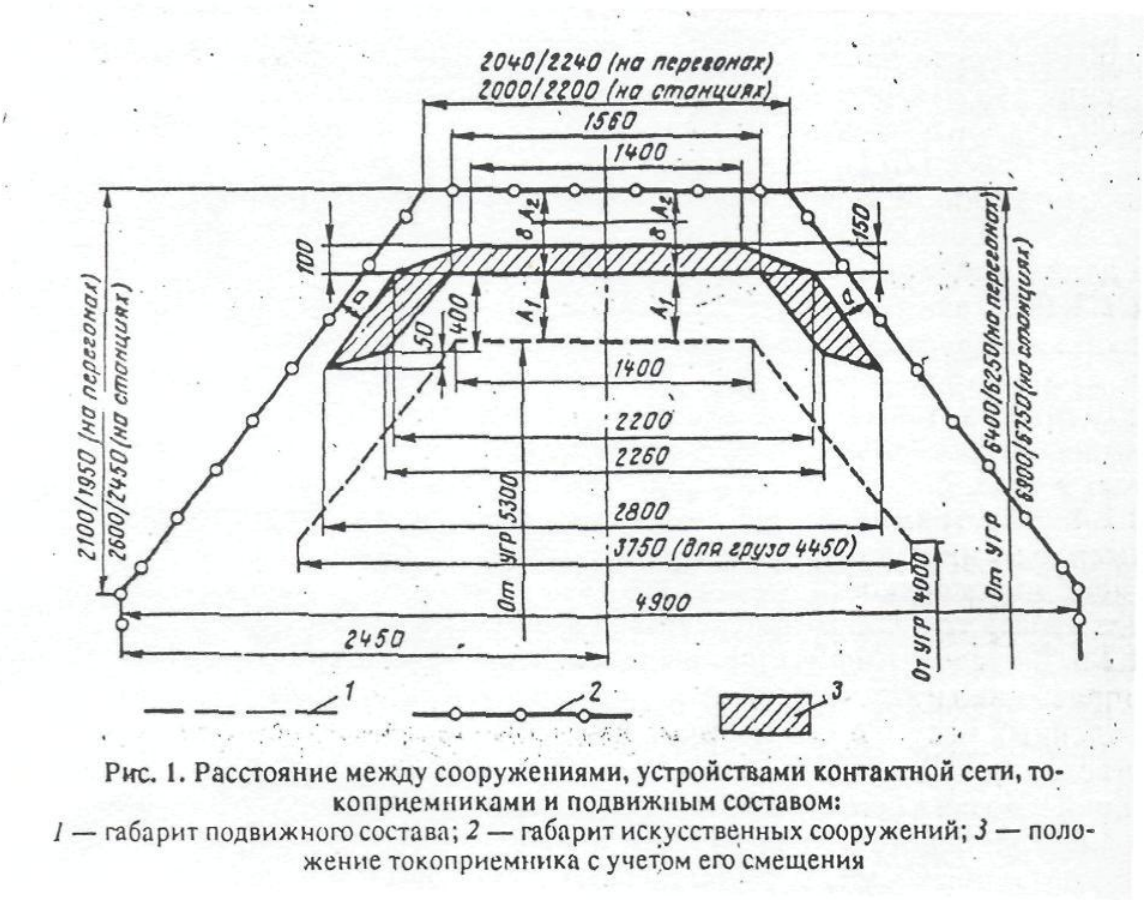


Рис. 1. Расстояние между сооружениями, устройствами контактной сети, токоприемниками и подвижным составом:
1 — габарит подвижного состава; *2* — габарит искусственных сооружений; *3* — положение токоприемника с учетом его смещения

Рис 1. Расстояние между сооружениями, устройствами контактной сети, токоприемниками и подвижным составом:	Fig. 1. Distance between structures and facilities of the overhead system, pantographs and rolling stock:
1 – габарит подвижного состава	1 – clearance gauge of rolling stock
2 – габарит искусственных сооружений	2 – clearance gauge of artificial structures
3 – положение токоприемника с учетом его смещения	3 – position of the pantograph with regard to the shift thereof
(на перегонах)	(at track sides)
(на станциях)	(at stations)
(для груза 4450)	(for load 4 450)
(от УГР)	(from the level of the rail head)

Poland and Slovakia

The requirements of the EN-50367:2006/AC:2010 standard apply.

Russia

The width of the pantograph slide: 2 000-2 260 mm. The profile of the pantograph slide in accordance with the draft standard GOST R Pantographs of Electrified Rolling Stock is presented in the figure.

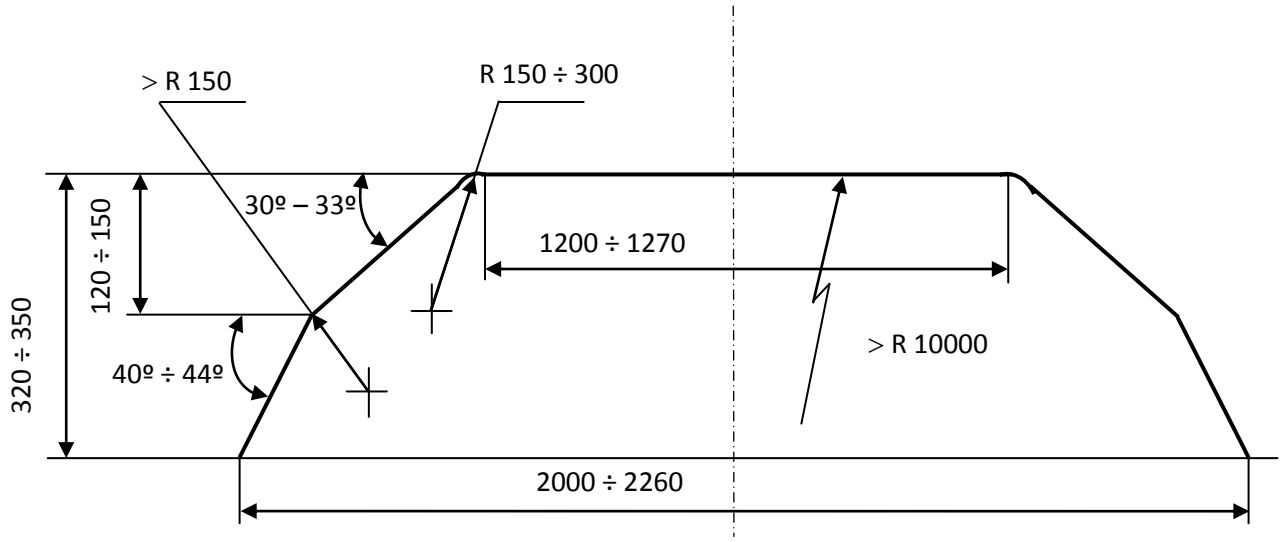
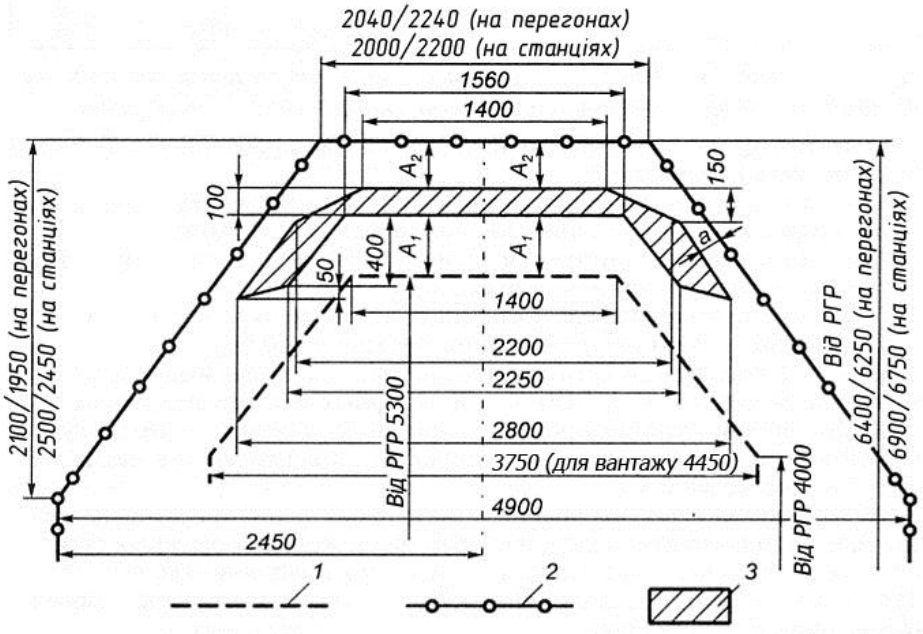


Fig. Configuration and dimensions of contact skates

Ukraine

The geometrical dimensions of a pantograph should ensure normal conditions for current collection and be located within the contours separated from the clearance gauge of the rolling stock and from grounded parts by permissible electrically insulating air gaps.



1 –clearance gauge of rolling stock; 2 – clearance gauge of artificial structures; 3 – position of the pantograph with regard to the shift thereof.

(на перегонах)	(at track sides)
(на станціях)	(at stations)
(для вантажу 4450)	(for load 4 450)
(від РГР)	(from the level of the rail head)

The aforementioned requirements are approved by the following documents:

Belarus	Design documentation
Latvia	Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways, TE-3199
Lithuania	Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways AE/41
Poland	EN-50367:2006/AC:2010
Russia	Draft standard GOST R Pantographs of Electrified Rolling Stock
Slovakia	EN-50367
Ukraine	GOST 9238-83 Construction and Rolling Stock Clearance Diagrams for 1 520 (1 524) mm Gauge Railways TsE -0023 Rules for Installations and Technical Maintenance of the Overhead Contact System of Electrified Railways TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways DBN V.2.3-19-2008 Transport Structures. 1 520 mm Gauge Railways. Designing Standards TsRB-004. Technical Operating Rules for Ukrainian Railways VND 31.1.07.000-02 Temporary Instruction for the Organisation of Fast Traffic of Passenger Trains. Requirements for the Infrastructure and Rolling Stock
Estonia	

5.7.2.9.3 Pantograph current load

Currently, requirements for this parameter are the same in all the countries but are not regulated. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Russia). For Latvia, Lithuania, and Estonia, these requirements shall be determined by design documentation.

Maximum permissible current should be determined both by the limit values of temperature increase of contact strips (plates) and by the occurrence of maximum permissible electroexplosive erosion in the contact (continuous sparking in the contact).

Load characteristics of pantographs for strips made of various materials are presented in Paragraph 5.7.2.9.4.

Belarus, Latvia, Lithuania, Poland, Slovakia, and Estonia

Design documentation.

Russia

Maximum permissible current should be determined both by the limit values of heating-up of contact strips (plates) and by the occurrence of maximum permissible electroexplosive erosion in the contact (continuous sparking in the contact).

Load characteristics of pantographs for strips made of various materials are presented in Paragraph 5.7.2.9.4.

Ukraine

Maximum permissible current should be determined both by the limit values of temperature increase of contact strips (plates) and by the occurrence of maximum permissible electroexplosive erosion in the contact (continuous sparking in the contact).

The aforementioned requirements are approved by the following documents:

Belarus	Design documentation
Latvia	Design documentation
Lithuania	Design documentation
Poland	Design documentation
Russia	Draft standard GOST R Pantographs of Electrified Rolling Stock
Slovakia	Design documentation
Ukraine	TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways TsE -0023 Rules for Installations and Technical Maintenance of the Overhead Contact System of Electrified Railways
Estonia	Design documentation

5.7.2.9.4 Contact strip material

Currently, requirements for this parameter are the same in all the countries but are not regulated. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Russia).

The following current-conducting elements (contact strips (plates)) shall be used on rolling stock in wintertime and summertime:

- carbon;

- carbon metallic;

- ceramic-metal on iron base.

Contact strips (plates) should comply with the requirements for technical specifications and load characteristics of pantographs.

Load characteristics of pantographs

Material of strips	Nominal current, A for pantographs			
	single-contact skate		double-contact skate	
	During	At a stop	During	At a stop

	movement	in wintertime	in summertime	movement	in wintertime	in summertime
Carbon strips A B	 1 250 1 650	 96 120	 60 78	 1 580 2 030	 156 204	 96 132
Graphite metallic	1 245	250	96	2 190-2 500	252	163
Ceramic-metal	-	-	-	2 200	500	330

Belarus

Contact strips (plates) should comply with the requirements of technical specifications and load characteristics of pantographs.

Latvia

Carbon graphite shall be used on the contact surface of a pantograph.

Lithuania

Carbon graphite and plain carbon shall be used on the contact surface of a pantograph.

Poland and Slovakia

The requirements of the EN-50367:2006/AC:2010 standard apply.

Russia

The following current-conducting elements (contact strips (plates)) shall be used on rolling stock in wintertime and summertime:

- carbon;

- carbon metallic;

- ceramic-metal on iron base;

Permissible hardness shall not be more than 70 Shore units; specific electric resistance shall not be less than 30 mcOhm*m.

Load characteristics of pantographs

Material of strips	Nominal current, A for pantographs					
	single-contact skate			double-contact skate		
	During movement	At a stop		During movement	At a stop	
		in wintertime	in summertime		in wintertime	in summertime
Carbon strips A B	 1 250 1 650	 96 120	 60 78	 1 580 2 030	 156 204	 96 132
Graphite metallic	1 245	250	96	2 190-2 500	252	163

Ceramic-metal	-	-	-	2 200	500	330

Ukraine

The following current-conducting elements (contact strips (plates)) shall be used on rolling stock in wintertime and summertime:

- carbon;
- carbon metallic;
- ceramic-metal on iron base.

Contact strips (plates) should comply with the requirements for technical specifications and load characteristics of pantographs.

Load characteristics of pantographs

Material of strips	Nominal current, A for pantographs					
	single-contact skate			double-contact skate		
	During movement	At a stop		During movement	At a stop	
		in wintertime	in summertime		in wintertime	in summertime
Carbon strips						
A	1 250	96	60	1 580	156	96
B	1 650	120	78	2 030	204	132
Graphite metallic	1 245	250	96	2 190-2 500	252	163
Ceramic-metal	-	-	-	2 200	500	330

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	Not regulated
Lithuania	Not regulated
Poland	EN-50367:2006/AC:2010
Russia	
Slovakia	EN-50367:2006/AC:2010
Ukraine	Technical specifications TsE -0023 Rules for Installations and Technical Maintenance of the Overhead Contact System of Electrified Railways TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	Not regulated

5.7.2.9.5 Pantograph static contact force

Currently, requirements for this parameter exist in all the countries; however, the limits of the range of the values thereof differ significantly. Specific values of the aforementioned range are presented in the table for each country.

For Latvia, Lithuania, and Ukraine, the characteristics of pantograph contact force should meet the following:

Characteristic	Pantograph	
	Heavy	Light
Static contact force, N passive (when lowering) active (when lifting)	Not more than 130 Not less than 100	Not more than 90 Not less than 60
Difference between the maximum and minimum contact force during movement within the operating height range of the pantograph	Not more than 15	Not more than 10
Difference between the contact force on the contact wire when lifting and lowering the pantograph	Not more than 30	Not more than 20

The static contact force (passive and active) for a specific type of pantograph shall be specified in accordance with its technical characteristics.

The mechanism of a pantograph should provide the possibility of decreasing the contact force by 10 N and increasing it by 20 N compared to the standard values of the active and passive component of static contact force.

In wintertime, contact force shall be increased by 10-20 N within the established values for specific pantographs compared to summertime.

For Russia, pantograph static contact force should be within the limits indicated in the table:

Indicator name	Indicator value for the pantograph type	
	heavy	light
Contact force:		
minimum active, N, not less than	90	70
maximum passive, N, not more than	130	110
Difference between the maximum and minimum contact forces in the event of one-sided movement of the pantograph, N, not more than	15	15

The design of the lifting mechanism of a pantograph should ensure the following for alternating current systems:

- average contact force of 70 N
- active contact force of not less than 60 N
- passive contact force of more than 80 N

for direct current systems:

- average contact force of 90 N
- active contact force of not less than 75 N
- passive contact force of more than 100 N.

Belarus

See Paragraph 5.7.2.9.3.

Latvia

Static contact force onto the contact wire shall be 60-90 N for pantographs TL-13U and 70-150 N for pantographs WBL 85.

Lithuania

Static contact force onto the contact wire shall be 60-90 N for pantographs TL-13U and 60-90 N for pantographs AX-NG 026 BU.

Poland and Slovakia

The requirements of the EN-50367:2006/AC:2010 standard apply.

Russia

Pantograph static contact force should be within the limits indicated in the table:

Indicator name	Indicator value for the pantograph type	
	heavy	light
Contact force:		
minimum active, N, not less than	90	70
maximum passive, N, not more than	130	110
Difference between the maximum and minimum contact forces in case of one-sided movement of the pantograph, N, not more than	15	15

The design of the lifting mechanism of a pantograph should ensure the following for alternating current systems:

- average contact force of 70 N
- active contact force of not less than 60 N
- passive contact force of more than 80 N

for direct current systems:

- average contact force of 90 N
- active contact force of not less than 75 N
- passive contact force of more than 100 N.

Ukraine

The characteristics of pantograph contact force should meet the following:

Characteristic	Pantograph	
	Heavy	Light
Static contact force, N passive (when lowering) active (when lifting)	 Not more than 130 Not less than 100	 Not more than 90 Not less than 60
Difference between the maximum and minimum contact force during movement within the operating height range of the pantograph	Not more than 15	Not more than 10
Difference between the contact force on the contact wire when lifting and lowering the pantograph	Not more than 30	Not more than 20

The static contact force (passive and active) for a specific type of pantograph shall be specified in accordance with its technical characteristics.

The mechanism of a pantograph should provide the possibility of decreasing the contact force by 10 N and increasing it by 20 N compared to the standard values of the active and passive component of static contact force.

The aforementioned requirements are approved by the following documents:

Belarus	Design documentation
Latvia	Design documentation
Lithuania	Design documentation
Poland	EN-50367:2006/AC:2010
Russia	Draft standard GOST R Pantographs of Electrified Rolling Stock TsRB-393
Slovakia	EN-50367
Ukraine	TsE -0023 Rules for Installations and Technical Maintenance of the Overhead Contact System of Electrified Railways TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	

5.7.2.9.6 Pantograph contact force and dynamic behaviour

Currently, requirements for this parameter are different in all the countries (Ukraine and Russia) or are not regulated (Latvia, Lithuania, and Estonia).

For Ukraine. The aerodynamic influence on an operating pantograph should not cause an increase in the contact force compared with the average static contact force of more than

1.8 times. For all pantographs being designed, the design wind speed influencing the lifted pantograph shall be assumed as 25 m/s alongside and across the track.

For Russia. The sum of the vertical component of the aerodynamic force acting the lifted operating (rear from the train head) pantograph and active contact force should not exceed 198 N for a heavy pantograph and 144 N for a light pantograph under the condition that electric rolling stock is running at the maximum speed for this pantograph modification and a head wind of not more than 10 m/s.

For electric rolling stock with a design speed of more than 160 km/h, the relation between the aerodynamic component of the contact force of the pantograph slide on the contact wire and the static contact force should not exceed 0.55 at a speed of 160 km/h and 0.60 at a speed of 200 km/h.

Belarus

See Paragraph 5.7.2.9.3.

Lithuania

There are no requirements for the dynamics of interaction between a pantograph and overhead system.

Poland and Slovakia

The requirements of standard EN-50367:2006/AC:2010.

Russia

There are no requirements for the dynamics of interaction between a pantograph and overhead system.

For electric locomotives and electric trains with a design speed of more than 160 km/h, the relation between the aerodynamic component of the contact force of the pantograph slide on the contact wire and the static contact force should not exceed 0.55 at a speed of 160 km/h and 0.60 at a speed of 200 km/h in accordance with NB ZhT TsT 03-98 and 04-98.

Ukraine

The aerodynamic influence on an operating pantograph should not cause an increase in the contact force compared with the average static contact force of more than 1.8 times. For all pantographs being designed, the design wind speed influencing the lifted pantograph shall be assumed as 25 m/s alongside and across the track.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	Not regulated
Lithuania	Not regulated
Poland	EN-50367:2006/AC:2010
Russia	Draft standard GOST R Pantographs of Electrified Rolling Stock NB ZhT TsT 03-98 NB ZhT TsT 04-98

Slovakia	EN-50367:2006/AC:2010
Ukraine	TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways
Estonia	Not regulated

5.7.2.9.7 Arrangement of pantographs

Currently, requirements for this parameter are the same in all the countries or are not regulated. A common constituent for these requirements can be identified.

Pantographs shall be installed on roofs of electric locomotives and cars of electric trains. Requirements for the number and arrangement of pantographs for specific rolling stock shall be specified in the technical assignment for the designing of the pantograph.

Additional requirements for Belarus, Russia, and Ukraine. It is necessary to provide for at least one backup pantograph. The reason of this requirement is associated with the necessity of ensuring the safety and continuity of the operation of electric rolling stock in the network and possibility of its evacuation.

The distance between two simultaneously lifted pantographs, as a rule, should be not less than 18 m except for the moment of starting.

Belarus

See Paragraph 5.7.2.9.3.

Lithuania

Pantographs shall be installed on roofs of electric locomotives and cars of electric trains. Requirements for the number and arrangement of pantographs for specific rolling stock shall be specified in the technical assignment for the designing of the pantograph.

Poland and Slovakia

The requirements of standard EN-50367:2006/AC:2010.

Russia

Pantographs shall be installed on roofs of electric locomotives and cars of electric trains. Requirements for the number and arrangement of pantographs for specific rolling stock shall be specified in the technical assignment for the designing of the pantograph.

When an electric locomotive is equipped with two or more pantographs, in normal conditions, power shall be supplied, as a rule, from the rear pantograph from the train head.

It is necessary to provide for at least one backup pantograph.

Ukraine

Pantographs shall be installed on roofs of electric locomotives and cars of electric trains. Requirements for the number and arrangement of pantographs for specific rolling stock shall be specified in the technical assignment for the designing of the pantograph. An electric locomotive should be equipped with at least two pantographs, while the distance between two adjacent pantographs, as a rule, should be not less than 18 m.

The aforementioned requirements are approved by the following documents:

Belarus	Design documentation
Latvia	Not regulated
Lithuania	Not regulated
Poland	EN-50367:2006/AC:2010
Russia	TsRB-393
Slovakia	EN-50367:2006/AC:2010
Ukraine	TsT-TsE-0104 Instruction for the Use of Pantographs of Electrified Rolling Stock in Different Operating Conditions Technical specifications
Estonia	Not regulated

5.7.2.9.8 Running through neutral sections

Currently, requirements for this parameter are the same in all the countries. A common constituent for these requirements can be identified.

A neutral section should be passed at a speed sufficient to avoid stopping within that section.

A neutral section should be passed with the power circuit and auxiliary circuits deenergised.

Belarus, Lithuania, Russia, and Ukraine

A neutral section should be passed at a speed sufficient to avoid stopping within that section.

Prior to passing a neutral section, electric rolling stock should be deenergised (the auxiliary machines and main switch should be switched off). After passing a neutral section, it is necessary to switch on the main switch and electric machines. When necessary, depending on the local conditions, neutral sections may be passed with the pantograph in the lowered position.

Points of switching on and off as well as of lowering and lifting the pantograph on electric rolling stock shall be marked with corresponding signs in accordance with the Rules for Railway Signalling (for Russia – in accordance with Instructions for Signalling TsRB-757).

The length of a neutral section may be not less than 50 m and shall be determined by the length of the in-service electric rolling stock.

Poland and Slovakia

The requirements of standard EN-50367:2006/AC:2010.

The aforementioned requirements are approved by the following documents:

Belarus	Instruction for Signalling at Belarusian Railways
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724

Lithuania	Rules for Railway Signalling
Poland	EN-50367:2006/AC:2010
Russia	TsRB-757
Slovakia	EN-50367:2006/AC:2010
Ukraine	TsSh-0001 – Instruction for Signalling and Communication at Ukrainian Railways
Estonia	

5.7.2.9.9 Insulation of pantograph from rolling stock

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Russia).

The electrical insulation of pantographs of rolling stock shall be ensured by the insulators on which the pantograph is to be mounted. The insulation of pantographs should comply with GOST 9219-88.

Latvia and Lithuania

GOST 9219-88.

Poland and Slovakia

The requirements of the EN-50163:2006/AC:2010 and EN-50124-1:2001/AC:2010 standards apply.

Belarus and Russia

The electrical insulation of pantographs of rolling stock shall be ensured by the insulators on which the pantograph is to be mounted. The insulation of pantographs should comply with GOST 9219-88.

The normative documents do not stipulate any uniform requirements for functional parameters of devices for the protection against external and internal excess voltages with the exception of the safety requirements contained in NB ZhT TsT 144-2003 (electrical strength of insulation, discharge voltage level, and explosion safety). Other parameters shall be stipulated in the technical documentation for a specific device.

Ukraine

The electrical insulation of pantographs of rolling stock shall be ensured by the insulators on which the pantograph is to be mounted. The insulation of pantographs should comply with GOST 9219.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 9219-95 Electric Traction Apparatuses. General Technical Conditions
Latvia	Informatory – GOST 9219-88
Lithuania	GOST 9219-88

Poland	EN-50163:2006/AC:2010 EN-50124-1:2001/AC:2010
Russia	GOST 9219-88
Slovakia	EN-50163:2006/AC:2010 EN-50124-1:2001/AC:2010
Ukraine	GOST 9219-88 Traction Electric Apparatuses. General Technical Requirements
Estonia	

5.7.2.9.10 Pantograph lowering

Currently, requirements for this parameter are different in all the countries or are not regulated.

The pantograph lowering time shall mean the time of lowering the pantograph from the maximum operating height to the retracted position from the starting moment of the movement of the contact skate. In normal conditions, the pantograph lowering time should not exceed:

For Russia – 6 s; at a temperature of ambient air below 30 °C, the pantograph lifting and lowering time may be increased by half.

For Ukraine – 10 s.

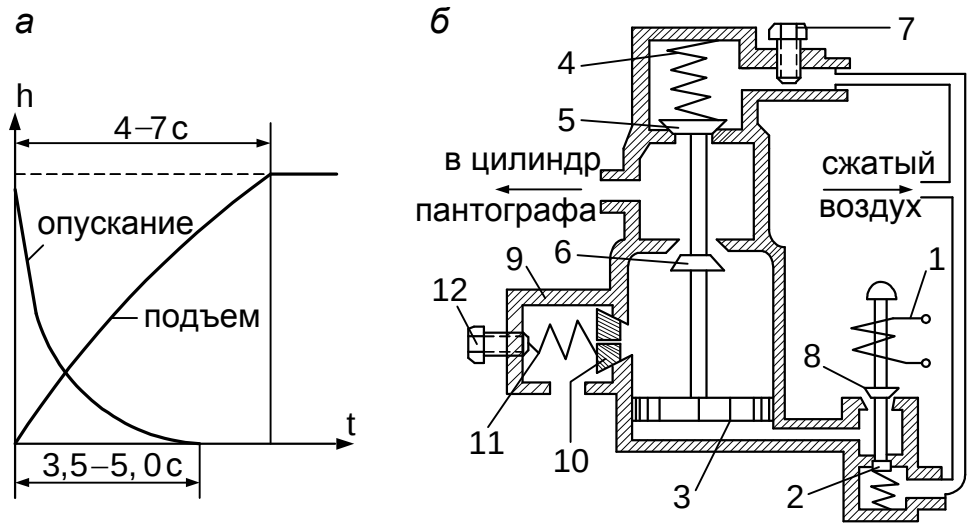
For Latvia, Lithuania, and Estonia, no standard requirements are established, and in practice the requirements for electric rolling stock are regulated by design documentation and are within the range of up to 10 s.

When running at speeds exceeding 160 km/h, in the event of an impact causing the destruction of the upper assembly of the pantograph, emergency lowering of the pantograph should be ensured on electric rolling stock.

Belarus

See Paragraph 5.7.2.9.3.

Latvia



Pantograph valve: a – dependence of the contact skate lifting on time; b (б) – pantograph valve arrangement

Опускание	lowering
Подъем	lifting
в цилиндр пантографа	to the pantograph cylinder
сжатый воздух	compressed air

Lithuania

The pantograph lowering time in normal conditions shall be 3.5-5 s for the TL-13U pantograph and <8 s for the AX-NG 026 BU pantograph .

Poland and Slovakia

The requirements of the EN-50206-1:2010 standard apply.

Russia

When running at speeds exceeding 160 km/h, in the event of an impact causing damage to the upper assembly of the pantograph, emergency lowering of the pantograph should be ensured on electric rolling stock.

The pantograph lowering time in normal conditions should not exceed 10 s.

Ukraine

The pantograph lowering time in normal conditions shall be defined in the technical specifications and should not exceed 10 s.

The aforementioned requirements are approved by the following documents:

Belarus	Design documentation
Latvia	Design documentation
Lithuania	Design documentation
Poland	EN-50206-1:2010
Russia	Draft standard GOST Pantographs of Electrified Rolling Stock

Slovakia	EN-50206-1:2010
Ukraine	Technical specifications TI-514 – Technical Instruction on the Repair and Adjustment of Pantographs of Electrified Rolling Stock
Estonia	Design documentation

5.7.2.10 Protection against failure processes in electrical equipment

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

Protection against emergency processes in the event of short circuits and exceeding of current loads in electrical equipment should be provided for on electric rolling stock. The protection should ensure that the following functions are performed:

- as a result of the activation of the protection system, the failed circuit should be disconnected from the power supply source;

- as a result of the activation of the protection system, the failure of short circuit elements shall not be permitted, except for the elements the failure whereof is provided for in the technical documentation;

- automatic notification (signalling) of the driver of the activation of the protection system should be ensured.

From the viewpoint of observing the principle of interoperability, it is reasonable to establish a uniform value of power of switching and atmospheric overvoltages (or the amplitude and duration of current) influencing the equipment of rolling stock from the overhead system. For the conditions of railways, this indicator shall be selected assuming the following conditions:

- unavailability of means of protection against atmospheric overvoltages in the overhead system;

- energy of overvoltages of up to 120 kJ (for direct current protection devices).

Latvia

Surge arresters

Surge arresters are intended for the protection of electric equipment of an electric train against overvoltages occurring in the overhead system in the event of powerful atmospheric electric discharges. Two arresters shall be installed on the roof of each motored car. Additionally, these units shall protect the equipment against switching overvoltages in the operation of motored and trailer cars. They may reach quite dangerous levels in the event of disconnection of shortcut currents, disconnections of electric circuits, switch-over of contactors, etc.

Technical characteristics of the RMVU-3,3 arrester

Nominal voltage, kV 3

Maximum permissible voltage, kV 4.2

Critical voltage, kV 6.7...7.4

Leakage current at voltage of 4 000 V, uA 80..L20

Technical characteristics of the RVKU arrester

Nominal voltage, kV 4

Critical voltage at frequency of 50 Hz, kV

not less than 5.3

not more than 6

Pulse critical voltage, kV

not less than 7.5

not more than 8.5

Inductive capacitive filter

During the operation of an electric train, severe radio interference can occur, which is caused by sparking of pantographs, switching of traction engines and auxiliary machines, switching-over of contactors, and other equipment. A filter consisting of an inductance coil and capacitor reduces radio interference by approximately 10 times. On electric trains ER2T and ER2, throttle 1DR.050 shall be used.

Capacitor filter 1F.004.

It shall be installed together with a throttle on the roof of a car and be enclosed in a closed metal box. The high-voltage leakage-free paper capacitor has a capacity of 1 uF and is designed for voltage of 6 000 V. The action of the filter is based on the property of the capacitor to easily pass alternating current and not to pass direct current. On the contrary, the inductance coil is not resistant to direct current and provides great resistance to alternating current.

High-speed circuit breaker BVP-105A

The high-speed circuit breaker serves for the protection of the power circuit of traction engines against short-circuit currents and overloads. The main requirement set for the breaker is that it should, as soon as possible, stop the increase of short-circuit current and cut out the circuit under protection while preventing damage to its elements.

When cutting out the circuit by means of ordinary contactors, the short-circuit current has time to reach its maximum value. In the case of the high-speed circuit breaker, breaking of its contacts and arch extinguishing occur much faster, and short-circuit currents do not reach their maximum. The self activation time of the unit is approximately 0.002 s and the arch extinguishing time is approximately 0.003 s; therefore, the total cut-out time is 0.005 to 0.01 s.

High-speed protection contactor (KZ)

This unit protects power circuits of electric trains type ER2T against overloads, short circuits, flashing-over, and flashover to the "ground" in modes of electrical braking. The contactor shall be included in the power circuit diagram from the "ground" side at the section at which currents of anchors and field winding close.

Fuses

Fuses serve for the protection of electric circuits against short circuits and overloads. Their response speed depends on the time of the fusion of the fusible element and arch extinguishing time. In its turn, the fusion time of the fusible element depends on the current, material of the wire, and arch-burning voltage. A big advantage of fuses is their single action and the necessity to replace the fuse or fusion wire after response.

In high-voltage circuits of auxiliary machines and heating systems, PKPS-3 fuses are used.

Technical characteristics of the KPS-3 fuse

Nominal voltage, V	4 000
Nominal current, A	20/31.5
Resistance, Ohm	0.028 to 0.039

In low-voltage control circuits, PR-2 fuses are used most widely. They have screw sockets without filler and fusible elements for currents of 6, 10, 15, 60, 100, and 200 A. Zinc fusible elements have narrowed places (necks) where the plate fuses in the case when current that exceeds the nominal one passes.

Differential relay R104B.

The power circuit of traction engines is protected against overloads and short circuits by means of the high-speed circuit breaker BV, with its setting time of (600 ±50) A.

Overload relay R-103.

This relay is used in power circuits of traction engines and in high-voltage circuits of auxiliary machines of electric trains type ER2. It protects the circuits against overloads and short circuits and shall be marked in electric circuit diagrams as RP1, RP2, RPD, RPK, and RPO.

Voltage reed relay and maximum voltage relay

(RN and RMN) 1R.008.

These relays are used on electric trains with electric braking, and the design thereof is similar to that of a wheel-slipping relay. The response current of the voltage relay RN should be 1.7 to 2.4 mA, the breaking current of the sealed contact should be 0.6 to 2.2 mA, and relay response voltage should be 2 400 V. The relay should break out at 1 700 V. The response voltage of the RMN relay should be adjusted to (3 950 ± 50) V, and the response current should be 2 to 4 mA.

Lithuania

Surge arresters

Surge arresters are intended for the protection of electric equipment of an electric train against overvoltages occurring in the overhead system in the event of powerful atmospheric electric discharges. Additionally, these units shall protect the equipment against switching overvoltages in alternating current circuits.

Technical characteristics of the RVE-25M arrester

Nominal voltage, kV 25

Maximum permissible voltage, kV 29

Critical voltage, kV 58-66

Conduction current at voltage of 28 kV, u 500-620 uA

Technical characteristics of the arrester RVMK-UM

Nominal voltage, kV 2.06

Maximum permissible voltage, kV 25

Critical voltage, kV 3.9-4.7

Maximum design follow current 115 A

Poland and Slovakia

The requirements of standard EN-50388:2005/AC:2010.

Russia

Protection against emergency processes in the event of short circuits and the exceeding of current loads in electrical equipment should be provided for on electric rolling stock. The protection should ensure that the following functions are performed:

– as a result of the activation of the protection system, the failed circuit should be disconnected from the power supply source;

- as a result of the activation of the protection system, the failure of short circuit elements shall not be permitted, except for the elements the failure whereof is provided for the in technical documentation;

- automatic notification (signalling) of the driver of the activation of the protection system should be ensured.

The value of the maximum short-circuit current influencing the equipment of traction rolling stock connected to a contact wire shall be established by Instruction TsE-462 Rules for the Installation of the Traction Power Supply System. Current protection units installed at the inlet of the electrical circuit diagram of rolling stock (alternating current main switches, high-speed circuit breakers, and direct current fuses) shall be designed for these modes. Other characteristics of current protection units (speed of response, ability to cut out low currents, sensitivity to load current surges, stability of operating current, etc.) shall be stipulated by the standard GOST 9219-95 as well as in the design documentation for the specific type of the protection unit. Additionally, the safety standards NB ZhT TsT 144-2003 stipulate obligatory requirements for certain characteristics of units directly influencing the safe operation of rolling stock (electrical strength of insulation, switching capacity, requirements for protective grounding, etc.).

The normative documents do not stipulate requirements for selective response of high-voltage protective power circuit breakers on rolling stock and the traction substation. Furthermore, when selecting the maximum switching capacity of high-speed direct current circuit breakers, it shall be taken into account that the protective circuit breaker of the traction substation will at all times be cut out in the event of a short circuit.

The normative documents do not stipulate any uniform requirements for functional parameters of devices for protection against external and internal excess voltages with the exception of the safety requirements contained in NB ZhT TsT 144-2003 (electrical strength of insulation, discharge voltage level, and explosion safety). Other parameters are be stipulated in the technical documentation for a specific device.

From the viewpoint of observing the principle of interoperability, it is reasonable to establish a uniform value of power of switching and atmospheric overvoltages (or the amplitude and duration of current) influencing the equipment of rolling stock from the overhead system. For the conditions of the Russian railways, this indicator shall be selected assuming the following conditions:

- unavailability of means of protection against atmospheric overvoltages in the overhead system;

- energy of overvoltages of up to 120 kJ (for direct current protection devices).

Ukraine

Protection against emergencies, in the event of short circuits and exceeding of current loads in electrical equipment, should be provided for on electric rolling stock. The protection should ensure that the following functions are performed:

- as a result of the activation of the protection system, the failed circuit should be disconnected from the power supply source;

– as a result of the activation of the protection system, the failure of short circuit elements shall not be permitted, except for the elements the failure whereof is provided for in the technical documentation (fuses);

- automatic notification (signalling) of the driver of the activation of the protection system should be ensured. Signalling devices should comply with GOST 12.2.056-81.

The value of the maximum short-circuit current influencing the equipment of traction rolling stock connected to a contact wire shall be established by Instruction TsE-0009 Rules

for Devices of Traction Electric Power Supply Systems of Ukrainian Railways. Current protection units installed at the inlet of the electrical circuit diagram of rolling stock (alternating current main switches, high-speed circuit breakers, and direct current fuses) shall be designed for these modes. Other characteristics of current protection units (speed of response, ability to cut out low currents, sensitivity to load current surges, stability of operating current, etc.) shall be stipulated by the standard GOST 9219-95 as well as in the design documentation for the specific type of the protection unit.

Besides, the standards of the Rules for Repair for each series of electric rolling stock stipulate obligatory requirements for certain characteristics of units directly influencing the safe operation of rolling stock (electrical strength of insulation, switching capacity, requirements for protective earthing, etc.).

The aforementioned requirements are approved by the following documents:

Belarus	Design documentation
Latvia	Design documentation
Lithuania	Design documentation
Poland	EN-50388:2005/AC:2010
Russia	Instruction TsE-462 Rules for the Installation of the Traction Power Supply System GOST 9219-95 NB ZhT TsT144-2003 Electrical Equipment on Rolling Stock. Safety Standards
Slovakia	EN-50388:2005/AC:2010
Ukraine	GOST 9219 Traction Electric Apparatuses. General Technical Requirements TsE-0009 Rules for Devices of Traction Electric Power Supply Systems of Ukrainian Railways TsE -0023 Rules for Installations and Technical Maintenance of the Overhead Contact System of Electrified Railways
Estonia	Design documentation

5.7.3 Diesel and other thermal traction units

5.7.3.1 Exhaust gases of engines

Currently, requirements for this parameter are different in all the countries. In Russia, the standards of the 1 520 mm gauge system are applied, while the European standards are applied in Member States of the European Union. This parameter will require additional study when introducing the 1 520 mm gauge system to the TSI.

For Ukraine, these indicators are regulated by technological instructions of tests and control of rolling stock.

For Latvia, Lithuania, and Estonia, the chemical composition and quality standards of emissions of chemical compounds in exhaust gases are regulated by the relevant Directives of the European Union and national legislation based on those Directives.

Latvia and Lithuania, and Estonia

The chemical composition and quantitative standards of emissions of chemical compounds in exhaust gases are regulated by the relevant Directives of the European Union and national legislation based on those Directives.

Poland

There are no standards. Upgrading or purchasing of new diesel locomotives shall be in accordance with the EU Directive concerning levels of exhaust gases.

Russia

Standards and methods for the determination of emissions of hazardous substances with exhaust gases and smoke of exhaust gases shall be standardised by the following documents:

- GOST R 50953 – for diesel locomotives;

- GOST R 51249 – in case of bench tests of new diesel engines or diesel engines after major repair.

Ukraine

The following Ukrainian standard is currently under development: Emissions of Hazardous Exhaust Substances and Smoke by Main-Line and Shunting Diesel Locomotives. Standards and Determination Methods.

The aforementioned requirements are approved by the following documents:

Belarus	GOST R 50952, GOST R 50953
Latvia	Rules No. 1047 adopted by the Cabinet of Ministers on 27 December 2005. Rules for the Emission of Air Pollutants from Internal-Combustion Engines of Mobile Machinery Not-Intended for Motor Roads Directives 97/68, 2001/63, 2002/88, 2004/26, and 2006/105
Lithuania	Order No. 715 of the Minister for Environment dated 24 December 2003 regarding the approval of the Methodology LAND 18-2003/M-03 for the assessment of pollution emitted into the environment from locomotives and diesel trains
Poland	Directive 2001/95/EC on general product safety. The General Product Safety Directive (GPSD) EN Standards, European Standards
Russia	GOST R 50953 GOST R 51249
Slovakia	Directive 2001/95/EC on general product safety. The General Product Safety Directive (GPSD) EN Standards, European Standards
Ukraine	Technological instructions for tests and control of rolling stock GSTU 32.001-94 Emissions of Pollutants with Exhaust Gases from Diesel Engines of Diesel Locomotives. Standards and Determination Methods

Estonia	

5.7.3.2 Others Requirements for Diesel and Other Thermal Traction units

- **Electromagnetic compatibility**

Belarus

Уровень мешающего влияния электрооборудования локомотива на рельсовые цепи, путевые устройства сигнализации

Частота сигнального тока (Гц)	Полоса пропускания (Гц)	Допустимый уровень помех (А)
25	19 +21	4,0
	21 + 29	1,0 опасное
	29 + 31	4,0
50 (для системы электроснабжения постоянного тока)	42 +46	5,0
	46 +54	1,3 опасное
	54 +58	5,0
175	167 + 184	0,4
420	408 + 432	0,35
480	468 + 492	0,35
580	568 + 592	0,35
720	703 + 732	0,35
780	768 + 792	0,35
4545	4508 + 4583	0,2
5000	4963 + 5038	0,2
5555	5518 + 5593	0,2

Уровень мешающего влияния электрооборудования локомотива на рельсовые цепи, путевые устройства сигнализации	The level of interfering influence of electrical equipment of the locomotive on rail track circuits and track signalling devices
Частота сигнального тока (Гц)	Signal current frequency (Hz)
Полоса пропускания (Гц)	Band-pass range (Hz)
Допустимый уровень помех (А)	Permissible level of interference (A)
(для системы электроснабжения постоянного тока)	(for direct current electric power supply systems)
опасное	dangerous

The requirements shall apply in the event of a single-wire electric power supply circuit for trailer cars.

Russia

The level of interference from electrical equipment of diesel locomotives and diesel trains on rail track circuits and track signalling devices should comply with NB-02-98 and NB-04-98. The requirements shall apply in the event of a single-wire electric power supply circuit for trailer cars.

Table

Signal current frequency, Hz	Permissible levels of interference	
	Frequency band, Hz	Effective value of harmonic current in case of continuous impact (more than 0.3 s), A, not more than
25	21-29	1.0
50	46-54	1.3
75	65-85	4.1
175	167-184	0.4
420	408-432.	0.35
480	468-492.	0.35
580	568-592.	0.35
720	708-732.	0.35
780	768-792	0.35
4 545	4 507.5-4 582.5	0.2
5 000	4 962.5-5 037.5	0.2
5 555	5 517.5-5 592.5	0.2

Compliance confirmation method

When checking this certification indicator, direct measurements of the level of harmonic disturbances on regulated frequencies in the current of a complete locomotive in all operating modes of the operation of its equipment shall be performed.

It is applicable for self-contained locomotives with centralised electric power supply.

Poland

PN-EN 50121-1:2008

PN-EN 50121-1:2008/AC:2008

PN-EN 50121-2:2010

PN-EN 50121-3-1:2010

PN-EN 50121-3-2:2009

PN-EN 50121-4:2008 + PN-EN 50121-4:2008/AC:2008

PN-EN 50121-5:2008 + PN-EN 50121-5:2008/AC:2008

- **External noise from an operating engine**

Belarus

GOST 12.2.056, GOST R 50951

Russia

In accordance with GOST R 50951, NB-02-98, and NB 04-98, the maximum permissible level of external noise caused by a diesel locomotive, diesel train, rail bus, or railcar when running at a speed equal to 2/3 of the design speed, in the traction mode with the utilisation rate of the traction power of not less than 2/3, at a distance of 25 m from the centreline of the track should be not more than:

when running on a continuous track – 84 dBA;

when running on a jointed track – 87 dBA.

Poland

PN-EN ISO 3095:2005

PN-K-11000:1992

- TSI NOISE

Requirements for diesel fuel

Belarus

STB 1658-2006 Fuels for Internal Combustion Engines. Diesel Fuel. Technical Requirements and Test Methods

STB 1657-2006 Fuels for Internal Combustion Engines. Fatty Acid Methyl Esters (FAME) for Diesel Engines. Technical Requirements and Test Methods

STB 1656-2006 Fuels for Internal Combustion Engines. Unleaded Gasoline. Technical Requirements and Test Methods

Russia

Fuel class “L” (summertime) and “Z” (wintertime) in accordance with GOST 305-82 is used for diesel engines.

Poland

PN-EN 590+A1:2010

- **Water treatment issues**

The quality of water for the refilling of cooling systems of diesel locomotives and diesel trains should comply with TsTChS-50 Instruction for the Treatment and Application of Water for Cooling of Engines of Diesel Locomotives and Diesel Trains (the Instruction is subject to revision in 2011).

Poland

The Instruction of the Minister for Health, Requirements for the Quality of Drinking Water, dated 29 March 2007 – ROZPORZĄDZENIE MINISTRA ZDROWIA1) z dnia 29 marca 2007 r. w sprawie jakości wody przeznaczonej do spożycia przez ludzi2) (Dz. U. z dnia 6 kwietnia 2007 r.)

5.7.4 Input impedance between pantograph and wheels

Requirements for this parameter are not regulated in the 1 520 mm gauge system.

Latvia

Not applicable.

Poland and Slovakia

The requirements of TSI CCS, Annex A, Appendix 1, Clause 3.6.1.

Belarus and Russia

The input impedance between the pantograph and wheel is not regulated.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	
Poland	TSI CCS Annex A appendix 1 clause 3.6.1
Russia	
Slovakia	TSI CCS Annex A appendix 1 clause 3.6.1
Ukraine	
Estonia	

5.8 CAB AND OPERATION

5.8.1 Driver's Cab

5.8.1.1 General provisions

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine). For Latvia, these requirements are of an informatory character.

The sizes of the cab and arrangement of equipment should be designed for the presence of three persons at the same time. The cab should be equipped with work places for the driver and assistant driver. The cab should be equipped with a seat for the accompanying person in accordance with the requirements of the customer.

For newly developed rolling stock, the requirement that the seats for the driver and the accompanying person be available in the cab shall be allowed.

Limit permissible sound and sound pressure levels in octave frequency bands in the driver's cab

Sound pressure levels, dB, in octave frequency bands with average geometric frequencies, Hz									Volume levels, dBA, not more than
31/5	63	125	250	500	1 000	2 000	4 000	8 000	
99	91	83	77	73	70	68	66	64	75

Note: Noise created in the premises by air conditioning, ventilation, air heating systems and other engineering and technical equipment should be 5 dB lower than the actual levels of noise in those premises (measured or determined by calculations) provided that those levels do not exceed the values presented in this table; otherwise, 5 dB lower than the values presented in this table.

Latvia

In the Russian Federation, the following documents exist (for informatory use):

NB ZhT TsT 01-98 Diesels Trains. Safety standards

NB ZhT TsT 01-98 Diesels Trains. Safety standards

Lithuania

The design of a diesel locomotive should provide for the possibility of being controlled by one driver.

The sizes of the cab and arrangement of equipment should be designed for the presence of three persons at the same time.

Belarus and Russia

The sizes of the cab and arrangement of equipment should be designed for the presence of three persons at the same time: the driver, assistant driver, and instructor driver in accordance with Paragraph 3.1.1. GOST 12.2.056. The cab should be equipped with work places on the right side for the driver and on the left side for the assistant driver. In the cab, there should be a seat for the instructor driver. In a cab of diesel locomotives in accordance with GOST 22339-77, not having a seat for the instructor driver is permitted.

Limit permissible levels of sound and sound pressure in octave-frequency bands in the driver's cab

Levels of sound pressure, dB, in octave-frequency bands with geometric mean frequency, Hz									Sound levels, dBA, not more than
31.5	63	125	250	500	1 000	2 000	4 000	8 000	
99	91	83	77	73	70	68	66	64	75

Note: Noise caused in rooms by air conditioning, air ventilation, and air heating systems, etc. and other engineering and technical equipment should be 5 dB lower than actual noise levels in those rooms (measured or determined by calculations) provided that these levels do not exceed the values indicated in this table; otherwise, 5 dB below the values indicated in this table.

Obligatory requirements for noise levels in the driver's cab (maximum permissible sound and sound pressure levels in octave frequency bands) are specified in SP 2.5.1336-03, SP 2.5.1198-03, (in the SSFZhT system: NB ZhT TsT 03, NB ZhT TST 01, NB ZhT TsT 02, NB ZhT TsT 04) – see the table.

It is also necessary to take into account the requirements of GOST 12.1.003.

Slovakia

UIC 651

Ukraine

The sizes of the cab and arrangement of equipment should be designed for the presence of three persons, i.e. the driver, assistant driver, and instructor driver, at the same time. The cab should be equipped with work places for the driver (on the right side) and assistant driver (on the left side). The cab should have a seat for the instructor driver.

The aforementioned requirements are approved by the following documents:

Belarus	NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives GOST 12.1.003 SSBT (Occupational Safety Standards System). Noise. General Safety Requirements
Latvia	Technical assignment
Lithuania	GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements. (Informatory) GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 617-6 Regulations covering the layout of drivers' compartments in powered stock
Poland	In accordance with UIC 651, PN-K-11001:1990, UIC 612, and UIC 617-6
Russia	GOST 12.2.056 GOST 22339-77 SP 2.5.1336-03 SP 2.5.1198-03 NB ZhT TsT 03 NB ZhT TsT 01 NB ZhT TsT 02 NB ZhT TsT 04
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements

Estonia	

5.8.1.2 Access and egress

5.8.1.2.1 Access and egress in operating conditions

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

The requirements for entrance doors, vestibule platforms, locks and handles of doors, devices fixing entrance doors in the open position, steps and handrails for lifting entrance doors, and devices preventing unauthorised persons from entering the cab shall be stipulated by GOST 12.2.056-81 or equivalent documents concerning safety requirements in each country. Requirements for handrails and handles of doors (including those for the additional handle on the entrance door) shall be regulated by SNiET 6.35 or equivalent documents.

The height of the doorway of the entrance door of locomotives should not be less than 1 780-40 mm (in accordance with GOST 12.2.056-81).

The width of the doorway of the entrance door of locomotives with a coach-type body should not be less than 530 mm, and the width of doors of locomotives with a hood-type body should not be less than 500 mm (for Ukraine, up to 400 mm shall be permitted).

The entrance door on locomotives with a coach-type body should open inward into the vestibule platform (machinery compartment). The height of the doorway of the door to the driver's cab of multi-unit rolling stock should be (SP 2.5.1198-03) at least 1 750 mm, and the width should be at least 530 mm.

Belarus

In accordance with GOST 12.2.056, NB ZhT TsT 03, NB ZhT TsT 01, NB ZhT TsT 02, and NB ZhT TsT 04.

Latvia and Lithuania

The arrangement and design of the entrance door of the driver's cab and coach-type body should ensure free entry to and exit from the locomotive. Entrance doors on locomotives with coach-type bodies should open inward into the vestibule (machinery compartment, cab).

On locomotives with hood-type bodies entrance doors to the driver's cab should open outward to the lateral platform and inward into the cab, with the central position of the door opening directly to the end platform.

Capote doors should open towards the external platform of the locomotive. Entrance doors should be fitted with locks with handles which should be in the horizontal position when the door is closed. On locomotives with the coach-type body, handles of outer doors should have a closed contour. On doors of vestibule platforms, cabs of locomotives with a coach-type body, and entrance doors of cabs, doors with hood-type body, it shall be permitted to install open-profile handles with the end bent towards the door.

Entrance doors should be fitted with devices fixing them in the open position.

The height of the doorway of entrance doors should be 1 780-40 mm.

For diesel locomotives, it shall be allowed to reduce the height of the doorway to 1 680 mm, while the upper edge of the doorway should be at a height of 1 780 mm from the floor of the cab or vestibule for doors of the machine (diesel engine) compartment. The height of the hood door should not be less than 1 230 mm.

The width of the doorway of the entrance door of locomotives with a coach-type body should not be less than 530 mm. On locomotives with a hood-type body, the width of the doorway of the entrance doors should not be less than 500 mm. On locomotives with a hood-type body, it shall be allowed to install doors with the width narrowing from 500 to 400 mm from the height of 1 400 mm towards the top.

The dimensions of doorways on locomotives to be built in accordance with the clearance gauges 01-T, 02-T, and 03-T in accordance with GOST 9238-83 shall be established on the basis of agreement between the developer and the customer.

For newly designed rolling stock – the requirements of the TSI LOC&PAS apply.

Poland

In accordance with UIC 651, PN-K-11001:1990 and UIC 617-6.

Russia

The requirements for entrance doors, vestibule platforms, locks and handles of doors, devices fixing entrance doors in the open position, steps and handrails for lifting entrance doors, and devices preventing unauthorised persons from entering the cab shall be stipulated by GOST 12.2.056-81. Requirements for handrails and handles of doors (including those for the additional handle on the entrance door) shall be regulated by SNiET 6.35.

The height of the doorway of the entrance door of locomotives should be not less than 1 780-40 mm (in accordance with GOST 12.2.056-81).

The width of doorways on locomotives with a coach-type body should not be less than 530 mm.

Entrance doors on locomotives with coach-type bodies should open inward into the vestibule (machinery compartment). The height of the doorway of the doors to the driver's compartment of multi-unit rolling stock (SP 2.5.1198-03) should be at least 1 750 mm, and the width should be at least 530 mm.

Slovakia

UIC 651.

Ukraine

The arrangement and design of the entrance door of the driver's cab and coach-type body should ensure free entry to and exit from the locomotive. Entrance doors on locomotives with coach-type bodies should open inward into the vestibule (machinery compartment, cab).

On locomotives with hood-type bodies, entrance doors to the driver's cab should open outward to the lateral platform and inward into the cab, with the central position of the door opening directly to the end platform.

Entrance doors should be fitted with locks with handles which should be in the horizontal position when the door is closed.

On locomotives with the coach-type body, handles of outer doors should have a closed contour. Entrance doors should be fitted with devices fixing them in the open position.

The height of the doorway of entrance doors should be 1 780-40 mm.

For diesel locomotives, it shall be allowed to reduce the height of the doorway to 1 680 mm, while the upper edge of the doorway should be at a height of 1 780 mm from the floor of the cab or vestibule for doors of the machine (diesel engine) compartment.

The width of the doorway of the entrance door of locomotives with a coach-type body should not be less than 530 mm. On locomotives with a hood-type body, the width of the doorway of the entrance doors should not be less than 500 mm. On locomotives with a hood-type body, it shall be allowed to install doors with the width narrowing from 500 to 400 mm from the height of 1 400 mm towards the top.

The dimensions of doorways on locomotives to be built in accordance with the clearance gauges 01-T, 02-T, and 03-T in accordance with GOST 9238-83 shall be established on the basis of agreement between the developer and the customer.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	Technical assignment
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 617-6 Regulations covering the layout of drivers' compartments in powered stock UIC 617-5 Special safety regulations for drivers' cabs of tractive units
Poland	In accordance with UIC 651, PN-K-11001:1990, UIC 617-6
Russia	GOST 12.2.056-81 SNiET 6.35 SP 2.5.1198-03 NB ZhT TsT 03 NB ZhT TsT 01 NB ZhT TsT 02 NB ZhT TsT 04
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements

	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.1.2.2 Driver's cab emergency exits

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

One lateral window on each side of the driver's cab should have an opening so that it could be used as an emergency exit after breaking the glass (in the event of an accident). In accordance with GOST 12.2.056, the opening of an opened window should have a width of not less than 520 mm on locomotives with hood-type bodies and not less than 450 mm on locomotives with coach-type bodies. The lower edge of the window should be at a height of 1 000±50 mm from floor level and at a height of 850±50 mm on locomotives with hood-type bodies.

The requirements for multi-unit rolling stock shall be determined by technical conditions for each specific type of multi-unit rolling stock during its development.

The driver's cab should be equipped with devices ensuring safe evacuation of the locomotive crew through lateral windows. Such devices may be in the form of rope ladders, tethers, and rescue ropes, the lower step whereof should reach the rail head when in the operating position.

Evacuation devices should correspond to the operating load of not less than 1.5 kN.

Belarus

These requirements are stipulated by GOST 12.2.056, NB ZhT TST 01, NB ZhT TsT 02, NB ZhT TsT 04.

Lithuania

In accordance with the requirements of the following:

UIC 617-6 Regulations covering the layout of drivers' compartments in powered stock

UIC 617-5 Special safety regulations for drivers' cabs of tractive units

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Russia

In accordance with SNiET 6.35, "One lateral window on each side of the driver's cab should have an opening so that it could be used as an emergency exit after breaking the glass (in the event of an accident). In accordance with GOST 12.2.056, "the opening of an opened window should have a width of not less than 520 mm on locomotives with hood-type bodies and not less than 450 mm on locomotives with coach-type bodies."

The driver's cab should be equipped with devices ensuring safe evacuation of the locomotive crew from any side of the electric locomotive. Such devices may be in the form of

rope ladders, tethers, and rescue ropes, the lower step whereof should reach the rail head when in the operating position.

The locomotive crew should be evacuated through lateral windows of the driver's cab. For this purpose, it is necessary to envisage an auxiliary means (a tether, etc.) (TsT-6). This requirement shall not cover multi-unit rolling stock.

Evacuation devices should correspond to the operating load of not less than 1.5 kN. (NB ZhT TsT 01-04).

Slovakia

UIC 651

Ukraine

The locomotive crew should be evacuated through lateral windows of the driver's cab. For this purpose, it is necessary to envisage an auxiliary means (a tether, etc.). This requirement shall not cover multi-unit rolling stock.

The opening of an opened window should have a width of not less than 520 mm on locomotives with hood-type bodies and not less than 450 mm on locomotives with coach-type bodies and multi-unit rolling stock, and a height of not less than 500 mm. The lower edge of the window should be at a height of 1 000±50 mm from the floor level and at a height of 850±50 mm on locomotives with hood-type bodies.

The driver's cab should be equipped with devices ensuring safe evacuation of the locomotive crew from any side of the electric locomotive. Such devices may be in the form of rope ladders, tethers, and rescue ropes, the lower step whereof should reach the rail head when in the operating position.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 04 Electric Locomotives
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	UIC 617-6 Regulations covering the layout of drivers' compartments in powered stock UIC 617-5 Special safety regulations for drivers' cabs of tractive units GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6
Russia	SNiET 6.35 GOST 12.2.056

	NB ZhT TsT 01 NB ZhT TsT 02 NB ZhT TsT 04
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.1.2.3 Means for the driver to receive and transfer service documentation

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent for these requirements can be identified (for all the countries).

It is necessary to envisage the possibility to accept and hand over service documents through the lateral windows of the driver's cab.

Lithuania

In accordance with the requirements of the following:

UIC 617-6 Regulations covering the layout of driver' compartments in powered stock

UIC 617-5 Special safety regulations for drivers' cabs of tractive units

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Belarus and Russia

In accordance with GOST 12.2.056-81, lateral windows of the driver's cab should be opened by shifting the movable section within the plane of the lateral wall of the cab horizontally or vertically. The lower edge of the opening of an open lateral window on locomotives with a coach-type body should be at a height of 1 000±50 mm from the floor. The opening of an open window should have a width of not less than 520 mm on locomotives with a hood-type body and not less than 450 mm on locomotives with a coach-type body.

Slovakia

UIC 651

Ukraine

The lateral windows of the driver's cab should be opened by shifting the movable section within the plane of the lateral wall of the cab horizontally or vertically. The lower edge of the opening of an open lateral window on locomotives with a coach-type body should be at a height of 1 000±50 mm from the floor. The opening of an open window should have a width of not less than 520 mm on locomotives with a hood-type body and not less than 450

mm on locomotives with a coach-type body and on multi-unit rolling stock, and a height of not less than 500 mm.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	Technical assignment
Lithuania	UIC 617-6 Regulations covering the layout of driver' compartments in powered stock UIC 617-5 Special safety regulations for driver' cabs of tractive units GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6
Russia	GOST 12.2.056-81
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.1.3 External visibility

5.8.1.3.1 Visibility from the driver's position

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Lithuania, Russia, and Ukraine).

The requirements for visibility conditions are specified in GOST 12.2.056 (for all the countries) and in SNiET 6/35, SP 2.5.1336 (for Russia).

The driver's cab should be located in the locomotive in such a manner that visibility of the track line, wayside signals, and contact wire is ensured for the driver and assistant driver (where available) in both the sitting and standing position from the driver's cab.

The driver's cab should be fitted with a glass cover that ensures the visibility of the track line and wayside signals as well as adjacent tracks and trains.

Belarus

The requirements for visibility conditions are specified in GOST 12.2.056.

Lithuania

The driver's cab should be located in the locomotive in such a manner that visibility of the track line, wayside signals, and contact wire is ensured for the driver and assistant driver in both the sitting and standing position from the driver's cab as well as visibility for the driver and assistant driver in the standing position of cars when approaching the train and working area of the personnel taking part in shunting operations. The distance from the front edge of the automatic coupler head of shunting locomotives to the beginning of a straight-line section where the driver and assistant driver, in the standing position when leaning out from the lateral window by 150 mm (from the outer surface of the window to the saggital plane of the head at eye level), can see the most remote rail forward in the direction of movement not exceeding 45 m.

The requirements of UIC 617-7 Regulations concerning conditions of visibility from driving compartments of electric powered stock.

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Russia

The requirements for visibility are specified in GOST 12.2.056; SNiET 6/35; and SP 2.5.1336.

"The driver's cab should be located in the locomotive in such a manner that visibility of the track line, wayside signals, and contact wire is ensured for the driver and assistant driver in both the sitting and standing position from the driver's cab." "The driver's cab should be fitted with a glass cover that ensures visibility of the track line and wayside signals as well as adjacent tracks and trains."

The conditions of visibility from the driver's cab in accordance with SNiET 6/35 are regulated similarly to Appendix F. The initial anthropometric characteristic of persons determining visibility conditions, which do not coincide with the characteristics indicated in Appendix E to the draft TSI, are specified.

Figures will follow.

Slovakia

UIC 651

Ukraine

The driver's cab should be located in the locomotive in such a manner that visibility of the track line, wayside signals, and contact wire is ensured for the driver and assistant driver in both the sitting and standing position from the driver's cab as well as visibility for the driver and assistant driver in the standing position of cars when approaching the train and working area of the personnel taking part in shunting operations. The distance from the front edge of the automatic coupler head of shunting locomotives to the beginning of a straight-line section where the driver and assistant driver, in the standing position when leaning out from the lateral window by 150 mm (from the outer surface of the window to the saggital plane of the head at the eye level), can see the most remote rail forward in the direction of movement not exceeding 45 m.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System).

	Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 617-7 Regulations concerning conditions of visibility from driving compartments of electric powered stock UIC 651
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6
Russia	GOST 12.2.056 SNiET 6/35 SP 2.5.1336
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.1.3.2 Rear and side visibility

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Lithuania, Latvia, Russia, and Ukraine).

In accordance with GOST 12.2.056-81, "Lateral windows of the driver's cab should be opened by shifting the movable section within the plane of the lateral wall of the cab horizontally or vertically". The height of the lower edge of the opening of an open window from the floor and the doorway width are regulated. The installation of protection shields, train view mirrors, arm rests of lateral windows, and fixing elements are also regulated. Conditions for safe and effective movement control when driving, for shunting movements on tracks while ensuring visibility conditions, and arrangement of work places in the driver's cab should be made with due regard to placing them near lateral windows while ensuring visibility of cars from both driving sides.

Lithuania

A train view mirror should be installed outside the driver's cab, on the side of the driver and assistant driver, on locomotives with coach-type bodies and on Type 1 diesel locomotives in accordance with GOST 22339-77. The mirror should not go beyond the

clearance gauge of protection shields. The shape of the mirror shall be agreed upon by the developer and the customer.

The requirements of UIC 617-7 Regulations concerning conditions of visibility from driving compartments of electric powered stock.

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Belarus and Russia

In accordance with GOST 12.2.056, "Lateral windows of the driver's cab should be opened by shifting the movable section within the plane of the lateral wall of the cab horizontally or vertically". The height of the lower edge of the opening of an open window from the floor and the doorway width are regulated. The installation of protection shields, train view mirrors, and arm rests of lateral windows are also regulated. SNiET 6/35 and SP 2.5.1336-03 regulate the fixing elements of the extensible or drop-down part of the lateral window.

In accordance with SP 2.5.1336-03, conditions for safe and effective movement control when driving, for shunting movements on tracks while ensuring visibility conditions, and arrangement of work places in the driver's cab should be made with due regard to placing them near lateral windows while ensuring visibility of cars from both driving sides.

Slovakia

UIC 651

Ukraine

A train view mirror should be installed outside the driver's cab, on the side of the driver and assistant driver, on locomotives with coach-type bodies and on Type 1 diesel locomotives in accordance with GOST 22339-77. The mirror should not go beyond the clearance gauge of protection shields. The shape of the mirror shall be agreed upon by the developer and the customer.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 617-7 Regulations concerning conditions of visibility from driving compartments of electric powered stock
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6
Russia	GOST 12.2.056 SNiET 6/35

	SP 2.5.1336-03
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.1.4 Interior layout

Currently, requirements for this parameter are the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

The requirements for the interior layout of the driver's cab shall take into account the anthropometric characteristics of the driver (assistant driver). The work place of the driver should ensure convenient operation of rolling stock in a free posture sitting or standing. The presence of three persons in the driver's cab shall be envisaged (See Paragraph 5.8.1.1 "General" of this document).

Latvia

Mutual arrangement of the control panel and work places shall be in accordance with […] and ensure convenient operation of the electric train in both sitting and standing position. The shape and design of the control panel as well as arrangement of controls and information displays shall ensure free movement of the upper and lower limbs of the driver and convenient and simultaneous monitoring of information displays and oncoming section of the track. The control panel shall be divided into three areas: traction, braking, and emergency signalling and auxiliary switchings. Regularly used devices shall be located in the optimum area of the information field of the work place.

The requirements of the following standards shall be used in Latvia as the reference source:

GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements

GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements

Lithuania

The interior layout of the driver's cab shall be arranged in accordance with the requirements of the following:

GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements

UIC 617-6 Regulations covering the layout of drivers' compartments in powered stock

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Belarus and Russia

The requirements for the interior layout of the driver's cab shall take into account the anthropometric characteristics of the driver (assistant driver). The anthropometric characteristics shall be the same as in Appendix F to the TSI (SP 2.5.1336 and SNiET 6/35).

The work place of the driver should ensure convenient operation and servicing of traction rolling stock in a free posture sitting or standing as he desires. The presence of three persons (including the driver, assistant driver, and instructor driver) in the driver's cab shall be envisaged (See Paragraph 5.8.1.1 "General" of this document).

Slovakia

UIC 651

Ukraine

Mutual arrangement of the control panel and seats of the driver and assistant driver should be in compliance with GOST 22269 and ensure convenient operation of the electric rolling stock in both sitting and standing position. The shape and design of the control panel as well as arrangement of controls and information displays shall ensure free movement of the upper and lower limbs of the driver and convenient and simultaneous monitoring of information displays and oncoming section of the track. The control panel shall be divided into three areas: traction, braking, and emergency signalling and auxiliary switchings. Regularly used devices shall be located in the optimum area of the information field of the work place.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements
Latvia	GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements (of informatory character) GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements (of informatory character) GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 617-6 Regulations covering the layout of drivers' compartments in powered stock UIC 651
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6

Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements SP 2.5.1336 SNiET 6/35
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements
Estonia	

5.8.1.5 Driver's seat

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

Traction rolling stock should be equipped with standard seats with certain adjustment features necessary for ensuring visibility from the driver's cab in accordance with Paragraph 5.8.1.3.1 and to be in compliance with technical specifications.

Belarus

The driver's seat and arrangement thereof should comply with the requirements of GOST 12.2.056-81 and NB ZhT TST-TsP 053-2001.

Latvia

Seats shall be rigidly fixed to the floor of the driver's cab and the seat shall rotate 180-360º around the vertical axis of the base structure and allow for fixing in the working position. Installation without rigid fixing to the floor shall be permitted subject to agreement between the manufacturer and the customer. The position of the seat bottom shall be adjustable in respect to the floor level and in the longitudinal direction.

Lithuania

The driver's seat and arrangement thereof should comply with the requirements of the following standards:

GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements

UIC 651 Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers.

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Russia

The entire set of the corresponding requirements is set forth in NB ZhT TST-TsP 053-2001.SP 2.5.1336; SNiET 6/35.

Slovakia

UIC 651

Ukraine

Seats shall be rigidly fixed to the floor of the driver's cab and the seat shall rotate 360º around the vertical axis of the base structure and allow for fixing in the working position. Installation without rigid fixing to the floor shall be permitted subject to agreement between the manufacturer and the customer. The seat bottom should be inclined by 3-6º from the horizontal plane towards the seat back. The position of the seat bottom shall be adjustable within a range of 420-600 mm in respect to the floor level by the height of the surface of the seat and by 200 mm in the longitudinal direction.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81, NB ZhT TST-TsP 053-2001
Latvia	Informatory – GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements GOST 21889-76 Man-Machine System. Human Operator's Chair. General Ergonomic Requirements GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 651 Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6
Russia	NB ZHT TST-TsP 053-2001 SP 2.5.1336 SNiET 6/35
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and

	Electric Trains. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements
Estonia	

5.8.1.6 Driver's Desk – Ergonomics

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

The main controls of the locomotive movement and information displays (indicators and signalling devices of assemblies of the main and auxiliary equipment) should be installed at the driver's desk in the right part of the driver's cab in respect of the main driving direction of the locomotive.

The shape and design of the driver's desk and arrangement of controls (handles, switches, and valves) and information displays should ensure free movement of the driver within the area of free access for operating the main controls and convenient observation of information displays and oncoming track section while both sitting and standing.

The requirements for the grouping of controls by functional attributes, shape, and colour of switches, for the use of the lever handle as the control element for the controls of the locomotive movement (controller and electrical and pneumatic brakes) and relation of the direction of its movement with the driving direction as well as information displays shall be regulated.

Belarus

The requirements are stipulated by в GOST 12.2.056-8, GOST 22269-76, NB ZhT TsT 03, NB ZhT TsT 01, NB ZhT TsT 02, and NB ZhT TsT 04.

Latvia

The driver's desk and operating equipment thereof as well as control facilities should be arranged to allow the driver, in his usual driving position, to maintain the normal position while not restricting his mobility. The reading area on the surface of the driver's desk in front of the driver's seat shall be accessible for displaying the train timetable and documents required when driving. Controls should be clearly marked so that they would be recognised by the driver in any situation.

Lithuania

The main controls of the locomotive movement and information displays (indicators and signalling devices of assemblies of the main and auxiliary equipment) should be installed at the driver's desk in the right part of the driver's cab in respect of the main driving direction of the locomotive.

The shape and design of the driver's desk and arrangement of controls (handles, switches, and valves) and information displays should ensure free movement of the upper and lower limbs of the driver within the area of free access of the body field for operating the

main controls and convenient observation of information displays and oncoming track section both in the sitting and standing position.

The controls on the driver's desk should be at a height of 800-1000 mm from the floor. The lower edge of the driver's desk should be at a height not less than 650 mm from the floor.

The driver's brake valve and auxiliary brake valve should be installed at the right side of the driver's desk.

The requirements of UIC 651 Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers.

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 612.

Russia

The complex of the corresponding requirements is specified in SP 2.5.1336; SNiET 6/35 (Chapter 10). Assessment in the certification system shall be made in accordance with the following safety standards: NB ZhT TsT 03; NB ZhT TsT 01; NB ZhT TsT 02, NB ZhT TsT 04.

The shape and design of the driver's desk and arrangement of controls (handles, switches, and valves) and information displays should ensure free movement of the upper and lower limbs of the driver within the area of free access of the body field for operating the main controls and convenient observation of information displays and oncoming track section both in the sitting and standing position.

The corresponding dimensions shall be regulated.

The requirements for the driver's desk in respect to organising the area for the placement of warning forms and timetable book shall be regulated (SNiET 6/35).

Requirements for the grouping of controls by functional attributes, shape, and colour of switches, for the use of the lever handle as the control element for the controls of the locomotive movement (controller and electrical and pneumatic brakes) and relation of the direction of its movement with the driving direction as well as information displays shall also be regulated (SNiET 6/35).

Graphical tools of visual information (graphic symbols, tables, and mnemonic diagrams) should be used for the marking of information display media and controls on the functional panels.

Slovakia

UIC 651 and 612.

Ukraine

The main controls of the locomotive movement and information displays (indicators and signalling devices of assemblies of the main and auxiliary equipment) should be installed at the driver's desk in the right part of the driver's cab in respect of the main driving direction of the locomotive.

The shape and design of the driver's desk and arrangement of controls (handles, switches, and valves) and information displays should ensure free movement of the upper and lower limbs of the driver within the area of free access of the body field for operating the

main controls and convenient observation of information displays and ahead track section both in the sitting and standing position.

The controls on the driver's desk should be at a height of 800-1000 mm from the floor. The lower edge of the driver's desk should be at a height not less than 650 mm from the floor. The control panel of the driver's desk should be inclined towards the driver by an angle of 6-10º in respect of the horizontal plane, and the information panel should be inclined in the direction from the driver by an angle of 30-45º in respect of the vertical plane.

GOST 12.2.056 also specifies the requirements for the grouping of controls by functional attributes, shape, and colour of switches, for the use of the lever handle as the control element for the controls of the locomotive movement (controller and electrical and pneumatic brakes) and relation of the direction of its movement with the driving direction as well as information displays.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements (of informatory character) GOST 12.2.056-81SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character) Instruction UIC No. 651 Layout of driver's cabs in locomotives, railcars, multi-unit trains and driving trailers GOST 30487-97 Electric Trains for Suburban Communication. General Safety Requirements (of informatory character) Instruction OSJD R No. 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 651 Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers UIC 612 Interfaces and other Locomotive Control Devices Instruction OSJD R No. 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock

Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 612Instruction OSJD R No. 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
Russia	SP 2.5.1336 SNiET 6/35 (Chapter 10) NB ZhT TsT 03 NB ZhT TsT 01 NB ZhT TsT 02 NB ZhT TsT 04 Instruction OSJD R No. 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Slovakia	UIC 651 and 612
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements Instruction OSJD R No. 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
Estonia	

5.8.1.7 Microclimate in the driver's cab

Currently, requirements for this parameter are the same in all the countries.

Drivers' cabs should be equipped with heating, ventilation, and air conditioning facilities ensuring normal working conditions for the personnel.

Belarus

The requirements shall be stipulated by GOST 12.2.056-81, NB ZhT TsT 03, NB ZhT TsT 01, NB ZhT TsT 02, and NB ZhT TsT 04.

Lithuania

Maximum permissible concentrations of hazardous substances (carbon monoxide, nitrogen oxides, sulphur dioxide, acrolein, formaldehyde, benzene, toluene, carbon black, and dust) in the driver's cab of a diesel locomotive with closed windows and doors while moving should comply with the requirements of GOST 12.1.005-76.(GOST 12.1.005-88 SSBT

(Occupational Safety Standards System). General Sanitary and Hygiene Requirements for Working Area Air.)

The driver's cab should be equipped with heating and ventilation units.

The parameters of microclimate and methodology for the determination thereof shall be stipulated by the requirements of GOST.

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Russia

By some indicators, the Russian standards (air temperature in the driver's cab, temperature differences by height, between the temperature of the enclosure and air temperature, temperature of the floor and walls, relative humidity, and speed of air movement) mostly correspond to EN 14813. In the 1 520 mm gauge system, the list of indicators by this parameter is broader.

The parameters to be assessed shall include the concentration of the products of incomplete combustion of diesel fuel (carbon monoxide, nitrogen dioxide, and sulphur dioxide) and products of destruction of polymeric materials in the air (SP 2.5.1336, SP 2.5.1198, Safety Standards (NB ZhT)). The condition of the air environment inside drivers' cabs of locomotives should comply with the requirements of hygiene standards for maximum permissible concentration of hazardous substances in the air of the working area.

All non-metal materials used in the structure and finishing of locomotive compartments should comply with the requirements of toxicological safety and be covered with sanitary and epidemiological inspection reports.

The back pressure (excessive air pressure inside the driver's cab) shall be assessed in accordance with SP 2.5.1336, SP 2.5.1198, and NB ZhT 01-04.

The quantity of outside air to be supplied to the compartment for one person shall be regulated.

The complex of the requirements for the microclimate of driver's cabs of locomotives obligatory in the territory of the Russian Federation shall be regulated by SP 2.5.1198 and SP 2.5.1336 (assessment in the certification system shall be made in accordance with NB ZhT TsT 03, NB ZhT TsT 01, NB ZhT TsT 02, and NB ZhT TsT 04). The Russian standards (air temperature in the driver's cab, temperature differences by height, between the temperature of the enclosure and air temperature, temperature of the floor and walls, relative humidity, and speed of air movement) mostly correspond to EN 14813. There are some differences by the following indicators:

- air temperature in the driver's cab in wintertime (at temperatures of the ambient air below +10 ºC, the temperature of the air inside the driver's cab shall be 20 to 24 ºC);
- temperature difference between the enclosure and air (not more than 3-5 ºC);
- horizontal temperature difference (across the width) at the level of 1 500 mm from the floor (not more than 2 ºC at temperatures of the ambient air below +10 ºC);
- temperature of the wall (not less than +15 ºC at temperatures of the ambient air below +10 ºC).

Slovakia

UIC 651. The minimum quantity of air to be refreshed in the driver's cab shall be 30 m^3 for one person.

Ukraine

Maximum permissible concentrations of hazardous substances (carbon monoxide, nitrogen oxides, sulphur dioxide, acrolein, formaldehyde, benzene, toluene, carbon black, and dust) in the driver's cab of a diesel locomotive with closed windows and doors while moving should comply with the requirements of GOST 12.1.005-76.

The driver's cab should be equipped with heating and ventilation systems which should have manual (stepped and smooth) and automatic air temperature control.

The parameters of microclimate and methodology for the determination thereof shall be stipulated by the requirements of GOST.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements NB ZhT TsT 01 Diesel Trains NB ZhT TsT 02 Diesel Locomotives NB ZhT TsT 03 Electric Trains NB ZhT TsT 04 Electric Locomotives
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 12.1.005-76 GOST 12.1.005-88 SSBT (Occupational Safety Standards System). General Sanitary and Hygiene Requirements for Working Area Air UIC 651
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6
Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements SP 2.5.1336 SP 2.5.1198 NB ZhT TsT 03 NB ZhT TsT 01 NB ZhT TsT 02 NB ZhT TsT 04
Slovakia	UIC 651

Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements Instruction OSJD R No. 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
Estonia	

5.8.1.8 Internal lighting

Currently, requirements for this parameter are different in all the countries but are regulated. A common constituent for these requirements can be identified for Latvia, Russia, and Ukraine.

Working illumination in drivers' cabs should be arranged by means of general illumination lamps. The illumination layout should provide for the possibility of turning on the bright light (ensuring an illumination intensity of not less than 20 lux but not more than 60 lux on the working surfaces of the driver's desk assuming the unevenness of illumination 2:1) and low light (ensuring an illumination intensity of 10 to 15 % of the illumination intensity in the "bright light" mode).

The intensity of the emergency illumination should be not less than 3 lux.

Local illumination: the illumination intensity of the place for the train timetable on the motor panel of the driver's desk with smooth and step adjustment from 1 lux to 10 lux. The permissible unevenness of illumination within the working area of the driver's desk shall also be regulated.

The artificial illumination of the scales of the most important graphical tools of visual information, separately for the information and operative panels of the driver's desk and the assistant driver's desk, should be ensured by an independent electric circuit.

Artificial illumination in the driver's cab shall be regulated by GOST 12.2.056-81, OST 32.120-98, SP 2.5.1336-03, and SanPiN 2.2.1/2.1.1.1278-03. (In SSFZhT (the Certification System for the Federal Railway Transport): NB ZhT TsT 03, NB ZhT TsT 01, NB ZhT TsT 02, and NB ZhT TsT 04), or by equivalent documents in each country.

Belarus

Artificial illumination in the driver's cab shall be regulated by 12.2.056-81.

Latvia

The driver's cab shall be equipped with general illumination lamps ensuring an illumination intensity of not less than 20 lux but not more than 60 lux, assuming the unevenness of illumination 2:1, at the level of the driver's desk. The illumination layout shall be envisaged for the turning on of the bright light ensuring the nominal illumination intensity

and low light ensuring an illumination intensity of 10 to 15 % of the maximum illumination intensity.

The requirements of the following standards shall be used in Latvia as the reference source:

GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements.

Lithuania

The nominal illumination intensity at the level of the driver's desk shall be 25-30 lux. The illumination layout should provide for the possibility of turning on the bright light ensuring the nominal illumination intensity and low light ensuring an illumination intensity of 10 % of the nominal illumination intensity.

Local illumination lamps should ensure an illumination intensity of 10-15 lux with smooth adjustment by 1 lux.

Lamps should be arranged in the driver's cab in such a manner that the direct luminous flux from lamps and light flow reflected from mirror surfaces would not be directed to the eyes of the driver when driving the locomotive either in the sitting or standing position.

Poland

In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6.

Russia

Artificial illumination in the driver's cab shall be regulated by GOST 12.2.056-81, OST 32.120-98, SP 2.5.1336-03, and SanPiN 2.2.1/2.1.1.1278-03. (In SSFZhT (the Certification System for the Federal Railway Transport): NB ZhT TsT 03, NB ZhT TsT 01, NB ZhT TsT 02, and NB ZhT TsT 04).

Working illumination in drivers' cabs should be arranged by means of general illumination lamps (electric incandescent lamps). The illumination layout should provide for the possibility of turning on the bright light (ensuring an illumination intensity of not less than 20 lux but not more than 60 lux on the working surfaces of the driver's desk assuming the unevenness of illumination 2:1) and low light (ensuring an illumination intensity of 10 to 15 % of the illumination intensity in the "bright light" mode).

The intensity of the emergency illumination should be not less than 3 lux.

Local illumination: the illumination intensity of the place for the train timetable on the motor panel of the driver's desk with smooth and step adjustment from 1 lux to 10 lux. The permissible unevenness of illumination within the working area of the driver's desk shall also be regulated.

In accordance with SP 2.5.1336-03 and SNiET TsUVS-6/35, "The artificial illumination of the scales of the most important graphical tools of visual information, separately for the information and operative panels of the driver's desk and the assistant driver's desk, should be ensured by an independent electric circuit".

Slovakia

UIC 651

EN 13272

Ukraine

The driver's cab shall be equipped with general illumination lamps ensuring an illumination intensity of not less than 20 lux but not more than 60 lux, assuming the unevenness of illumination 2:1, at the level of the driver's desk. The illumination layout shall be envisaged for the turning on of the bright light ensuring the nominal illumination intensity and low light ensuring an illumination intensity of 10 to 15 % of the maximum illumination intensity. Local illumination lamps should ensure an illumination intensity of 10 lux with smooth adjustment by 1 lux.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	In accordance with UIC 651, PN-K-11001:1990, and UIC 617-6
Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements OST 32.120-98 SP 2.5.1336-03 SanPiN 2.2.1/2.1.1.1278-03 (In SSFZhT (the Certification System for the Federal Railway Transport): NB ZhT TsT 03 NB ZhT TsT 01 NB ZhT TsT 02 NB ZhT TsT 04) SP 2.5.1336-03 SNiET TsUVS-6/35 GOST 12.2.056-81
Slovakia	UIC 651 EN 13272
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.2 Windscreen

5.8.2.1 Mechanical characteristics

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Russia, and Ukraine).

Windscreens should be fitted with safe, polished, and mechanically strong glass.

All glass used in the driver's cab, when their open area exceeds 200 cm^2 (including the glass covers of appliances) should be made of safety glass and carry indelible marking.

Windscreens should be made of the sort of safety glass which, when being broken through or cracked, should remain an entire whole and ensure sufficient protective cover and observation for the driver.

The degree of damage of the windscreen causing loss of its transparency and impairment of the visibility of the railway track should not exceed 80 % in the event of being subject to shock stress with energy of 10 kJ.

Windscreens should be water-resistant and heat-resistant and ensure operating efficiency when being used under conditions of cyclic changes of the temperature of the glass and allow for non-uniform heating with a flow of warm air with a difference in temperature. Specific values of the parameters shall be regulated by national standards.

In terms of dynamic strength, toughened windshield glass should withstand impact by an item with a weight of 0.5 km flying at a speed equal to double the design speed of the traction rolling stock and prevent the penetration by such item. Toughened electrically-heated glass should be fitted with an automatic controller preventing the overheating of the glass. The specific capacity of electric heating should be not less than 0.1 W/cm^2.

Belarus

The requirements are stipulated by в GOST 5727-88 and GOST 12.2.056.

Latvia and Lithuania

Windscreens of the driver's cab on locomotives with a coach-type body should be fitted with safe, polished, and mechanically strong glass.

Requirements

LST EN 15152:2007 Railway Applications. Front windscreens for train cabins.

UIC 617-4 Position of front and side windows and of other windows situated in the driving compartments of electric powered stock.

Poland

Safety glass and heated glass in accordance with UIC 651 and PN-EN-15152:2007.

Russia

In accordance with GOST 12.2.056, "The driver's cab should be fitted with such glass cover that ensures the visibility of the track line and wayside signals as well as adjacent tracks and trains for the driver and assistant driver both in the sitting and standing position". In accordance with SP 2.5.1336-03 and SNiET TsUVS-6/35, "Windscreens shall ensure good

observation for the locomotive crew, without distortion of colours of light signals, in both daytime and night time under any weather conditions. The angle of the installation of the windscreens should be selected so that reflection of outer light signals and internal light sources in them would be avoided".

Windscreens should be fitted with safe, polished, and mechanically strong glass in accordance with GOST 5727-83.

All glass used in the driver's cab, when their open area exceeds 200 cm^2 (including the glass covers of appliances) should be made of safety glass and carry indelible marking.

Windscreens should be made of the sort of safety glass which, when being broken through or cracked, should remain as an entire whole and ensure sufficient protection cover and observation for the driver.

Glass should have a thickness of 22-25 mm and have good visco-elastic properties.

The degree of damage of the windscreen causing loss of its transparency and impairment of the visibility of the railway track should not exceed 80 % in the event of being subject to shock stress with energy of 10 kJ.

Windscreens should be water-resistant and heat-resistant and ensure operating efficiency when being used under conditions of cyclic changes of the temperature of the glass with an amplitude of up to 12-15 ºC and allow for non-uniform heating with a flow of warm air with a difference in temperature of up to 3-4 ºC within a length of 400-500 mm.

Slovakia

UIC 651

EN 15152

Ukraine

The driver's cab should be fitted with glass that ensure the visibility of the track line and wayside signals as well as adjacent tracks and trains for the driver and assistant driver in both the sitting and standing position. Windscreens should prevent any perceptual aberration of the signalling colours adopted for colour signalling on railway transport in accordance with GOST 24179. The transmission factor for the visible portion of the spectrum shall be as follows:

- not less than 75 % for tempered safe glasses;

- not less than 70 % for toughened glasses.

In terms of dynamic strength, toughened windshield glass should withstand impact by a stone or bottle with a weight of 0.5 km flying at a speed equal to double the design speed of the traction rolling stock and prevent the penetration by such stone or bottle. Toughened electrically-heated glass should be fitted with an automatic controller preventing the overheating of the glass. The specific capacity of electrical heating should be not less than 0.1 W/cm^2.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements

Latvia	GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements LST EN 15152:2007 Railway Applications. Front windscreens for train cabins UIC 617-4 Position of front and side windows and of other windows situated in the driving compartments of electric powered stock
Poland	In accordance with UIC 651 and PN-EN-15152:2007
Russia	GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions GOST 12.2.056 SP 2.5.1336-03 SNiET TsUVS-6/35
Slovakia	UIC 651 EN 15152
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions
Estonia	

5.8.2.2 Optical characteristics

Currently, requirements for this parameter are different in all the countries. It is not possible to identify a common constituent for these requirements because of numerous minor differences.

On the other hand, there is certain similarity of requirements in the 1 520 mm gauge system (on the basis of the requirements applicable in Russia and Ukraine).

Windscreens shall ensure good observation for the locomotive crew, without distortion of the colours of light signals, in both daytime and night time under any weather conditions.

The total transmittance factor of glass should be not less than 70 %.

The glasses of the windscreens of the driver's cab, within the field of vision of the driver and assistant driver, should be free from any mirror reflection of appliances, normally illuminating signal lamps of the signalling system, and panel lamps hindering the observation of the track line and wayside signals during the hours of darkness when the headlight and buffer lamps are switched on.

Belarus

The glass of the windscreens of drivers' cabs in locomotives with a coach-type body as well as windows in the front and back walls on locomotives with a hood-type body should prevent optical and colour perceptual aberration of signals.

Latvia and Lithuania

The glass of the windscreens of drivers' cabs in locomotives with a coach-type body as well as windows in the front and back walls on locomotives with a hood-type body should prevent optical and colour perceptual aberration of signals. The light transmittance in the visible portion of the spectrum should be not less than 75 %.

The requirements of

LST EN 15152:2007 Railway Applications. Front windscreens for train cabins

UIC 617-4 Position of front and side windows and of other windows situated in the driving compartments of electric powered stock.

Poland

In accordance with UIC 651 and PN-EN-15152:2007.

Russia

In accordance with SP 2.5.1336-03 and SNiET TsUVS-6/35, windscreens shall ensure good observation for the locomotive crew, without distortion of the colours of light signals, in both daytime and night time under any weather conditions.

The total transmittance factor of glass should be not less than 70 % (in accordance with SP 2.5.1336-03).

Windscreens should be water-resistant and heat-resistant and ensure operating efficiency when being used under conditions of cyclic changes of the temperature of the glass with amplitude of up to 12-15 ºC and allow for non-uniform heating with a flow of warm air with a difference in temperature of up to 3-4 ºC within a length of 400-500 mm.

The glass of the windscreens of the driver's cab, within the field of vision of the driver and assistant driver, should be free from any mirror reflection of appliances, normally illuminating signal lamps of the signalling system, and panel lamps hindering the observation of the track line and wayside signals during the hours of darkness when the headlight and buffer lamps are switched on.

Slovakia

UIC 651

EN 15152

Ukraine

Windscreens should prevent any perceptual aberration of the signalling colours adopted for colour signalling on railway transport in accordance with GOST 24179. The transmission factor for the visible portion of the spectrum shall be as follows:

- not less than 75 % for tempered safe glasses;

- not less than 70 % for toughened glasses.

The glass of the windscreens of the driver's cab, within the field of vision of the driver and assistant driver, should be free from any mirror reflection of appliances, normally illuminating signal lamps of the signalling system, and panel lamps hindering the observation of the track line and wayside signals during the hours of darkness when the headlight and buffer lamps are switched on.

The optical characteristics of toughened glasses of windscreens should comply with the following:

- angle of deflection – not more than 40 angular minutes;

- lack of definition (blur of image) – not more than 14 angular minutes.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	Informatory – GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements LST EN 15152:2007 Railway Applications. Front windscreens for train cabins. UIC 617-4 Position of front and side windows and of other windows situated in the driving compartments of electric powered stock
Poland	UIC 651 PN-EN-15152:2007
Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements SP 2.5.1336-03 SNiET TsUVS-6/35
Slovakia	UIC 651 EN 15152
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 5727-88 Safety Glass for Land Transport. General Technical Conditions
Estonia	

5.8.2.3 Equipment

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Latvia, Lithuania, Poland, Russia, and Ukraine).

All windscreens should be fitted with the following:

- effective de-icing facilities;

- effective windscreen wipers;

- sun-protection blinds or screens;

- water sprays.

Glass equipment of windscreens and front lateral windows intended for the monitoring of the rear-view mirrors should ensure satisfactory observation under any weather conditions.

Levers of wiper blades should have a matte surface and ensure adherence of the wiper blades along the whole length. A wiper should perform its functions under any operating and weather conditions (while moving at the maximum speed, in high wind, dense snow shower, etc.). The drive of the wipers of the windscreen should be adjustable to at least 2 degrees of speed and ensure a cyclic operating mode. When being switched off, it should drive the wipers to the resting position (optimally, in parallel to the upper edge of the window).

Water sprays of windscreens should ensure effective spraying and, when interacting with wipers, cleaning of the windscreen.

Windscreens of locomotives and the front lateral window of shunting locomotives should be equipped with height-adjustable screens protecting against the blinding effect of sun rays. The screens should be made of a material with a light transmittance factor of not more than 0.1.

When turned off, movable elements of the window wiper should not hinder the driver from observing the track in front of the locomotive.

Belarus

In accordance with GOST 12.2.056-81.

Lithuania

Windscreens of locomotives and the front lateral window of shunting locomotives should be equipped, over the whole width, with height-adjustable screens (not less than 2/3 of the height from the upper edge of the window) protecting against the blinding effect of sun rays.

Windows should be equipped with wipers and window heaters.

Movable elements of the window wiper should not hinder the driver from observing the track in front of the locomotive.

Poland

Heating, cleaning, water spraying, and wiping facilities shall be pneumatic or, for upgraded locomotives, electrical.

In accordance with the DTR (technical documentation for the locomotive) technical documentation and WTO (documentation for acceptance for operation).

For newly built locomotives – if purchased, requirements in accordance with TSI LOC&PAS.

Russia

In accordance with SNiET TsUVS-6/35 and SP 2.5.1336-03 (and also, partially, GOST 12.2.056), all windscreens should be fitted with the following:

- effective de-icing facilities;

- effective and sufficiently powerful windscreen wipers;

- sun-protection blinds or screens;

- water sprays.

The heating of windscreens and front lateral windows for the monitoring of the rear-view mirrors should be arranged so that approximately 60 % of the area of the window would not freeze.

Levers of wiper blades should have a matte surface and ensure adherence of the wiper blades alongside the whole length. A wiper should properly perform its functions under any operating and weather conditions (while moving at the maximum speed, in high wind, dense snow shower, etc.). The drive of the wipers of the windscreen should be adjustable to at least 2 degrees of speed and ensure a cyclic operating mode. When being switched off, it should drive the wipers to the resting position (optimally, in parallel to the upper edge of the window).

Water sprays of windscreens should ensure effective spraying and, when interacting with wipers, cleaning of the windscreen.

Slovakia

UIC 651

Ukraine

Windscreens of locomotives and the front lateral window of shunting locomotives should be equipped, over the whole width, with height-adjustable screens (not less than 2/3 of the height from the upper edge of the window) protecting against the blinding effect of sun rays. The screens should be made of a material with a light transmittance factor of not more than 0.1.

Subject to agreement with the customer, windows may be equipped with window washers. Window wipers and window heaters should clean and heat the sector of the window that ensures visibility of the driving way, wayside signals, and contact wire for the driver and assistant driver in both the sitting and standing position as well as observation for the driver and assistant driver in the standing position of cars when approaching the train and working area of the personnel taking part in shunting operations.

When turned off, movable elements of the window wiper should not hinder the driver from observing the track in front of the locomotive. On the outside of the driver's cab of locomotives with a coach-type body as well as at the side of the driver and assistant driver on Type 1 diesel locomotives in accordance with GOST 22339-77, a train observation mirror

should be installed. The mirror should not go beyond the clearance gauge of the protective shields (600x110-160 mm).

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements UIC 617-4 Position of front and side windows and of other windows situated in the driving compartments of electric powered stock
Poland	In accordance with the technical documentation DTR i WTO
Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements SNiET TsUVS-6/35 SP 2.5.1336-03 GOST 12.2.056
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.3 Driver-machine interface

5.8.3.1 Driver's vigilance control function

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Lithuania, Poland, Russia, Ukraine, and Estonia). In the 1 520 mm gauge system, normative documents regulate only the availability of devices for controlling the driver's vigilance. These devices should be included in the list of devices permitted to the use on rolling stock in accordance with the established procedure.

Belarus

A driver's vigilance control device should be installed within the reach of the body field of the driver.

The following shall be used on Belarusian railways: ALSN (Continuous Automatic Locomotive Signalling) with various upgrades and KLUB-U (Locomotive Complex Safety

Device). The method and periodicity of vigilance control shall be stipulated by the operating instructions for these systems.

Latvia

Locomotives and multi-unit rolling stock (diesel trains and electric trains) shall be equipped with a driver's vigilance control device (UKBM).

The UKBM shall be intended for controlling the driver's vigilance when driving rolling stock. The UKBM shall be installed on locomotives equipped with ALSN facilities.

The UKBM should ensure the following:

Preliminary light signalling in the event of a periodical check of the driver's vigilance within a time period of 7±2 s before the moment of activation of the electro-pneumatic automatic stop valve whistle.

Break in the power supply circuit of the electro-pneumatic automatic stop valve in the event of continuous pressing by the driver of the vigilance pedal, vigilance handle, or special vigilance button within a time period exceeding 7±2 s.

The possibility of vigilance acknowledgement by pressing the vigilance handle, vigilance pedal, or vigilance button in case of a single check of vigilance for the change of signal indications of the cab traffic light signals.

The possibility of vigilance acknowledgement by pressing the vigilance handle (vigilance pedal) in the event of a periodical check by light signalling or by applying the vigilance button at any moment before the beginning of emergency braking.

De-energising of the power supply circuit of the electro-pneumatic automatic stop valve when the reverse handle of the controller is in the neutral position, or when the special switch is in the "Standing" position while the travelling speed is higher than the minimum speed controlled by the speed gauge.

Periodical vigilance check irrespective of the travelling speed and location of the reverse handle of the controller in the operating position or special switch in the position "Drive" with the following intervals:

20-30 s – in the event of the "K" (red), "KZh" (red-and-yellow), "B" with "KZh" (white with red-and-yellow), and "Zh" (yellow) lights of the cab traffic light signals as well as after vigilance acknowledgement in the event of a periodical check by the audible signal of the electro-pneumatic automatic stop valve;

70-90 s – in the event of "B" (white) light of the cab traffic light signals after simultaneous pressing of the vigilance handle and auxiliary button controlled by the assistant driver;

90-120 s – in case of "Z" (green) light of the cab traffic light signals.

In the event of operation by one person, multi-unit rolling stock shall be equipped with the Driver's Vigilance Control Telemechanical System (TSKBM). The TSKBM system is intended for the assurance of train traffic safety when operating jointly with ALSN. The system shall ensure continuous control of the working efficiency of the driver by the parameters of galvanic skin resistance. When decreased working efficiency of the driver is detected in accordance with the parameters of galvanic skin resistance, TSKBM shall perform

a vigilance check. When operating jointly with ALSN, TSKBM shall break the circuit supplying voltage to the electro-pneumatic valve, and TSKBM shall transmit to those devices a signal requiring the performance of a vigilance check. In the event of non-acknowledgement of vigilance, the train shall brake automatically. The TSKBM system shall ensure preliminary light signalling by means of the yellow indicator of the light-emitting-diode linear prior to a query for vigilance acknowledgement. In other cases, the indicator shall be off. Pressing of the upper handle of the special vigilance handle shall be recorded as vigilance acknowledgement, while the number of pressing actions shall not be limited.

Lithuania

A driver's vigilance control device should be installed within arm's reach of the driver.

The following shall be used on Lithuanian railways: ALSN (Continuous Automatic Locomotive Signalling) with various upgrades and KLUB-U (Locomotive Complex Safety Device). The method and periodicity of vigilance control shall be stipulated by the operating instructions for these systems.

Poland

Radiostop, SA, (GPS trial period SHP).

Russia

In accordance with SNiET 6/35, the group of information display media and controls on the driver's desk shall include within the traction area, among others, a vigilance control device.

Slovakia

Order No. 250/97 of the Minister for Transport. Code of Laws.

National Technical Specification for the Driver's Vigilance System.

Ukraine

Locomotives and multi-unit rolling stock shall be equipped, within the field of reach of the body field of the driver's work place, with a PKPM driver's vigilance control device (analogue of the UKBM).

PKPM should ensure the following:

Preliminary light signalling in case of periodical check of the driver's vigilance within a time period of 7±2 s before the moment of activation of the electro-pneumatic automatic stop valve whistle.

A break in the power supply circuit of the electro-pneumatic automatic stop valve in the event of continuous pressing by the driver of the vigilance pedal, vigilance handle, or special vigilance button within a time period exceeding 7±2 s.

The possibility of vigilance acknowledgement by pressing the vigilance handle, vigilance pedal, or vigilance button in the event of a single check of vigilance for the change of signal indications of the cab traffic light signals.

The possibility of vigilance acknowledgement by pressing the vigilance handle (vigilance pedal) in the event of a periodical check by light signalling or by applying the vigilance button at any moment before the beginning of emergency braking.

De-energising of the power supply circuit of the electro-pneumatic automatic stop valve when the reverse handle of the controller is in the neutral position, or when the special switch is in the "Standing" position while the travelling speed is higher than the minimum speed controlled by the speed gauge.

Periodical vigilance check irrespective of the travelling speed and location of the reverse handle of the controller in the operating position or special switch in the position "Drive" with the following intervals:

30-40 s – in case of "K" (red), "KZh" (red-and-yellow), "B" with "KZh" (white with red-and-yellow), and "Zh" (yellow) lights of the cab traffic light signals as well as after vigilance acknowledgement in the event of a periodical check by the audible signal of the electro-pneumatic automatic stop valve;

70-90 s – in the event of "B" (white) light of the cab traffic light signals after simultaneous pressing of the vigilance handle and auxiliary button controlled by the assistant driver and in the event of "Z" (green) light of the cab traffic light signals (at a travelling speed below 20 km/h);

90-120 s – in the event of "Z" (green) light of the cab traffic light signals at a travelling speed above 20 km/h in the event of turning to the "night" position.

On new rolling stock, the Automatic Locomotive Signalling of Main-Line Locomotives (ALS-MU), which ensures the following, shall be used:

Receipt and decryption of the signals of ALSN;

Indication of the signals of traffic lights to the driver;

Control and indication of parameters of movement (actual speed, distance covered, and time of the day);

Regular driver's vigilance control by means of indication and light signalling;

Formation and indication of the permissible travelling speed depending on the design features of the locomotive and indications of the cab traffic light signals;

Control and indication of air pressure in the brake manifold of the locomotive;

Control of the travelling speed and braking with the use of automatic-stop equipment in the event of exceeding the permissible speed in accordance with the indications of the cab traffic light signals;

Prevention of spontaneous movement (rolling-down) of the locomotive;

Registration of the parameters of movement in the electronic memory of the registration cassette.

Estonia

General Electric locomotives – the VEPS system for vigilance control, signalling, and emergency braking; designed in Estonia; document Cargo No. 18. For other locomotives – ALSN, document Cargo No. 17.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge.

	Safety Requirements GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements
Latvia	LDz Instruction for the Use and Maintenance of the Driver's Vigilance Control Telemechanical System (TSKBM) No. DR-20/2000 dated 27 July 2000 LDz Instruction for the Technical Maintenance of Continuous Automatic Locomotive Signalling (ALSN) and the Driver's Vigilance Control Devices approved by Order No. DV-3/367 on 26 August 2004
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 31187-2003 Main-Line Diesel Locomotives. General Technical Requirements (Informatory)
Poland	UIC 641 Instruction for traffic Ir-1 (Radiostop)
Russia	SNiET 6/35
Slovakia	Order No. 250/97 of the Minister for Transport. Code of Laws National Technical Specification for the Driver's Vigilance System
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements TsT-TsSh-0072. Instruction for the Technical Maintenance of Continuous Automatic Locomotive Signalling (ALSN) Devices and the Driver's Vigilance Control Devices at Ukrainian Railways Instruction for the Procedure for the Use of Automatic Locomotive Signalling of Main-Line Locomotives Type ALS-MU
Estonia	Cargo No. 18 Cargo No. 17

5.8.3.2 Speed indicator

Currently, requirements for this parameter are presumably the same in all the countries. A common constituent may be identified for these requirements (on the basis of the requirements applicable in Lithuania, Latvia, Ukraine, and Russia). In the 1 520 mm gauge system, normative documents regulate only the availability of devices for controlling the driver's vigilance. These devices should be included in the list of devices permitted for use on rolling stock in accordance with the established procedure.

Belarus

On traction and multi-unit rolling stock, type 3SL-2M speed gauges shall be used (GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions).

Latvia

In Latvia, two types of speed gauges shall be used on locomotives and multi-unit rolling stock (diesel trains and electric trains): 3SL-2M and, on reconstructed electric trains, the KPD-3 complex of means for the collection and registration of data.

Technical characteristics of the 3SL-2M:

Range of the measurement and registration of speed, km/h: 0 to 150

Capacity of the mileage counter, km: 999 999

Duration of the operation of the clock from one full wind-up, hours: not less than 30

Speed gauges shall record on the tape the movement of locomotive "Forward" and "Back".

The speed gauge shall operate from the drive, the design and installation whereof shall ensure the transmission of rotation from the wheels of the locomotive to the driving shaft of the speed gauge at temperatures, °C: -20 to +50

Power supply for the electric circuit of the direct-current speed gauge, V: 50

Operating life of the speed gauge, hours: 40 000

Maximum length of the track to be recorded on one spool tape, km: 2 400

Registered duration of a stop, hours: 24

The KPD-3V complex of means for the collection and registration of data

The KPD-3V shall ensure the registration of the following information:

• on the value of the travelling speed accurate within 1 km/h;

• on the value of pressure accurate within 9.8 kPa (0.1 kgs/cm^2);

• on the value of the current time accurate within 1 s;

• on the condition of signals of the Automatic Locomotive Signalling;

• on the value of the negative acceleration of movement (positive value of acceleration shall not be registered);

• on the direction of movement;

• on the value of the distance covered accurate within 0.01 km;

• on the track code and coding period.

Power supply for the KPD-3V shall be ensured from the on-board system by means of direct-current voltage with nominal voltage values of 50, 75, and 110 V with deviations from the nominal values of 20 to minus 30 %.

Voltage ranges shall be switched-over automatically.

Pulsation within double amplitude with a frequency of 100 to 150 Hz shall be up to 20 % of the nominal value of the inlet voltage (50, 75, and 110 V).

The input power shall be not more than 200 W.

The average service life shall be not less than 10 years.

The limit of the permissible absolute accuracy of the measurement of speed, without taking into account the wheel slide and slippage, shall be ±1.5 km/h within the whole range of temperatures.

The limit of the permissible absolute accuracy of the registration of speed, without taking into account the wheel slide and slippage, shall be ±2.5 km/h within the whole range of temperatures.

Lithuania

The most important devices, including the speed gauge, cab traffic light signals, manometers of the brake manifold and equalising brake valve tank, ampere meters and voltage meters of the power unit and traction engines, should be located within the optimal area of the information field of the driver's work place.

TSI CCS

Poland

In accordance with the DTR technical documentation (technical documentation for the locomotive) and WTO (documentation for acceptance for operation) – UTK.

Russia

In accordance with SNiET 6/35, the informational part of the speed gauge should be located on each driver's desk strictly at the axis of symmetry crossing the centre of the recess. Shifting the installation location of the speed gauge from the axis of symmetry by not more than ±50 mm shall be permitted.

The recommendations for the ergonomic and system-and-technical formation of video images on the display of the driver's desk of locomotives and multi-unit rolling stock (including the presentation of information on the travelling speed (actual, recommended, and maximum permissible), deviations from the timetable, etc.) shall be specified in the Instruction R TsUVSS-6-13.

Slovakia

Order No. 250/97 of the Minister for Transport. Code of Laws.

National Technical Specification for Speed Gauges.

Ukraine

In Ukraine, type 3SL-2M speed gauges shall be used on locomotives and multi-unit rolling stock

Technical characteristics of the 3SL-2M:

Range of the measurement and registration of speed, km/h: 0 to 150

Capacity of the mileage counter, km: 999 999

Duration of the operation of the clock from one full wind-up, hours: not less than 30

Speed gauges shall record on the tape the "Forward" and "Back" movement of the locomotive.

The speed gauge shall operate from the drive, the design and installation whereof shall ensure the transmission of rotation from the wheels of the locomotive to the driving shaft of the speed gauge at temperatures, °C: -20 to +50

Power supply for the electric circuit of the direct-current speed gauge, V: 50

Operating life of the speed gauge, hours: 40 000

Maximum length of the track to be recorded on one spool tape, km: 2 400

Registered duration of a stop, hours: 24

On new rolling stock, the Automatic Locomotive Signalling of Main-Line Locomotives (ALS-MU), which ensures the following, shall be used:

New rolling stock shall be equipped with

Receipt and decryption of the signals of ALSN;

Indication of the signals of traffic lights to the driver;

Control and indication of parameters of movement (actual speed, distance covered, and time of the day);

Regular driver's vigilance control by means of indication and light signalling;

Formation and indication of the permissible travelling speed depending on the design features of the locomotive and indications of the cab traffic light signals;

Control and indication of air pressure in the brake manifold of the locomotive;

Control of the travelling speed and braking with the use of automatic-stop equipment in the event of exceeding the permissible speed in accordance with the indications of the cab traffic light signals;

Prevention of spontaneous movement (rolling-down) of the locomotive;

Registration of the parameters of movement in the electronic memory of the registration cassette.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (of informatory character)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements TSI CCS
Poland	In accordance with the technical documentation DTR i WTO
Russia	SNiET 6/35 Instruction R TsUVSS-6-13
Slovakia	Order No. 250/97 of the Minister for Transport. Code of Laws. National Technical Specification for Speed Gauges

Ukraine	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions TsT-0073 Instruction for the Repair of Locomotive Speed Gauges Instruction for the Procedure for the Use of Automatic Locomotive Signalling of Main-Line Locomotives Type ALS-MU
Estonia	

5.8.3.3 Design and arrangement of the driver's display

Currently, requirements for this parameter are different in all the countries. It is not possible to identify a common constituent for these requirements. This parameter will require additional study when introducing the 1 520 mm gauge system to the TSI.

Belarus and Latvia

Not regulated.

Lithuania

In accordance with the requirements of the TSI CCS.

Poland

UIC 612

In accordance with the DTR technical documentation (technical documentation for the locomotive) and WTO (documentation for acceptance for operation).

Russia

The requirements for the design and arrangement of the driver's display (and recommendations) shall be contained in SNiET 6/35; R TsUVSS-6-13; NB ZhT TsT 03, NB ZhT TsT 01, NB ZhT TsT 02, and NB ZhT TsT 04.

The recommendations for the ergonomic and system-and-technical formation of video images on the display of the driver's desk of locomotives and multi-unit rolling stock shall be specified in the document under the same title (R TsUVSS-6-130).

Slovakia

Instruction UIC 612.

Ukraine

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	Not regulated
Lithuania	UIC 612 TSI CCS
Poland	In accordance with the technical documentation DTR i WTO
Russia	SNiET 6/35; R TsUVSS-6-13

	NB ZhT TsT 03 NB ZhT TsT 01 NB ZhT TsT 02 NB ZhT TsT 04
Slovakia	Instruction UIC 612
Ukraine	
Estonia	

5.8.3.4 Controls and indicators

Currently, requirements for this parameter are the same in all the countries.

The driver's desk should be equipped with the minimum necessary number of information display media (indicators and signalling devices).

Information display media of constant and periodical use should be located on the driver's desk in front of the driver within the longitudinal size of the desk of not more than 1 000 mm.

The most important devices should be located within the optimal area of the information field.

Belarus

The driver's desk should be equipped with the minimum necessary number of information display media (indicators and signalling devices).

Information display media of constant and periodical use should be located on the driver's desk in front of the driver within the longitudinal size of the desk of not more than 1 000 mm.

The most important devices should be located within the optimal area of the information field.

Lithuania

The driver's desk should be equipped with the minimum necessary number of information display media (indicators and signalling devices).

Information display media of constant and periodical use should be located on the driver's desk in front of the driver within the longitudinal size of the desk of not more than 1 000 mm.

Indicators should be pointer-type and digital. Those indicators from which quantitative information shall be read with high precision should have a movable pointer and immovable scale.

The diameter of the case of braking system indicators should be not less than 100 mm, and that of the case of other indicators should be not less than 60 mm.

Signalling devices of the alarm warning signalling system on locomotives should be made in the form of signal lamps or illuminated indicator boards. The signal lamps should have red caps with corrugated or matte surface. Lamps of the warning signalling system

should send a flashing signal with a frequency of 2-5 Hz, and those of the alarm signalling system should send a constantly lighting signal.

Poland

In accordance with UIC 651 and UIC 612.

Russia

The information panel of the driver's desk should be located perpendicularly to the driver's view to the signalling devices (to have a wide protective visor) in order to prevent the phenomena of parallax and mirror reflection in windscreens.

The requirements for information display media (types, grouping, arrangement, and information display levels): in the most comprehensive manner, the requirements are specified in SNiET 6/35. In accordance with SNiET 6/35, it is necessary to envisage the possibility of smooth adjustment of the brightness of scales of information display media depending on the driver's light perception, especially in the event of implementing electronic indicators. It is reasonable to use information display media with built-in illumination ensured by means of light-emitting diodes.

In accordance with SP 2.5.1336:

The illumination layout in the driver's cab should provide for the possibility of local illumination of control and measuring devices of 10 to 15 lux with smooth adjustment of the illumination from 1 to 10 lux.

The local illumination facility of control and measuring devices on the driver's desk should ensure the possibility of adjusting the brightness of scales with the white area: minimum of at least 0.6 Cd/m^2 and maximum of 2 Cd/m^2 to 5 Cd/m^2. In the event of scales with a black area, the white digital imaging of scales should have the aforementioned brightness.

In accordance with SNiET 6/35:

In order to highlight some signals, it is recommended to additionally use an audible signal. Fire, alarm, and wheel slippage light signals should be accompanied by an audible signal. The colour of signals (red and white) sent by signalling devices and constancy of the signal (flashing or constant) shall be regulated.

Slovakia

Instructions of the UIC 651 and 612.

Ukraine

The driver's desk should be equipped with the minimum necessary number of information display media (indicators and signalling devices).

Information display media of constant and periodical use should be located on the driver's desk in front of the driver within the longitudinal size of the desk of not more than 1 000 mm.

The most important devices should be located within the optimal area of the information field.

Indicators should be pointer-type and digital. Those indicators from which quantitative information shall be read with high precision should have a movable pointer and immovable

scale. The diameter of the case of braking system indicators should be not less than 100 mm, and that of the case of other indicators should be not less than 60 mm.

Signalling devices of the alarm warning signalling system on locomotives should be made in the form of signal lamps or illuminated indicator boards. The signal lamps should have red caps with a corrugated or matte surface. Lamps of the warning signalling system should send a flashing signal with a frequency of 2-5 Hz, and those of the alarm signalling system should send a constantly lit signal.

The local illumination facility of control and measuring devices on the driver's desk should ensure the possibility of adjusting the brightness of scales with the white area within the range of minimum values of not more than 0.6 Cd/m^2 to maximum values of not more than 2 Cd/m^2. In the event of scales with a black area, the white digital imaging of scales should have the aforementioned brightness.

The information panel of the driver's desk should be located perpendicularly to the driver's view to the signalling devices (to have a wide protective visor) in order to prevent the phenomena of parallax and mirror reflection in windscreens.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (informatory)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements TsI CCS UIC 651 UIC 612
Poland	UIC 651 and UIC 612
Russia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements SNiET 6/35 SP 2.5.1336
Slovakia	Instructions of the UIC 651 and 612
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements GOST 22269-76 Man-Machine System. Operator's Working Place. Mutual Arrangement of Elements of the Working Place. General Ergonomic Requirements

	Instruction OSJD R No. 652 Technical and Hygiene Requirements for Drivers' Compartments of Traction Rolling Stock
Estonia	

5.8.3.5 Signs and labels in the driver's cab

Currently, requirements for this parameter are presumably the same in all the countries. This parameter requires additional studying in terms of the application of different state standards in each country.

General requirements for all the countries: indication of the maximum speed of the locomotive; inscription prohibiting the passing of a restrictive signal. Tumbler switches, switches, devices, and indicators shall have plates with corresponding inscriptions or digital indications.

Belarus

General requirements for all the countries: indication of the maximum speed of the locomotive; inscription prohibiting the passing of a restrictive signal. Tumbler switches, switches, devices, and indicators shall have plates with corresponding inscriptions or digital indications.

Lithuania

UIC 617-5 Special safety regulations for drivers' cabs of tractive units.

Poland

In accordance with UIC 651 and PN-K-11001:1990.

Russia

Signs and inscriptions in the driver's cab should comply with GOST 12.2.056.

Slovakia

Instructions of the UIC 651.

Ukraine

Signs and inscriptions in the driver's cab should comply with GOST 12.2.056 and local instructions.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (informatory)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (informatory)

	UIC 617-5 Special safety regulations for drivers' cabs of tractive units
Poland	In accordance with UIC 651 and PN-K-11001:1990
Russia	GOST 12.2.056
Slovakia	Instructions of the UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.3.6 Remote control of shunting operations

Currently, requirements for this parameter in the 1 520 mm gauge system are not regulated in all the countries.

Belarus and Latvia

In Latvia, they are not regulated.

Lithuania

Requirements in accordance with the technical assignment for the designing of rolling stock.

Poland

Remote control of shunting operations is not applicable.

Russia

Remote control of shunting operations is not applicable.

Slovakia

Order No. 250/97 of the Minister for Transport. Code of Laws.

Ukraine

Remote control of shunting operations is not applicable.

The aforementioned requirements are approved by the following documents:

Belarus	
Latvia	
Lithuania	Design documentation
Poland	In accordance with the technical documentation DTR i WTO
Russia	
Slovakia	Order No. 250/97 of the Minister for Transport. Code of Laws.
Ukraine	
Estonia	

5.8.4 Onboard kit of tools and signalling accessories

Currently, requirements for this parameter are presumably the same in all the countries.

Locomotives should be equipped with the following:

- set of tools and accessories necessary for the performance of technical maintenance;

- fire extinguishers and fire-fighting equipment;

- set of signalling accessories (signal lamp, flags, and detonating cartridges);

- set of electrical protection equipment and first aid kit;

- individual protection equipment;

- set of brake shoes.

Latvia

Units of hauling equipment shall be fitted with a set of tools and signalling accessories: detonating cartridges, red and yellow signal flags, and signal lamp. Additionally, hauling units shall have dry powder fire extinguishers and carbon dioxide fire extinguishers. Brake shoes shall be available for the anchorage of units.

Belarus and Lithuania

Locomotives should be equipped with a set of signalling accessories in accordance with the effective TOR.

A locomotive should be equipped with a set of tools necessary for the performance of technical maintenance. The list of tools and necessity of electrical insulation of their handles shall be determined by agreement between the manufacturer and the customer.

A locomotive shall be equipped with cabinets and boxes for the storage of signalling accessories and tools.

Poland

Instruction Ir-1 Instruction for Train Traffic at PKP

Russia

Locomotives should be equipped with the following:

- set of tools and accessories necessary for the performance of technical maintenance in accordance with GOST 12.2.056, Paragraphs 1.9.1 and 1.9.2;

- fire extinguishers and fire-fighting equipment in accordance with GOST 12.2.056, Paragraph 1.5.1;

- set of signalling accessories (signal lamp, flags, and detonating cartridges);

- set of electrical protection equipment and first aid kit in accordance with GOST 12.2.056, Paragraph 1.7.6 and 2.17;

- individual protection equipment with Paragraph 7 TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock;

- set of brake shoes.

Slovakia

Order No. 250/97 of the Minister for Transport. Code of Laws.

Ukraine

A locomotive should be equipped with a set of tools necessary for the performance of technical maintenance (the list of tools and necessity of electrical insulation of their handles shall be determined by agreement between the manufacturer and the customer), a set of signalling accessories (detonating cartridges, red and yellow signal flags, and signal lamp), set of electrical protection equipment and individual protection equipment, and a first aid kit with a set of medicines for the provision of pre-medical first aid.

A locomotive shall be equipped with cabinets and boxes for the storage of signalling accessories and tools. Additionally, it is necessary to envisage places for the storage of a number of brake shoes stipulated by the normative and technical documentation.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724 LDz Instruction for the Assurance of Fire Safety of Locomotives, Multi-Unit Rolling Stock, and Passenger Cars, No. DR-64/2004 dated 04 November 2004
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	Instruction Ir-1Instruction for Train Traffic at PKP
Russia	GOST 12.2.056 Paragraphs 1.9.1, 1.9.2 GOST 12.2.056 Paragraph 1.5.1 GOST 12.2.056 Paragraph 1.7.6, 2.17; TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock Paragraph 7
Slovakia	Order No. 250/97 of the Minister for Transport. Code of Laws
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.5 Storage facility for staff personal effects

Currently, requirements for this parameter are presumably the same in all the countries.

The driver's cab or locomotive vestibule should be equipped with a locker for the storage of clothing and personal belongings. The driver's cab not equipped with lockers for clothes should be fitted with hooks for light outer clothing.

Latvia and Lithuania

The driver's cab or locomotive vestibule should be equipped with a locker for the storage of clothing and suitcases (briefcases). The dimensions of the locker shall be as follows: height of not less than 1 200 mm, width of 450-500 mm, and depth of 250-400 mm. It is allowed to have two lockers with a width of 250 mm, and the depth and height as specified above.

Poland

UIC 651

In accordance with the technical documentation DTR (technical documentation for locomotives) and WTO (documentation for acceptance for operation).

Belarus and Russia

The driver's cab or locomotive vestibule should be equipped with a locker for the storage of clothing and suitcases (briefcases). The dimensions of the locker for clothing and personal belongings shall be in accordance with GOST 12.2.056.

The driver's cab not equipped with lockers for clothes should be fitted with hooks for light outer clothing.

Slovakia

UIC 651

Ukraine

The driver's cab or locomotive vestibule should be equipped with a locker for the storage of clothing and suitcases (briefcases). The dimensions of the locker shall be as follows: height of not less than 1 200 mm, width of 450-500 mm, and depth of 250-400 mm. It is allowed to have two lockers with a width of 250 mm, and the depth and height as specified above.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Latvia	Informatory – GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	UIC 651, in accordance with the technical documentation DTR i WTO
Russia	GOST 12.2.056
Slovakia	UIC 651
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements

	DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	

5.8.6 Movement parameters recording device

Currently, requirements for this parameter are presumably the same in all the countries.

The minimally required list of parameters to be recorded on a removable media shall include the following: distance covered, travelling speed, pressure in the brake manifold (pressure in brake cylinders for multi-unit rolling stock), indications of the cab traffic light signals, movement direction, time, driver's vigilance acknowledgement markers, and activated state of the safety devices.

Latvia

In Latvia, two types of speed gauges shall be used on locomotives and multi-unit rolling stock (diesel trains and electric trains): 3SL-2M and, on reconstructed electric trains, a KPD-3 complex of means for the collection and registration of data.

The 3SL-2M shall be used for the performance of the following functions: indication of the travelling speed, distance covered, time of the day, registration of the travelling speed, distance covered, time of the day and standing time, pressure in the brake manifold in the braking mode, registration of the movement direction and signal lights of the cab traffic light signals, and signalling of the controlled speeds (the number of signals – 4). The measurement range shall be 5 to 150 km/h, accuracy ±1.5 km/h; in the other modifications – 5 to 220 km/h, accuracy ±3.0 km/h.

KPD-3V

Range of the linear travelling speed – 0 to 300 km/h.

Range of the linear travelling acceleration – minus 0.99 to 0.99 m/s^2.

KPD-3V shall ensure the measurement and registration of the value of air pressure in the brake manifold within the range of 0 to 980 kPa (10.0 kgs/cm^2).

KPD-3V shall ensure the storage and input for indication at request of the value of the distance travelled in terms of kilometres as a seven-bit decimal number.

KPD-3V shall ensure the reading of the current time from 0 to 23:59.

KPD-3V shall have three inputs for the receipt of information from electricity meters.

KPD-3V shall ensure the registration of the following information on a metallised paper tape:

• on the value of the travelling speed accurate within 2 km/h;

• on the value of pressure on locomotives: in the brake manifold – accurate within 49 kPa (0.5 kgs/cm^2) within the range from 0 to 294 kPa (from 0 to 3.0 kgs/cm^2) and accurate within 9.8 kPa (0.1 kgs/cm) within the range from 294 to 637 kPa (from 3.0 to 6.5 kgs/cm); on multi-unit rolling stock: in the brake cylinder – accurate within 9.8 kPa (0.1 kgs/cm) within the range from 59 to 343 kPa (from 0.6 to 3.5 kgs/cm^2);

• on the value of the current time: for locomotives – accurate within 1 min, and for multi-unit rolling stock – accurate within 30 s;

• on the condition of the lamps of the traffic lights of the automatic brake command and position of the handle of the electro-pneumatic valve;

• on the value of the negative travelling acceleration (on call) as two decimal numbers with a minimum nominal scale point of 0.01 m/s2 (positive acceleration shall not be registered);

• on the direction of movement;

• on the value of the distance travelled accurate within 0.1 km;

• on power consumption for the trip.

Lithuania

Locomotives, diesel trains, and electric trains shall be equipped with radio stations and speed gauges registering the data stipulated by the railway managing body.

The requirements for the list of parameters shall be in accordance with the TSI OPE.

Poland

In accordance with the DTR technical documentation (technical documentation for the locomotive) and WTO (documentation for acceptance for operation) – UTK.

Belarus and Russia

The minimally required list of parameters to be recorded on a removable media shall include the following: distance covered, travelling speed, pressure in the brake manifold (pressure in brake cylinders for multi-unit rolling stock), indications of the cab traffic light signals, movement direction, and time.

Slovakia

Order No. 250/97 of the Minister for Transport. Code of Laws.

Ukraine

In Ukraine, type 3SL-2M speed gauges shall be used on traction and multi-unit rolling stock.

The 3SL-2M shall be used for the performance of the following functions: indication of the travelling speed, distance covered, time of the day, registration of the travelling speed, distance covered, time of the day and standing time, pressure in the brake manifold in the braking mode, registration of the movement direction and signal lights of the cab traffic light signals, and signalling of the controlled speeds (the number of signals – 4). The measurement range shall be 5 to 150 km/h, accuracy ±1.5 km/h; in the other modifications – 5 to 220 km/h, accuracy ±3.0 km/h.

On new rolling stock, the Automatic Locomotive Signalling of Main-Line Locomotives (ALS-MU), which ensures the following, shall be used:

Receipt and decryption of the signals of ALSN;

Indication of the signals of traffic lights to the driver;

Control and indication of parameters of movement (actual speed, distance covered, and time of the day);

Regular driver's vigilance control by means of indication and light signalling;

Formation and indication of the permissible travelling speed depending on the design features of the locomotive and indications of the cab traffic light signals;

Control and indication of air pressure in the brake manifold of the locomotive;

Control of the travelling speed and braking with the use of automatic-stop equipment in the event of exceeding the permissible speed in accordance with the indications of the cab traffic light signals;

Prevention of spontaneous movement (rolling-down) of the locomotive;

Registration of the parameters of movement in the electronic memory of the registration cassette.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions
Latvia	LDz Instruction for the Technical Maintenance of Continuous Automatic Locomotive Signalling (ALSN) and the Driver's Vigilance Control Devices approved by Order No. DV-3/367 on 26 August 2004
Lithuania	ADV-001 Regulation on the Technical Operation of Railways TSI OPE No. 137/T Instruction for the Operation and Repair of Locomotive Speed Gauges System KLUB-U (Locomotive Complex Safety Device). Operating Manual
Poland	In accordance with the technical documentation DTR i WTO
Russia	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions
Slovakia	Order No. 250/97 of the Minister for Transport. Code of Laws
Ukraine	GOST 23213-84 Locomotive Speed Gauges. General Technical Conditions ЦТ-0073 Instruction for the Repair of Locomotive Speed Gauges Instruction for the Procedure for the Use of Automatic Locomotive Signalling of Main-Line Locomotives Type ALS-MU
Estonia	

5.9 *FIRE SAFETY AND EVACUATION*

5.9.1 General provisions and categorisation

(Paragraphs 5.9.1.1-5.9.1.2 are combined in Paragraph 5.9.1)

Currently, requirements for this parameter are the same in all the countries.

Locomotives and multi-unit rolling stock should be equipped with a fire alarm system, fire-extinguishing units, fire-fighting equipment and tools in accordance with the standards of the instruction for the assurance of fire safety on locomotives and multi-unit rolling stock.

Latvia

The fire safety of cars should be ensured by fire prevention and fire-fighting systems and preparedness condition of fire-fighting equipment.

The fire safety system should:

– prevent the occurrence of fire;

– ensure human safety in the event of fire;

– ensure the safety of material values in case of fire.

(Passenger cars for international traffic)

Rules No. 82 adopted by the Cabinet of Ministers of the Republic of Latvia on 17 February 2004. The Rules for Fire Safety stipulate the requirement for the mandatory development of local instruction for fire safety for any legal or natural person.

Locomotives, multi-unit rolling stock, and passenger cars shall be equipped with fire extinguishers, and fire-fighting equipment and tools in accordance with standards.

Rolling stock shall be categorised and equipped with fire equipment (fire alarm equipment, fire prevention equipment, and fire-fighting equipment) in accordance with the Instruction of the Infrastructure Manager.

Main-line diesel locomotives, which are used for hauling freight trains and which are operated by one driver, should be equipped with automatic fire equipment (equipment activation and fire extinguishing shall be performed without the involvement of personnel).

Lithuania

The fire safety of cars should be ensured by fire prevention and fire-fighting systems and preparedness condition of fire-fighting equipment.

The fire safety system should:

– prevent the occurrence of fire;

– ensure human safety in the event of fire;

– ensure the safety of material values in the event of fire.

The fire safety requirements shall cover all traction rolling stock: locomotives, diesel and electric trains, both newly manufactured and after major repair: KR-2. The terms and definitions of the fire safety of traction rolling stock shall be in accordance with the standard LST EN ISO 13943:2000.

The standards of the equipping of rolling stock with primary fire-extinguishing equipment and fire equipment and tools shall be as follows:

Name of rolling stock	Class of fire	Measurement unit	Standard, items								
			Fire extinguishers			Fire equipment			Fire tools		
			Water-and-	Dry powder	Carbon-dioxide	Fire-hose	Fire	Sand box	Axe	Bar	Hook

			powder, 10 l	2	5/10	2	5/8	barrel RS-50 or RSK - 50	hose Ø 50 mm, length 20 m	with a shovel			
Diesel trains	B, E	Train	4	-	2	-	2		-	-	-	-	-
Railcars	B, E	Railcar	1	-	-	1	1	-	-	-	-	-	-
Electric trains:													
Eight-car	A, E	Train	4	-	2	-	2	-	-	2	2	-	2
Four-car	A, E	Train	2	-	1	-	1	-	-	1	1	-	1

Poland

In accordance with PN-K-02511:2000 and PN-K-02507:1997.

In accordance with the requirements of PN-K-02511:2000, PN-K-02507:1997, and UIC 642.

In accordance with the requirements of PN-K-02511:2000 and PN-K-02507:1997.

Belarus and Russia

In order to ensure the safety of passengers and servicing personnel in the event of fire, locomotives and multi-unit rolling stock should comply with the requirements of GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements.

In accordance with the aforementioned GOST, rolling stock intended for the carriage of passengers shall be designed so that the permissible level of fire hazard to people should be not more than 10^{-6} of the level of exposure to the effect of fire hazards exceeding maximum permissible values per person per year. The hazards affecting people and material values include the following:

- flame and sparks;

- elevated temperature of the environment;

- toxic combustion and thermal decomposition products;

- smoke;

- decreased concentration of oxygen.

Additional requirements shall be stipulated in accordance with the following:

VNPB-03 Passenger Cars. Fire Safety Requirements;

TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock;

TsT-TsUO 175 Instruction for the Assurance of Fire Safety on Locomotives and Multi-Unit Rolling Stock.

Guidance for the Assurance of Fire Safety of In-Service Traction Rolling Stock.

Examples of additional requirements:

1) Electrical equipment should be designed for possible mechanical, electrical, and thermal loads (in accordance with TsT-6 and VNPB-03);

2) Diesel engines used on diesel locomotives should have additional types of fire protection in accordance with GOST 29076-91 Marine, Locomotive, and Industrial Diesel Engines. Fire Safety Requirements;

3) Diesel engine compartments and diesel engine exhaust systems should comply with the requirements of TsT-6;

4) The fire alarm system should ensure guaranteed detection of overheating and fire outbreak, signalling of the occurrence thereof (optical and acoustic), and input of the information on the driver's desk or control panel of the fire protection unit (in accordance with TsT-6);

etc.

Premises for passenger rolling stock shall be categorised (three categories) in accordance with VNTP-05-97 Categorisation of Premises and Buildings of Railway Transport Enterprises and Facilities in Terms of Explosives-and-Fire and Fire Hazard. Depending on the results of calculations, rolling stock shall be categorised and equipped with fire protection equipment (fire alarm system, fire-extinguishing units, and fire-fighting equipment).

Premises for freight locomotives shall be categorised in accordance with VNTP-05-97 Categorisation of Premises and Buildings of Railway Transport Enterprises and Facilities in Terms of Explosives-and-Fire and Fire Hazard. Depending on the results of calculations, rolling stock shall be categorised and equipped with fire protection equipment (fire alarm system, fire-extinguishing units, and fire-fighting equipment).

Slovakia

Standards series EN 45545 and UIC 642.

Ukraine

In order to ensure the safety of passengers and servicing personnel in the event of fire, locomotives and multi-unit rolling stock should comply with the requirements of GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements.

In accordance with the aforementioned GOST, rolling stock intended for the carriage of passengers shall be designed so that the permissible level of fire hazard to people should be not more than 10^{-6} of the level of exposure to the effect of fire hazards exceeding maximum permissible values per person per year. The hazards affecting people and material values include the following:

- flame and sparks;

- elevated temperature of the environment;

- toxic combustion and thermal decomposition of materials;

- smoke;

- decreased concentration of oxygen.

Additional requirements shall be stipulated in accordance with the following:

TsUO-0018. Rules for Fire Safety on Railway Transport;

TsT-0067 Instruction for the Assurance of Fire Safety on Locomotives and Multi-Unit Rolling Stock;

NAPB Fire Safety Regulatory Acts 03.003-2000 TsUO-0021 – Fire Safety Standards for Passenger Cars.

Locomotives and multi-unit rolling stock should be equipped with a fire alarm system, fire-extinguishing units, fire-fighting equipment and tools in accordance with the standards of the instruction for the assurance of fire safety on locomotives and multi-unit rolling stock.

Estonia

Fire Safety Rules on Railways approved by Order No. 223 of the General Director of the Estonian Railways dated 23 July 1997.

Mainly the same requirements as those applicable in Russia and Ukraine.

Locomotives, multi-unit rolling stock, and passenger cars shall be equipped with fire extinguishers, and fire-fighting equipment and tools in accordance with standards.

Rolling stock shall be categorised and equipped with fire equipment (fire alarm equipment, fire prevention equipment, and fire-fighting equipment) in accordance with the Instruction of the Infrastructure Manager.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements, VNPB-03 Passenger Cars. Fire Safety Requirements Instruction TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock VNTP-05-97 Categorisation of Premises and Buildings of Railway Transport Enterprises and Facilities in Terms of Explosives-and-Fire and Fire Hazard GOST 29076-91 Marine, Locomotive, and Industrial Diesel Engines. Fire Safety Requirements
Latvia	Rules No. 82 adopted by the Cabinet of Ministers of the Republic of Latvia on 17 February 2004. Rules for Fire Safety Instruction of the Infrastructure Manager of LDz for the Assurance of Fire Safety of Locomotives, Multi-Unit Rolling Stock, and Passenger Cars, No. DR-64/2004 dated 04 November 2004 Instruction for the Assurance of Fire Safety in Cars of International

	Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999 ST SEV 5637-86, Standard of the Council for Mutual Economic Assistance. Fire-Fighting Equipment. Classification of Fires Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999 Standards for the Equipping of Rolling Stock in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia with Emergency Fire-Fighting Equipment. 25. Meeting of the Council for Railway Transport of 29 November 1999
Lithuania	Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų keleivinių vagonų priešgaisrinės saugos užtikrinimo instrukcija. (Translated from the following source: Instruction for the Assurance of Fire Safety in Cars of International Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999) Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų geležinkelių tarptautinio keleivinio transporto riedmenų aprūpinimo pirminėmis gaisro gesinimo priemonėmis normos. (Translated from the following source: Standards for the Equipping of Rolling Stock in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia with Emergency Fire-Fighting Equipment. 25. Meeting of the Council for Railway Transport of 29 November 1999) No. 201/S Fire Safety Rules in Railway Transport
Poland	PN-K-02511:2000 PN-K-02507:1997 UIC 642
Russia	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements VNPB-03 Passenger Cars. Fire Safety Requirements Instruction TsT-6 General Technical Requirements for Fire Protection of Traction Rolling Stock VNTP-05-97 Categorisation of Premises and Buildings of Railway Transport Enterprises and Facilities in Terms of Explosives-and-Fire and Fire Hazard GOST 29076-91 Marine, Locomotive, and Industrial Diesel Engines. Fire Safety Requirements

Slovakia	Standards series EN 45545 UIC 642
Ukraine	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety RequirementsTsUO-0018. Rules for Fire Safety on Railway Transport TsT-0067 Instruction for the Assurance of Fire Safety on Locomotives and Multi-Unit Rolling Stock NAPB Fire Safety Regulatory Acts 03.003-2000 TsUO-0021 – Fire Safety Standards for Passenger Cars NAPB Fire Safety Regulatory Acts 03.004-2002 (TsUO -0023) – Standards for the Equipping of Railway Transport Facilities and Rolling Stock with Fire Safety Equipment and Inventory DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	Fire Safety Rules on Railways approved by Order No. 223 of the General Director of Estonian Railways dated 23 July 1997

5.9.1.1 Categorisation for passenger rolling stock. *Combined into the united Paragraph 5.9.1*

5.9.1.2 Categorisation for freight locomotives. *Combined into the united Paragraph 5.9.1*

5.9.2 Material Requirements

Currently, requirements for this parameter are different in all the countries; however, it is possible to identify a common constituent for Latvia, Lithuania, Russia, Ukraine, and Estonia.

Material requirements are regulated by different documents in each country; however, the decisive requirements for non-flammability of materials are the same. The indicators of fire safety of materials are stipulated in the aforementioned documents.

Non-metallic materials used in the internal equipment of locomotives and multi-unit rolling stock, depending on their intended purpose, should have indicators of fire safety in accordance with GOST 12.1.044-89:

- Oxygen index – not less than 28;
- Flame propagation index – 0 to 20 (slowly propagating flame);
- Smoke formation factor – 50 m^2/kg;
- Combustion products toxicity index – low-hazardous (toxicity index – not less than 120 g/m^3)

Wooden parts should be treated with antipyrenes using the methods of coating or deep impregnation (GOST 12.2.056).

Belarus

Material requirements are regulated by different documents in each country; however, the decisive requirements for non-flammability of materials are the same. The indicators of fire safety of materials are stipulated in the aforementioned documents.

Non-metallic materials used in the internal equipment of locomotives and multi-unit rolling stock, depending on their intended purpose, should have indicators of fire safety in accordance with GOST 12.1.044-89:

- Oxygen index – not less than 28;
- Flame propagation index – 0 to 20 (slowly propagating flame);
- Smoke formation factor – 50 m^2/kg;
- Combustion products toxicity index – low-hazardous (toxicity index – not less than 120 g/m^3)

Wooden parts should be treated with antipyrenes using the methods of coating or deep impregnation (GOST 12.2.056).

Latvia

Requirements for materials and internal equipment structures

Non-metallic materials used in the internal equipment of passenger cars, depending on their intended purpose, should be confirmed and documented by tests for flame fire engineering characteristics including flammability, flame propagation, smoke formation, and combustible material toxicity indices in accordance with GOST standards and effective normative requirements.

Fire hazard indicators should be determined by organisations certified and licensed for this type of activities.

All non-metallic materials and fire-protection systems newly developed for use in structures of cars should be approved by the Chief Railway Fire Supervision Inspector and the Chief Railway Sanitary Supervision Officer and be approved by fire and hygiene safety certificates, which form an obligatory integral part of a certificate of conformity.

When materials belong to the same flammability and/or flame propagation group, it is necessary to select those materials which have better smoke formation and toxicity indicators.

Materials used in the internal equipment for the building and repair of passenger cars, depending on their intended purpose, should be:

In the event of the building and repair of cars within the scope of major and restoration repair:

- non-flammable – for the manufacturing of ceilings, sheathing of the roof insulation, air exhaust pipe of the ventilation unit, and frames of benches and berths;

- non-flammable or flame-retardant – for thermal insulation of the body, accumulator battery cases, partitions, luggage shelves, furniture, lockers, lining of walls and doors, wooden embedded parts, and base grating of walls, ceilings, and roof;

- flame-resistant – for damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, sound insulation of ceilings, thermal insulation of the pipes of the water supply system, tanks of the water supply system and heating pipes, and bodies of accumulator batteries. When using accumulator batteries with a metal case, the use of insulating rubber coverings shall be permitted;

- slowly-propagating-flame – for the manufacturing of curtains and sun-blinds, covering of benches, berths, and seats, flooring, lining of the surfaces of walls, partitions, and luggage shelves, lockers, and furniture.

In the event of car repair within the scope of KR-2 (Major Repair 2):

- non-flammable – for the replacement of ceilings, sheathing of the roof and air duct of the ventilation unit;

- non-flammable or flame-retardant – for the replacement of lockers, partitions, frames of benches and berths, luggage shelves, furniture, lining of longitudinal and vestibule walls, doors, wooden embedded parts, and base grating of walls, ceilings, and roof;

- flame-resistant – for the replacement of damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, thermal insulation of the pipes of the water supply system, and sound insulation of ceilings;

- slowly-propagating-flame – for the replacement of curtains, covering of benches, berths, and seats, flooring, for the lining of the surfaces of walls, partitions, and furniture.

In the event of car repair within the scope of KR-1 (Major Repair 1):

- non-flammable – for the replacement of ceilings, sheathing of the roof, and air duct of the ventilation unit;

- non-flammable or flame-retardant – for the replacement of frames of benches and berths, luggage shelves, furniture, lockers, lining of longitudinal and vestibule walls, doors, wooden embedded parts, and base grating of walls, roof, and partitions;

- flame-resistant – for the replacement of damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, sound insulation of ceilings, thermal insulation of the pipes of the water supply system, tanks of the water supply system, and heating pipes;

- slowly-propagating-flame – for the replacement of curtains and sun-blinds, covering of benches, berths, and seats, flooring, lining of the surfaces of walls, partitions, and luggage shelves, lockers, and furniture.

The structures of benches, shelves, and seats should not cause the spread of flame when testing in accordance with the Methodology set forth in Appendix 4 (to the Agreement between the Railways of TsZhT).

These requirements shall not apply to small parts (such as: hooks, bushings, overhead lamps, plates, and decorative grilles) with a weight of not more than 100 g as well as packing and sealing materials, lamp diffusers, photographic diagram shields, floor structures (insulation, frame grating, and floor decking) except for flooring.

Fire safety of newly built cars shall be evaluated on the basis of field fire tests of the basic model and, in the event of introducing principal changes to the system of its fire fighting system, as and when needed and at the request of the customer.

It shall be permitted to carry out field fire tests on a model of a car section.

Lithuania

Requirements for materials and internal equipment structures

Non-metallic materials used in the internal equipment of passenger cars, depending on their intended purpose, should be confirmed and documented by tests for flame fire engineering characteristics including flammability, flame propagation, smoke formation, and combustible material toxicity indices in accordance with GOST standards and effective normative requirements.

Materials used in the internal equipment for the construction and repair of passenger cars, depending on their intended purpose, should be:

In the building of cars and repair of cars within the scope of major repairs and refurbishment (KVR):

- non-flammable – for the manufacturing of ceilings, sheathing of the roof insulation, air exhaust pipe of the ventilation unit, and frames of benches and berths;

– non-flammable or flame-retardant – for thermal insulation of the body, cases of accumulator batteries, partitions, luggage shelves, furniture, lockers, lining of walls and doors, wooden embedded parts, and base grating of walls, ceilings, and roof;

- flame-resistant – for damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, sound insulation of ceilings, thermal insulation of the pipes of the water supply system, tanks of the water supply system and heating pipes, and bodies of accumulator batteries. When using accumulator batteries with a metal case, the use of insulating rubber coverings shall be permitted;

- slowly-propagating-flame – for the manufacturing of curtains and sun-blinds, covering of benches, berths, and seats, flooring, lining of the surfaces of walls, partitions, and luggage shelves, lockers, and furniture.

In the event of car repair within the scope of KR-2 (Major Repair 2):

- non-flammable – for the replacement of ceilings, sheathing of the roof and air duct of the ventilation unit;

- non-flammable or flame-retardant – for the replacement of lockers, partitions, frames of benches and berths, luggage shelves, furniture, lining of longitudinal and vestibule walls, doors, wooden embedded parts, and base grating of walls, ceilings, and roof;

- flame-resistant – for the replacement of damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, thermal insulation of the pipes of the water supply system, and sound insulation of ceilings;

- slowly-propagating-flame – for the replacement of curtains, covering of benches, berths, and seats, flooring, for the lining of the surfaces of walls, partitions, and furniture.

In the event of car repair within the scope of KR-1 (Major Repair 1):

– non-flammable – for the replacement of ceilings, sheathing of the roof and air duct of the ventilation unit;

- non-flammable or flame-retardant – for the replacement of frames of benches and berths, luggage shelves, furniture, lockers, lining of longitudinal and vestibule walls, doors, wooden embedded parts, and base grating of walls, roof, and partitions;

- flame-resistant – for the replacement of damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, sound insulation of ceilings, thermal insulation of the pipes of the water supply system, tanks of the water supply system, and heating pipes;

- slowly-propagating-flame – for the replacement of curtains and sun-blinds, covering of benches, berths, and seats, flooring, lining of the surfaces of walls, partitions, and luggage shelves, lockers, and furniture.

Non-toxic and flame-retardant materials shall be used for the manufacturing of diesel locomotives.

Materials used for the internal decoration of the driver's cab, irrespective of the type of rolling stock, should be non-flammable or flame-retardant.

Wooden parts should ensure protection against ignition in accordance with the standard GOST 3191-93 – Railway Cars for 1 520 mm Gauge – Parts Made of Wood and Wooden Materials – General Technical Conditions.

Flame-retardant materials shall be used for damp-proofing and sound insulation. It shall also be permitted to use vinyl artificial leather, non-woven polyvinylchloride fabric, polyvinylchloride board, and polyvinylchloride film grade G.

Flame-retardant materials shall be used for curtains and the coating of the driver's seat. The lining of walls and partitions of the driver's cab should comply with the indicators specified in the standards LST 1441:1996, LST EN 1182:1996, LST 1531:1998, LST 1531:1998/1K, LST 1532:1998, and LST 1532:1998/1K.

The lining of the walls of the machinery (diesel engine) compartment should be non-flammable and flame-retardant.

Poland

In accordance with the requirements of PN-EN-50306-1,2,3,4:2003.

Russia

Non-metallic materials used in the internal equipment of locomotives and multi-unit rolling stock, depending on their intended purpose, should have indicators of fire safety in accordance with GOST 12.1.044-89:

- Oxygen index – not less than 28;
- Flame propagation index – 0 to 20 (slowly propagating flame);
- Smoke formation factor – 50 m^2/kg;
- Combustion products toxicity index – low-hazardous (toxicity index – not less than 120 g/m^3)

Materials of the decoration and structures of passenger compartments should comply with the requirements of VNPB-03.

Materials used in the internal equipment of the driver's cab should meet the requirements of TsT-6.

Wooden parts should be treated with antipyrenes by the methods of coating or deep impregnation (GOST 12.2.056).

Textile materials melting under thermal impact should be flame-retardant and comply with the requirements of GOST R 50810-95 Fire Hazard of Textiles. Decorative Textiles. Flammability Test Method and Classification.

Slovakia

Standards series EN 45545 and UIC 642.

Ukraine

Requirements for materials and internal equipment structures

Non-metallic materials used in the internal equipment of passenger cars, depending on their intended purpose, should be confirmed and documented by tests for flame fire engineering characteristics including flammability, flame propagation, smoke formation, and combustion products toxicity indices in accordance with GOST standards and effective normative requirements.

Fire hazard indicators should be determined by specialised organisations certified by UkrSEPRO.

All non-metallic materials and fire-protection systems newly developed for use in structures of cars should be approved by the Paramilitary Fire Railway Protection Directorate, the Central Railway Sanitary and Epidemiology Service, the Main Directorate of Locomotive Facilities, and the Main Directorate of Suburban Transportation and be approved by fire and hygiene safety certificates, which form an obligatory integral part of a certificate of conformity.

When materials belong to the same flammability and/or flame propagation group, it is necessary to select those materials which have better smoke formation and toxicity indicators.

Materials used in the internal equipment for the building and repair of passenger cars, depending on their intended purpose, should be:

In the event of the building and repair of cars within the scope of major and restoration repair:

- non-flammable – for the manufacturing of ceilings, sheathing of the roof insulation, air exhaust pipe of the ventilation unit, and frames of benches and berths;

- non-flammable or flame-retardant – for thermal insulation of the body, accumulator battery cases, partitions, luggage shelves, furniture, lockers, lining of walls and doors, wooden embedded parts, and base grating of walls, ceilings, and roof;

- flame-resistant – for damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, sound insulation of ceilings, thermal insulation of the pipes of the water supply system, tanks of the water supply system and heating pipes, and bodies of accumulator batteries. When using accumulator batteries with a metal case, the use of insulating rubber coverings shall be permitted;

- slowly-propagating-flame – for the manufacturing of curtains and sun-blinds, covering of benches, berths, and seats, flooring, lining of the surfaces of walls, partitions, and luggage shelves, lockers, and furniture.

Non-metallic materials used in the internal equipment of locomotives and multi-unit rolling stock, depending on their intended purpose, should have indicators of fire safety in accordance with GOST 12.1.044-89:

- Oxygen index – not less than 28;
- Flame propagation index – 0 to 20 (slowly propagating flame);
- Smoke formation factor – 50 m^2/kg;
- Combustion products toxicity index – low-hazardous (toxicity index – not less than 120 g/m^3)

In the event of car repair within the scope of KR-2 (Major Repair 2):

– non-flammable – for the replacement of ceilings, sheathing of the roof and air duct of the ventilation unit;

- non-flammable or flame-retardant – for the replacement of lockers, partitions, frames of benches and berths, luggage shelves, furniture, lining of longitudinal and vestibule walls, doors, wooden embedded parts, and base grating of walls, ceilings, and roof;

- flame-resistant – for the replacement of damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, thermal insulation of the pipes of the water supply system, and sound insulation of ceilings;

- slowly-propagating-flame – for the replacement of curtains, covering of benches, berths, and seats, flooring, for the lining of the surfaces of walls, partitions, and furniture.

In the event of car repair within the scope of KR-1 (Major Repair 1):

- non-flammable – for the replacement of ceilings, sheathing of the roof, and air duct of the ventilation unit;

- non-flammable or flame-retardant – for the replacement of frames of benches and berths, luggage shelves, furniture, lockers, lining of longitudinal and vestibule walls, doors, wooden embedded parts, and base grating of walls, roof, and partitions;

- flame-resistant – for the replacement of damp-proofing, diffusers, compensating inserts and sound-insulating elements of the ventilation unit, sound insulation of ceilings, thermal insulation of the pipes of the water supply system, tanks of the water supply system, and heating pipes;

– slowly-propagating-flame – for the replacement of curtains and sun-blinds, covering of benches, berths, and seats, flooring, lining of the surfaces of walls, partitions, and luggage shelves, lockers, and furniture.

The structures of benches, shelves, and seats should not cause the spread of flame when testing in accordance with the Methodology set forth in Appendix 4 (to the Agreement between the Railways of TsZhT).

These requirements shall not apply to small parts (such as: hooks, bushings, overhead lamps, plates, and decorative grilles) with a weight of not more than 100 g as well as packing and sealing materials, lamp diffusers, photographic diagram shields, floor structures (insulation, frame grating, and floor decking) except for flooring.

Fire safety of newly built cars shall be evaluated on the basis of field fire tests of the basic model and, in the event of introducing principal changes to the system of its fire fighting system, as and when needed and at the request of the customer.

It shall be permitted to carry out field fire tests on a model of a car section.

Non-toxic and flame-retardant materials shall be used for the manufacturing of diesel locomotives.

Materials used for the internal decoration of the driver's cab, irrespective of the type of rolling stock, should be non-flammable or flame-retardant.

Wooden parts should ensure protection against ignition in accordance with the standard GOST 3191-93 – Railway Cars for 1 520 mm Gauge – Parts Made of Wood and Wooden Materials – General Technical Conditions.

Flame-retardant materials shall be used for damp-proofing and sound insulation. It shall also be permitted to use vinyl artificial leather, non-woven polyvinylchloride fabric, polyvinylchloride board, and polyvinylchloride film grade G.

The lining of the walls of the machinery (diesel engine) compartment should be non-flammable and flame-retardant.

Wooden parts should be treated with antipyrenes using the methods of coating or deep impregnation (GOST 12.2.056).

For the internal lining of the cab, it is necessary to use materials which do not emit toxic substances at the permissible temperature of the ambient air in accordance with GOST 16350-80.

Estonia

In accordance with the information applicable for Latvia.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.1.044-89 Fire-and-Explosive Hazard of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof
Latvia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport GOST 12.1.044-89 Fire-and-Explosive Hazard of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof (informatory)
Lithuania	39/V-KL Priešgaisrinės saugos normos. Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų keleiviniai vagonai. Priešgaisrinės saugos reikalavimai. (Translated from the following source: Fire Safety Standards. Passenger Cars in

	International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999) 15/T General Technical Requirements for Fire Safety for Traction Rolling Stock GOST 31187-2003 (Informatory)
Poland	In accordance with the requirements of PN-EN-50306-1,2,3,4:2003
Russia	VNPB-03 Passenger Cars. Fire Safety Requirements GOST 12.1.044 TsT-6 GOST 12.2.056-81 GOST R 50810-95 Fire Hazard of Textiles. Decorative Textiles. Flammability Test Method and Classification
Slovakia	Standards series EN 45545-2 UIC 642
Ukraine	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements TsT-0067 Instruction for the Assurance of Fire Safety on Locomotives and Multi-Unit Rolling Stock NAPB Fire Safety Regulatory Acts 03.004-2002 (TsUO -0023) – Standards for the Equipping of Railway Transport Facilities and Rolling Stock with Fire Safety Equipment and Inventory GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 12.2.056-81 GOST 12.1.044-89 Fire-and-Explosive Hazard of Substances and Materials. Nomenclature of Indices and Determination Methods Thereof
Estonia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999

5.9.3 Special measures for flammable liquids

Currently, requirements for this parameter are the same in all the countries (except for Poland).

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

Fuel tanks and oil transformers should be located outside the passenger compartment and be divided from it by a fire partition.

It shall be prohibited to install fuel tanks and oil transformers in attic premises and roofs of cars.

The ventilation system of accumulator battery compartments should not be combined with the ventilation system of passenger compartments (TsT-6 for Russia).

In the diesel engine compartment, it is necessary to organise a centralised collection of oil and fuel leakages to a tank installed outside the diesel engine compartment.

The exhaust system and silencers should be designed (shielded and insulated) in such a manner, that the temperature of the outer surface would not reach the self-ignition point of the fuel and oil.

Diesel engines should be fitted with devices preventing drops and sprays of oil and fuel from getting onto hot surfaces.

Lubricating materials should be kept only in metal containers (cans, oil boxes, etc.) with narrow necks or caps, tightly closable, and cleaning rags, both clean and dirty, shall be kept in metal boxes or barrels with covers. Lubricant and cleaning materials may be stored only in strictly appropriated places of service premises or in special under-body boxes.

Leakage of oil or fuel from hoses and lines in diesel engines, compressors, reduction gear boxes, and other assemblies shall not be permitted.

Poland

In accordance with the requirements of

PN-K-02511:2000,

ISO 5658-2:2006

UIC 642

Slovakia

The requirements of standard EN-45545-7 apply.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements TsT-6
Latvia	Instruction for the Assurance of Fire Safety in Cars of International Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999 GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (informatory)
Lithuania	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos

	Respublikų keleivinių vagonų priešgaisrinės saugos užtikrinimo instrukcija. (Translated from the Instruction for the Assurance of Fire Safety in Cars of International Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999) Standard LST EN 2:1996/A1:2004 Gaisrų klasifikavimas (Classification of fires) 15/T General Technical Requirements for Fire Safety for Traction Rolling Stock No. 201/S Fire Safety Rules in Railway Transport
Poland	PN-K-02511:2000 ISO 5658-2:2006 UIC 642
Russia	TsT-6 GOST 12.2.056-81
Slovakia	Standard EN-45545-7
Ukraine	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements ІЦТ-0067 Instruction for the Assurance of Fire Safety on Locomotives and Multi-Unit Rolling Stock NAPB Fire Safety Regulatory Acts 03.004-2002 (TsUO -0023) – Standards for the Equipping of Railway Transport Facilities and Rolling Stock with Fire Safety Equipment and Inventory GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 12.2.056-81
Estonia	Instruction for the Assurance of Fire Safety in Cars of International Traffic Passenger Trains between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. 25. Meeting of the Council for Railway Transport of 29 November 1999

5.9.4 Passenger evacuation

Currently, requirements for this parameter are the same in all the countries (except for Poland and Russia).

Belarus, Latvia, Lithuania, Ukraine, and Estonia

Requirements for the assurance of safe conditions for passenger evacuation.

In the course of manufacturing and repair within the scope of a KVR and KR-2, passenger cars should be equipped with additional emergency exits. The number (not less than two) and arrangement of the emergency exits should ensure the completion of the

evacuation of people before maximum permissible values of dangerous fire factors are reached.

For special-purpose cars, not intended for mass carriage of passengers, the availability, number, and places of arrangement of emergency exits shall be determined by the customer.

The necessary and estimated time of the evacuation of passengers should be determined for each model of passenger car.

A fire safety instruction should be posted in each car.

Poland and Slovakia

Only locomotives – there is no passenger rolling stock.

For new rolling stock – requirements in accordance with TSI LOC&PAS.

Standard EN-45545-4.

Russia

In accordance with SniP 2.09.02-85, the evacuation of people in the event of fire is the forced process of the movement of people from the area of the impact of dangerous factors of fire to a safe area.

Evacuation routes should ensure safe evacuation of all passengers before the beginning of the impact of dangerous fire factors (temperature, smoke, and toxic combustion products).

A passenger car should have not less than two evacuation exits. All external doors of passenger cars should be equipped with emergency opening devices allowing their use as emergency exits.

In addition to evacuation exits, a passenger car should have emergency exits, the number whereof shall depend on the design passenger capacity of the car and length of evacuation paths.

Each car intended for the carriage of up to 40 passengers should have not less than two emergency exits from each side of the car. If the number of passengers exceeds 40, there should be at least three emergency exits from each side of the car.

Emergency exits should be equipped with auxiliary facilities (ladders, tethers, etc.) in accordance with VNPB-03.

The arrangement of emergency exists on multi-unit rolling stock should ensure the completion of the evacuation of people before maximum permissible values of dangerous fire factors are reached (VNPB-03).

The time required for the evacuation of passengers should be determined in accordance with GOST 12.1.004.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements TsT-6

	NB ZhT TsT 01 NB ZhT TsT 03
Latvia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport Instruction of the Infrastructure Manager of LDz for the Assurance of Fire Safety of Locomotives, Multi-Unit Rolling Stock, and Passenger Cars, No. DR-64/2004 dated 04 November 2004
Lithuania	39/V-KL Priešgaisrinės saugos normos. Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų keleiviniai vagonai. Priešgaisrinės saugos reikalavimai. (Translated from the following source: Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999)
Poland	TSI LOC&PAS Standard EN-45545-4
Russia	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements SNiP 2.09.02-85 VNPB-03 Passenger Cars. Fire Safety Requirements TsT-6 NB ZhT TsT 01 NB ZhT TsT 03
Slovakia	TSI LOC&PAS Standard EN-45545-4
Ukraine	GOST 12.1.004-91 SSBT (Occupational Safety Standards System). Fire Safety. General Requirements TsT-0067 Instruction for the Assurance of Fire Safety on Locomotives and Multi-Unit Rolling Stock NAPB Fire Safety Regulatory Acts 03.004-2002 (TsUO -0023) – Standards for the Equipping of Railway Transport Facilities and Rolling Stock with Fire Safety Equipment and Inventory GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 12.2.056-81 DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of

	Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport

5.9.5 Fire barriers

Currently, requirements for this parameter are different in all the countries, on the other hand, a certain similarity of requirements applicable in Latvia, Lithuania, and Estonia can be noted.

Latvia, Lithuania, and Estonia

Requirements for fire-retardant structures

When constructing passenger cars and performing repair within the scope of a major repairs and refurbishment (KVR), it is necessary to install a fire-retardant partition between the guard's accommodation and passenger space, while in compartment cars there should also be fire-retardant partitions between compartments dividing the passenger space into not less than three blocks.

The inter-ceiling space in non-compartment type cars and over the big corridor of compartment-type cars should be divided into at least three areas by means of the installation of fire-retardant frames.

The fire-retardant partition between the guard's accommodation and passenger space should be extended to the metal lining of the body along the following contour: roof – lateral walls. The posts of the base grating of lateral walls composing the partition should be made of a non-flammable or flame-retardant material. The technological gaps between the panel of the partition and metal of the lining of the roof and seams in the posts of the base grating of the internal lining of lateral walls should be packed with stuffing of a non-flammable or flame-retardant material and have the same fire-retardant properties as the partition itself. The panel of the fire-retardant inter-compartment partition should be extended to the metal of the boarding of the roof insulation and facing of the lining of the lateral wall and floor. The technological gaps along the contour of the joining of the partition with the boarding of the roof insulation and facing of the lateral wall should be overlapped with a non-flammable or flame-retardant material and should ensure the same fire-retardant properties as the panel itself.

(1) The fire-resistance rating of fire-retardant partitions determined in accordance with the Methodology for Testing of the Fire-Resistance of Inner Fire-Retardant Structures of Cars (Appendix 6) shall be 15 minutes, while partitions should have the following properties:

- within 15 minutes, the average temperature at the non-heated side should not exceed the initial temperature by more than 139 ºC, while the maximum temperature at separate points of the structure should not exceed +225 ºC except for metal parts such as bolts, screws, bushes, etc.;

- to prevent the penetration of flame within 30 minutes (for the partition between the passenger space and guard's accommodation) and within 20 minutes (for inter-compartment partitions and fire-retarding frames).

The joints of fire-retardant partitions and structures of doors and door frames in the partition between a compartment and passenger space should have the same fire-retardant properties as the partition itself.

The sealing of openings at points where pipes, the ventilation duct, and cable trunks pass through fire-retardant partitions should comply with the requirements of Paragraph (1).

Hinges of doors should be made of materials which have a melting point not below +850 ºC.

Fire-retardant partitions may be made of non-flammable materials as well as of combined materials but complying with the requirements of Paragraph (1).

Lithuania (additional requirements)

On diesel locomotives and electric locomotives, the driver's cab should be separated from the diesel engine compartment (on electric locomotives, from the machinery compartment) by a fire partition. On diesel trains, the diesel engine compartment should be separated by fire partitions from both the driver's cab and passenger space.

If the diesel engine is installed under the floor of the motored car, the structure of the floor or partition protecting the floor against horizontal flame should be resistant to fire for not less than 0.5 hours.

Fire partitions of all contours should join the metal lining of the body. It shall be permitted to mount the partition to the lateral wall and wooden floor beams deeply impregnated or covered with fire-retardant coating or contacting the metal lining of the body. The space between the metal roofing and partition should be covered with non-flammable rockwool from both sides.

The fire partition should be resistant to directly impacting fire for not less than 0.5 hours.

If the diesel engine is installed under the floor of the motored car, the structure of the floor or partition protecting the floor against horizontal flame should be resistant to fire for not less than 0.5 hours.

Openings for pipes, cable units, and ventilation ducts in fire partitions should be closed. The material of the sealant should be resistant to directly impacting fire for not less than 0.5 hours.

The same requirements shall be set for doors and door posts mounted in partitions. Door hinges should be made of a metal with a melting point not below 950 °C.

Poland and Slovakia

Only locomotives – there is no passenger rolling stock

Requirements for new rolling stock – in accordance with the TSI LOC&PAS.

Standard EN-45545-3

Belarus and Russia

Fire-retardant structures should comply with the requirements specified in VNPB-03 and TsT-6.

Traction rolling stock should comply with the following requirements:

the driver's cab on locomotives should be separated from the machinery compartment (diesel engine compartment) by a fire-retardant partition;

the equipment to be installed in the under-floor space, which may lead to fire in the emergency mode, should be separated by a fire-resistant partition with a fire-retardant rating of not less than 20 minutes (Guidance for the Assurance of Fire Safety of In-Service Traction Rolling Stock);

the driver's cab should be separated from the passenger's space by a fire-resistant partition with a fire-retardant rating of not less than 30 minutes (TsT-6);

in cases where the length of the body exceeds 20 m or two cars with a total length of more than 20 metres, it is necessary to envisage end walls and gangway doors with a fire-retardant rating of not less than 15 minutes;

roof spaces of cars should be divided into two or three sections, depending on the length of the car, by fire-retardant partitions (frames) with a fire-retardant rating of not less than 15 minutes;

the enclosing structures of the premises (sections) of cars where the installation of heating, air conditioning, and ventilation systems is allowed should have a fire-retardant rating of not less than 15 minutes;

the passenger space should be separated from the diesel engine compartments located under the car floor or in the adjacent section at the same level with the passenger space by a fire-resistant partition with a fire-retardant rating of not less than 30 minutes;

the passenger space should be separated from the power equipment compartments located under the floor or in the roof space by a fire-resistant partition with a fire-retardant rating of not less than 30 minutes. Openings for pipes, cable units, and ventilation ducts in fire partitions should be sealed. The material of the sealant should be resistant to directly impacting fire for not less than 0.5 hours.

Hinges of doors should be made of materials which have a melting point not below 950 ºC.

Fire-retardant partitions may be made of non-flammable materials as well as of combined materials with a fire-retardant rating of not less than 0.5 hours.

Ukraine

Requirements for fire-retardant structures

When constructing passenger cars and performing repair within the scope of a KVR, it is necessary to install a fire-retardant partition between the guard's accommodation and passenger space, while in compartment cars there should also be fire-retardant partitions between compartments dividing the passenger space into not less than three blocks.

The inter-ceiling space in non-compartment type cars and over the big corridor of compartment-type cars should be divided into at least three areas by means of the installation of fire-retardant frames.

The fire-retardant partition between the guard's accommodation and passenger space should be extended to the metal lining of the body along the following contour: roof – lateral walls. The posts of the base grating of lateral walls composing the partition should be made of a non-flammable or flame-retardant material. The technological gaps between the panel of the partition and metal of the lining of the roof and seams in the posts of the base grating of the internal lining of lateral walls should be packed with stuffing of a non-flammable or flame-retardant material and have the same fire-retardant properties as the partition itself. The panel

of the fire-retardant inter-compartment partition should be extended to the metal of the boarding of the roof insulation and facing of the lining of the lateral wall and floor. The technological gaps along the contour of the joining of the partition with the boarding of the roof insulation and facing of the lateral wall should be overlapped with a non-flammable or flame-retardant material and should ensure the same fire-retardant properties as the panel itself.

(1) The fire-resistant rating of fire-retardant partitions determined in accordance with the Methodology for Testing of the Fire-Resistance of Inner Fire-Retardant Structures of Cars (Appendix 6) shall be 15 minutes, while partitions should have the following properties:

- within 15 minutes, the average temperature on the non-heated side should not exceed the initial temperature by more than 139 ºC, while the maximum temperature at separate points of the structure should not exceed +225 ºC except for metal parts such as bolts, screws, bushes, etc.;

- prevent the penetration of flame within 30 minutes (for the partition between the passenger space and guard's accommodation) and within 20 minutes (for inter-compartment partitions and fire-retarding frames).

The joints of fire-retardant partitions and structures of doors and door frames in the partition between a compartment and passenger space should have the same fire-retardant properties as the partition itself.

The sealing of openings at points where pipes, the ventilation duct, and cable trunks pass through fire-retardant partitions should comply with the requirements of Paragraph (1).

Hinges of doors should be made of materials which have a melting point not below +850 ºC.

Fire-retardant partitions may be made of non-flammable materials as well as of combined materials but complying with the requirements of Paragraph (1).

On diesel locomotives and electric locomotives, the driver's cab should be separated from the diesel engine compartment (on electric locomotives, from the machinery compartment) by a fire partition. On diesel trains, the diesel engine compartment should be separated by fire partitions from both the driver's cab and passenger space.

The aforementioned requirements are approved by the following documents:

Belarus	TsT-6 Guidance for the Assurance of Fire Safety of In-Service Traction Rolling Stock
Latvia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999
Lithuania	39/V-KL Priešgaisrinės saugos normos. Tarptautinio susisiekimo tarp NVS šalių, Estijos, Latvijos ir Lietuvos Respublikų keleiviniai vagonai. Priešgaisrinės saugos reikalavimai. (Translated from the following source: Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for

	Railway Transport of 29 November 1999) 15/T General Technical Requirements for Fire Safety for Traction Rolling Stock
Poland	TSI LOC&PAS Standard EN-45545-3 prEN 45545-1:2010 PN-K-02507:1997 UIC 564-2 UIC 642
Russia	VNPB-03 Passenger Cars. Fire Safety Requirements TsT-6 Guidance for the Assurance of Fire Safety of In-Service Traction Rolling Stock
Slovakia	Standard EN-45545-3
Ukraine	NAPB Fire Safety Regulatory Acts 03.003-2000 TsUO-0021 – Fire Safety Standards for Passenger Cars DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements
Estonia	Fire Safety Standards. Passenger Cars in International Traffic between the Member States of the CIS, the Republic of Latvia, the Republic of Lithuania, and the Republic of Estonia. Fire Safety Requirements. 25. Meeting of the Council for Railway Transport of 29 November 1999

5.10 SERVICING

5.10.1 General provisions

Currently, requirements for this parameter are the same in all the countries (except for Poland).

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

The main objective of technical maintenance in the course of operation is to ensure traffic safety owing to the maintenance of traction rolling stock in good operating condition. This is achieved by the monitoring of the operation of units and systems of traction rolling stock, performance of routine maintenance, and timely prevention, detection, and elimination of troubles as well as by the observance of fire safety requirements and sanitary standards.

Poland

Technical documentation for operation and technical maintenance DSU.

Slovakia

The requirements of the TOR.

Technical documentation for the operation and technical maintenance of rolling stock.

The aforementioned requirements are approved by the following documents:

Belarus	For various series of traction rolling stock
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	T/144 Instruction for the Technical Maintenance of In-Service Diesel Locomotives, Electric Locomotives, and Multi-Unit Rolling Stock
Poland	Technical documentation for operation and technical maintenance DSU
Russia	TOR Instruction No. 3 of OAO Russian Railways dated 17 January 2005 regarding the system of technical maintenance and repair of locomotives of OAO Russian Railways
Slovakia	TOR Technical documentation for the operation and technical maintenance of rolling stock
Ukraine	Technical Operating Rules for Ukrainian Railways Paragraph 12.4-12.10 TsT-0056. Instruction for the Technical Maintenance of In-Service Diesel Locomotives, Electric Locomotives, and Multi-Unit Rolling Stock Order No. 30 Ts-Z of Ukrainian Railways regarding the improvement of the system of the technical maintenance, operation, and routine and major repair of traction rolling stock
Estonia	TOR approved by Order No. 39 of the Minister dated 09 July 1999, Paragraph 148-152

5.10.2 Access to the windscreen for cleaning

Currently, requirements for this parameter are the same in all the countries except for Poland and Slovakia.

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

The design of locomotives and multi-unit rolling stock with a design speed of less than 160 km/h should provide for footboards and handrails for the lifting and maintenance of the front part of the driver's cab while ensuring the possibility of manual cleaning of the driver's cab windscreen. Lower footboards should be installed in the ultimate lower position in accordance with the conditions for meeting the clearance gauge of rolling stock in accordance with GOST 9238:

the step of footboards by height should not be more than 400 mm;

the width of footboards should not be less than 300 mm;

the width of the support surface of footboards should not be less than 60 mm;

the depth of the free space at the outer edge of a footboard shall not be less than 150 mm;

the diameter of a handrail for climbing should be 19–38 mm at the operating length;

the space between handrails and the body should be not less than 45 mm;

the beginning of the operating section of a handrail should be located not higher than 1 500 mm from the rail head level;

the mounting of platforms, footboards, and handrails should be designed for the impact of forces of not less than 2 kN.

The surface of platforms and footboards should prevent slipping.

Poland

The design of locomotives with a coach-type body should provide for footboards and handrails for the cleaning of the head part.

In accordance with the DTR technical documentation (technical documentation for the locomotive) and WTO (documentation of acceptance for operation).

Slovakia

The design of locomotives with a coach-type body should provide for footboards and handrails for the cleaning of the head part.

In accordance with the technical documentation for rolling stock.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 12.2.056-81SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (informatory)
Latvia	GOST 12.2.056-81SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements (informatory)
Lithuania	Procedure for the Check of the Quality of Preparedness for a Voyage of Passenger, Diesel, and Electric Trains 07 May 2004 GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements
Poland	In accordance with the technical documentation DTR i WTO
Russia	GOST 12.2.056-81SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements GOST 30487 NB ZhT TsT 01, 02, 03, 04
Slovakia	Technical documentation for rolling stock
Ukraine	GOST 12.2.056-81 SSBT (Occupational Safety Standards System). Electric Locomotives and Diesel Locomotives for 1 520 mm Gauge. Safety Requirements DSTU 4493:2005 Main-Line Passenger Cars of Diesel Trains and Electric Trains. Safety Requirements

Estonia	Instructions for the technical maintenance of rolling stock

5.10.3 Exterior cleaning of trains

Currently, requirements for this parameter are the same in all the countries.

Belarus, Latvia and Lithuania, Poland, Russia Slovakia, Ukraine, and Estonia

It is necessary to ensure for the possibility of the external cleaning of multi-unit rolling stock and locomotives when they pass stationary washing plants at a speed of 3-5 km/h.

The aforementioned requirements are approved by the following documents:

Belarus	Rules for the technical maintenance and routine repair: of a specific type of traction rolling stock
Latvia	Unified Technological Process for the Handling of Long-Distance and Local Passenger Train Formations at the Riga Passenger Station, LDz 2002
Lithuania	Procedure for the Inspection of the Quality of Preparedness for a Voyage of Passenger, Diesel, and Electric Trains 07 May 2004
Poland	TSI LOC&PAS
Russia	Rules for the Technical Maintenance of Locomotives
Slovakia	TSI LOC&PAS
Ukraine	GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car TsT– 0047 – Instruction for the Use of Water for the Cooling of Engines of Diesel Locomotives and Diesel Trains
Estonia	Rules for the Technical Maintenance of Locomotives

5.10.4 Toilet discharge system

Currently, requirements for this parameter are the same in all the countries.

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

When installing closed-type toilets on locomotives and multi-unit rolling stock, they should have external connections allowing for withdrawal and discharge. OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car should be used as the reference material.

Poland and Slovakia

On existing rolling stock – absent. For newly built rolling stock, in accordance with the requirements of the TSI LOC&PAS.

The aforementioned requirements are approved by the following documents:

Belarus	OSJD O+R 562 Sanitary and Technical Requirements for the Design

	of a Passenger Car
Latvia	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
Lithuania	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
Poland	TSI LOC&PAS
Russia	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
Slovakia	TSI LOC&PAS
Ukraine	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
Estonia	OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car

5.10.5 Water supply system

Currently, requirements for this parameter are different in all the countries, while it is possible to identify two sets of the same requirements for the groups of countries "Latvia, Lithuania, and Estonia" and "Russia and Ukraine".

Latvia, Lithuania, and Estonia

It is covered by the requirements of Paragraph 5.4.1.

Poland and Slovakia

Washing stands on locomotives. For newly built rolling stock, the requirements of the TSI LOC&PAS will apply.

Belarus, Russia, and Ukraine

Water supply for sanitary purposes:

The water supply system should be equipped with water tanks, distribution pipes, and water taps made of materials which do not affect the quality of water and are permitted for use in drinking water supply by the authorities of the State Sanitary and Epidemiology Service.

The quality of water should comply with the requirements of normative documents.

Sources of utility and drinking water supply at train servicing points should comply with the requirements of GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules.

Water supply for technical purposes:

During the cold season, the cooling of the diesel engine, blowing air and oil as well as heating of the driver's cab of a diesel locomotive should be ensured by the water system of the diesel locomotive.

The system shall be refilled with water through refilling heads.

The process of refilling the cooling system with water may be monitored through the water level gauge glass, where the level of water should be above the half-way mark after refilling.

The tank of the sanitary facility of a diesel locomotive shall be refilled through the refilling head.

For the cooling of the diesel engine, condensed or fresh boiled settled water without mechanical impurities with the addition of special anti-corrosion additives should be used.

The quality of water for the refilling of cooling systems of diesel locomotives and diesel trains is dealt with in the Instruction for the Treatment and Application of Water for Cooling of Engines of Diesel Locomotives and Diesel Trains.

The aforementioned requirements are approved by the following documents:

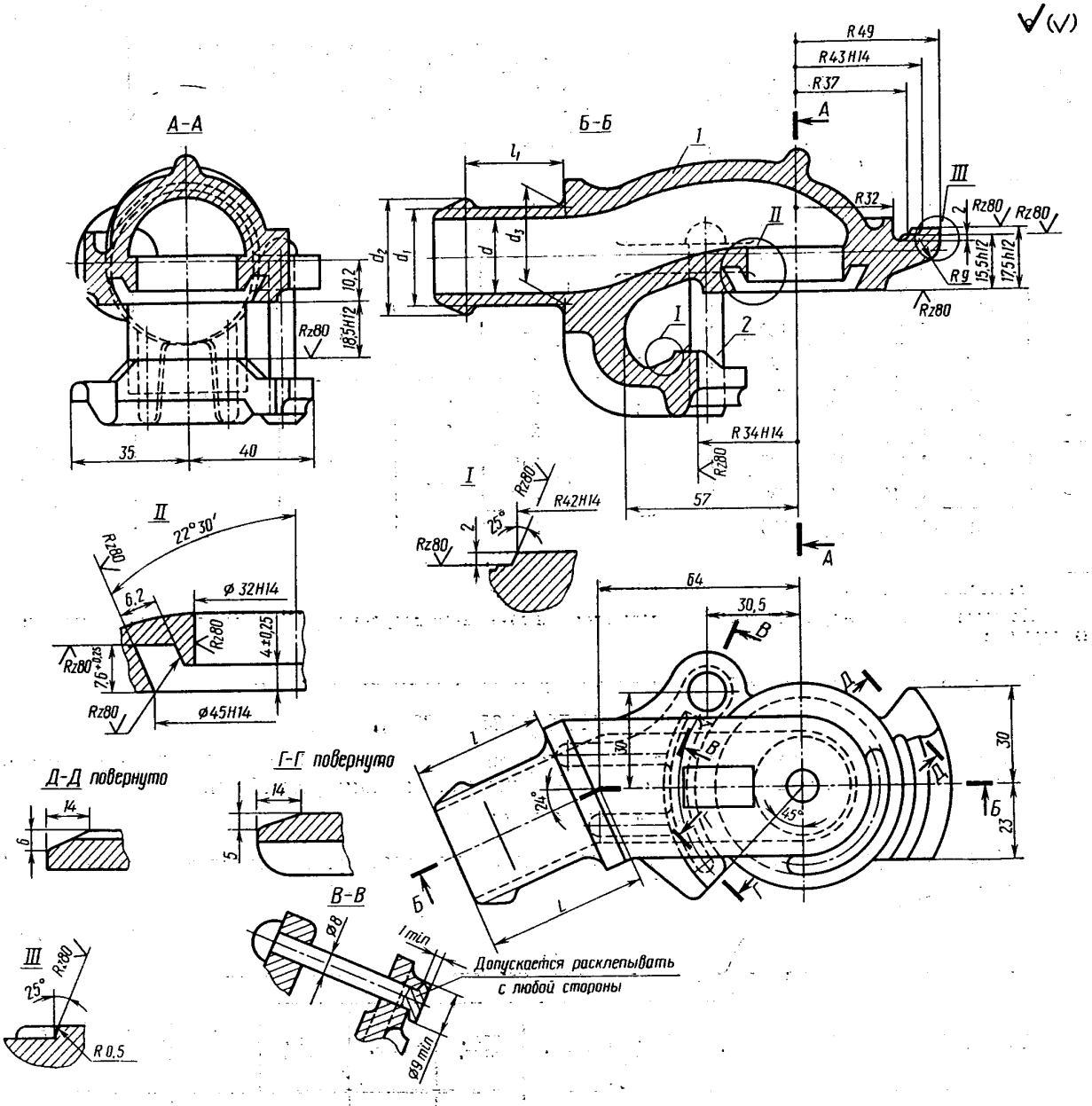
Belarus	GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car
Latvia	Rules No. 235 of the Cabinet of Ministers dated 29 April 2003 – Requirements for the Quality and Obligatory Harmlessness of Drinking Water; Procedure for Checking and Control
Lithuania	HN24:2003 Safety and Quality Requirements for Drinking Water
Poland	TSI LOC&PAS
Russia	SanPiN 2.1.4.1074-01 Drinking Water. Hygiene Requirements for the Quality of Water of Centralised Drinking Water Supply Systems GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules TsTChS-50 Instruction for the Treatment and Application of Water for Cooling of Engines of Diesel Locomotives and Diesel Trains
Slovakia	TSI LOC&PAS
Ukraine	GOST 2761-84 Sources of Centralised Utility and Drinking Water Supply – Hygiene and Technical Requirements and Selection Rules OSJD O+R 562 Sanitary and Technical Requirements for the Design of a Passenger Car TsT– 0047 – Instruction for the Use of Water for the Cooling of Engines of Diesel Locomotives and Diesel Trains
Estonia	TsTChS-50 Instruction for the Treatment and Application of Water for Cooling of Engines of Diesel Locomotives and Diesel Trains TOR, Paragraph 48-49

5.10.6 Interface for water refilling

Currently, requirements for this parameter are the same in all the countries.

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

Connecting head R17B in accordance with GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions (currently this GOST is being revised) shall be used for water refilling.



Черт. 4

Повернуто	Turned
Допускается расклепывать с любой стороны	Riveting-over from any side shall be permitted
соединительная головка	connecting head
заклепка	Rivet
Черт.	Drawing

Poland and Slovakia

In accordance with UIC 563

The aforementioned requirements are approved by the following documents:

Belarus	GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions
Latvia	GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions (informatory)
Lithuania	GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions
Poland	In accordance with UIC 563, PN-K88209:1997
Russia	GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions
Slovakia	UIC 563
Ukraine	GOST 2593-82 Connection Brake Pipes of Rolling Stock. Technical Conditions
Estonia	

5.10.7 Special requirements for stabling trains

Currently, requirements for this parameter are different in all the countries, while it is possible to identify two sets of the same requirements for the groups of countries "Latvia, Lithuania, and Estonia" and "Russia and Ukraine".

Latvia, Lithuania, and Estonia

No standards for stabling are available. Requirements for equipment shall be stipulated by the technical design assignment.

Poland and Slovakia

Requirements for equipment shall be stipulated by the technical design assignment.

Belarus, Russia, and Ukraine

The stabling of locomotives and multi-unit rolling stock awaiting for operation shall be permitted at main and intermediate depots, locomotive maintenance depots as well as at points which have necessary conditions for the assurance of their preservation and technical maintenance personnel.

Requirements for the conditions of the stabling of locomotives and multi-unit rolling stock shall be regulated by normative documents.

The stabling of locomotives and multi-unit rolling stock awaiting operation may be performed with both lowered and lifted pantographs.

During autumn and winter, it is necessary to arrange for the monitoring of changes in outer air temperature in order to make a decision regarding the heating of electric machines in the event of thaw in order to prevent frost formation on collectors and winding.

During autumn and winter, before manoeuvring electric trains and diesel trains for passenger boarding after stabling, it is necessary to ensure that the passenger space is heated up to a temperature not lower than +13 °C.

During winter, pre-heating of oil of the hydraulic transmission prior to starting movement shall be ensured.

In the event of stabling of diesel rolling stock during winter, the required temperature conditions for the operation of diesel engines shall be ensured.

When required, power to electric locomotives and electric trains during stabling shall be supplied from the overhead contact system.

Locomotives should be equipped with the following:

- Socket for the charging of accumulator batteries from an external source;
- Socket for connecting traction electric engines to an external source.

The aforementioned requirements are approved by the following documents:

Belarus	Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions No. TsT-814 Technical Instructions for the Winterisation, Operation and Maintenance of Diesel Locomotives and Diesel Trains in Winter Conditions approved by the Department of Locomotive Facilities of the Russian Ministry of Railways on 30 December 1997, No. TsT-14/97 Technical Instructions for the Winterisation, Operation and Maintenance of Diesel Locomotives and Diesel Trains in Winter Conditions approved by the Department of Locomotive Facilities of the Russian Ministry of Railways on 30 December 1997, No. TsT-14/97
Latvia	Requirements for equipment shall be stipulated by the technical design assignment
Lithuania	Requirements for equipment shall be stipulated by the technical design assignment
Poland	Requirements for equipment shall be stipulated by the technical design assignment
Russia	Instruction for Set-up Procedures and Technical Maintenance of Electric Locomotives in Winter and Summer Conditions No. TsT-814 Technical Instructions for the Winterisation, Operation and Maintenance of Diesel Locomotives and Diesel Trains in Winter Conditions approved by the Department of Locomotive Facilities of the Russian Ministry of Railways on 30 December 1997, No. TsT-14/97 Technical Instructions for the Setting-up Procedures and Technical Maintenance of Electric Locomotives in Winter Conditions approved by the Department of Locomotive Facilities of the Russian Ministry of Railways on 25 October 1995, No. TsTEP-21-95
Slovakia	Requirements for equipment shall be stipulated by the technical design assignment

Ukraine	TsT-0052. Instruction for the Preparation for Operation and Technical Maintenance of Electric Locomotives in Winter Conditions TsT-0070. Instructive Guidance for the Winterisation, Operation and Maintenance of Diesel Locomotives and Diesel Trains in Winter Conditions
Estonia	Requirements for equipment shall be stipulated by the technical design assignment

5.10.8 Refuelling equipment

Currently, requirements for this parameter are different in all the countries, while it is possible to identify two sets of the same requirements for the groups of countries "Latvia, Lithuania, and Estonia" and "Russia and Ukraine".

Latvia and Lithuania

Requirements for equipment shall be stipulated by the technical design assignment. The requirements coincide with those applicable in Russia and Ukraine but are not regulated.

Poland

In accordance with the technical documentation DTR i WTO

UIC 627-2

Belarus, Russia, and Ukraine

Each section of a diesel locomotive or the motored car of a diesel train shall be equipped with filler ports from both sides of the section or motored car.

Fuel shall be filled directly to the filling neck through standardised filler in the form of a nut or connecting piece.

The fuelling nozzle should be equipped with devices for attaching it to the filling neck of the tank, electrostatic elimination, and quick fuel shut-off.

It shall be permitted to install a filter in the filling neck of the fuel tank.

Air-removal and protective devices on a fuel tank should ensure fuel supply at a rate of up to 400 l/min (Instruction OSJD O+R 655).

Slovakia

UIC 627-2

The aforementioned requirements are approved by the following documents:

Belarus	Instruction OSJD O+R 655
Latvia	Requirements for equipment shall be stipulated by the technical design assignment
Lithuania	Requirements for equipment shall be stipulated by the technical design assignment
Poland	In accordance with the technical documentation DTR i WTO

	UIC 627-2
Russia	Instruction OSJD O+R 655
Slovakia	UIC 627-2
Ukraine	OSJD O+R 655 Unification of Structural Units of the Outfit of Diesel Rolling Stock
Estonia	Instruction V-013 for the Use of Lubricants and Diesel Fuel approved by Order No. 147 dated 10 May 2000 Instruction OSJD O+R 655

5.11 DOCUMENTATION FOR OPERATION AND MAINTENANCE

5.11.1 General provisions

Currently, it is planned to develop a uniform document concerning the admittance of rolling stock for operation within the 1 520 mm gauge infrastructure including issues of the provision of documentation for the operation and technical maintenance of rolling stock.

Agreement No… on the certification of railway products between railway administrations.

Latvia and Lithuania

State requirements for the availability of documentation for putting into operation and for operation.

Poland

Technical documentation for operation and technical maintenance DTSU.

Belarus, Russia, and Ukraine

General requirements for the operation, technical maintenance, and repair of traction rolling stock shall be presented in the TOR.

Requirements of documentation relating to the operation, technical maintenance, and repair of traction rolling stock should take into account the requirements of the TOR.

Operation shall mean the stage of the life cycle of rolling stock, at which its quality is implemented, maintained, and restored. Operation shall include use in accordance with the intended purpose, transportation, storage, technical maintenance and repair.

Technical maintenance shall mean a complex of operations or operation for maintaining the working capacity or serviceability of a product when using it in accordance with the intended purpose, expectation, storage, and transportation (GOST 18322-78, Article 1).

Repair shall mean a complex of operations for restoring the serviceability or working capacity of products and restoring the lifetime of products or component parts thereof (GOST 18322-78, Article 2).

The content of documentation for operation, technical maintenance, and routine repair: of rolling stock should comply with GOST 2.601-2006 Unified Design Documentation System – Operation Documents.

The content of documentation for repairs (medium and major) should comply with GOST 2.602-95 Unified Design Documentation System – Repair Documents.

Slovakia

Technical documentation for operation and technical maintenance of rolling stock.

Estonia

Railway Transport Law, 2004; the chapter regarding the acceptance of rolling stock for operation.

TOR, Paragraph 137

The aforementioned requirements are approved by the following documents:

Belarus	TOR Regulation of the System of Technical Maintenance and Repair of Locomotives and Multi-Unit Rolling Stock at Belarusian Railways
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	ADV-001 Regulation on the Technical Operation of Railways Order of the Minister regarding the putting into operation of new sub-systems
Poland	Resolution of the Minister for Transport regarding the Basic Technical Requirements for the Operation of Rolling Stock dated 12 October 2005 (as amended on 07 November 2007)
Russia	TOR No. TsRB-756 dated 26 May 2000 (as amended and supplemented by Orders of the Ministry of Railways of the Russian Federation, No. 16Ts dated 03 July 2011 and No. 24Ts dated 27 May 2002) GOST 18322-78, Articles1-2 GOST 2.601-2006 Unified Design Documentation System – Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair Documents
Slovakia	Technical documentation for operation and technical maintenance of rolling stock
Ukraine	Technical Operating Rules for Ukrainian Railways No. TsRB 004 GOST 18322-78, Articles 1-2. System of Technical Maintenance and Repair of Machinery and Equipment – Terms and Definitions GOST 2.601-2006 Unified Design Documentation System – Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair Documents
Estonia	Railway Transport Law, 2004; the chapter regarding the acceptance of rolling stock for operation TOR, Paragraph 137

5.11.2 General documentation

Currently, requirements for this parameter are the same in all the countries (except for Poland).

Belarus, Latvia, Lithuania, Poland, Russia, Slovakia, Ukraine, and Estonia

The basic set of documentation required for the operation and repair of rolling stock should be defined by the Technical Assignment for the designing of rolling stock.

The Operating Manual (OM), which should be included in the delivery package of any batch of locomotives or multi-unit rolling stock, serves as the main document laying the basis for operation, maintenance, and routine repair of a locomotive or multi-unit rolling stock.

The requirements for the OM are regulated in GOST 2.601-2006 (in Russia and Ukraine). The OM for locomotives and multi-unit rolling stock, as a rule, shall consist of the following parts:

- Part 1. Technical Description;

- Part 2. Operation;

- Part 3. Technical Maintenance and Routine Repair.

Each part of the OM, in its turn, may be composed of several books consisting of chapters and sub-chapters.

Part 1 of the OM, Technical Description, for each series of locomotives or multi-unit rolling stock, as a rule, contains the following:

- intended purpose and characteristics of the locomotives or multi-unit rolling stock;

- make-up (of the train of multi-unit rolling stock);

- description of the arrangement of equipment;

- description of the electrical diagrams;

- description of the pneumatic diagrams;

- description of the hydraulic diagrams;

- description of the electrical equipment and converters;

- description of the pneumatic equipment;

- description of the ventilation system;

- etc.

Part 2 of the OM, Operation, shall contain safety requirements, procedure for preparation for putting into operation, procedure for the start-up of systems, adjustment, running-in, procedure for the control of the rolling stock, information on typical troubles for each kind of rolling stock and methods of the elimination thereof, limit values of parameters and characteristics of the equipment for safety operation, and list of operations to be carried out by the locomotive crew during the acceptance and transfer of rolling stock and on the route (TO-1 for locomotives and multi-unit rolling stock and TO-2 for multi-unit rolling stock). Specifics of the aforementioned operations may be regulated in separate books and special operating manuals.

Part 3 of the OM, Technical Maintenance and Routine Repair, shall specify safety precautions in the course of work as well as the nomenclature, periodicity, and content of work for technical maintenance and routine repair.

Certain provisions of this part of the OM may be regulated in separate books concerning individual types of equipment and containing corresponding chapters and sub-chapters applicable to the components of the equipment.

Poland (additionally)

Resolution of the Minister for Transport regarding the Basic Technical Requirements for the Operation of Rolling Stock dated 12 October 2005 (as amended on 07 November 2007).

Technical documentation for operation and technical maintenance DTSU.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 2.601-2006 Unified Design Documentation System – Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair Documents
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724 Rules No. 1211 adopted by the Cabinet of Ministers – Procedure for Putting into Operation, Compliance Assessment, Manufacturing, Upgrading, and Reconditioning Repair of Rolling Stock
Lithuania	TOR Order No. 3-122 of the Minister for Transport and Communications of the Republic of Lithuania dated 22 April 2008 regarding the approval of the System of the Standards for the Runs of Cars between Repairs and Periodicity of Repair as well as of the Technical Maintenance and Repair of Traction Rolling Stock
Poland	Resolution of the Minister for Transport regarding the Basic Technical Requirements for the Operation of Rolling Stock dated 12 October 2005 (as amended on 07 November 2007)
Russia	GOST 2.601-2006 Unified Design Documentation System – Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair Documents
Slovakia	TOR
Ukraine	GOST 2.601-2006 Unified Design Documentation System – Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair Documents TsT-0056. Instruction for the Technical Maintenance of In-Service Diesel Locomotives, Electric Locomotives, and Multi-Unit Rolling Stock

	TsT-0056. Instruction for the Technical Maintenance of In-Service Diesel Locomotives, Electric Locomotives, and Multi-Unit Rolling Stock VND 32.1.07.000-02 Temporary Instruction for the Organisation of Fast Traffic of Passenger Trains. Requirements for the Infrastructure and Rolling Stock
Estonia	TOR, Paragraph 137 Direction No. 1-3, P. 2/7-C of EVR Cargo Board Members dated 10 February 2009

5.11.3 Maintenance file

5.11.3.1 Justification of the maintenance and repair system

Currently, requirements for this parameter are the same in all the countries, while it is possible to identify two sets of the same requirements for the groups of countries "Latvia, Lithuania, and Estonia" and "Russia and Ukraine".

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

Locomotives of different series and multi-unit rolling stock are covered with operating and repair documents of manufacturing plants, on the basis of which the transportation company shall develop the repair system of the rolling stock.

This document shall regulate the following:

- type (scope) of technical maintenance and repair as well as its intended purpose and brief characteristic;

- periodicity of technical maintenance and repair to be calculated in terms of the time of the stay of the locomotive in the operating fleet or its line mileage;

- procedure for planning and recording of technical maintenance and repair of rolling stock.

In their turn, repair enterprises shall develop technical documentation for the repair of locomotives and multi-unit rolling stock following the documentation of manufacturing plants.

For Latvia, Lithuania, and Estonia, this procedure shall be regulated by the National Authority for Traffic Safety.

Poland and Slovakia

Technical documentation for operation and technical maintenance DSU.

Russia (supplementary information)

In accordance with the currently effective version of the TOR, the scheduled and preventive repair system for traction rolling stock established by the Ministry of Railways of Russia is adopted for the railway network of the Russian Federation.

Currently, the TOR is being revised.

In accordance with the draft of the next version of the TOR (as of 30 April 2009) prepared by the Ministry of Railways of the Russian Federation:

"The system of technical maintenance and repair and rates for runs of rolling stock between repairs shall be stipulated by the manufacturers thereof upon agreement between the customer and federal executive body in charge of railway transport.

Operating manuals for rolling stock shall be developed and approved by the manufacturer after coordinating with the customer and federal executive body in charge of railway transport".

Before the approval of the new version of the TOR, the following shall be effective in OAO Russian Railways:

- Instruction No. 3 of OAO Russian Railways dated 17 January 2005 regarding the system of technical maintenance and repair of locomotives of OAO Russian Railways;

- Instruction No. 622r of OAO Russian Railways dated 6 April 2006 regarding schedule preventive technical maintenance of multi-unit rolling stock.

The aforementioned organisational and administrative documents shall regulate the following:

- type (scope) of technical maintenance and repair as well as its intended purpose and brief characteristic;

– periodicity of technical maintenance and repair to be calculated in terms of the time of the stay of the locomotive in the operating fleet or its line mileage;

– procedure for planning and recording of technical maintenance and repair of rolling stock;

- rating of the duration and labour intensity of the technical maintenance and repair of rolling stock.

The system of the technical maintenance and repair of locomotives of OAO Russian Railways provides for the following types of scheduled technical maintenance and repair:

technical maintenance: TO 1; TO 2; TO 3; TO 4; TO 5a; TO 5b; TO 5c; TO 5d;

routine repair: TR 1; TR 2; TR 3;

medium repair SR;

major repair: KR.

The scheduled and preventive system of the technical maintenance and repair of multi-unit rolling stock provides for the following types of scheduled technical maintenance and repair:

technical maintenance TO-1; TO-2; TO-3; TO-4; TO-5a; TO-5b; TO-5c; TO-5d;

routine repair: TR-1; TR-2; TR-3;

major repair: KR-1 and KR-2;

major repair (upgrading) with the extension of the service life: KRP.

The scopes and procedure for the performance of obligatory operations in the event of scheduled technical maintenance and repair, rejection criteria, and permissible methods for

the restoration of parts and assembly units shall be defined by the effective documentation for operation and repair.

The equipment and tools required for the performance of technical maintenance and repair shall be specified in the Manuals for the technical maintenance and repair of the corresponding type of traction rolling stock.

Ukraine (supplementary information)

In accordance with the currently effective version of the TOR, the scheduled and preventive repair system for traction rolling stock is adopted for the railway network of Ukraine.

Order No. 30-TsZ 2004 concerning the scheduled and preventive repair and technical maintenance system for traction and multi-unit rolling stock is in effect.

This document regulates the following:

- type (scope) of technical maintenance and repair as well as its intended purpose and brief characteristic;

– periodicity of technical maintenance and repair to be calculated in terms of the time of the stay of the locomotive in the operating fleet or its line mileage;

- procedure for planning and recording of technical maintenance and repair of rolling stock.

The system of the technical maintenance and repair of locomotives and multi-unit rolling stock provides for the following types of scheduled technical maintenance and repair:

technical maintenance: TO 1; TO 2; TO 3; TO 4; TO 5;

routine repair: TR 1; TR 2; TR 3;

major repair: KR-1 and KR-2;

major repair (upgrading) with the extension of the service life: KRP.

The scopes and procedure for the performance of obligatory operations in the event of scheduled technical maintenance and repair, rejection criteria, and permissible methods for the restoration of parts and assembly units shall be defined by the effective documentation for operation and repair.

The equipment and tools required for the performance of technical maintenance and repair shall be specified in the Manuals for the technical maintenance and repair of the corresponding type of traction rolling stock.

The aforementioned requirements are approved by the following documents:

Belarus	TOR Regulation of the System of Technical Maintenance and Repair of Locomotives and Multi-Unit Rolling Stock at Belarusian Railways
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724 Rules No. 1211 adopted by the Cabinet of Ministers – Procedure for Putting into Operation, Compliance Assessment, Manufacturing,

	Upgrading, and Reconditioning Repair of Rolling Stock
Lithuania	TOR 2008-04-22 LR Susisiekimo ministro įsakymas Nr.3-122 Dėl traukos riedmenų ridos nuo atlikto remonto iki kito remonto normų ir remonto periodiškumo bei traukos riedmenų techninės priežiūros ir remonto sistemos patvirtinimo (Order No. 3-122 of the Minister for Transport and Communications of the Republic of Lithuania dated 22 April 2008 regarding the approval of the System of the Standards for the Runs of Cars between Repairs and Periodicity of Repair as well as of the Technical Maintenance and Repair of Traction Rolling Stock)
Poland	Resolution of the Minister for Transport regarding the Basic Technical Requirements for the Operation of Rolling Stock dated 12 October 2005 (as amended on 07 November 2007)
Russia	Instruction No. 3 of OAO Russian Railways dated 17 January 2005 regarding the system of technical maintenance and repair of locomotives of OAO Russian Railways Instruction No. 622r of OAO Russian Railways dated 6 April 2006 regarding schedule preventive technical maintenance of multi-unit rolling stock
Slovakia	Technical documentation for operation and technical maintenance of rolling stock
Ukraine	Technical Operating Rules for Ukrainian Railways No. TsRB 004 Order No. 30-TsZ 2004 Regulation on the System of Scheduled and Preventive Repair and Technical Maintenance of Traction Rolling Stock
Estonia	TOR, Paragraph 131

5.11.3.2 Maintenance and repair manuals

Currently, requirements for this parameter are the same in all the countries (except for Poland).

Latvia (supplementary information)

In Latvia, the following types of technical maintenance and repair are established:

- Technical maintenance: TO-1, TO-2, TO -3, TO-4, and TO-5;
- Routine repair: TR-1 and TR-3;
- Major repair: medium (SR) and main (GR);
- Special repair;
- Upgrading.

1. Technical maintenance types TO-1, TO-2, and TO-3 are intended for the prevention and elimination of faults of in-service traction rolling stock (hereinafter referred to as “TRS”), maintenance thereof in operating, fire-safety, and environmentally-safe condition

as well as for the assurance of trouble-free operation during railway transportation and shunting operations.

1.1. Technical maintenance type TO-1 shall be performed during the acceptance and transfer of TRS by a locomotive crew. The list of work under TO-1 to be performed shall be posted in the driver's cab of the TRS on a conspicuous place. During the transfer of the TRS, the driver shall confirm the performance of the work under TO-1 by making an entry in the log of the technical condition of the traction vehicle, LU-12L.

1.2. Technical maintenance types TO-2 and TO-3 shall be performed by composite crews of the repair company of the TRS. When necessary, TO-2 may be performed by mobile crews at permanent work places of locomotive crews.

1.3. Technical maintenance types TO-4 and TO-5:

1.3.1. Technical maintenance type TO-4 is intended for the machining of wheelsets, for the maintenance of wheelset tyres in accordance with the requirements of the Technical Operating Rules of the railway. It shall be permitted to combine the machining of tyres with the performance of TO-3 and TR-1 while extending the stabling limit to be agreed upon with the user of the TRS.

1.3.2. Technical maintenance type TO-5 is intended for the preparation of placing TRS in long-term storage, preservation for long-term stabling, awaiting of TR-2, SR, GR, special repair or upgrading, or for putting into operation after withdrawal from storage as well as for the preparation for operation of TRS that arrived in a non-operating condition after repair work.

2. Routine repair types TR-1 and TR-3 are intended for the maintenance of the operating condition of TRS, restoration of the main operating parameters, and assurance of stability during the period between repair types SR or GR, by the performance of diagnostics and inspection, repair, replacement, adjustment, and testing of nodes and assemblies.

3. Medium repair type SR is intended for the restoration of the parameters and lifetime of TRL during the period from building to GR and from GR to the end of operation, by means of the replacement of worn-out nodes, assemblies, and worn-out parts with new or repaired ones, and in accordance with the technical rules for medium repair by the adjustment of units and testing and complete painting of TRS.

4. Main repair type GR is intended for the restoration of the operating ability, entire lifetime, and basic parameters in service in accordance with the requirements of repair type GR.

5. Special repair is intended for the extension of the standard operating life of TRS established by the manufacturer. Prior to special repair of traction rolling stock, the technical condition of the TRS shall be assessed in order to determine whether or not it is possible to extend the operating life. TRS shall be assessed by a certification institution accredited with the national agency, the Latvian National Accreditation Bureau, in accordance with the standard LVSEN45011:2004 – General Requirements for Institutions Engaged in

Product Certification Systems as well as by other assessment institutions in accordance with international agreements. The certification institution shall present its assessment of the feasibility of extending the operating life of TRS as well as the list and scopes or required work. On the basis of the assessment and list of the required work issued by the certification institution, the repair organisation, against the order of the owner of the TRS, shall perform special repair during scheduled repair.

6. Upgrading of TRS. Prior to the upgrading of TRS with the change of functional tasks and replacement of bearing structures, the technical condition of the TRS shall be assessed in order to determine whether or not such upgrading is possible. TRS or a model thereof shall be assessed by a certification institution accredited with the national agency, the Latvian National Accreditation Bureau, in accordance with the standard LVSEN45011:2004 – General Requirements for Institutions Engaged in Product Certification Systems. On the basis of the assessment of the certification institution regarding the feasibility of the upgrading of traction rolling stock, the upgrading organisation or the customer shall ensure the development of the TRS upgrading project in accordance with the technical documentation for the traction rolling stock. The developed project shall be coordinated with the State Railway Technical Inspectorate. It shall be permitted to combine the upgrading of TRS with scheduled or special repair. After the completion of upgrading, during the warranty period, the cycles of the repair of TRS and periodicity thereof shall be performed in accordance with the technical documentation for upgrading.

Poland and Slovakia

Technical documentation for operation and technical maintenance DSU.

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

The requirements for the performance of technical maintenance and routine repair shall be included in the Operating Manual (OM, Part 3).

Part 3 of the OM, Technical Maintenance and Routine Repair, shall contain a description of the organisation of work, safety measures in the course of work, nomenclature, periodicity, and content of work for technical maintenance and routine repair, standards for tolerances and wear, requirements for the qualification of personnel, criteria for the completion of maintenance work both in respect of the transport unit as a whole and to types of equipment.

The contents of books, chapters, and sub-chapters of Part 3 of the OM, Technical Maintenance and Routine Repair, shall be regulated by GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents

The main documentation required for the repair of rolling stock and time limits for the development thereof should be defined by the Technical Assignment for the designing of rolling stock. The development of the documentation shall be completed before the beginning of commercial production.

Repair documents are intended for the preparation of repair operations, repair, and control of repaired products and component parts thereof in the course of the performance of medium and major repair.

The following shall be classified as repair documents:

Repair documents register;

Repair Manual RR (for medium and major repair);

Repair drawings;

Technological documentation for the performance of repair including technological instructions for preparation for repair, performance of repair, control and tests, and adjustment and tuning;

Standard rates of the consumption of spare parts for repair;

Standard rates for the consumption of materials;

Register of spare parts, tolls, and accessories for repair;

Technical documentation for the fixtures for the performance of repair.

Types and completeness of the set of repair documents shall be regulated by GOST 2.602 –95.

The aforementioned requirements are approved by the following documents:

Belarus	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair Documents
Latvia	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents (Informatory) Rules No. 1211 adopted by the Cabinet of Ministers – Procedure for Putting into Operation, Compliance Assessment, Manufacturing, Upgrading, and Reconditioning Repair of Rolling Stock
Lithuania	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents (Informatory) GOST 2.602-68 (as amended on 18 September 1985 and 06 March 1989) Repair Documents GOST 2.602-95 Repair Documents (Informatory). Order No. 3-122 of the Minister for Transport and Communications of the Republic of Lithuania dated 22 April 2008
Poland	Resolution of the Minister for Transport regarding the Basic Technical Requirements for the Operation of Rolling Stock dated 12 October 2005 (as amended on 07 November 2007)
Russia	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair Documents
Slovakia	Technical documentation for operation and technical maintenance of rolling stock
Ukraine	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents GOST 2.602-95 Unified Design Documentation System – Repair

	Documents
Estonia	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents (Informatory) GOST 2.602-95 Repair Documents (Informatory). TOR, Paragraph 148-152 List of Technological Documents for the Technical Maintenance and Repair of Rolling Stock of EVR Cargo Ltd dated 10 February 2009 (defines a list of 70 documents)

5.11.4 Operating documents

Currently, requirements for this parameter are the same in all the countries.

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

Operating documents are intended for the operation of rolling stock, familiarisation with its design, studying of the operating rules (use in accordance with the intended purpose, technical maintenance and routine repair, storage, and transportation), reflecting of data certifying the values of the main parameters and characteristics guaranteed by the manufacturer, and reflecting data on the condition and parameters of in-service equipment.

Latvia (supplementary information)

Technical maintenance within scope one and scope two (hereinafter referred to as "TO-1" and "TO-2") is intended for the maintenance of in-service locomotives in operating, fire-safety, and environmentally-safe condition as well as for the assurance of trouble-free operation.

TO-1 shall be performed by the personnel of the locomotive crew during each trip or working shift.

Responsibility for the quality of TO-1 shall be borne by the driver of the locomotive (traction vehicle).

The locomotive technical condition log, version LU-12L, should be constantly kept in each locomotive for the registration of transfer and acceptance, quantity of fuel and lubricating materials, troubles and defects detected, and repair, maintenance and inspections performed.

The technical condition of in-service locomotives, including the quality of TO-1 and TO-2 performed, shall be checked in accordance with the procedure established by the traffic safety internal supervision system. If locomotive crews are changed en route, the quality of TO-1 shall be checked by the crew accepting the locomotive, and the results of the check shall be registered in the log LU-12L.

If trouble arises with assemblies, units, or nodes of the locomotive, which does not pose a threat to traffic safety, does not cause breakdown of other assemblies and units, does not require limitation of the travelling speed of the train, it shall be allowed to drive the locomotive up to the station that has a locomotive repair enterprise or shop.

Poland and Slovakia

Technical documentation for operation and technical maintenance DSU.

Russia and Ukraine (supplementary information)

Operating documents are intended for the operation of rolling stock, familiarisation with its design, studying of the operating rules (use in accordance with the intended purpose, technical maintenance and routine repair – see 5.11.3.2, storage, and transportation), reflecting of data certifying the values of the main parameters and characteristics guaranteed by the manufacturer, and reflecting data on the condition and parameters of in-service equipment.

The requirements for the studying of the model rolling stock and direct use thereof in accordance with the intended purpose shall be specified in the Operating Manual (OM, Part 1 – Technical Description, and Part 2 – Operation).

The following shall also be classified as operating documents:

- Necessary instructions (for assembling, start-up, adjustment and running-in, etc.);
- Data sheet;
- Certificate (for certain component parts of rolling stock);
- Catalogue of parts and assembly units;
- Standard rates of the consumption of spare parts;
- Standard rates for the consumption of materials;
- Register of spare parts, tolls, and accessories;
- Register of operating documents;
- Special operating instructions;
- On-board log of the technical condition of the locomotive and multi-unit rolling stock.

The content of books, chapters, and sub-chapters of the documents listed above shall be regulated by GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents.

Estonia (supplementary information)

The requirements for the studying of the model rolling stock and direct use thereof in accordance with the intended purpose shall be specified in the Operating Manual (OM, Part 1 – Technical Description, and Part 2 – Operation).

The aforementioned requirements are approved by the following documents:

Belarus	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents GOST 2.601-2006 Unified Design Documentation System – Operation Documents
Latvia	TOR Instruction No. DVI-3/340 LDz Instruction for the Technical Maintenance of In-Service Diesel Locomotives
Lithuania	TOR

Poland	Resolution of the Minister for Transport regarding the Basic Technical Requirements for the Operation of Rolling Stock dated 12 October 2005 (as amended on 07 November 2007)
Russia	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents GOST 2.601-2006 Unified Design Documentation System – Operation Documents
Slovakia	Technical documentation for operation and technical maintenance of rolling stock
Ukraine	GOST 2.610-2006 Unified Design Documentation System – Rules for Drawing up Operation Documents GOST 2.601-2006 Unified Design Documentation System – Operation Documents
Estonia	TOR

5.11.5 Instructions for actions in emergency situations

Currently, requirements for this parameter are the same in all the countries.

Belarus, Latvia, Lithuania, Russia, Ukraine, and Estonia

For each series of locomotives and multi-unit rolling stock, it shall be envisaged to develop procedures for emergency situations to be specified in special operating instructions developed on the basis of normative documents, which shall be approved in each country in accordance with the effective procedure.

Poland and Slovakia

The instructions for procedures in emergency situations shall be stipulated by the Infrastructure Manager.

The aforementioned requirements are approved by the following documents:

Belarus	TOR GOST 2.610
Latvia	03.08.2010 KM LR Railway Technical Operating Rules, No. 724
Lithuania	TOR Railway Traffic Rules
Poland	Instruction Ir-1 Instruction for Train Traffic at PKP, TSI LOC&PAS
Russia	GOST 2.610
Slovakia	Instructions of the Infrastructure Manager TSI LOC&PAS
Ukraine	Technical Operating Rules for Ukrainian Railways No. TsRB 004 GOST 2.610 Unified Design Documentation System. Rules for Drawing up Operation Documents

	Special Instructions
Estonia	TOR Special Instructions

6 COMPARISON WITH THE TARGET VALUES OF THE 1 435 mm GAUGE SYSTEM

Target values for the "basic parameters" of the 1 435 mm gauge railway system will be specified in the TSI "Locomotives and passenger rolling stock", which is in the process of being adopted under the Directive on the interoperability of the rail system within the Community.

6.1 STRUCTURE AND MECHANICAL EQUIPMENT

6.1.1 General provisions

6.1.2 Mechanical couplings

6.1.2.1 General provisions and definitions

6.1.2.2 Inner coupling

The TSI requirements

"Inner couplings between the different vehicles of a unit shall incorporate a resilient system capable of withstanding the forces due to the intended operating conditions."

are applicable to the 1 520 mm gauge system.

Inner couplings should ensure resilient connection between the units of rolling stock and withstand specified excess of operating loads.

Different designs of coupling devices shall be permitted.

6.1.2.3 End coupling

The TSI requirements

"Where an end coupling is provided at any end of a unit, the following requirements apply to all types of end coupling (automatic, semi-automatic or manual): end couplings shall incorporate a resilient coupling system, capable of withstanding the forces due to the intended operational and rescue conditions;"

are applicable to the 1 520 mm gauge system except for the requirements specified for manual coupling devices. Manual coupling devices are not used in the 1 520 mm gauge system. The automatic coupling device SA-3 is used as a standard end-coupling device on locomotives.

6.1.2.4 Rescue coupling

The TSI requirements

"Provisions shall be made to enable the recovery of the line in case of breakdown by hauling or propelling the unit to be rescued by means of a power unit equipped with the same type of end coupling system or by means of a recovery unit with a manual coupling system.

This is achieved either by means of a permanently installed compatible coupling system or through a rescue coupling device (also called rescue adaptor)."

are applicable to the 1 520 mm gauge systems with the exception of references to the manual coupling type UIC. The SA-3 automatic coupler is used instead of manual coupling UIC.

6.1.2.5 Staff access for coupling and uncoupling

The first paragraph of the TSI requirements

"Units shall be designed so that staff are not exposed to undue risk during coupling and uncoupling, or rescue operations."

is applicable to the 1 520 mm gauge system.

Couplings devices, which require the involvement of shunting masters for uncoupling of units of rolling stock, should be equipped with an uncoupling arrangement allowing the control of operations to be performed with coupling devices without the presence of shunting masters in the inter-car (inter-sectional) area at the moment of application of longitudinal compressive force.

6.1.3 Inter-car and inter-section gangways

The structure of the TSI requirements is applicable to the 1 520 mm gauge system, but with other values. There are additional requirements for inter-sectional locomotive gangways (to be checked against TSI PRM by ERA).

6.1.4 Strength of vehicle structure

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.1.5 Passive safety

The functional requirements for passive safety and principles of their definition on the basis of scenarios, which are similar to those defined by TSI but have certain differences with them, are applicable to the 1 520 mm gauge system.

Detailed requirements for the 1 520 mm gauge system have been developed within the OAO Russian Railways and will be proposed to the Ministry of Transport of Russia for approval. The requirements will differ from the requirements of standard EN15227.

6.1.6 Possibility of jacking

The TSI requirements are applicable to the 1 520 mm gauge system with the exception of values and calculation methods specified in the standard EN12663-1 and the symbols for the marking of lifting points.

6.1.7 Fixing of devices to carbody structure

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.1.8 Staff and Freight Access Doors

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ

The TSI requirements

"Vehicles fitted with a compartment dedicated to train crew or freight shall be equipped with a device to close and lock the doors. The doors shall remain closed and locked until they are intentionally released."

are applicable to the 1 520 mm gauge system.

In the 1 520 mm gauge system, there are also additional requirements for this parameter.

6.1.9 Mechanical characteristics of glass

The TSI requirements

"Where glass is used in glazing (including mirrors), it shall be either laminated or toughened glass which is in accordance with a relevant national or international standard with regard to the quality and area of use, thereby minimising the risk to passenger and staff being injured by breaking glass."

are applicable to the 1 520 mm gauge system.

In the 1 520 mm gauge system, there are also additional requirements for this parameter.

6.1.10 Load conditions and weight characteristics

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values of parameters differ.

6.2 IMPACT ON TRACK AND CLEARANCE GAUGE OF ROLLING STOCK

6.2.1 Clearance gauge of rolling stock

The TSI requirements are not applicable to this parameter. The requirements must be replaced by those of the current version of GOST 9238 (or similar documents in different states).

6.2.2 Static axle load

TSI Locomotives and Passenger Rolling Stock does not specify the exact value of axle load, but only requires to indicate information about the distance between all axles of a unit of rolling stock and its length.

The axle load limits are established by TSI Infrastructure depending on the category of the line.

Unlike TSI Locomotives and Passenger Rolling Stock, the 1 520 mm gauge system specifies absolute limits of the load of rolling stock on the track. The values of differences in loads on wheels and axles specified for the 1 520 mm gauge system are stricter than those specified in TSI.

6.2.3 Rolling stock parameters which influence ground-based systems

6.2.3.1 Rolling stock parameters which influence the CCS subsystem

It is considered within the TSI CCS. Open point.

6.2.3.2 Axle bearing monitoring

The purpose of the requirements for this parameter in the TSI and 1 520 mm gauge system coincide.

The TSI requirements are not applicable to track-side monitoring systems of the 1 520 mm gauge system due to the difference in gauge.

Requirements for on-board monitoring systems should be defined both for the 1 435 mm gauge system and for the 1 520 mm gauge system.

6.2.4 Rolling stock dynamic behaviour

6.2.4.1 Safety against derailment running on twisted track and track with deviations within the track maintenance tolerance

The TSI requirements may be applied; however, the values of the factors require further clarification.

The 1 520 mm gauge system applies a different approach and methodology than those defined in TSI.

6.2.4.2 Running dynamic behaviour

The TSI requirements may be applied; however, the values of the factors require further clarification.

The 1 520 mm gauge system applies a different approach and methodology than those defined in TSI.

6.2.4.3 Limit values for running safety

The TSI requirements may be applied; however, the values of the factors require further clarification.

The 1 520 mm gauge system applies a different approach and methodology than those defined in TSI.

6.2.4.3.1 Track vertical and transversal loading limit values

The TSI requirements may be applied; however, the values of the factors require further clarification.

The 1 520 mm gauge system applies a different approach and methodology than those defined in TSI.

6.2.4.3.2 Equivalent conicity

This parameter is not applicable to the 1 520 mm gauge system.

6.2.4.3.2.1 Design values for new wheel profiles

The TSI requirements are not applicable to the 1 520 mm gauge system due to the difference in approaches and because of the non-applicability of the equivalent conicity parameter.

The description of the wheel profile is in accordance the requirements of GOST.

6.2.4.3.2.2 In-service values of wheelset equivalent conicity

The TSI requirements are not applicable to the 1 520 mm gauge system due to the difference in approaches and because of the non-applicability of the equivalent conicity parameter.

The description of the wheel profile is in accordance the requirements of GOST.

Wear tolerances are limited by the requirements of GOST.

6.2.5 Running gear

6.2.5.1 Structural design of bogie frame

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.2.5.2 Wheelsets

6.2.5.3 Mechanical and geometrical characteristics of wheelsets

Mechanical characteristics: The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

Geometric characteristics: The TSI requirements are not applicable because of the difference of gauge.

6.2.5.4 Mechanical and geometrical characteristics of wheels

Mechanical characteristics: The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

Geometric characteristics: The TSI requirements are not applicable because of the difference of gauge. Profiles of the wheels in the 1 520 mm gauge system are determined by the requirements of GOST.

6.2.5.5 Mechanical characteristics of axle

Mechanical characteristics: The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

In the 1 520 mm gauge system, the parameter is described by a separate standard GOST.

6.2.6 Minimum permissible curve radius

This parameter is applicable to the 1 520 mm gauge system.

6.2.7 Sanding devices

The TSI does not require the availability of these sanding devices.

For the 1 520 mm gauge system, the availability of these devices on traction and multiple-unit rolling stock is mandatory.

6.2.8 Flange lubrication

The TSI does not require the availability of these lubrication devices.

For the 1 520 mm gauge system, the availability of these devices on traction and multiple-unit rolling stock is mandatory in certain countries.

6.2.9 Life guards

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.3 BRAKING

6.3.1 General provisions

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.3.2 Main functional and safety requirements

6.3.2.1 Functional requirements

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.3.2.2 Safety requirements

Currently, the safety requirements in the 1 520 mm gauge system do not imply the need for risk analysis.

6.3.3 Type of braking system

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

Structurally, the systems ensure compatibility in accordance with the command principles characteristic to each system.

6.3.4 Braking command

6.3.4.1 Emergency braking

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.3.4.2 Service braking

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.3.4.3 Direct-action brake command

The TSI requirements are applicable to the 1 520 mm gauge system.

6.3.4.4 Dynamic brake command

The TSI requirements are applicable to the 1 520 mm gauge system.

It is necessary to envisage automatic replacement of the dynamic brake with pneumatic (electro-pneumatic) one in case of reduction or failure of the dynamic brake.

6.3.4.5 Parking brake command

The TSI requirements are practically applicable to the 1 520 mm gauge system.

6.3.5 Braking performance

6.3.5.1 General requirements

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.3.5.2 Emergency braking

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.3.5.3 Service braking

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.3.5.4 Calculations of thermo-cyclic capacity

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.3.5.5 Parking brake

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.3.6 Wheel-rail adhesion – wheel slide protection system

6.3.6.1 Limit value of the wheel-rail adhesion factor

This parameter is not applicable (is not regulated) in the 1 520 mm gauge system.

6.3.6.2 Wheel slide protection system

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.3.7 Dynamic braking systems (electro- and hydro-dynamic)

In the 1 520 mm gauge system, the dynamic brake is not included in the calculation of the emergency braking characteristics.

6.3.8 Braking system independent of adhesion conditions

6.3.8.1 General provisions

6.3.8.2 Magnetic track brake

This parameter is not regulated in the 1 520 mm gauge system.

6.3.8.3 Eddy current track brake

This parameter is not regulated in the 1 520 mm gauge system.

6.3.9 Brake state monitoring and fault indication

The TSI requirements are comparable to the requirements of the 1 520 mm gauge system.

6.3.10 Brake requirements for rescue purposes

The TSI requirements are comparable to the requirements of the 1 520 mm gauge system.

This parameter will require additional study when introducing the 1 520 mm gauge system in the TSI.

6.4 PASSENGER SERVICING

It is necessary to adapt the PRM (persons with reduced mobility) rules for the 1 520 mm gauge system.

6.4.1 Sanitary systems

The TSI requirements are comparable to the requirements of the 1 520 mm gauge system.

6.4.2 Public address and communication systems

The TSI requirements are applicable to the 1 520 mm gauge system.

6.4.3 Possibility of sending an alarm signal from passengers to the driver: functional requirements

The TSI requirements are not applicable to the 1 520 mm gauge system.

The TSI requirements are newly developed and will require additional study.

In the 1 520 mm gauge system, the emergency break signal (activation of the emergency stop valve) means absolute stoppage of the train.

6.4.4 Safety instructions and signs for passengers

The TSI requirements are applicable to the 1 520 mm gauge system.

6.4.5 Covered by the requirements of Paragraph 4.2 *(Public address and communication systems)*

6.4.6 Exterior doors: access to and egress from rolling stock

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

The TSI requirements are newly developed and can be applied only to the newly designed rolling stock.

There is also need for further research including that with regard to the requirements of TSI PRM and the supplementary information provided in the table concerning doors.

6.4.7 Door system construction

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

There is also need for further research including that with regard to the requirements of TSI PRM and the supplementary information provided in the table concerning doors.

6.4.8 Inter-car doors

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

There is also need for further research including that with regard to the requirements of TSI PRM and the supplementary information provided in the table concerning doors.

6.4.9 Internal air quality in rolling stock

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

At the same time, sanitary requirements are interpreted more broadly in the 1 520 mm gauge system.

6.5 ENVIRONMENTAL CONDITIONS AND AERODYNAMIC EFFECTS

6.5.1 Environmental conditions

The purpose of the requirements for this parameter in the TSI and in the 1 520 mm gauge system coincide; however, the values and calculation and verification methods differ.

6.5.2 Aerodynamic effects

This parameter is applicable to the 1 520 mm gauge system.

This parameter will require additional study when introducing the 1 520 mm gauge system in the TSI.

6.6 SYSTEM PROTECTION

6.6.1 Electrical safety

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.6.2 Diagnostics; Software

This parameter is applicable to the 1 520 mm gauge system.

In accordance with the new version of the TSI (Revision 4.0), the description of these parameters is distributed over other chapters. The requirements are stipulated by normative documents for each type of rolling stock as well as by additional design requirements to be agreed with the customer.

6.6.2.1 Diagnostics

6.6.2.2 Software

6.6.3 External lights, head and tail lights, and audible signals

6.6.3.1 External lights; head and tail lights

6.6.3.1.1 External light

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.6.3.1.2 Head lights

This parameter is applicable to the 1 520 mm gauge system and is described by national rules and instructions for signalling in each country.

6.6.3.1.3 Tail lights

This parameter is applicable to the 1 520 mm gauge system and is described by national rules and instructions for signalling in each country.

6.6.3.1.4 Lamp control

The TSI requirements are applicable to the 1 520 mm gauge system.

6.6.3.2 Audible signals (warning horn and whistle)

6.6.3.2.1 General provisions

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

These requirements are described by GOST.

6.6.3.2.2 Warning horn sound pressure level

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.6.3.2.3 Protection against external impact

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.6.4 Train and car identification – external marking

This parameter is applicable to the 1 520 mm gauge system and is regulated by the Technical Operating Rules and other national documents in each country.

6.6.5 Electronic identification of rolling stock

This parameter is applicable to the 1 520 mm gauge system.

6.7 TRACTION AND ELECTRICAL EQUIPMENT

6.7.1 Traction Performance

6.7.1.1 General provisions

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

These requirements are described by the documents under the Rules for Traction Calculations for Train Operation and technical (design and operational) documentation for rolling stock.

6.7.1.2 Requirements for traction performance

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

These requirements are described by the documents under the Rules for Traction Calculations for Train Operation and technical (design and operational) documentation for rolling stock.

For the 1 520 mm gauge system, traction performance characteristics are contained in the design documentation for rolling stock and shall be thereafter be included in the Rules for Traction Calculations for Train Operation.

6.7.2 Power supply

6.7.2.1 General provisions

In the 1 520 mm gauge system, two types of power supply systems are used: 3 kV DC and 25 kV, 50 Hz AC systems with the overhead position of the contact wire. Both systems use rails as the conductor of return current.

These systems are described by the TSI requirements.

The geometry of the pantograph slide for the 1 520 mm gauge system is different from that described by the TSI requirements.

6.7.2.2 Range of operating voltages and frequencies

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST and the Technical Operating Rules.

6.7.2.3 Regenerative braking with energy to the overhead contact line

This parameter is applicable to the 1 520 mm gauge system, is described by the requirements of GOST and is regulated by local instructions.

6.7.2.4 Maximum power and current from the overhead contact line

This parameter is applicable to the 1 520 mm gauge system and is described by the Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways.

6.7.2.5 Maximum current at standstill for DC systems

This parameter is applicable to the 1 520 mm gauge system and is described by the Rules for the Installation and Technical Operation of the Overhead Contact System of Electrified Railways.

6.7.2.6 Power factor

This parameter is not regulated in the 1 520 mm gauge system.

6.7.2.7 Electromagnetic compatibility (CCS and communication, including disturbances generated by rolling stock to the overhead contact line)

This parameter is applicable to the 1 520 mm gauge system and is regulated by safety requirements, GOST, and other normative documents.

6.7.2.8 Measuring of energy consumption

This parameter is not regulated in the 1 520 mm gauge system.

6.7.2.9 Requirements for pantograph

6.7.2.9.1 Working range in height of pantograph

6.7.2.9.1.1 Height of interaction of rolling stock with contact wires

This parameter is applicable to the 1 520 mm gauge system.

The pantograph shall be installed on the roof of traction rolling stock and must touch the contact wire at a height of 5 550 mm to 6 800 mm (for direct current), or 5 675 mm to 6 800 mm (for alternating current) from the rail head.

6.7.2.9.1.2 Working range in height of pantograph as a component part

This parameter is applicable to the 1 520 mm gauge system.

6.7.2.9.2 Pantograph slide geometry

This parameter is applicable to the 1 520 mm gauge system; however, the requirements are expressed in different approaches and, correspondingly, are described by different documents.

6.7.2.9.3 Pantograph current load

This parameter is applicable to and regulated in the 1 520 mm gauge system.

6.7.2.9.4 Contact strip material

This parameter is not regulated in the 1 520 mm gauge system directly; however, it is regulated by means of current and temperature characteristics.

6.7.2.9.5 Pantograph static contact force

This parameter is applicable to the 1 520 mm gauge system; however, the requirements for the limits of their value ranges differ slightly from country to country.

6.7.2.9.6 Pantograph contact force and dynamic behaviour

This parameter is applicable to the 1 520 mm; however, the requirements differ from country to country.

6.7.2.9.7 Arrangement of pantographs

This parameter is applicable to the 1 520 mm gauge system.

The requirements for the number of pantographs and their arrangement for specific rolling stock shall be specified in the technical assignment for the designing thereof.

6.7.2.9.8 Running through neutral sections

The TSI requirements are applicable to the 1 520 mm gauge system.

6.7.2.9.9 Insulation of pantograph from rolling stock

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.7.2.9.10 Pantograph lowering

The TSI requirements are comparable to the requirements of the 1 520 mm gauge system; however, their specific values must be adapted to the 1 520 mm gauge system.

The ambient temperature shall be taken into account.

6.7.2.10 Protection against failure processes in electrical equipment

The TSI requirements are comparable to the requirements of the 1 520 mm gauge system but their specific values must be adapted for the 1 520 mm gauge system.

6.7.3 Diesel and other thermal traction units

6.7.3.1 Exhaust gases of motors

This parameter is applicable to the 1 520 mm gauge system; however, requirements differ from country to country.

This parameter will require additional study when introducing the 1 520 mm gauge system to the TSI.

6.7.3.2 Others requirements for diesel and other thermal traction units

In the 1 520 mm gauge system, additional parameters are applicable: electromagnetic compatibility, external noise from the running engine, requirements for diesel fuel, and water preparation issue.

In the EU legislation, electromagnetic compatibility issues are covered by the EMC Directive. Noise level issues are covered by the TSI Noise requirements.

6.7.4 Input impedance between pantograph and wheels (for compatibility with rail track circuits)

This parameter is not regulated in the 1 520 mm gauge system.

6.8 *CAB AND OPERATION*

6.8.1 Driver's cab

6.8.1.1 General provisions

The TSI requirements are comparable to the requirements for the 1 520 mm gauge system; however, their specific values must be adapted to the 1 520 mm gauge system.

6.8.1.2 Access and egress

6.8.1.2.1 Access and egress in operating conditions

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.1.2.2 Driver's cab emergency exits

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST. The requirements for multiple-unit rolling stock shall be defined by technical specifications for each specific type of multiple-unit rolling stock during its designing.

6.8.1.2.3 Means for the driver to receive and transfer service documentation

This parameter is not regulated in the 1 520 mm gauge system. It is necessary to provide for the possibility to receive and transfer service documentation through the side windows of the driver's cab.

6.8.1.3 External visibility

6.8.1.3.1 Visibility from the driver's place

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.1.3.2 Rear and side visibility

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.1.4 Interior layout

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.1.5 Driver's seat

The TSI requirements are applicable to the 1 520 mm gauge system.

6.8.1.6 Driver's Desk – Ergonomics

The TSI requirements are comparable to the requirements for the 1 520 mm gauge system; however, their specific values must be adapted to the 1 520 mm gauge system.

6.8.1.7 Microclimate in the driver's cab

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

At the same time, sanitary and hygiene requirements are interpreted more broadly in the 1 520 mm gauge system.

6.8.1.8 Internal lighting

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST and safety standards.

6.8.2 Windscreen

6.8.2.1 Mechanical characteristics

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.2.2 Optical characteristics

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.2.3 Equipment

The TSI requirements are applicable to the 1 520 mm gauge system.

6.8.3 Driver-machine interface

6.8.3.1 Driver's vigilance control function

In the 1 520 mm gauge system, normative documents only regulate the availability of driver's vigilance control devices as such, which ensures automatic stoppage of the rolling stock in the event of loss of the driver's vigilance.

6.8.3.2 Speed indicator

In the 1 520 mm gauge system, normative documents only regulate the availability of these devices.

6.8.3.3 Design and arrangement of the driver's display

This parameter is applicable to the 1 520 mm gauge system; however, requirements differ from country to country.

This parameter will require additional study when introducing the 1 520 mm gauge system to the TSI.

6.8.3.4 Controls and indicators

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.3.5 Signs and labels in the driver's cab

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.8.3.6 Remote control of shunting operations

This parameter is not regulated in the 1 520 mm gauge system.

6.8.4 Onboard kit of tools and signalling accessories

The TSI requirements are applicable to the 1 520 mm gauge system.

In the 1 520 mm gauge system, the list of the onboard kit of tools and accessories is broader.

6.8.5 Storage facility for staff personal effects

The TSI requirements are applicable to the 1 520 mm gauge system and are comparable; however, their specific values must be adapted to the 1 520 mm gauge system.

6.8.6 Recording device of movement parameters

This parameter is applicable to the 1 520 mm gauge system.

The minimum required list of parameters that must be recorded on the removable data media include: the distance travelled, moving speed, pressure in the braking pipe (the pressure in the braking cylinders for multiple-unit rolling stock), indications of the locomotive traffic lights, moving direction, time, driver's vigilance acknowledgement markers, state (switch-on) of safety devices.

The minimally required list of parameters to be recorded on a removable media shall include the following: distance covered, travelling speed, pressure in the brake manifold (pressure in brake cylinders for multi-unit rolling stock), indications of the cab traffic light signals, movement direction, time, driver's vigilance acknowledgement markers, and activated state of the safety devices.

6.9 FIRE SAFETY AND EVACUATION

6.9.1 General provisions and categorisation

(Paragraph 6.9.1 combines Paragraphs 6.9.1.1-6.9.1.2)

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST or by national documents in each country.

6.9.1.1 Categorisation for passenger rolling stock

6.9.1.2 Categorisation for freight locomotives

6.9.2 Material requirements

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.9.3 Special measures for flammable liquids

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST or by national documents in each country.

6.9.4 Passenger evacuation

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, safety standards, or national documents in each country.

6.9.5 Fire barriers

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, safety standards, or national documents in each country.

6.10 *SERVICING*

6.10.1 General provisions

The TSI requirements are applicable to the 1 520 mm gauge system.

6.10.2 Access to the windscreen for cleaning

The TSI requirements are applicable to the 1 520 mm gauge system.

6.10.3 Exterior cleaning of train

The TSI requirements are applicable to the 1 520 mm gauge system.

6.10.4 Toilet discharge system

The TSI requirements are applicable to the 1 520 mm gauge system.

6.10.5 Water supply system

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, safety standards, or national documents in each country.

6.10.6 Interface for water refilling

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST.

6.10.7 Special requirements for stabling of trains

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of the technical assignment project or instructions for preparation for operation and maintenance of locomotives and multiple-unit rolling stock.

6.10.8 Refuelling equipment

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of project technical specification or OSJD/UIC instructions.

6.11 *DOCUMENTATION FOR OPERATION AND MAINTENANCE*

6.11.1 General provisions

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, the Technical Operating Rules, or national documents in each country.

6.11.2 General documentation

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, the Technical Operating Rules, or national documents in each country.

6.11.3 Maintenance file

6.11.3.1 **Justification of the maintenance and repair system**

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of the Technical Operating Rules or national documents in each country.

6.11.3.2 **Maintenance and repair manuals**

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, the Technical Operating Rules, or national documents in each country.

6.11.4 Operating documents

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, the Technical Operating Rules, or national documents in each country.

6.11.5 Instructions for actions in emergency situations

This parameter is applicable to the 1 520 mm gauge system and is described by the requirements of GOST, the Technical Operating Rules, or national documents in each country.

7 APPENDICES

7.1 LIST OF THE MEMBERS OF THE CONTACT GROUP

Refer to memoranda of the corresponding meetings of the OSJD-ERA Contact Group.

7.2 MATERIALS PROVIDED BY THE MEMBERS OF THE CONTACT GROUP

Refer to the corresponding chapters of the ERA Extranet.