

TECHNICAL SPECIFICATIONS

UTILITY REQUIREMENTS

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CONTENTS

1	Introduction	8
1.1	Purpose	8
1.2	Application	8
2	Common requirements.....	9
2.1	Overall requirements	9
2.2	Requirements for the design documentation	15
2.3	Responsibility of the Utility owner	16
2.4	Demand and right for independent third-party expertise	17
2.5	Supervision of construction works	17
3	Specific requirements	18
3.1	Buried gas, oil, district heating, steam, chemicals, other pressurized utilities	18
3.2	Buried gravity sewage, gravity drainage, gravity storm water utilities	20
3.3	Overhead electricity lines and buried cables	23
	References	26
	Annexes	27
	Annex 1. Buried utilities vertical placement	27
	Annex 2. Overhead utilities vertical placement	28
	Annex 3. Minimum vertical clearances between overhead lines and electrified railway catenary contact line and from top of the rail	29
	Annex 4. Buried utilities horizontal placement	30
	Annex 5. Overhead electricity lines horizontal placement	32

ACRONYMS AND ABBREVIATIONS

A full list of acronyms and abbreviations can be found in RBR Glossary of Abbreviations. The following acronyms and abbreviations are used throughout this document:

Abbreviation	Definition
RBR	RB Rail AS, is a multinational joint venture of the Republics of Estonia, Latvia and Lithuania, which has been established to implement the Rail Baltica global project as the central coordinator.
IB	National Implementing Body
IM	Railway Infrastructure Manager
DN	Diameter Nominal, alphanumeric designation of size for reference purposes followed by a dimensionless whole number which is indirectly related to the physical size in millimetres of the bore (ID) or outside diameter (OD) of the end connections
DTD	Detailed Technical Design
GSM-R	International wireless communications standard for railway communication and applications
LDS	Leakage detection system, system to detect and notify about leakage in carrier pipe
LoG	Level of Geometry set out by BIM documentation
LoI	Level of Information set out by BIM documentation
PLC	A programmable logic controller is a small, modular solid-state computer with customized instructions for performing a particular task
SCADA	Supervisory control and data acquisition is a control system architecture that uses computers, networked data communications and graphical user interfaces for process supervisory management
SMAS	Status monitoring and alarm system, system to detect anomalies in systems or in part of the systems work compared to normal behaviour and notifies via alarm of such of event
VRC	Variable-resistance conductor system using three parallel strands of conductor, represented by resistors.

DEFINITIONS

The following terms are used throughout this document:

Term	Definition
Cable insulation	External cover of cable protecting conduit and internal layers of cable from climate and physical/chemical damage.
Detailed Technical Design	DTD phase consists of preparation of detailed drawings and specifications establishing the requirements for the construction of the project. DTD describes the quality, configuration, size, and relationship of all components to be incorporated into the project. DTD must be consistent with the project program, the construction budget, and the project schedule. DTD is basis for starting Construction.
Direct bury cables	Communications or transmissions electrical cable which is especially designed to be buried under the ground without any kind of extra covering, sheathing, or piping to protect it.
Master Design	During the Master Design phase, the project design is further refined including field studies, especially of a topographical, geological, geotechnical, hydrological and hydraulic nature. In the engineering project, details are provided of the unit costs of the materials and of the different construction phases. All design decisions are completed during this phase in order to prepare the subsequent construction documents and to start procuring construction works.
National Implementing body	Rail Baltic Estonia OU (reg. nr 12734109) in Estonia, Eiropas Dzelzceļa līnijas SIA (reg. nr 40103836785) in Latvia, AB LTG Infra (reg. nr 305202934) in Lithuania.
Railway Infrastructure manager	Railway infrastructure manager during operational period after construction of the project.
Railway Right-of-Way (Estonia)	An area of land which is an integral part of the railway infrastructure, and which is intended for the placement of railway infrastructure objects in order to ensure the development of the railway infrastructure and the safe operations, maintainability, and also to protect people and the environment from harmful effects of the railway. The boundaries of the railway Right of Way in designs shall be determined in compliance with, Republic of Estonia regulations, current building standards in effect for the relevant construction facility and in compliance with the cross-section drawings provided in the Design Guidelines. The railway Right-of-Way includes for the railway line assigned Land plots and the zones inside the railway and railway equipment fence and other physical barriers like noise walls, retaining walls, etc.
Railway Right-of-Way (Latvia)	An area of land which is an integral part of the railway infrastructure, and which is intended for the placement of railway infrastructure objects in order to ensure the development of the railway infrastructure and the safe operations, maintainability, and also to protect people and the environment from harmful effects of the railway. The boundaries of the railway Right of Way in designs shall be determined in compliance with, Republic of Latvia regulations, current building standards in effect for the relevant construction facility and in compliance with the cross-section drawings provided in the Design Guidelines. The railway Right-of-Way includes for the railway line assigned Land plots and the zones inside the railway and railway equipment fence and other physical barriers like noise walls, retaining walls, etc.
Railway Right-of-Way (Lithuania)	An area of land which is an integral part of the railway infrastructure, and which is intended for the placement of railway infrastructure objects in order to ensure the development of the railway infrastructure and the safe operations, maintainability, and also to protect people and the environment from harmful effects of the railway. The boundaries of the railway Right-of-Way in designs shall be determined in compliance with, Republic of Lithuania Law on of the special land use conditions, current building standards in effect for the relevant construction facility and in

	compliance with the cross-section drawings provided in the Design Guidelines. The railway Right-of-Way includes for the railway line assigned Land plots and the zones inside the railway and railway equipment fence and other physical barriers like noise walls, retaining walls, etc.
Utilities	Infrastructure services provided to consumers (public) and are important for the normal functioning of society. Including but not limited to railway operation communication and energy supply networks, communication networks, sewage networks, water supply networks, drainage networks, oil and gas networks, heating supply networks, land melioration networks, electrical supply networks, lighting networks etc.
Utility owner	In this document Utility owner is considered Utility owner or Utility manager or Utility possessor.

1 Introduction

1.1 Purpose

1. This document provides requirements for utilities construction, in Rail Baltica railway right-of-way and in relation to railway. It is mainly directed to third parties who would like to construct new or reconstruct existing utilities transverse or parallel to railway. Also, the same principals must be followed by designer of the Rail Baltica infrastructure.
2. This document does not describe requirements for third-party non-utility related structures and buildings.

1.2 Application

3. This document describes the requirements for construction of typical utilities according to common practices in contact with Rail Baltica railway. This document does not cover specialized utilities and structures such as for toxic chemicals, nuclear power stations, windfarms, fuel storages, etc. For those special requirements will be developed by IB or IM (or RBR, when is the Client of design services) case-by-case.
4. If special environmental, landscape, geologic or other conditions exist that do not allow utility to be designed and constructed according to this document then this shall be applied for exception with justifications to IB or IM (or RBR, when is the Client of design services). IB or IM (or RBR, when is the Client of design services), shall evaluate whether the application and results of the technical study are sufficient and, in duly justified cases, may require an additional study or information, if such is not submitted then the exception will be automatically declined. The exception considered accepted only when it was accepted by IB or IM (or RBR, when is the Client of design services) in written exceptional approval. RBR shall be informed about each IB approved exception with provided justifications.

2 Common requirements

2.1 Overall requirements

5. Along the railway (parallel to railway line) inside the railway right-of-way third party utilities and the related structures and equipment/structures (also even when utility itself is transverse to railway line) are not allowed and can be designed and built only in exceptional circumstances (refer to requirement No. 4). For this the third party must submit a technical study that there is no other way to realize their project. The before named technical study must be approved by IB or IM (or RBR, when is the Client of design services) before commencing with Design and technical approval and must in minimum demonstrate the following:
 - 5.1. An alternate location is not feasible, from the standpoint of providing efficient utility services in a manner conducive to safety, durability, and economy of maintenance and operations.
 - 5.2. The placement will not adversely affect the design, construction, operation, maintenance, safety, or stability of the railway facility.
 - 5.3. The placement will not interfere with or impair the proposed use or future expansion of the railway facility.
 - 5.4. The disapproval of the use of the right-of-way does not result in an immitigable impact to the owner, the environment, or the public.
6. IB or IM (or RBR, when is the Client of design services) may reject the utility design proposal or expected activity if it will interface with the foreseen future development and maintenance of railway or equipment, will not ensure compliance with railway traffic safety requirements and cause danger to environment, human property, life or health, will restrict passenger mobility, restrict road vehicle access to buildings or equipment in the railway station or equipment areas.
7. Placing of third-party utilities parallel along the railway under the railway storm management ditches and waterways is not allowed in any circumstances.
8. Placing of third-party utilities under and on to the facility sites, such as traction power facility and communications' tower sites, CCS facilities are not allowed and can be design and built only in exceptional circumstances (refer to requirement No. 4).
9. In no circumstance's utilities can be placed in location of unstable ground or areas with high risk of landslides.
10. All buried utilities carrying liquids shall be placed below the freezing point of the ground.
11. Transverse crossings of utilities that are at less than 60-degrees from the railway longitudinal alignment shall be classified as longitudinal encroachment.
12. When crossing Rail Baltica railway with utilities, the crossing shall be designed at as close as possible to a perpendicular 90 degrees angle to minimize the crossing distance. Crossings with angles exceeding 90 ± 5 degrees must be properly justified and require exceptional approval (refer to requirement No.4).
13. For exceptional cases crossings with existing utilities built before Rail Baltica infrastructure may remain at an angle that is not perpendicular (90 degrees) to the designed railway. In case of buried utilities casing or protection pipes shall be provided for these utilities according to relevant requirements of this document. Solutions shall be agreed between Utility owner and IB or IM (or RBR, when is the Client of design services).
14. Outside the railway right-of-way all the utilities should be placed as far away from the railway as possible but any time not closer than stipulated with current document.

15. All the new utilities must be placed as close to the existing non-railway utilities as possible respecting other conditions stipulated in this document.
16. The trenchless or open trench method shall be used for the construction of all the buried utilities transverse to the railway line, that shall be built before the railway construction has started. Method shall be selected on CAPEX criteria and duration of construction works. The cost estimation of construction works and duration of railway traffic break (if necessary, when approaching existing railway lines under operation) comparison between the open trench vs trenchless shall be provided and pre-aligned with IB or IM (or RBR, when is the Client of design services) case-by-case. The comparative estimation should take into account the geological conditions, compaction, soil replacement if needed, and also launching and receiving shafts at the entry and exit points if for trenchless option.
17. All the buried utilities transverse to the railway line and built after the railway construction has started shall be designed to and built only using the trenchless method. All the buried pipelines shall have casing pipe. Telecommunication and electricity cables shall be installed in the protection pipes. The 110kV and higher voltage cables additionally shall have casing pipe if required by national regulations.
18. All casing pipes shall be selected to withstand the applied loads, taking into account the final deformations of the pipes. The casing pipes may not deform beyond the limits specified by the designer/supplier, the corresponding calculations shall be provided in the design documentation. All casing pipes crossing the railway must have the minimum stiffness rating (ring stiffness) of at least 30kN/m².
19. For trenchless method the design must include in minimum following and be in line with EN 12889:
 - 19.1. Soil investigation and interpretation
 - 19.2. Method selection
 - 19.3. Soil stabilizing design
 - 19.4. Pipe design inc. pipe shield design
 - 19.5. Pipe installation design and requirements for machinery
 - 19.6. Fracture Mitigation Plan
 - 19.7. Pipe installation control measures and documenting
 - 19.8. Shaft design (when applicable)
 - 19.9. Health and Safety measures to be applied
20. IB or IM (or RBR, when is the Client of design services) reserves the rights to decide if utility location on structures shall be permitted or not after third party submits carefully reasoned evidence that there is no other option to build their utilities other than installing them on RB structures and will take into account CAPEX-OPEX impact, legal acts and propose cost compensation schema.
21. For utilities crossing the railway there must be foreseen means to take them out of use (valves, circuit breaks etc.) when their malfunction, breaking or other circumstances related to them will cause danger to railway. Designer shall evaluate and assess the related risks and include these into project risk register and hazard register.
22. Design shall include the requirements for trench slopes and support measures from work safety perspective or clear references to applicable related rules and regulations.
23. If metal carrier or casing pipes are used then they must have protective coating and/or cathodic protection and/or the calculated thickness must be increased to allow the casing pipe to withstand the loads during full 100-year life span taking account loss of thickness from corrosion, and also meet EN 13480-6, Annex A, the corresponding calculations including calculations related to corrosion shall be provided in the design

- documentation.. Designer shall evaluate and assess the corrosion related risks and include these into project risk register and hazard register. Design shall also include and follow the corrosion protection requirements by EN 12501 and/or cathodic protection by EN 12954, including but not delimited to corrosion assessment, cathodic protection effectiveness assessment, monitoring, inspection and maintenance. For protective coating reference to applicable European standard used must be made.
24. Metal casing pipe installed under a railway shall have a specified minimum yield strength of 235 MPa or greater and their thickness must be calculated according to the imposed loads, life span and ground conditions.
 25. Concrete casing pipe installed under a railway shall have a specified minimum strength class of 30/37 and with minimum exposure class XC4 XF4 or greater and their thickness must be calculated according to the imposed loads and ground conditions.
 26. Metal casing pipes (including solutions with reinforced concrete) and carrier pipes shall be grounded and bonded. Possible solutions shall be analysed by the designer of utilities case by case and integrated with the earthing and bonding systems applied to different facilities in railway infrastructure. Solutions shall be approved by IB or IM (or RBR, when is the Client of design services).
 27. If other materials are used for casing pipes, they shall fulfil all the life-cycle requirements set out for steel and concrete casing pipes.
 28. All utilities buried or overhead which might be compromised by lightning shall be grounded for lightning outside the railway right-of-way.
 29. Grounding of third-party utilities must be at 20m away of any grounding points and structures of railway. Grounding of any facility or equipment must be confirmed with IB or IM (or RBR, when is the Client of design services) in every specific point separately.
 30. All the utilities related to electronic and electric devices shall meet the EMC requirements set in DG RBDG-MAN-021.
 31. To minimize the possibility that utility pipelines become part of the Traction Power Return System, insulated joints or couplings shall be installed at or adjacent to the shut-off valves or at a similar location where shut-off valves are not required.
 32. Casing and carrier pipe joints under the railway shall be of leakproof construction and capable of withstanding railway loads (axle load 25 tons). For the load calculation methodology described by EN 1991-2 paragraph 6.3.6.2 must be applied above the reference plane in upper load distribution zone.
 33. **Note:** For standard sleeper spacing 1666 pc/km with sleeper width 290 mm and total combined ballast and sub-ballast layer thickness of 620 mm, the interference reference plane is at the boundary of sub-ballast layer and embankment, in other cases it must be calculated accordingly.
 34. Below the interference reference plane, the methodology utilizing the Boussinesq principal of elastic half-space theory for a uniformly loaded strip is used. The method assumes that the soil is a homogenous, isotropic mass within a semi-infinite geometry and the loads applied are within the linear elastic range for the substrate strength. Therefore, it is important to check that the bearing capacity ultimate limit state condition is satisfied before proceeding.
 35. The data is provided for the design of utilities below a loaded section of the running track and interference reference plane. The following graph and associated tabulated data present a profile of total stresses with depth.
 36. The calculated stresses must be factored using the appropriate design approach according to EC7.
 37. For sections of the embankment which adopt light-weight fill, the stresses may produce a conservative design. It is up to the designer to adopt the appropriate parameters or use the chart provided (Currently a unit weight of 18kN/m³ and 22kN/m³ is assumed for the ballast and embankment material respectively).

38. Buoyancy has not been accounted for as ground water depths are location specific. This must be assessed on a section-by-section basis by the designer.
39. **Note:** Stresses can be obtained either by reading directly from the graph, or alternatively by the process of interpolation using the tabulated data. Stresses account the rail, sleeper and live loading respectively. The sum of the imposed and overburden pressures is presented as the blue profile within the graph.

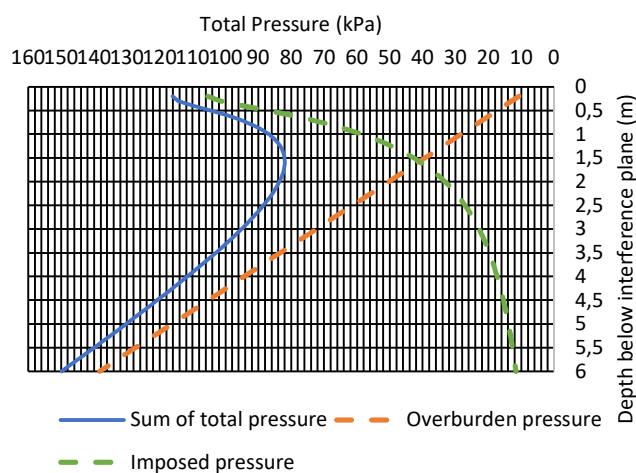


Exhibit 1: Pressure based on casing pipe depth

Table 1: Pressure based on casing pipe depth

Depth below interference reference level, Z (m)	Sum of total pressure (kPa)
0.2	116
0.3	114
0.4	110
0.5	105
0.6	100
0.7	95
0.8	92
0.9	89
1	87
1.1	85
1.2	84
1.3	83
1.4	82
1.5	82
1.6	82
1.7	82
1.8	82
1.9	83

2	84
2.1	84
2.2	85
2.3	86
2.4	87
2.5	88
2.6	90
2.7	91
2.8	92
2.9	94
3	95
3.1	97
3.2	98
3.3	100
3.4	101
3.5	103
3.6	105
3.7	106
3.8	108
3.9	110
4	112
4.1	113
4.2	115
4.3	117
4.4	119
4.5	121
4.6	123
4.7	124
4.8	126
4.9	128
5	130
5.1	132
5.2	134

5.3	136
5.4	138
5.5	140
5.6	142
5.7	144
5.8	146
5.9	148
6	150

40. IB or IM (or RBR, when is the Client of design services) leaves itself possibility to change, update or imply additional conditions without any prior explanations. Informing of the parties will be implemented on need basis.
41. There is not allowed to set additional easement at the railway right-of-way.
42. For utility installation at existing structures or railways, a Work Monitoring Plan must be implemented. The utility designer needs assess the demand for monitoring scope and, if needed, include it in the Work Monitoring Plan. The considered scope as minimum must consist of:
 - 42.1. For utilities which will be installed after the railway construction has started - calculate the predicted settlement on top of the railway surface;
 - 42.2. For utilities which will be installed after the railway construction has started – monitoring of the settlements of the railway surface and report the fact to IB;
 - 42.3. Monitoring of existing surface anomalies;
 - 42.4. Dust and air pollution monitoring;
 - 42.5. Contamination monitoring;
 - 42.6. Ground water monitoring;
 - 42.7. Vibration monitoring;
 - 42.8. Monitoring of sensitive operational structures and equipment;
 - 42.9. Monitoring quantity and quality of excavated soil comparing it to design information.
43. The utility contractor is obliged to reinstate the area affected by construction works to its prior state, when reinstating the affected area after completion of works, the guidance and demands of IB or IM (or RBR, when is the Client of design services) shall be respected.
44. All buried utilities inside the railway Right-of-Way shall be marked with marking posts and signs above ground following requirements listed below:
 - 44.1. Technical solution of markings posts and signs and minimum requested information to be indicated shall be according to the national norms, but with additional not smaller than 120x120mm sign sheet containing, following information, if not duplicated:
 - 44.1.1. type of utility and main characteristics of utility (voltage, pressure, diameter, type of gas etc.);

- 44.1.2. Utility owner;
- 44.1.3. emergency phone number;
- 44.1.4. Rail Baltica kilometer;
- 44.1.5. depth of utility from the ground and elevation.
- 44.2. If not required by national norms additional marking post with sign sheet shall be installed at the following places:
 - 44.2.1. at the bottom of embankment in fill;
 - 44.2.2. at top of the backslope of cut;
 - 44.2.3. right at the fence (sign sheet without post) if previous marking post is more than 5 m away from the fence line;
 - 44.2.4. other utility crossing;
 - 44.2.5. at the road crossing, at the backslope of the ditch or bottom of embankment if road without the ditches.
- 44.3. The final marking plan shall be aligned with IB.
- 47. All buried utilities inside the railway Right-of-Way, except the sections installed in trenchless method, must be marked with warning tape which is to be placed 0,3m above the utility.
- 48. Minimum vertical and horizontal clearances for safety of the railway are given in Annexes 1 to 5.
- 49. **All applicable laws, standards and norms in related country and European Union must be followed. If demands set in those are more stringent than in current document, then the more stringent demands must be followed.**

2.2 Requirements for the design documentation

- 50. All the designs must be presented in two equal copies from which one copy is in pdf format and another copy in dwg (drawings), xlsx (tables) and docx (text files) and BIM model data according to DG RBDG-MAN-030. BIM LOD will be agreed case-by-case with the objective to obtain the minimum model definition for referencing in the asset database.
- 51. Design must include at least following documents: layout, cross-sections, longitudinal profile and explanatory note. IB or IM (or RBR, when is the Client of design services), leaves itself possibility to demand any additional drawings and documents if needed for the design validation and clash check with railway design.
- 52. In the design the railway alignment stations must be marked with the accuracy of 1m.
- 53. The dwg drawings must be in metric units (meters) and in residing country coordinate and altimetry systems.
- 54. In design the railway must be shown on profile, sections and layouts. Also, the distances in metric units must be shown- both in plan, sections and profile. For the trenchless method the start and end excavation locations, depth and incline of the slopes must be shown.
- 55. The third-party Utility owner is fully responsible for their design and confirms that they are aware of the prevailing ground conditions, loads from railway its structures and embankment and their suitability for installation of their utility and the methods of installations designed.
- 56. All the known existing and future utilities, buildings, roads, railways and nature objects must be shown on the design drawings.

57. Designer shall submit a utility, existing structure and railway protection and monitoring plan for utilities within the zone of influence of excavation limits.
58. The Designer shall include in the utility design a requirement, that contractor for utility construction works shall receive permission from IB or IM.
59. As-Built Documentations must be submitted to IB or IM and RBR not later than 30 days after completion of construction works.
60. For designs where RBR is the Client, design documentation must meet the Rail Baltica 2d CAD Standard as long as it doesn't contradict with Utility Owner's requirements. For Other designs where the Client is the Utility owner, Rail Baltica 2d CAD standards shall be followed as far as they do not contradict with the Designing company's internal CAD standards and Utility owner's requirements. BIM requirements shall be followed to the extent as instructed by IB or IM or RBR case-by-case for each specific utility type.
61. As-built documentation has to meet the DG RBDG-MAN-030 requirements, as outlined on the official website: railbaltica.org.
62. The Utility owner is responsible for providing all "as-built data" in accordance with the DG RBDG-MAN-040 requirements. This information must be submitted to the RBR AIM team for integration into the RBR Asset Register system. Third-party models will be utilized strictly for reference purposes.
63. For all designs which has an interface with RB project, but are out of scope of IB or IM (or RBR when is the Client of design services) responsibility, there shall be included requirement, that contractor for utility construction works prior planned construction works shall receive permission for construction works from IB or IM.
64. In case of accidental damage being done to an unidentified utility that was previously not surveyed properly and incorrect or no information about its location was provided by the Utility owner, then RBR and IB or IM shall not be held accountable for compensating the created damage.

2.3 Responsibility of the Utility owner

65. The owner of the utilities will be responsible that all the works are carried out according to documentation approved by RBR or IB or IM. RBR, IM and IB will not be liable for any damages to the utilities that are not constructed according to the documentation approved by RBR or IB or IM. Allowed deflections during construction from the design are given in SPECIFIC REQUIREMENTS chapter of this document.
66. Third-party owner will be fully responsible for the good condition, warranty, up-keep, maintenance and repairs of their utilities throughout period of exploitation and acknowledges that the utilities are placed in high risk zone and they will have no demands later to the owner of the railway.
67. When the utility is put out of service then the Utility owner is obliged to remove the utility from railway right-of-way and restore the affected area to its prior state. It shall be noted that only trenchless methods after construction of the railway has started can be used (backfilling with foamed concrete etc.).
68. Owner of the Railway will carry no liability for safe keeping the third-party utilities inside the railway right-of-way.
69. Contract must be concluded between the railway owner and the Utility owner setting out the exact specific conditions that are applied for construction, warranty, up-keep, maintenance and repairs of the utility.
70. Utility owner when carrying out work inside the railway right-of-way must include in his team certified railway engineer, technician, mechanic or signalling engineer who is trained and authorized to work inside railway right-of-way by the laws of the Country.

2.4 Demand and right for independent third-party expertise

71. Before approval of design IB or IM (or RBR, when is the Client of design services), has the rights to demand that the Utility owner will present an Independent Third-Party Expertise for the design. If IB or IM (or RBR, when is the Client of design services) determines that the expertise provided by the Utility owner is not performed correctly then IB or IM (or RBR, when is the Client of design services) leaves itself a right to order additional Independent Third-Party Expertise before giving approval of design.

2.5 Supervision of construction works

72. Inside the railway right-of-way RBR or IB or IM has full rights to inspect and supervise that the construction works are carried out according to approved design and applicable Health and Safety policy is followed. If any discrepancies are found, then IB or IM has the right to stop the construction works and to demand the rectification the constructions already built if they do not meet the agreed design. In case of severe violation IB or IM has right do ban the Contractor from railway right-of-way.
73. At the completion of construction sign-off on the completion act by IB or IM is needed before pursuing the Permit of Use. Copy of as-built documentation must be provided to RBR and IB or IM and meeting the demands set out in the REQUIREMENTS FOR THE DESIGN DOCUMENTATION chapter of this document.

3 Specific requirements

3.1 Buried gas, oil, district heating, steam, chemicals, other pressurized utilities

74. None of the buried pipelines can be placed under cross-overs and turnouts.
75. For gas pipelines type of gas that is to be transported by the pipeline must be indicated in design.
76. Casing pipe must be at least 2xDe of carrier pipe for pipes up to DN200 and 1,5xDe of carrier pipe for pipes over DN200, but not smaller than required by regulations.
77. Using open trench construction, the minimum bedding under the utilities must always be built according to manufacturer's specification and applicable European Standard but never less than 15cm thick from rock material and compacted to compaction level 0,98. If the excavated material in the trench is of quality class Q0 or Q1 according to UIC 719R, it cannot be backfilled and needs to be replaced by a suitable material. The backfill of the trench must be made from QS2 and QS3 class material in accordance with UIC 719R. The backfills from QS2 soils shall be compacted in 200-300 mm lifts to a compaction level not less than 0.97 for each lift, furthermore, at the final surface level the bearing capacity ratio shall not exceed $Ev2/Ev1 \leq 2.6$. The backfills from QS3 soils shall be compacted in 200-300 mm lifts to a compaction level not less than 0.98 for each lift, furthermore, at the final surface level the bearing capacity ratio shall not exceed $Ev2/Ev1 \leq 2.5$. The bearing capacity $Ev2$ determined by a plate loading test shall be at least as high as those for upper embankments set out in the Technical Specifications for Rail Baltica railway construction works. Trench must always be wide enough to allow machined compaction. Minimum thickness of initial back fill before starting machined compaction must be at least 300 mm. The soils used for back-fill shall not include any ice or snow and cannot be frozen. Maximum stone size allowed is 64 mm.
78. Trench shall always be de-watered.
79. Casing pipes must extend at least 5m out from the railway right-of-way. High embankment and deep cut situations shall be assessed case-by-case where the previous requirement is not appropriate.
80. Retention/service manholes must be watertight and with internal diameter of at least 1000 mm with lockable lid. Manholes must be designed to applicable loads (traffic, soil etc.). Placing of soils and their compaction same rules must be followed as for pipe installations.
81. The pressurized distribution lines shall have shut valves each side of the railway. Shut-off valves must be placed outside the railway right-of-way and casing pipe (at least in length allowing their repairs and replacement) and have appropriate signage. For transmission lines designer shall obtain the from Utility owner information about shut off possibility in emergency case, and it should be included in the design documentation. Application of shut valves for transmission lines must be evaluated by designer, based requirements of national regulation and on risk assessment. An assessment of the risk shall be carried out by the EU Regulation 402/2013 on the common safety method for risk evaluation and assessment. Application of shut valves for transmission lines must be agreed with IB or IM (or RBR, when is the Client of design services) and Utility owner. Solutions of shut valves, if applicable, must be agreed with relevant Utility owner.
82. For gas pipelines casing pipes vent pipes must be built allowing to remove gas from inside the casing pipe in emergency and to prevent build-up of gas inside the casing pipe. Venting pipes must be brought through the ground outside the railway right-of-way and must extend at least 1,5m above the ground surface.

83. Emergency response procedures shall be developed by the designer or Utility owner to address situations where a pipeline leak, railway derailment, or incident may compromise the integrity of the pipeline. In addition, emergency response measures from the IM must be considered during the risk evaluation and assessment process. Local conditions shall be considered when developing these procedures.
84. Ends of casing pipes not ending in retention manhole must be sealed to prevent intrusion of soil and debris. Seal must consider thermal/heat expansion of the pipelines.
85. All crossing pressurized pipelines with shut-off valves, if applicable, shall have valve manholes or valve extension system accessible from the ground level for closing the pipeline section under the railway. The valves must be located outside the railway right-of-way.
86. Section of pipeline to be grounded (within railway right-of-way) shall be separated by isolators from other sections of the pipeline. Grounding of any facility or equipment must be confirmed with IB or IM (or RBR, when is the Client of design services in every specific point separately).
87. All hydrants that are not designed for railway must be placed outside the railway right-of-way.
88. Application of leakage detection system (LDS) must be evaluated by Designer in accordance with DG RBDG-MAN-029 chapter 3.1.6 requirements. An assessment of the risk shall be carried out by the EU Regulation 402/2013 on the common safety method for risk evaluation and assessment. The pipelines with applicable LDS and with connection to Rail Baltica SCADA must be equipped with LDS or status monitoring and alarm system (SMAS) which telemetry must comply with IEC 60870-5 and applicable EU legislation and standards for connection to Rail Baltica SCADA. And at least two output ports must be foreseen for hardwired connection to Rail Baltica SCADA from LDS. Only secure one-way telemetry is allowed- emergency/information signals from controller or PLC only.
89. Tolerances for construction (inc. casing pipes) for open trench construction:
 - 89.1. Alignment at joints ± 5 mm;
 - 89.2. Horizontal alignment: ± 100 mm ($< \varnothing 1,5$ m) and ± 200 mm ($\varnothing \geq 1,5$ m);
 - 89.3. Elevation, measured each 20 m along the utility line: ± 30 mm ($< \varnothing 1,5$ m) and ± 50 mm ($\varnothing \geq 1,5$ m);
 - 89.4. Grade difference, measured between the manholes or/and ends of casing pipe:
 $[-0,001 \text{ m/m}] \div [+0,003 \text{ m/m}]$;
 - 89.5. Grade difference, measured between the manholes or/and ends of casing pipe of utilities carrying gases:
 $[\pm 0,002 \text{ m/m}]$;
 - 89.6. The designer shall keep the horizontal distances from the neighbouring objects including as the values of minimum distances required by legal acts, regulations and this document as the horizontal alignment maximum allowed tolerance value into the total.
 - 89.7. Other, less strict, tolerances for open trench construction (inc. casing pipes) are acceptable in the case if the designed utility location, including chosen less strict tolerances, has enough clearance reserve, ensuring a principle – do not violate:
 - 89.7.1. Other required values set in this document;
 - 89.7.2. Requirements of legal acts and regulations regarding distances to buildings, structures, engineering networks, utilities, facilities and other objects and their protection zones or land plots;
 - 89.7.3. The interests of third parties by the conditions stipulated in contracts or written consents if such exist, etc.
90. Tolerances for construction (inc. casing pipes) for trenchless construction:

- 90.1. Alignment at joints ± 5 mm;
- 90.2. Horizontal alignment: ± 300 mm ($< \varnothing 1,5$ m) and ± 500 mm ($\varnothing \geq 1,5$ m);
- 90.3. Elevation: ± 200 mm ($< \varnothing 1,5$ m) and ± 300 mm ($\varnothing \geq 1,5$ m);
- 90.4. Grade difference, measured between the manholes or/and ends of casing pipe: $[-0,001 \text{ m/m}] \div [+0,01 \text{ m/m}]$;
- 90.5. The designer shall keep the horizontal distances from the neighbouring objects including as the values of minimum distances required by legal acts, regulations and this document as the horizontal alignment maximum allowed tolerance value into the total.
- 90.6. Other, less strict, tolerances for trenchless construction (inc. casing pipes) are acceptable in the case if the designed utility location, including chosen less strict tolerances, has enough clearance reserve, ensuring a principle – do not violate:
 - 90.6.1. The corresponding utility type required minimum distances for open trench installation method in the Annex 1, and other required values set in this document;
 - 90.6.2. Requirements of legal acts and regulations regarding distances to buildings, structures, engineering networks, utilities, facilities and other objects and their protection zones or land plots;
 - 90.6.3. The interests of third parties by the conditions stipulated in contracts or written consents if such exist, etc.
- 91. When support structures are used in trench during construction (retention walls, ties etc.) then they need to be removed parallel with the backfilling.

3.2 Buried gravity sewage, gravity drainage, gravity storm water utilities

- 92. None of the buried pipelines can be placed under crossovers and turnouts and railway system equipment locations.
- 93. Casing pipe must be at least $2 \times D_e$ of carrier pipe for pipes up to DN200 and $1,5 \times D_e$ of carrier pipe for pipes over DN200, but not smaller than required by national regulations.
- 94. Using open trench construction, the minimum bedding under the utilities must always be built according to manufacturer's specification and applicable European Standard but never less than 15cm thick from rock material and compacted to compaction level 0,98. If the excavated material in the trench is of quality class Q0 or Q1 according to UIC 719R, it cannot be backfilled and needs to be replaced by a suitable material. The backfill of the trench must be made from QS2 and QS3 class material in accordance with UIC 719R. The backfills from QS2 soils shall be compacted in 200-300 mm lifts to a compaction level not less than 0.97 for each lift, furthermore, at the final surface level the bearing capacity ratio shall not exceed $E_{v2}/E_{v1} \leq 2.6$. The backfills from QS3 soils shall be compacted in 200-300 mm lifts to a compaction level not less than 0.98 for each lift, furthermore, at the final surface level the bearing capacity ratio shall not exceed $E_{v2}/E_{v1} \leq 2.5$. The bearing capacity E_{v2} determined by a plate loading test shall be at least as high as those for upper embankments set out in the Technical Specifications for Rail Baltica railway construction works. Trench must always be wide enough to allow machined compaction. Minimum thickness of initial back fill before starting machined compaction must be at least 300 mm. The soils used for back-fill shall not include any ice or snow and cannot be frozen. Maximum stone size allowed is 64 mm.
- 95. Trench shall always be de-watered.

96. Casing pipes must extend at least 5m out from the railway right-of-way. High embankment and deep cut situations shall be assessed case-by-case where the previous requirement is not appropriate.
97. All gravity pipes carrying liquids, and their casing pipes must have grade of at least 0,4% and end in retention/service manhole. Grade must be towards the manhole. If inside the casing pipes are to be allowed to be carried out maintenance works, then the retention/service manholes must be placed at each end of the casing pipe.
98. Retention/service manholes must be watertight and with internal diameter of at least 1000 mm with lockable lid. Manholes must be designed to applicable loads (traffic, soil etc.). Placing of soils and their compaction same rules must be followed as for pipe installations.
99. Emergency response procedures shall be developed by the designer or Utility owner to address situations where a pipeline leak, railway derailment, or incident may compromise the integrity of the pipeline. In addition, emergency response measures from the IM must be considered during the risk evaluation and assessment process. Local conditions shall be considered when developing these procedures.
100. Ends of casing pipes not ending in retention manhole must be sealed to prevent intrusion of soil and debris. Seal must consider thermal/heat expansion of the pipelines.
101. Section of pipeline to be grounded (within railway right-of-way) shall be separated by isolators from other sections of the pipeline. Grounding of any facility or equipment must be confirmed with IB or IM (or RBR, when is the Client of design services) in every specific point separately.
102. Application of leakage detection system (LDS) must be evaluated by Designer in accordance with DG RBDG-MAN-029 chapter 3.1.6 requirements. An assessment of the risk shall be carried out by the EU Regulation 402/2013 on the common safety method for risk evaluation and assessment. The gravity pipes with applicable LDS shall contain leakage detection sensors placed in the down grade manholes. If connected to Rail Baltica SCADA, the telemetry must comply with IEC 60870-5 and applicable EU legislation and standards for connection to Rail Baltica SCADA. And at least two output ports must be foreseen for hardwired connection to railway SCADA from sensors. Only secure ha one-way telemetry is allowed- emergency/information signals from controller or PLC only.
103. Tolerances for construction (inc. casing pipes) for open trench construction:
 - 103.1. Alignment at joints ± 5 mm;
 - 103.2. Horizontal alignment: ± 100 mm ($< \varnothing 1,5$ m) and ± 200 mm ($\varnothing \geq 1,5$ m);
 - 103.3. Elevation, measured each 20 m along the utility line: ± 30 mm ($< \varnothing 1,5$ m) and ± 50 mm ($\varnothing \geq 1,5$ m);
 - 103.4. Grade difference, measured between the manholes or/and ends of casing pipe: $[-0,001 \text{ m/m}] \div [+0,003 \text{ m/m}]$;
 - 103.5. The designer shall keep the horizontal distances from the neighbouring objects including as the values of minimum distances required by legal acts, regulations and this document as the horizontal alignment maximum allowed tolerance value into the total.
 - 103.6. Other, less strict, tolerances for open trench construction (inc. casing pipes) are acceptable in the case if the designed utility location, including chosen less strict tolerances, has enough clearance reserve, ensuring a principle – do not violate:
 - 103.6.1. Other required values set in this document;
 - 103.6.2. Requirements of legal acts and regulations regarding distances to buildings, structures, engineering networks, utilities, facilities and other objects and their protection zones or land plots;

- 103.6.3. The interests of third parties by the conditions stipulated in contracts or written consents if such exist, etc.
104. Tolerances for construction (inc. casing pipes) for trenchless construction:
- 104.1. Alignment at joints ± 5 mm;
 - 104.2. Horizontal alignment: ± 300 mm ($< \varnothing 1,5$ m) and ± 500 mm ($\varnothing \geq 1,5$ m);
 - 104.3. Elevation: ± 200 mm ($< \varnothing 1,5$ m) and ± 300 mm ($\varnothing \geq 1,5$ m);
 - 104.4. Grade difference, measured between the manholes or/and ends of casing pipe:
[-0,001 m/m] ÷ [+0,01 m/m];
 - 104.5. The designer shall keep the horizontal distances from the neighbouring objects including as the values of minimum distances required by legal acts, regulations and this document as the horizontal alignment maximum allowed tolerance value into the total.
 - 104.6. Other, less strict, tolerances for trenchless construction (inc. casing pipes) are acceptable in the case if the designed utility location, including chosen less strict tolerances, has enough clearance reserve, ensuring a principle – do not violate:
 - 104.6.1. The corresponding utility type required minimum distances for open trench installation method in the Annex 1, and other required values set in this document;
 - 104.6.2. Requirements of legal acts and regulations regarding distances to buildings, structures, engineering networks, utilities, facilities and other objects and their protection zones or land plots;
 - 104.6.3. The interests of third parties by the conditions stipulated in contracts or written consents if such exist, etc.
105. When support structures are used in trench during construction (retention walls, ties etc.) then they need to be removed parallel with the backfilling.

3.3 Overhead electricity lines and buried cables

106. None of the buried cables can be placed under crossovers and turnouts.
107. At the span, where the wires cross the railway, the cable utility shall be double-dead ended to avoid a single point of failure so that the wires are not dropped onto the tracks.
108. Overhead utility facilities shall have the supporting poles, masts, towers, and guy-wires located outside the railway right-of-way and designed in such manner that falling towards railway in accidental situation is avoided. Where such condition is impractical, a design variance shall be submitted to the IB or IM (or RBR, when is the Client of design services) and at no times the before named structures can be closer to railway than specified in Annexes 2 and 5.
109. Lower voltage overhead electricity lines should be placed lower than the higher voltage ones. All electricity lines below 110kV must be foreseen buried. Distances in Annexes 2 and 3 must be respected.
110. For overhead electricity lines means for de-icing during exploitation must be designed. Specific methodology (hydrophobic coating, electro-thermal, ice rolling, VRC, passive-solar etc.) must be presented with maintenance and operations manuals. If physical de-icing is to be foreseen (e.g. Ice rolling) then this must be possible to execute without need to enter railway right-of-way. Solution must be approved by RBR and IB or IM.
111. The application of a status monitoring and alarm system to detect line breaks over the railway must be evaluated by the Designer, based requirements of national regulation and on risk assessment in conjunction with measures applied by requirement No.107. An assessment of the risk shall be carried out by the EU Regulation 402/2013 on the common safety method for risk evaluation and assessment. Application of status monitoring and alarm system must be agreed with IB or IM (or RBR, when is the Client of design services) and Utility owner. If applicable, Systems telemetry must comply with IEC 60870-5 and applicable EU legislation and standards for connection to Rail Baltica SCADA. At least two output ports must be foreseen for hardwired connection to railway SCADA from sensors. Only secure ha one-way telemetry is allowed- emergency/information signals from controller or PLC only. Solutions of status monitoring and alarm system, if applicable, must be agreed with relevant Utility owner.
112. Always buried installation of cable lines shall be preferred when crossing the railway.
113. All electricity cables over 1kV crossing the railway must be at least 5m away from other signalling or communication cables, crossing the railway.
114. Direct bury cables shall not be used.
115. Emergency response procedures shall be developed by the designer or Utility owner to address situations where a line break, railway derailment, or incident may compromise the integrity of the cable line. In addition, emergency response measures from the IM must be considered during the risk evaluation and assessment process. Local conditions shall be considered when developing these procedures.
116. If a reserve for the cable needs to be foreseen, then it must be left inside a cable manhole outside of railway right-of-way if Utility owner approves the use of manholes in their utility network, if not, then the reserve needs to be left as instructed by the Utility owner and agreed with IB or IM (or RBR, when is the Client of design services).
117. Buried cables shall not have deep bends (less than 60x diameter of cable) in railway right-of-way.
118. Cable protection pipes crossing the railway shall have minimum compressive strength not less than 1250 N (according to EN 61386), when extra casing required by national regulations – protection pipe must be at least 1,5xDe of cables for pipes up to DN110 and 1,2xDe of cables for pipes over DN110, but not smaller than required by national regulations.

119. Using open trench construction, the minimum bedding under the utilities must always be built according to manufacturer's specification and applicable European Standard but never less than 15cm thick from rock material and compacted to compaction level 0,98. If the excavated material in the trench is of quality class Q0 or Q1 according to UIC 719R, it cannot be backfilled and needs to be replaced by a suitable material. The backfill of the trench must be made from QS2 and QS3 class material in accordance with UIC 719R. The backfills from QS2 soils shall be compacted in 200-300 mm lifts to a compaction level not less than 0.97 for each lift, furthermore, at the final surface level the bearing capacity ratio shall not exceed $Ev2/Ev1 \leq 2.6$. The backfills from QS3 soils shall be compacted in 200-300 mm lifts to a compaction level not less than 0.98 for each lift, furthermore, at the final surface level the bearing capacity ratio shall not exceed $Ev2/Ev1 \leq 2.5$. The bearing capacity $Ev2$ determined by a plate loading test shall be at least as high as those for upper embankments set out in the Technical Specifications for Rail Baltica construction works. Trench must always be wide enough to allow machined compaction. Minimum thickness of initial back fill before starting machined compaction must be at least 300 mm. The soils used for back-fill shall not include any ice or snow and cannot be frozen. Maximum stone size allowed is 64 mm.
120. Trench shall always be de-watered.
121. Casing/protection pipes must extend at least 5m out from the railway right-of-way. High embankment and deep cut situations shall be assessed case-by-case where the previous requirement is not appropriate.
122. If reserve casing/protection pipes will be added for future use, then their heads must be sealed tight and marked in nature as for other utilities.
123. In no circumstances can be cable splicers be located or cables be spliced inside railway right-of-way.
124. Tolerances for construction (inc. casing pipes) for open trench construction:
 - 124.1. Alignment at joints ± 5 mm;
 - 124.2. Horizontal alignment: ± 100 mm;
 - 124.3. Elevation, measured each 20 m along the utility line: ± 30 mm;
 - 124.4. The designer shall keep the horizontal distances from the neighbouring objects including as the values of minimum distances required by legal acts, regulations, and this document as the horizontal alignment maximum allowed tolerance value into the total.
 - 124.5. Other, less strict, tolerances for open trench construction (inc. casing pipes) are acceptable in the case if the designed utility location, including chosen less strict tolerances, has enough clearance reserve, ensuring a principle - do not violate:
 - 124.5.1. Other required values set in this document;
 - 124.5.2. Requirements of legal acts and regulations regarding distances to buildings, structures, engineering networks, utilities, facilities and other objects and their protection zones or land plots;
 - 124.5.3. The interests of third parties by the conditions stipulated in contracts or written consents if such exist, etc.
125. Tolerances for construction (inc. casing pipes) for trenchless construction:
 - 125.1. Alignment at joints ± 5 mm;
 - 125.2. Horizontal alignment: ± 300 mm;

- 125.3. Elevation: ± 150 mm; The designer shall keep the horizontal distances from the neighbouring objects including as the values of minimum distances required by legal acts, regulations and this document as the horizontal alignment maximum allowed tolerance value into the total.
- 125.4. Other, less strict, tolerances for open trench construction (inc. casing pipes) are acceptable in the case if the designed utility location, including chosen less strict tolerances, has enough clearance reserve, ensuring a principle - do not violate:
 - 125.4.1. The corresponding utility type required minimum distances for open trench installation method in the Annex 1 "BURIED UTILITIES VERTICAL PLACEMENT", and other required values set in this document;
 - 125.4.2. Requirements of legal acts and regulations regarding distances to buildings, structures, engineering networks, utilities, facilities and other objects and their protection zones or land plots;
 - 125.4.3. The interests of third parties by the conditions stipulated in contracts or written consents if such exist, etc.
- 126. When support structures are used in trench during construction (retention walls, ties etc.) then they need to be removed parallel with the backfilling.

REVIEW AND UPDATE OF THE DOCUMENT

Revision 2.0: Document formatting has been updated in compliance with company document management requirements. Content improvements. Document content updates can be traced in Utilities Requirements content updates Comment Sheet RBCN-ROA-SPC_AP-R-00001.

Revision 3.0: Updates regarding underground cable protection measures, Point 15. / 19. / 20. / 123. Document content updates can be traced in Utilities Requirements content updates Comment Sheet RBCN-ROA-SPC_AP-R-00002.

Revision 4.0: Improved the requirements during the alignment with the National Implementing Bodies. Document content updates can be traced in Utilities Requirements content updates Comment Sheet RBCN-ROA-SPC_AP-R-00003.

References

Ref:	Document Number:	Document Title:
1.	RBDG-MAN-033-0101	BIM Manual
2.	RBDG-MAN-034-0101	CAD Standard
3.	RBGL-CRS-TPL-Z-00001	Internal Governance Document template (MS Word)
4.	RBCN-ROA-SPC_AP-R-00001	Utility Requirements content updates
5.	RBCN-ROA-SPC_AP-R-00002	Utility Requirements content updates
6.	RBCN-ROA-XX-XX-SPC-R-00003	Utility Requirements Status Assessment procedure

Annexes

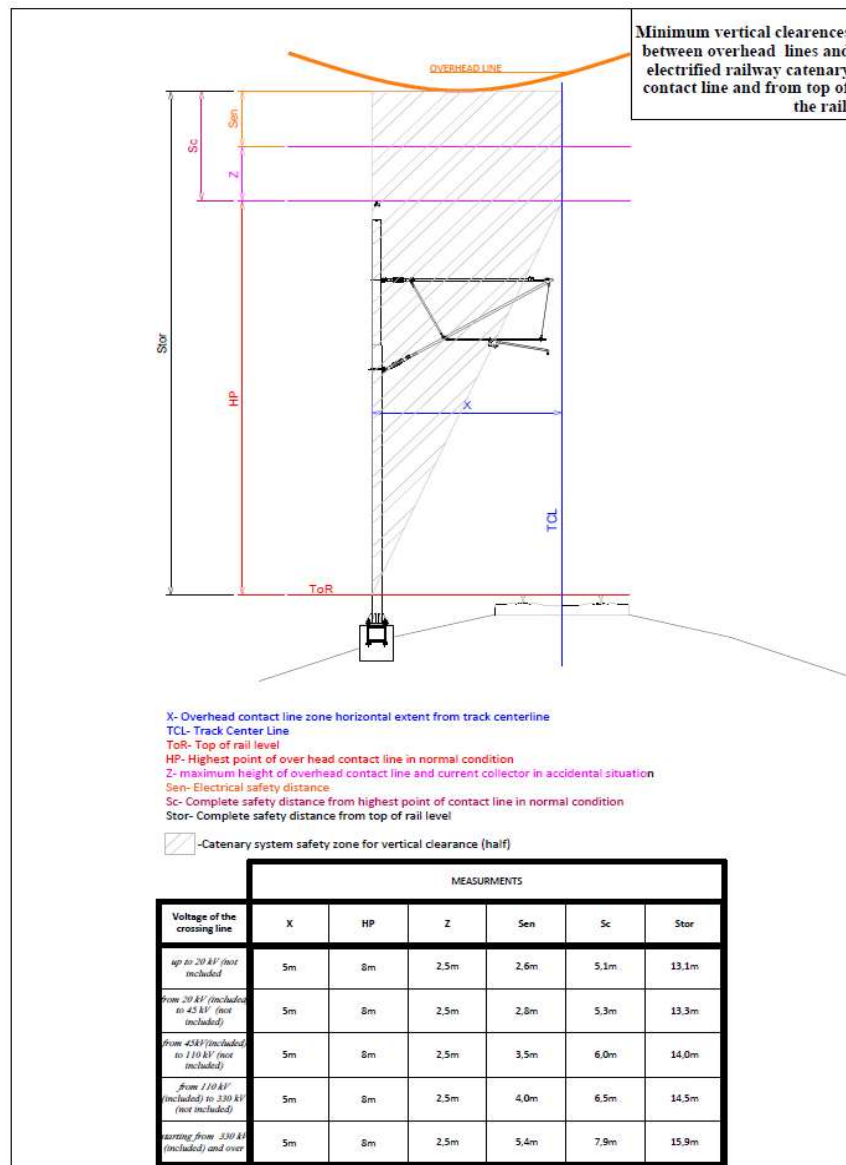
Annex 1. Buried utilities vertical placement

Utility	Minimum buried depth from top of the rail and/or existing ground to the top of the utility casing pipe (including ditches)	Minimum buried depth from top of the road pavement and/or existing ground to the top of the utility casing pipe (including ditches)
<i>Water pipelines</i>	2,5m open trench, 3,5m for trenchless methods	2,0m open trench, 2,5m for trenchless methods
<i>Sewage and drainage pipelines</i>	2,0m open trench, 3,0m for trenchless methods	1,5m open trench, 2,5m for trenchless methods
<i>Pressure sewage pipelines</i>	2,5m open trench, 3,5m for trenchless methods	2,0m open trench, 2,5m for trenchless methods
<i>Gas pipe</i>	3,0m open trench with 2,0m wide concrete slab cover 0,5m deep from existing ground, 4,0m for trenchless methods	2,0m open trench with 1,0m wide concrete slab cover 0,5m deep from existing ground, 2,5m for trenchless methods
<i>Oil and fuel pipelines</i>	3,0m open trench with 2,0m wide concrete slab cover 0,5m deep from existing ground, 4,0 for trenchless methods	2,0m open trench with 1,0m wide concrete slab cover 0,5m deep from existing ground, 2,5m for trenchless methods
<i>District heating and steam pipelines</i>	2,0m open trench, 3,0m for trenchless methods	1,2m open trench, 1,7m for trenchless methods
<i>Industrial pipelines</i>	2,0m open trench, 3,0m for trenchless methods *	1,2m open trench, 1,7 for trenchless methods *
<i>Electricity cables below <110kV</i>	2,0m; 3,0m for trenchless methods	1,0m; 1,7m for trenchless methods
<i>Electricity cables ≥110kV and over</i>	2,5m; 3,5m for trenchless methods	1,5m; 2,0m for trenchless methods
<i>Communication cables</i>	1,5m; 2,5m for trenchless methods	1,0m; 1,5m for trenchless methods
REMARK: *.Additionally load calculations have to be carried out according to A.3.3. EN 13480-6		

Annex 2. Overhead utilities vertical placement

Utility type and Voltage	Minimum vertical clearances between overhead lines and electrified railway catenary contact line and from top of the rail*.	Minimum vertical clearances between overhead lines and electrified railway catenary contact line at railway ramps, stations and loading areas
<i>Tele-communication cable</i>	Only buried installation allowed	Only buried installation allowed
<i>Electricity cables below < 110 kV crossing with railway</i>	Only buried installation allowed	Only buried installation allowed
<i>Electricity 110 kV</i>	14,5m from track and 6,5m from highest electrified part of the catenary system	18,5m
<i>Electricity 330 kV and over</i>	15,9m from track and 7,9m from highest electrified part of the catenary system	19,9m
<i>Fixed electrical installations (isolators, conductors etc.)</i>	4,5m in every direction	4,5m in every direction
REMARK: 1) Crossing of other overhead utilities (fuel lines, district heating lines, steam lines, gas lines and others) with railway except electric cables, is strictly not permitted (also within the structures as viaducts and overpasses) 2) For all of the vertical distances indicated, the electric cables should be calculated for ambient external environment temperatures: -Minimum temperature with no other climatic action -40C° -Normal ambient temperature (every day temperature) +5C° -Maximum temperature +35C° 3) All suspensions and deflections have to be proved by calculations 4) Design must meet requirements set in this document, EN 50341-1 If there is conflict in demands between this document and the EN 50341-1 then the most stringent demands shall prevail. If EN 50341-1 reference to National Normative Aspects (NNA) then EVS-EN 50341-2-20 shall be considered as the prevailing NNA. 5) In location where the railway vertical profile has not been defined and/or can change during future designs and/or construction IB or IM (or RBR, when is the Client of design services) can define additional safety clearance. 6) LV/MV Electrical cables cannot be implemented with overhead technical solution (only crossing under railway). Only 110 and 330 kV could be implemented with overhead technical solution. * - Please see scheme in Annex 3 for measurements description		

Annex 3. Minimum vertical clearances between overhead lines and electrified railway catenary contact line and from top of the rail



Annex 4. Buried utilities horizontal placement

Utility type	Horizontal distance (m) from underground utilities to:					
	Structures and railway related buildings (bridges, overpasses, tunnels etc.) and their foundations	Fence and ramp foundations	Railway catenary pole foundations and grounding system foundations	Road/street curb stone, road edge, road verge with reinforcement	Highway ditch outer edge or highway embankment cut line with existing ground (natural subgrade)	1435 railway embankment cut line with existing ground (natural subgrade) or railway ditch outer edge
Water and pressurized sewage pipelines	5	3	10	1,5	1	10
Gravity sewage and gravity stormwater pipelines	3	1,5	10	1,5	1	10
Gravity drainage collectors	3	1	5	1,5	1	5,8
Gravity drainage pipelines	0,4	0,4	0,6	0,4	0,4	5,8
Gas pipelines with the following pressure (MPa):						
Low pressure $\leq 0,005$ MPa	2	1	10	2	1	10
Middle pressure $0,005 \leq 0,4$ MPa	2	1	10	2	1	10
High pressure $0,4 \leq 1,6$ MPa	7	1	10	1,5	1	10,8
Very high pressure Over 1,6 MPa	50	25	50	50	50	50
District heating pipelines	2	1,5	10	1	4	10

All types Electrical power supply cables	1	1	5	1,5	1	10,8
Electricity masts, poles, towers, and guys	Mast, pole, tower or guy height from ground + 10m	Mast, pole, tower or guy height from ground + 10m	Mast, pole, tower or guy height from ground + 10m	Mast, pole, tower or guy height from ground + 10m	Mast, pole, tower or guy height from ground + 10m	Mast, pole, tower or guy height from ground + 10m
Railway technological electric power supply cables	0,6	0,6	0,6	1,96	1	1,9
Telecommunication cables	0,6	0,6	2	1	1	10,8
Railway technological telecommunication network cables	0,6	0,6	0,6	1,5	5	1,9
Utility canals and utility tunnels	2	1,5	1,5	1,5	1	5,8
Fuel pipelines	30	5	30	15	15	30

Annex 5. Overhead electricity lines horizontal placement

Utility type	Horizontal distance (m)		
	Railway catenary pole foundations and grounding system foundations	Road ditch outer edge or highway embankment cut line with existing ground (natural subgrade)	1435 railway embankment cut line with existing ground (natural subgrade) or railway ditch outer edge
Up to 35 kV (included) electricity guyed masts, poles, towers in rural areas	15m	8m	15m
Over 35 kV (not included) electricity guyed masts, poles, towers in rural areas	30m	8m	30m
Up to 35 kV (included) electricity un- guyed masts, poles, towers in rural areas	Height of the mast measured from ground level + 10m	15m	Height of the mast measured from ground level + 10m
Over 35 kV (not included) electricity un- guyed masts, poles, towers in rural areas	Not allowed inside of railway right-of-way	Not allowed inside of railway and road right-of-way	Not allowed inside of railway right-of-way
Up to 110 kV (included) electricity guyed masts, poles, towers in urban areas	Not allowed inside of railway right-of-way	Not allowed inside of railway and road right-of-way	Not allowed inside of railway right-of-way
Over 110 kV (not included) electricity guyed masts, poles, towers in urban areas	8m	3m	8m
Up to 110 kV (included) electricity un- guyed masts, poles, towers in urban areas	Not allowed inside of railway right-of-way	Not allowed inside of railway and road right-of-way	Not allowed inside of railway right-of-way
Over 110 kV (not included) electricity un- guyed masts, poles, towers in rural areas	Not allowed inside of railway right-of-way	Not allowed inside of railway and road right-of-way	Not allowed inside of railway right-of-way