Rail Baltica
Coordinated by RB Rail

Annex 1
RB Rail AS procurement "Joint Rail Baltica chainage and geodetic reference network development study",
ID No RBR 2023/13,

TECHNICAL SPECIFICATION

JOINT RAIL BALTICA CHAINAGE AND GEODETIC REFERENCE NETWORK DEVELOPMENT STUDY

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CONTENTS

ACRONYMS AND ABBREVIATIONS

In this document where the context admits, the following words shall have the meaning assigned to them hereafter:

Table 1: Acronyms and Abbreviations

Abbreviation	Definition
CAD	Computer Aided Design
CDE	Common Data Environment
CP0	RB Geodetic Reference Network (Level 0)
GIR	Ground Investigation Report
ICD	Interface Control Document
MoM	Minutes of Meeting
PWDM	ProjectWise Deliverables Management
RAMS	Reliability, Availability, Maintainability and Safety
RBR	RB Rail AS.
RFI	Request for Information
TS	Technical Specification
TWG	Technical Working Group

DEFINITIONS

The following terms are used throughout this document:

Table 2: Terms and Definitions

Term	Definition
Affected parties	Project external stakeholders – State institutions, local government bodies, public and/or private enterprises, legal or private entities (persons) representing the owners and/or managers of the assets (networks and/or objects of power supply, gas, oil, water, drainage etc.) that are linked to the designed layout of Rail Baltica railway line and shall be consulted during the provision of Design Services.
Assessment Body	The independent and competent external or internal individual, organization or entity which undertakes investigation to provide a judgement, based on evidence, of the suitability of a system to fulfil its safety requirements.
Building permit	Construction permit issued by state authorities based on national construction legislation.
Client	RB Rail AS, a joint stock company registered in the Latvian Commercial Register under registration No 40103845025, legal address at Satekles iela 2B, Riga, LV-1050, Latvia (the "Principal").
Contractor	Service provider awarded with an Agreement to conduct the Services specified in the present Technical Specification and Agreement. Contractor fully covers fulfilment of all requirements, duties, rights and responsibilities of Contractor and Investigator in accordance with national legislation and shall be certified/licensed in the country to provide the Services.
Final Location Design	Corresponds to definition of Geodetic Reference Network Design for Infrastructure construction sites and according to the Law of the Republic of Estonia/Latvia or Lithuania on Geodetic Network establishment.
Design Guidelines	Set of predefined and standardized technically and economically justified engineering and design solutions for Rail Baltica infrastructure to be applied at design, construction, and operation phases of Rail Baltica Railway, which forms an integral part of this Technical Specification. The Design guidelines may be changed by the Client therefore the Agreement always refers to the most current version of the Design guidelines.
Design Priority Section	Part of Design Section identified as separate Rail Baltica railway line section for planning of the Design Services, construction and management purposes.
Design Section	Section of overall Rail Baltica railway line falling under the scope of the Services.
Design Services	Corresponds to all Rail Baltica Design and Design Supervision Services under the Agreement.
Environmental Impact Assessment	Assessment of the significant effects of a project or development proposal on the environment.
Global Project	All the activities undertaken by the Rail Baltica railway implementing parties to build, render operational and commercialize the Rail Baltica railway and related railway infrastructure in accordance with the agreed route, technical parameters and time schedule.
National Geodetic Network	Geodetic Network Points, which is owned by National Institutions and will be selectively part of RB Geodetic Reference Network. The amount of selected points will be defined after Investigation phase.

National Institutions	Local government bodies and/or public enterprises, who are owners of the National Geodetic Network and provide official geodetic information for existing National Geodetic Network.
Pre-design	Design prepared by Client with pre-defined locations of new Geodetic Reference Network points and with selected existing National Geodetic Network points.
Rail Baltica railway	A new fast conventional double track electrified standard gauge (1435 mm) railway line on the route from Tallinn through Pärnu - Riga - Panevėžys - Kaunas.
Railway infrastructure	Correspond to the Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area (recast), as well as it includes freight and passenger terminals and infrastructure and rolling stock maintenance facilities and the ground underneath them and the airspace above them to the extent that the national legislation permits the ownership of the ground and the airspace.
Railway station	Part of a railway containing necessary sidings and necessary equipment, which allows to perform train traffic organization (change of direction, overtaking, crossing) and commercial (passenger exchange, freight operations, etc.) operations. The border of a railway station is a station border (an entry signal or a border sign).
RB Geodetic Reference Network (CP0)	Rail Baltica Level 0 (CP0) Geodetic Network, which is include selected National Geodetic Network points and additionally installed geodetic points. The final amount of Level 0 points will be defined after approved Location Design Phase.
Reliability, Availability, Maintainability and Safety	As per RAMS requirements and RAMS methods, the obligatoriness Directives, Regulations and Standards following the Directives (EU) 2016/797 and Regulation (EU) 2013/402, the standard EN50126-1, Rail Baltica RAMS Design Guidelines and procedures.
Urban Node	Means part of the railway located in an urban environment in an urban node usually having one or more Local Facilities. For Rail Baltic / Rail Baltica railway there are three urban nodes – Riga (LV), Tallinn (EE), Vilnius (LT) which are listed in regulation 1315/2013 and Kaunas (LT). Railway Urban Node Section borders are defined considering their functionality.
Work Breakdown Structure	A hierarchical framework for organizing and ordering activities that make up the entire scope of Design services. It covers all project scope and breaks down into unique manageable parts that correspond to key deliverables, phases of work, and milestones. They are product (deliverable-based) structures that provide a common frame of reference for managing and reporting project elements (e.g., estimating, scheduling, etc.) to stakeholders.
Work Package	The work and services defined at the lowest level of the work breakdown structure.

1. General

1.1 Introduction

The Baltic countries Estonia, Latvia and Lithuania have historically been linked to the east-west railway transport axis using the 1520 mm gauge railway system. Because of the existing historical and technical constraints, the existing rail system is incompatible with mainland European standards, thus there is a consensus that Estonia, Latvia, and Lithuania need to be fully integrated into the wider European rail transport system. Currently there is no efficient 1435 mm railway connection along the Warsaw - Kaunas - Riga - Tallinn axis, i.e., there are missing links or significant bottlenecks. Thus, there are no direct passenger or freight services along the railway axis as the existing infrastructure does not allow for competitive services compared to alternative modes of transport. Thus, most of the North-South freight is being transported by road transport and the overall accessibility in the region is low.

Rail Baltica is already designed to become a part of the EU TEN-T North Sea – Baltic Core Network Corridor, which links Europe's largest ports of Rotterdam, Hamburg, and Antwerp – through the Netherlands, Belgium, Germany and Poland – with the three Baltic States, further connecting to Finland via the Gulf of Finland short sea shipping connections with a future fixed link possibility between Tallinn and Helsinki.

The contracting authority RB Rail AS ("RBR") was established by the Republics of Estonia, Latvia, and Lithuania, via state-owned holding companies, to coordinate the development and construction of the fast-conventional standard gauge railway line on the North Sea – Baltic TEN-T Core Network Corridor (Rail Baltica II) linking three Baltic states with Poland and the rest of the EU.

The shareholders structure of RBR is presented in Figure 1.

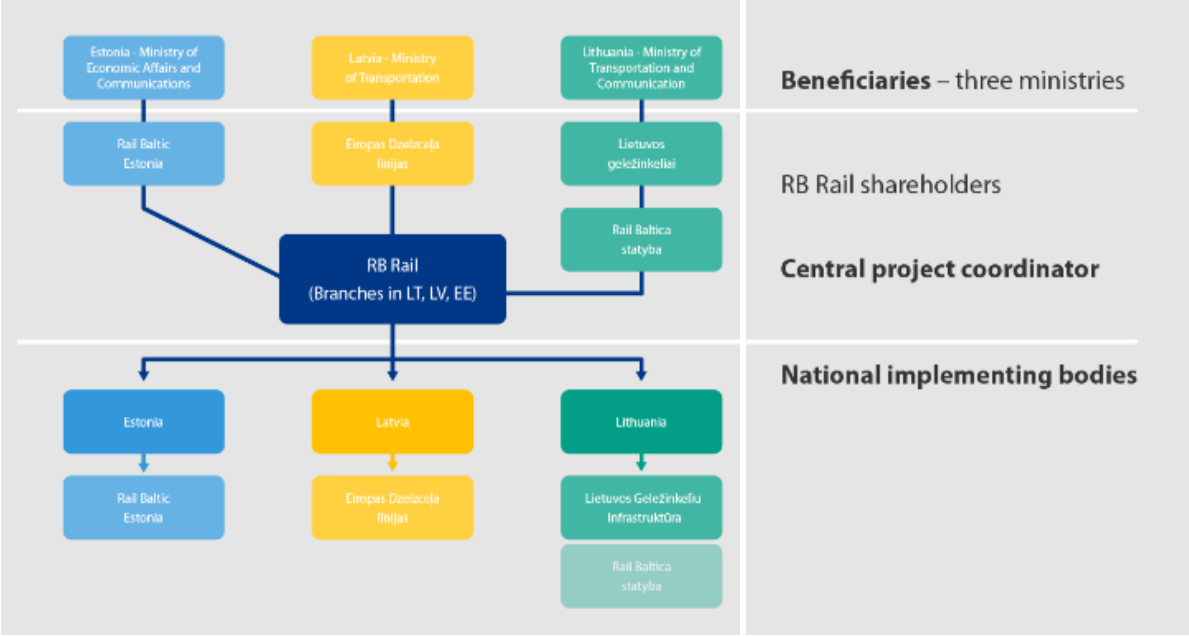
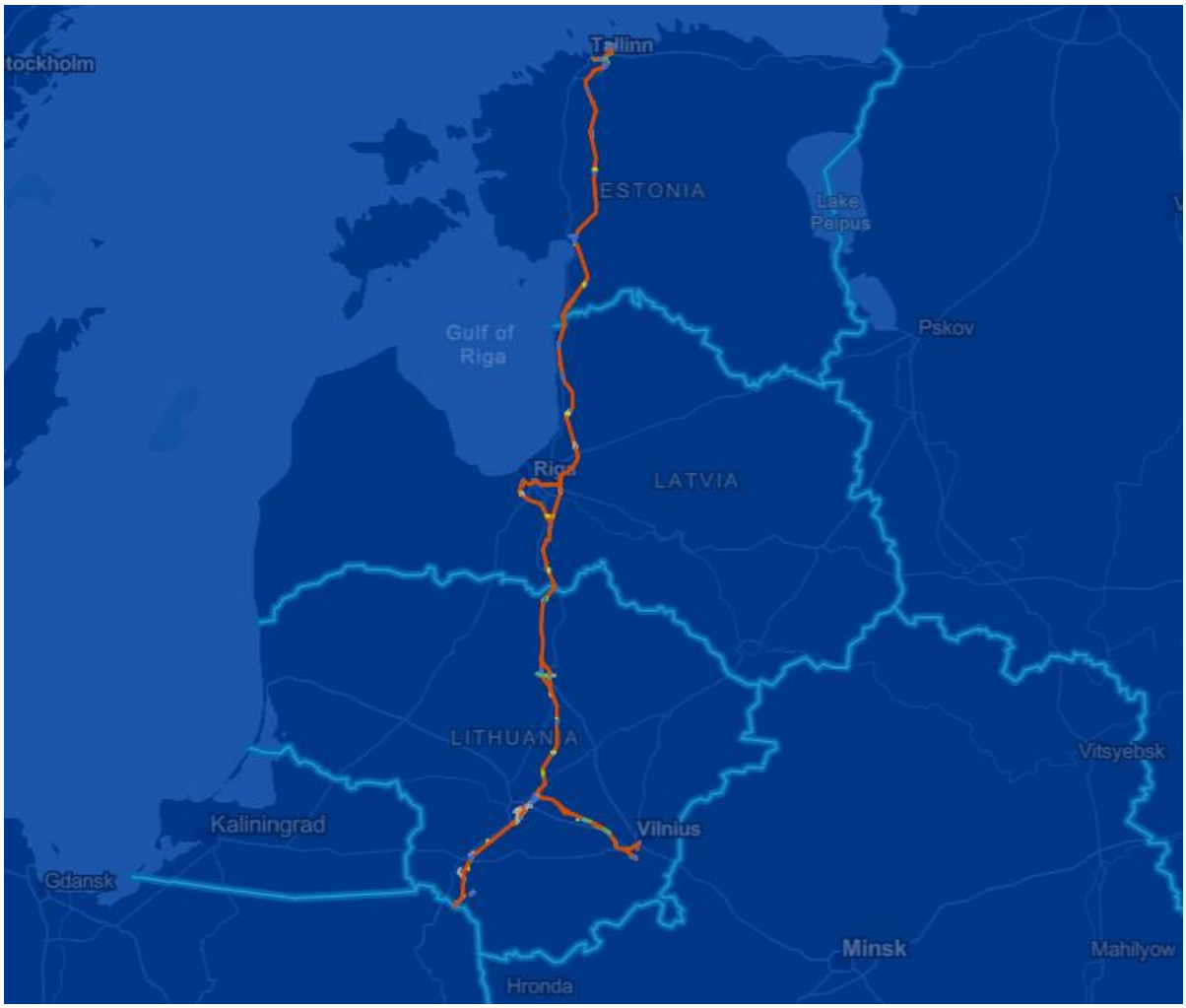


Figure 1: The shareholders' structure

Rail Baltica is a joint project of three EU Member States – Estonia, Latvia, and Lithuania – and concerns the building of a fast conventional double track 1435 mm gauge electrified railway line on the route from Tallinn through Pärnu (EE), Riga (LV), Riga International Airport (LV), Panevėžys (LT), Kaunas (LT) (see map 1, page 8).

The expected core outcome of the Rail Baltica project is a European gauge (1435mm) double-track railway line of 870km in length meant for both passenger and freight transport and the required additional infrastructure (to ensure full operability of the railway). It will be interoperable with the TEN-T Network in the rest of Europe and competitive in terms of quality with other modes of transport in the region.



Drawing 1: Rail Baltica high-speed railway alignment overview (http://www.railbaltica.org/)

Further information is available in http://www.railbaltica.org/

1.2 Legal references

The Contractor shall follow EU directives, all national construction and other legislation, EU standards, Country-specific legislation/standards/rules, and other legal acts applicable for the provision of the Design Services. Main applicable legal acts (non-exhaustive list) are provided below[1]:

Estonia

- Construction Law of the Republic of Estonia (Est. "Ehitusseadustik ")
  https://www.riigiteataja.ee/akt/105032015001?leiaKehtiv

[1] The Client is not responsible for the availability and content of the information available online (except for www.railbaltica.org website)

- Regulations for Geodetic works and for Geodetic Networks (Est. "Geodeetiliste tööde tegemise ja geodeetilise märgi tähistamise kord, geodeetilise märgi kaitsevööndi ulatus ning kaitsevööndis tegutsemiseks loa taotlemise kord ")
  https://www.riigiteataja.ee/akt/103072013014?leiaKehtiv
- Country's register of legal acts
  https://www.riigiteataja.ee/en/
- On the recognition of the "Rail Baltica" project as a project of special national interest
  https://ttja.ee/en/business-client/railway/rail-baltic/preliminary-design-and-studies

Latvia

- Construction Law of the Republic of Latvia (Lat. Noteikumi par Latvijas būvnormatīvu LBN 005-15 "Inženierizpētes noteikumi būvniecībā")
  https://likumi.lv/ta/id/275007-noteikumi-par-latvijas-buvnormativu-lbn-005-15-inzenierizpetes-noteikumi-buvnieciba
- Regulations for Geodetic works and for Geodetic Networks (Lat. Noteikumi par Latvijas būvnormatīvu LBN 305-15 "Ģeodēziskie darbi būvniecībā")
  https://likumi.lv/ta/id/274935-noteikumi-par-latvijas-buvnormativu-lbn-305-15-geodeziskie-darbi-buvnieciba-
- Country's register of legal acts
  https://likumi.lv/
- On the recognition of the "Rail Baltica" project as a project of special national interest
  https://www.sam.gov.lv/en/projects/rail-baltica-0?utm_source=https%3A%2F%2Fstatics.teams.cdn.office.net%2F

Lithuania

- Construction Law of the Republic of Lithuania (Lith. "Lietuvos Respublikos Statybos įstatymas")
  https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.26250/asr
- Construction Technical Regulations (Lith. "Statybos techniniai reglamentai")
  https://vtpsi.lrv.lt/lt/teisine-informacija/teises-aktai-2/statybos-techniniai-reglamentai
- Country's register of legal acts
  https://www.e-tar.lt/portal/en/index
- On the recognition of the "Rail Baltica" project as a project of special national interest
  https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/TAIS.408298

General

- Intergovernmental Agreement on the development of the Rail Baltic / Rail Baltica railway connection
  https://www.railbaltica.org/wp-content/uploads/2017/05/Intergovernmental_Agreement_2017.pdf
- The Contracting Scheme for Rail Baltica
  https://www.railbaltica.org/wp-content/uploads/2017/05/Contracting-Scheme-Rail-Baltica-2016.jpg

1.3 Description of services

It is within the intention of Rail Baltica to establish a unified RB Geodetic Reference Network along the RB Project's Alignment from Tallinn (EE) to Kaunas (LT) approx. 600 km. Part of this activity is to reassure or establish the physical presence of Geodetic Reference Network points at 117 selected locations (See drawing 2a/b/c and Table 1).

a b c

Drawing 2a/b/c: Pre-designed Rail Baltica Geodetic Reference Network Points (CP0) locations (a-Estonia, b-Latvia, c- Lithuania)

At those locations, it shall be investigated by the Contractor, if there are already existing National Geodetic Network points, which can be part of RB Geodetic Reference Network and report their usability. At the locations that National Geodetic Network points are not usable or do not exist, new RB Geodetic Reference Network points shall be designed, according to the requirements of this document.

Country	New RB Geodetic Reference Network Points need to design	National Geodetic Network points need to investigate
EE	4	34
LV	39	8
LT	3	29
TOTAL	46	71
	117	

Table 1. Total amount of RB Reference Geodetic Network points (CP0)

"Joint Rail Baltica chainage and Geodetic Reference Network development study" is a multi-phase geodetic activity, where current Procurement is covering following phases:

Phase 1 - Investigations of existing National Geodetic Network points and locations of new pre-designed RB Geodetic Reference Network (CP0) points for the entire length of the route, starting from Estonia/Tallinn-Muuga (EE) through Latvia (LV) until Lithuania/Kaunas (LT) approx. 600km. Results are summarized in the Interim report.

Phase 2 – Location Design of RB Geodetic Reference Network (CP0) points for the entire length of the route, starting from Estonia/Tallinn-Muuga (EE) through Latvia (LV) until Lithuania/Kaunas (LT) approx. 600km. Final Deliverable is Final Location Design of RB Geodetic Reference Network, approved by Affected parties and all relevant institutions.

Phase 1 and 2 activities are described in detail in Section 3 "Design Process and Deliverables".

This procurement DOES NOT include further Phases, such as construction, installation and measurements of new RB Geodetic Reference Network points and the measurements with adjustment, which would be required to carry out in order to complete the RB Geodetic Reference Network.

1.4 Time schedule

1.4.1 Every Phase of current procurement until the review and approval the Final Location Design by the Client, is based on following time schedule:

Stages	Description of activity	Timeframe
1	Phase 1 - Investigations and Interim Report	5 weeks
2	Interim Report review and approval by Client	1 week
3	Phase 2 - Draft version of Location Design	4 weeks
4	Draft version review and approval by Client	1 week
5	Phase 2 - Final Location Design	4 weeks
6	Final Location Design review and approval by Client	2 weeks
TOTAL:		**17 weeks**

Table 2. Time schedule of current procurement Phases

1.5 National institutions

Main Country's national regulatory institutions (non-exhaustive list) as a guidance for the Contractor to consider throughout the Agreement implementation provided below:

- Estonian Land Board (Est. "Maa-amet")
- www.maaamet.ee
- Latvian Geospatial Information Agency (Latv. "Latvijas Ģeotelpiskās informācijas aģentūra")
- www.lgia.gov.lv
- Lithuanian Ministry of Environment (Lith. "Lietuvos Respublikos aplinkos ministerija")
- www.am.lrv.lt

The Contractor shall consider and follow any legal acts, rules or regulations issued by the Country's national institutions and applicable for the implementation of the Design Services and Design Supervision Services.

1.6 Affected Parties

The Contractor shall be responsible for the coordination of activities of the Design Services with Affected parties within and/or in association with the Scope of the Services. The indicative (non-exhaustive) list of Affected parties is as follows:

1. Transport infrastructure operators/owners: railways, roads, airports
2. Power transmission operators (high voltage) and power suppliers (low and medium voltage)
3. Oil/gas transmission operators

4. State/municipal institutions
5. Landowners and land managers
6. State Forest Service
7. Telecom (communication cable lines, mobile operators)
8. Fire/Rescue services and military authorities
9. Private enterprises
10. Railway authorities
11. State/municipal service companies (water supply, heat supply etc.)
12. Environmental monitoring institutions
13. Culture heritage monitoring institutions
14. Melioration and land drainage authorities and owners / managers
15. any other institutions involved in Design process

2. Scope of the Services

2.1 Main Tasks

2.1.1 In accordance with the national legislation and Rail Baltica Global project requirements, the Contractor shall perform all necessary tasks to provide:

1. Location and investigation of the existence and condition of the selected National Geodetic Network points, as well as their usability. Creation of interim report with results of investigation works.
2. Selecting new National Geodetic Network point or designing new RB Geodetic Reference Network point if the existing National Geodetic Network point is not usable even after slight cleaning of surroundings (agreed with landowner) for suitable GNSS measurements or there are no National Geodetic Network points on site.
3. Creation of Location Design of Rail Baltica high-speed railway Geodetic Network and collecting all necessary permits. The location design contains of all the necessary approvals regarding the used point type, location and installation method, which is necessary for the next phases - establishment and construction of the points in the locations specified in the Location Design.

2.1.2 The Contractor shall review and analyse all references and annexes necessary for the provision of services under the Agreement.

2.1.3 The Contractor shall analyse all the requirements for design and for next phase needed for construction works, prepare and submit all necessary applications to the respective authorities for information and permits.

2.1.4 The Contractor shall undertake all necessary works for Site Investigations, including accessibility, open sky visibility obstacles, ownership of land where the new RB Geodetic Reference Network points will be designed, soil condition and suitability to guarantee stability for specific point type (if necessary, test drilling and analysis or analysis of relevant data from existing geotechnical databases) etc.

2.1.5 The Contractor shall assess existing structures and utilities (including but not limited to high / low voltage electricity lines, general gas pipelines, water supply and sewer, telecommunication lines) intersections and Technical Conditions.

2.1.6 The Contractor shall analyse existing data and implement necessary investigations of the underground utilities of the designed point location with a cable locator.

2.1.7 The Contractor shall obtain all permits, qualification certificates, licenses required to implement and complete the Final Location Design Services.

2.1.8 The Contractor shall prepare Location Design proposals for the exact location of the new Geodetic Reference Network points.

2.1.9 The Contractor shall cooperate with all parties involved in approval process and obtain any required approvals (from the Client, National Institutions, Affected parties, etc.) required during the design process.

2.1.10 If relevant and required according to national legislation, the Contractor shall apply for the necessary number of Building Permits (considering but not limited to the indicative amount of Construction Objects specified in this TS) by ensuring the provision of necessary design data in accordance with national legislation.

2.1.11 Of all deficiencies and errors in technical specifications, including pre-designed coordinates and other deficiencies discovered during the work or issues to receive approvals, the Contractor is obliged to inform the Client immediately.

3. Design Process and Deliverables

3.1 General Requirements

The Contractor prepares the Final Location Design of RB Geodetic Network for the entire length of the route, starting from Estonia, Tallinn/Muuga (EE) trough Latvia (LV) until Lithuania/Kaunas (LT) approx. 600km.

3.1.1 The Contractor shall submit all Location Design Services deliverables (Final Location Design) including all data, as described in TS Requirements. All files shall be delivered in:

1. Native-editable file format (e.g. MS Word, MS Excel, AutoCAD (AutoCAD template will be provided for the Contractor after signing the Agreement), etc.) and shall include all styles and external reference, so the Client could fully re-create the drawings when needed;
2. Non-editable file format (JPEG, PDF).

3.1.2 In addition, the Contractor shall submit Final Location Design deliverables to Affected parties and to National state institutions based on their individual request, which may require to provide deliverables in hard-copy format, CDs, USB sticks, combined PDFs with size limitations. The Contractor shall engage with the Client, National state institutions and Affected Parties to ensure all necessary native-editable and non-editable files are provided upon submission.

3.2 Investigations and Interim Report

The Contractor shall carry out two (2) different types of investigations.

3.2.1 Investigations of existing National Geodetic Network points for the entire length of the route, starting from Estonia/Tallinn-Muuga (EE) trough Latvia (LV) until Lithuania/Kaunas (LT) approx. 600km.

3.2.1.1 All the necessary site investigations to verify the existence of existing National Geodetic Network points in the nature and their suitability for GNSS measurement and elevational measurement with levelling traverse. If by RB Rail AS proposed National Geodetic Network point is not existing or are surrounded by buildings, facilities or with dense vegetation, where the cutting/removal is not easily feasible, a new closest point must be found or, if necessary, a new location must be designed.

3.2.1.2 Investigations of existing national Geodetic grid and Interim Report, as part of RB Rail Geodetic Reference Network include:

A. Physical existence of the geodetic point on site and its condition by visual check. Information about visible defects, deficiencies or other damage that may affect the further use of the mark is provided in the inspection table. Information about missing National Geodetic Network point needs to be added in the inspection table. Information about the possibility of placing the Barcode Invar Levelling Rod on the centre of the marker must also be added. The information in MS XLS and in PDF must be provided in the Interim Report and in the Final Location Design.

B. A possible major physical location changes due to subsidence or other direct factor, checking possible gross errors (≥ 5 cm) in official coordinates using the RTK-GNSS method. Every selected National Geodetic Network point needs to be measured with 3 initializations and the arithmetic mean value and its deviation from the official coordinate in a centimetre accuracy are given in the inspection table. The information in MS XLS and in PDF must be provided in the Interim Report and in the Final Location Design.

C. A panorama of the sky plot should be prepared in order to be able to plan the possibility of carrying out GNSS-static measurements based on them. After the cut-off angle of 15 degrees, at least 70% in each quarter of the panorama must be free of obstacles. The information in DWG and in PDF format, must be provided in the Interim Report and in the Final Location Design.

D. Photos of the existing National Geodetic Network point location (3 pcs) must be provided with Investigation report, as following:

1. Photo of centre;

2. A close-up Photo of point;

3. Photo of point from a distance.

The information in JPEG and in PDF format, must be provided in the Interim Report and in the Final Location Design.

E. The Contractor prepare Interim Report with Investigated Data, which is noted in this TS in chapter 3.2 Investigations and Interim Report.

F. Interim Report contain Explanatory letter with description of investigation details. The information must be provided in MS Word and in PDF format.

G. Interim Report contain overall drawing with investigated point locations. The information must be provided in AutoCAD (AutoCAD template will be provided for the Supplier after signing the Agreement) and in PDF format.

H. Interim Report contain Table with investigated (existing) points with official and checked mean coordinates with deviations from official coordinates and existing point types. Coordinates must be provided in national (regionally in L-EST97/EH2000, LKS-92/LAS2000,5/, LKS-94/LAS07), in WGS84 (geodetic) coordinate systems and in ellipsoidal height system. The information must be provided in MS XLS and in PDF format.

3.2.2 Investigations of locations of new pre-designed RB Geodetic Reference Network (CP0) points (provided by RB RAIL AS) for the entire length of the route, starting from Estonia/Tallinn-Muuga (EE) trough Latvia (LV) until Lithuania/Kaunas (LT) approx. 600 km.

3.2.2.1 All the necessary site investigations to verify the suitability of locations of new pre-designed RB Geodetic Reference Network points in the nature and their suitability for GNSS measurement and elevational measurement with levelling traverse.

3.2.2.2 Investigations of locations of new pre-designed RB Geodetic Reference Network points include:

I. All pre-designed locations for new Geodetic Reference Network points by RB Rail AS must be checked in nature and their suitability for static GNSS measurement and elevational measurement with levelling traverse. If needed new location have to be chosen and estimated coordinates have to be provided in centimetre accuracy. The information in MS XLS and in PDF must be provided in the Location Design and in the Final Report.

J. A panorama of the sky plot should be prepared in order to be able to plan the possibility of carrying out GNSS-static measurements based on them. After the cut-off angle of 15 degrees, at least 70% in each quarter of the panorama must be free of obstacles. The information in DWG and in PDF format, must be provided in the Final Location Design.

K. Photos of locations of new pre-designed RB Geodetic Reference Network points (5 pcs) as following:

1. Photo of every main direction North/East/South/West (4pcs)

2. Photo of new location from a distance

The information in JPEG and in PDF format, must be provided in the Final Location Design.

3.3 Final Location Design

3.3.1 The Contractor shall prepare Final Location Design of RB Geodetic Reference Network for construction and installation as designated in this Technical Specification.

3.3.2 The Contractor shall prepare mandatory document(-s) and present them for Client's review and approval.

3.3.3 The Contractor shall carry all necessary tasks and procedures to get approvals from national institutions and from affected parties. This step shall include getting approvals from national Road Agencies and underground/overground utilities' managers/operators where relevant.

3.3.4 The Final Location Design contains all the necessary approvals regarding the used point type, location and installation method, which is necessary for the establishment and construction of the points in the locations specified by RB RAIL AS in the pre-design.

3.3.5 The Contractor shall carry out all necessary activities at its own cost to obtain necessary Building Permits for all Construction Objects according to the national construction legislation when or if necessary.

3.3.6 The Contractor shall be responsible for the applications to receive the Building Permits (according to applicable national law, if needed) and provision of any relevant information that may affect the performance of the work. The Contractor is obliged to consider all the comments and remarks issued by the relevant authorities during building permit review process. Implementation of changes to the design solutions according to the comments and remarks must be agreed prior with the Client. When or if necessary.

3.3.7 The Contractor shall apply the best engineering practice to optimize the design solutions and achieve the best value for cost and quality for the RB Geodetic Reference Network.

3.3.8 When necessary and possible, a protective fence and/or a simpler type of sign post must be designed. The corresponding proposal with schemes or drawings must be attached to the Final Location Design and have to be approved by the Client and Affected Parties. For Pillar-monument sign post is not necessary.

3.3.9 Final Location Design of RB Geodetic Reference Network include:

L. Explanatory letter with description of design details. The information must be provided in MS Word and in PDF format.

M. Overall drawing with designed point locations. The information must be provided in AutoCAD (AutoCAD template will be provided for the Supplier after signing the Agreement) and in PDF format.

N. Table with designed (new and existing) points with new and checked coordinates and designed point types. Coordinates of existing points must be provided in national and official (regionally in L-EST97/EH2000, LKS-92/LAS2000,5/, LKS-94/LAS07), in WGS84 (geodetic) coordinate systems and in ellipsoidal height system. Coordinates for new locations have to be provided in national (L-EST97, LKS92, LKS94) and in WGS84 (geodetic) coordinate system. The information must be provided in MS XLS and in PDF format.

O. Unique RB Geodetic Reference Network point numbering, provided by Client.

P. All investigated Data, which is noted in this TS in chapter 3.2 Investigations.

3.3.10 The Final Location Design have to include proposals and recommendations by the Contractor on methodology for further construction/installation phase.

3.3.11 The Final Location design does not include proposals for methodology of survey.

4. Client's Review and Approval Process

4.1 Means of Verifications

4.1.1 The Interim Report, including results from investigations, must be approved by the Client and Affected Parties before commencement of Final Location Phase (Phase 2).

4.1.2 The Final Location Design, including new CP0 point locations, types, used materials, recommendations and proposals for construction and installation methodologies must be approved by the Client and Affected Parties.

4.2 Confidentiality / Security Clause

4.2.1 Please note, the document (attached file, document folder) contains limited access information.

4.2.2 Limited access information intended for a limited number of persons for the purpose of fulfilling the assigned professional duties and tasks and disclosure or loss whereof due to the nature or content of such information impedes or could impede the functioning of RBR, related companies thereof or another institution involved in the fulfilment of the tasks of Global Project or/and state administration, becomes detrimental or could become detrimental to the legitimate interests of persons.

4.2.3 Please follow the "need to know" principle in respect of handling limited information and circulation of documents of limited accessibility, i.e., limited information for work purposes is received and used only by the employee to whom it concerns.

4.2.4 Dissemination of information without the written permission of joint venture company RBR is not allowed.

5. Annexes

Annex1. Detailed Technical Descriptions of CP0 point types and installation methodologies

Point type nb. 1. Pillar-monument

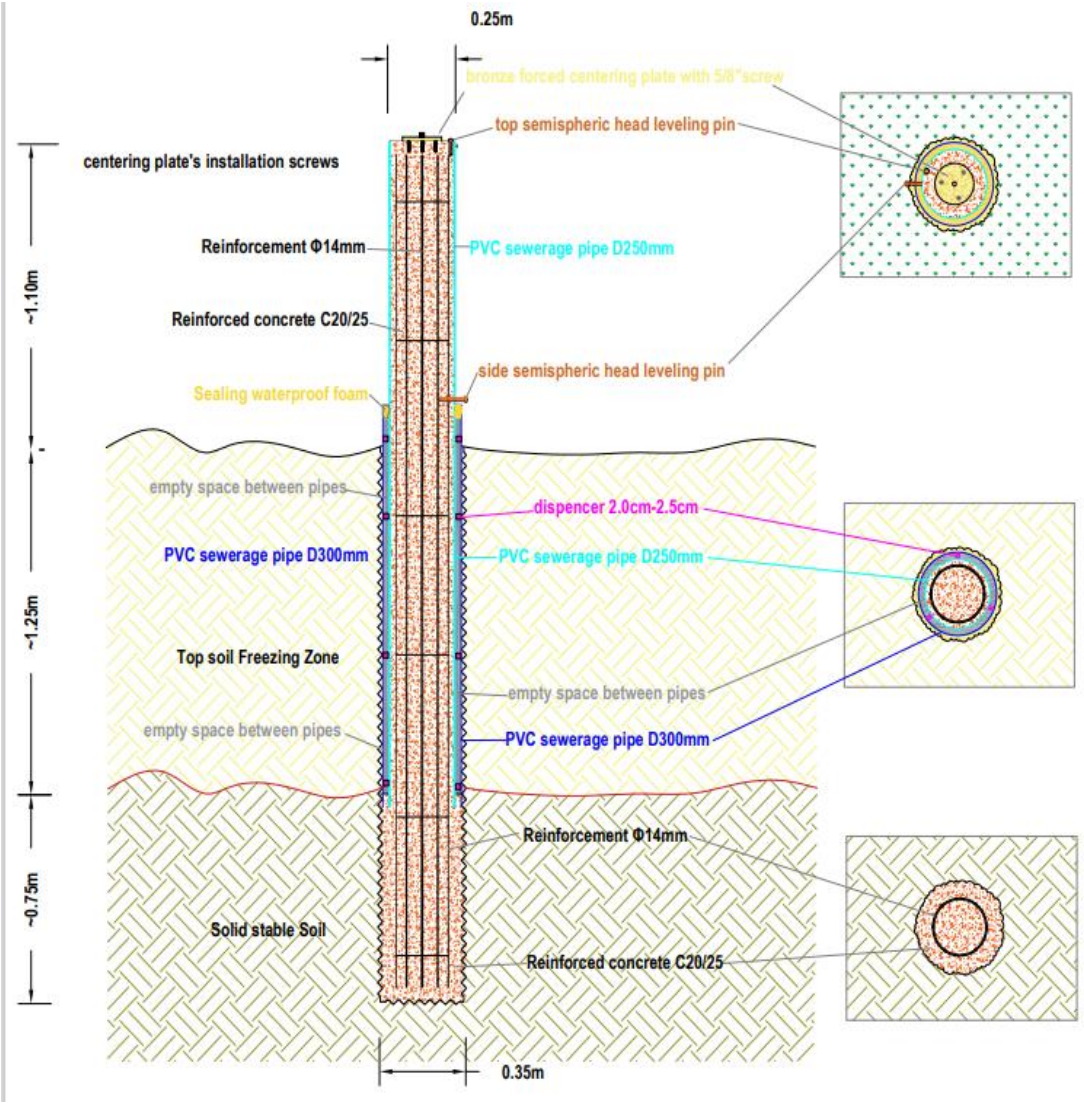


Figure 1. Point type nb. 1 for CP0 at non-urban areas, and if possible, at urban areas.

Purpose of this type of monument is to create a concrete, stable, easy to use and long-lasting RB Geodetic Reference Network point, for accurate GNSS baseline and leveling measurements. Monument shall be constructed in such way to be well anchored in soil below the freezing zone layer, and practically not affected by this phenomenon.
A forced centering plate shall be on top of it, to setup a tribrach of total station or GNSS receiver eliminating centering errors or malfunctions of tribrach , as well as to assist surveyors for fast and stable setup of the equipment.

TECHNICAL SPECIFICATIONS:

1. Reinforced Concrete C20/25 pillar of 25cm diameter
2. Height above ground L1=~ 1.10m
3. Anchoring depth below lowest freezing zone layer L3= ~0.75m
4. Protected part between ground and lowest freezing zone layer L2=~1.25m depending on thickness of the freezing zone at the spot.
5. Steel reinforcement at pile shape caging, with 8 rebars of 14mm d and length of L1+L2+L3.
6. PVC cylindrical sewerage pipe of 25cm diameter and length of L1+L2
7. PVC cylindrical sewerage pipe of 30cm diameter and length of L2
8. PVC dispensers of 2.0cm~2.5cm, placed in the gap between the 2 PVC pipes.
9. Bronze centering plate, with bolt of 5/8" with universal thread, suitable for all tribraches.
10. Centering plate bolt thread length shall be between 1.0cm and 2.0cm
11. Centering plate diameter shall be 16cm
12. Leveling pin with semispherical head shall be placed between the centering plate and the edge
of pillar, ideally at 10cm-12cm from the centering bolt.
13. Protective metal or plastic cap for the thread of the centering bolt.

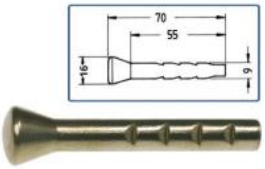
INSTALLATION METHODOLOGY

1. Drilling with proper machinery a 35cm diameter vertical hole to a depth of L2+L3 meters.
2. Placement of the rebar cage till the bottom of the excavation. The remaining overground part shall be not more than 1.10m.
3. Poor the C20/25 concrete in the pile hole, ideally with using a pipe to avoid separation of concrete materials for a length of L3 above the bottom, to reach the freezing zone lowest level. Concrete shall be vibrated, to tight up with the soil and the whole structure to be anchored to the stable soil.
4. Attaching the dispensers at the outer and lower part of the small diameter PVC pipe for the length of L2.
5. Sinking the 25cm diameter PVC pipe, so to include the rebar cage, to the top of the poor concrete. The top of the 25cm pipe shall be ~1.10m higher than the ground level.
6. Sinking the 30cm diameter PVC pipe, as an external sleeve to include the 25cm PVC, to the top of the poor concrete. The top of the 30cm pipe shall be at the ground level.
7. If there is gap between the soil and external PVC pipe, it shall be filled with sand or very thin aggregate.
8. Filling the 25cm PVC pipe with C20/25 concrete to the top.
9. Level and smoothen the surface of the concrete to prepare for the installation of the centering plate and leveling pin.
10. Depending on the type of centering plate, it can be installed when the concrete is still fresh (if the plate has anchors-pic 1), or when dry (if the plate has installation screws-pic 2)
11. When the concrete is fresh, the leveling semispherical head bolt shall sink in concrete, leaving only the head on surface.
12. At a low level of the pillar, when concrete is dry, a second leveling pin (similar to the top one) shall be installed perpendicular to the pillar-pic 3 . Installation shall be by drilling and using epoxy glue to stabilize the pin.
13. Special care shall be taken to seal from water entrance the gap between the 2 PVC pipes, at the top of the 30cm PVC pipe.

14. The name of each pillar shall be marked with color using 10cm height fonts and text stencils.

Picture 1

Picture 2



Picture 3

Picture 4

LABELING AND PROTECTION

15. The name of each pillar shall be marked with color using 10cm height fonts and text stencils (See picture 4).
16. Protective fence (steel or plastic) have to installed to secure the Geodetic point.
17. All types of protective fences need to approved during designing period with RB RAIL AS and other necessary institutions.

The Final report must include photos of the fabrication of the centers, the completed sign, and the various stages of point installation.

Point type nb. 2. Underground point

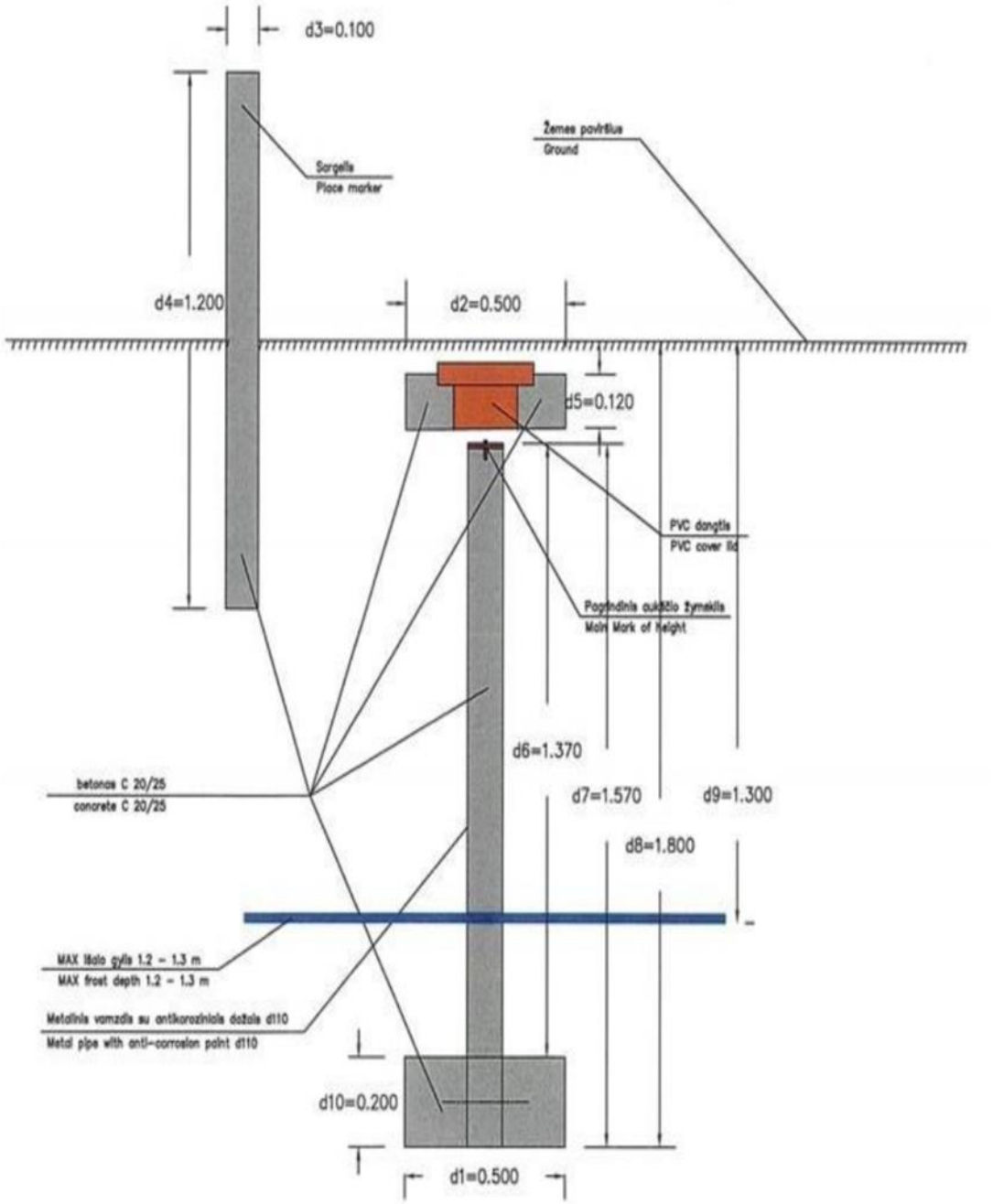


Figure 2. Underground point type nb. 2 for CP0 at non-urban and urban areas, if establishment of the pillar-monument (type nb. 1) is not reasonable or is not permitted.

UNDERGROUND POINT TYPE nb. 2. TECHNICAL SPECIFICATIONS & INSTALLATION METHOD STATEMENT

This underground point types can be placed when pillar-monument (type nb. 1) will not possible to install and only in areas where there is no dense network of underground utilities. This point can be installed by both drilling and digging methods, depend of the soil.

TECHNICAL SPECIFICATIONS:

1. The Geodetic point need to produced under stationary conditions to quarantee homogeneous quality.
2. The sign consists of a casing tube, a center rod and an anchor. The center rod (Ø 20 mm, L = 1570-2040 mm) have to made of stainless steel SS2377 and passivate with primer paint before casting.
3. The acid-resistant stainless steel SS2353 clamps (Ø 5 mm, L = 72 mm) are attached to the center rod.
4. The casing pipe is made of a plastic pipe with an outer diameter of 90-110 mm and a wall thickness of not less than 8 mm. The length of the casing pipe is 1,5m-2 m.
5. The casing pipe is attached to the anchor with two fixing irons (reinforcing iron Ø 16 mm, L = 420 mm). The diameter of the circular anchor is 480-500 mm, height 200 mm. The armature frame of the anchor is passivated with a primer and a concrete layer at least 20 mm thick. Rebar loops with a diameter of 5 mm are installed in the anchor.
6. The center rod is placed in the jacket tube so that the upper end is 20 mm above and the lower end is 20 mm below the edge of the jacket tube. The lower edge of the casing pipe must remain at a height of 40 mm from the base of the anchor.
7. The casing pipe is filled with non-shrinking concrete mix M 300, the anchor is made of concrete M 300. During concreting, a cast iron dial is placed at the top of the casing pipe so that the top surface of the dial is flush with the edge of the casing pipe. The casing pipe and the anchor are concreted together, the concrete mixture is compacted by vibration.
8. After the concrete mixture hardens, the gaps between the main mark (from bronze) and the jacket tube and center rod are sealed with Casco Marin&Teknik 4062 sealant or an equivalent sealant.
9. The center have to made in stationary conditions (workshop). The anchor have to installed on intact soil; the upper end of the Geodetic point must remain ca 0.2-0.5 m below the ground.
10. A square concrete collar with dimensions 400x400x100mm or 500x500x120, made in stationary conditions, used concrete brand 400, have to placed on top of the center rod.

Depending on the location of the sign, the following need to placed on the concrete collar:

a. metal plate with dimensions 250x250x6 mm. Two Ø10 mm holes have to drilled in the plate to make it easier to lift the plate. The plate is coated with "Epitar" (or similar) epoxy paint.
b. a cast-iron cover hatch, the upper surface of which is flush with the ground.

INSTALLATION METHODOLOGY

1. Drilling or digging with proper machinery a 50cm diameter vertical hole to a depth of L2+L2,5 meters.
2. The anchor of the Geodetic point have to set below the regional freeze depth on the ground of undisturbed structure.
3. The base of the concrete anchor must be leveled and compacted.
4. The excavated soil must be backfilled and compacted.

LABELING AND PROTECTION

1. An identification post (steel, concrete or plastic) have to installed for external decoration, to which an identification label with number have to added.

2. Protective fence (steel or plastic) have to installed to secure the Geodetic point and identification post.
3. All types of identification posts and protective fences need to approved during designing period with RB RAIL AS and other necessary institutions.

The Final report must include photos of the fabrication of the centers, the completed sign, and the various stages of point installation.

Point type nb. 3. Underground point.

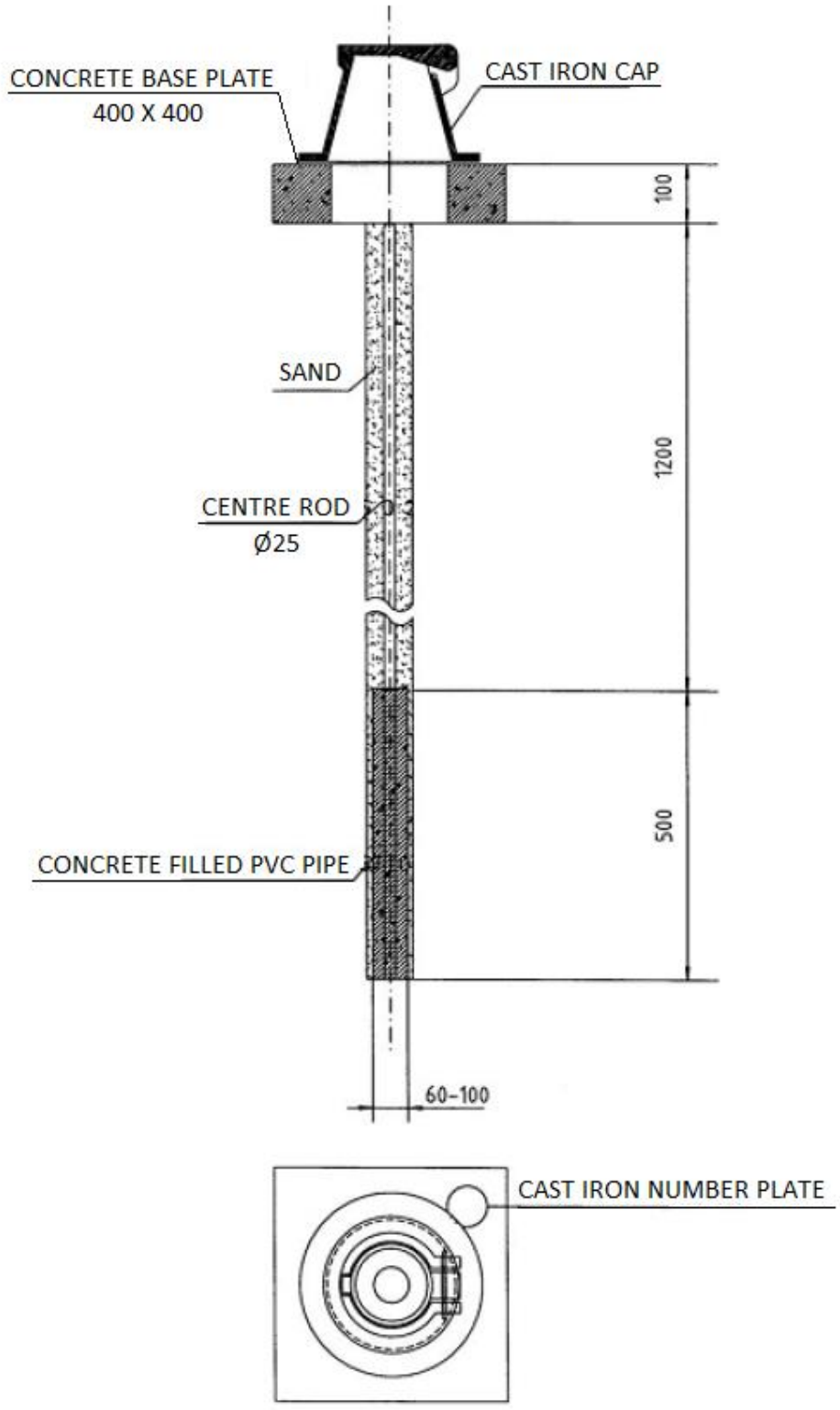


Figure 3. Underground point type nb. 3 for CP0 at non-urban and urban areas, if establishment of the pillar-monument (type nb. 1) and underground point (type nb. 2) is not reasonable or is not permitted.

UNDERGROUND POINT TYPE nb. 3. TECHNICAL SPECIFICATIONS & INSTALLATION METHOD STATEMENT

This underground point types can be placed when pillar-monument (type nb. 1) or underground point (type nb. 2) will not possible to install and only in areas where there is no dense network of underground utilities.

TECHNICAL SPECIFICATIONS:

1. The Geodetic point need to produced under stationary conditions to quarantee homogeneous quality.
2. The center rod is a round iron with a diameter of 25 mm and a length of 1700 mm.
3. The center rod have to hot-dip galvanized and completely coated with "Epitar" (or similar) epoxy paint.
4. A hole with a diameter of Ø2 mm have to drilled in the upper, curved center of the center rod.
5. The center anchor is a 0.5 m long and Ø60-100 mm plastic pipe filled with concrete (grade 400) and fixed around the lower end of the center rod to a rebar cross.
6. The concrete mixture is compacted in a plastic tube by vibration.
7. A square concrete collar with dimensions 400x400x100mm, made in stationary conditions, used concrete brand 400, have to placed on top of the center rod.

Depending on the location of the sign, the following need to placed on the concrete collar:

c. metal plate with dimensions 250x250x6 mm. Two Ø10 mm holes have to drilled in the plate to make it easier to lift the plate. The plate is coated with "Epitar" (or similar) epoxy paint.

d. a cast-iron cover hatch, the upper surface of which is flush with the ground.

INSTALLATION METHODOLOGY

5. The center have to placed in a hole pre-drilled with a drilling machine in the location chosen for the mark in nature.
6. Drilling with proper machinery a 12cm diameter vertical hole to a depth of ca 2 meters.
7. The anchor of the Geodetic point have to set below the regional freeze depth on the ground of undisturbed structure.
8. The base of the concrete anchor must be compacted.
9. The hole around the rod have to filled with sand and compacted by tamping.

LABELING AND PROTECTION

4. An identification post (steel, concrete or plastic) have to installed for external decoration, to which an identification label with number have to added.
5. Protective fence (steel or plastic) have to installed to secure the Geodetic point and identification post.
6. All types of identification posts and protective fences need to approved during designing period with RB RAIL AS and other necessary institutions.

The Final report must include photos of the fabrication of the centers, the completed sign, and the various stages of sign installation.

Annex2. Coordinate table of pre-designed RBR Geodetic Reference Network - CP0

Table 1. Table of pre-designed CP0 coordinates in Estonia

Country	Name	X coordinates (m)	Y coordinates (m)	WGS-84 N (deg)	WGS-84 E (deg)
		L-EST97			
Estonia	E1_New	6596522,000	557957,010	59,50238068	25,02332718
Estonia	E2_IRU97	6590215,231	552983,838	59,44642773	24,93397906
Estonia	E3_New	6587511,574	544018,762	59,42318633	24,7754107
Estonia	E4_Rae_mois	6582467,433	551151,225	59,3771123	24,89984635
Estonia	E5_Katku	6578484,826	547697,847	59,34176702	24,83822601
Estonia	E6_Lokuti97	6574614,860	542469,019	59,30758435	24,74558846
Estonia	E7_Saku	6572816,803	537911,671	59,29187486	24,6652719
Estonia	E8_Tagadi	6566702,776	543206,871	59,23648957	24,75697365
Estonia	E9_Urge	6560540,473	544484,130	59,1810432	24,77809662
Estonia	E10_New	6553370,920	545279,150	59,11660209	24,7905236
Estonia	E11_New	6548324,490	546046,027	59,0712203	24,80285666
Estonia	E12_Alu_Metskyla	6546063,304	543808,903	59,05115667	24,76340502
Estonia	E13_Sulupere97	6540152,491	544158,083	58,9980603	24,76830951
Estonia	E14_Raikkyla99	6532782,595	542787,141	58,93203925	24,743038
Estonia	E15_Purku97	6526720,850	545242,409	58,87737118	24,78444118
Estonia	E16_Vaharu99	6522806,355	546251,588	58,84212297	24,80112673
Estonia	E17_Jarvakandi	6516517,912	547366,250	58,78554928	24,81910195
Estonia	E18_Kaisma97	6509163,781	547920,315	58,71946785	24,82711431
Estonia	E19_Sohlu99	6503059,764	546158,095	58,66486079	24,79545161
Estonia	E20_Viluvere99	6499613,072	548524,341	58,63365989	24,83548569
Estonia	E21_Tootsi(13)	6493762,276	546210,151	58,58138655	24,79445103
Estonia	E22_Kyyne99	6489489,096	544445,497	58,54320739	24,76327961
Estonia	E23_Selja	6486303,236	547490,650	58,51428415	24,81490555
Estonia	E24_Kuiaru99	6483300,954	543807,050	58,48771659	24,75112627

Estonia	E25_Oti_1	6480257,303	538309,468	58,46090898	24,65635921
Estonia	E26_Pulli	6475978,404	539012,149	58,42243104	24,66766782
Estonia	E27_Oraste_B	6472716,255	536343,945	58,39337372	24,62148868
Estonia	E28_Raja_1	6469288,297	531941,501	58,36294114	24,54573266
Estonia	E29_Poska_A	6466523,473	538515,184	58,33758895	24,65757687
Estonia	E30_Laadi97	6459264,975	536557,128	58,27258962	24,62299763
Estonia	E31_PSU2	6455263,241	541227,396	58,2362478	24,70186816
Estonia	E32_Venemurru99	6449198,519	539127,861	58,18199069	24,6651037
Estonia	E33_Laiksaare9953	6440880,008	541498,404	58,10708972	24,70391202
Estonia	E34_Saki99	6438633,189	534674,540	58,08750754	24,58783552
Estonia	E35_Urissaare99	6431995,247	535700,092	58,02782945	24,60420709
Estonia	E36_Kabli97	6431034,536	527353,316	58,01980006	24,46283485
Estonia	E37_Majaka99	6425477,251	526065,417	57,96998319	24,44042605
Estonia	E38_Orajoe99	6417636,686	525582,166	57,8996169	24,43140877

Table 2. Table of pre-designed CP0 coordinates in Latvia

Country	Name	X coordinates (m)	Y coordinates (m)	WGS-84 N (deg)	WGS-84 E (deg)
		LKS-92			
Latvia	V39_New	412690,648	524505,483	57,85543865	24,41291856
Latvia	V40_New	408007,890	522673,460	57,81347435	24,38160484
Latvia	V41_New	402106,431	521288,007	57,76053437	24,35776283
Latvia	V42_Svētciems	396453,862	521875,984	57,70973332	24,36712935
Latvia	V43_New	391017,826	522647,284	57,66086699	24,37956246
Latvia	V44_New	386704,671	523053,114	57,62210409	24,38595257
Latvia	V45_New	381042,199	525999,099	57,5710815	24,43466518
Latvia	V46_New	372663,177	525873,733	57,49582442	24,43167887
Latvia	V47_New	374750,328	531228,058	57,5142348	24,52127408
Latvia	V48_New	371147,833	535452,631	57,48156521	24,59126535
Latvia	V49_New	365605,787	533830,345	57,43190827	24,56344482
Latvia	V50_New	362012,062	530648,182	57,39985327	24,50999947
Latvia	V51_New	356929,473	528681,147	57,35432648	24,47667584
Latvia	V52_New	351676,083	526724,096	57,30725559	24,44358213
Latvia	V53_New	347500,377	527661,749	57,26969028	24,45867842
Latvia	V54_New	343215,025	533726,150	57,23078917	24,55864876
Latvia	V55_New	338581,409	535041,641	57,1890679	24,57978475
Latvia	V56_New	333641,797	535167,233	57,14468682	24,58116607
Latvia	V57_New	330211,895	538082,035	57,11364448	24,62880982
Latvia	V58_Pļavasmājas	326270,321	536172,282	57,078392	24,59670895
Latvia	V59_New	323137,692	533959,768	57,05042015	24,55978896
Latvia	V60_New	318703,547	532800,812	57,01067192	24,5401078
Latvia	V61_New	315805,912	527098,042	56,98501169	24,44589648
Latvia	V62_New	311562,124	525092,743	56,94700166	24,41247898

Latvia	V63_New	309358,832	519641,897	56,92747191	24,32270788
Latvia	V64_New	307713,580	513847,534	56,91290118	24,22742013
Latvia	V65_New	309988,598	507295,290	56,93348843	24,11987753
Latvia	V66_New	310812,066	501288,562	56,94094178	24,0211781
Latvia	V67_New	307902,444	497919,076	56,91480004	23,96582297
Latvia	V68_Tīrumnieki	303285,682	494833,668	56,87330063	23,91524234
Latvia	V69_Bērzpils	299404,106	501995,347	56,83845419	24,03270479
Latvia	V70_New	297217,255	506523,586	56,81876664	24,10686896
Latvia	V71_Bitiene	294246,198	508933,488	56,79203539	24,14624373
Latvia	V72_New	292033,923	514814,798	56,77201094	24,24239348
Latvia	V73_New	287360,286	518235,433	56,72990296	24,29802705
Latvia	V74_Bunči	306364,818	525040,066	56,9003152	24,41109944
Latvia	V75_New	300066,822	523637,435	56,84381098	24,38748653
Latvia	V76_V79_Daugmale	294670,702	523610,933	56,79533604	24,38655261
Latvia	V77_New	282306,086	519036,783	56,68446514	24,31074907
Latvia	V78_New	277638,099	515622,923	56,64265501	24,25474019
Latvia	V79_New	270528,030	518134,654	56,57868809	24,29519603
Latvia	V80_New	267737,922	514231,662	56,5537562	24,23151062
Latvia	V81_New	261384,865	510811,476	56,49677063	24,17560958
Latvia	V82_New	256918,032	515421,613	56,45651145	24,25022667
Latvia	V83_Likverteni	253587,034	517863,602	56,42649897	24,28962148
Latvia	V84_New	246265,599	517450,605	56,36073675	24,28243835
Latvia	V85_New	241055,647	520589,424	56,31380284	24,3328316

Table 3. Table of pre-designed CP0 coordinates in Lithuania

Country	Name	X coordinates (m)	Y coordinates (m)	WGS-84 N (deg)	WGS-84 E (deg)
		LKS-94			
Lithuania	T86_8316	6239050,739	521167,509	56,28455178	24,3418468
Lithuania	T87_270	6235090,629	517458,808	56,24913035	24,28169218
Lithuania	T88_8318	6230207,786	512924,659	56,20541385	24,20829772
Lithuania	T89_8336	6226303,001	511019,193	56,17038573	24,17742692
Lithuania	T90_714	6220666,945	512642,098	56,11971746	24,20329076
Lithuania	T91_8348	6215151,529	509863,200	56,07023808	24,15840152
Lithuania	T92_942	6209196,650	512757,625	56,01667685	24,20460198
Lithuania	T93_4	6200504,391	514355,774	55,93854818	24,22976894
Lithuania	T94_8375	6197399,520	511956,691	55,91072209	24,1912337
Lithuania	T95_686	6191323,295	512500,790	55,85612394	24,19965552
Lithuania	T96_New	6186787,670	512649,880	55,81537503	24,20182555
Lithuania	T97_New	6182609,649	513584,368	55,77781691	24,2165266
Lithuania	T98_2182	6177863,563	510495,916	55,73525745	24,16711642
Lithuania	T99_2212	6172251,423	517085,331	55,68465346	24,27168223
Lithuania	T100_679	6165048,575	521867,643	55,61975491	24,34715376
Lithuania	T101_2312	6160884,340	520698,512	55,58239627	24,32828136
Lithuania	T102_2338	6155373,235	523774,653	55,53274636	24,3765945
Lithuania	T103_782	6147396,004	524761,227	55,46103246	24,39151005
Lithuania	T104_2125	6142475,488	525956,137	55,41676593	24,40994433
Lithuania	T105_834	6135849,467	524968,609	55,3572901	24,3937561
Lithuania	T106_834	6135849,467	524968,609	55,3572901	24,3937561
Lithuania	T107_3419	6127102,226	523478,588	55,27877862	24,36952738
Lithuania	T108_3424	6123823,710	520677,457	55,2494496	24,3252008
Lithuania	T109_3439	6118787,850	518650,232	55,20428735	24,29298583
Lithuania	T110_3451	6114812,539	515997,066	55,1686651	24,25108171

Lithuania	T111_3459	6111728,789	512619,635	55,14105727	24,19793447
Lithuania	T112_625	6104391,131	515730,540	55,07504396	24,24632162
Lithuania	T113_3415	6099862,305	513409,553	55,03442289	24,20976519
Lithuania	T114_3405	6097577,140	507691,750	55,01401294	24,12026061
Lithuania	T115_1376	6093720,170	511842,864	54,97927823	24,18500352
Lithuania	T116_7673	6087524,551	505853,959	54,92371886	24,09132164
Lithuania	T117_New	6084986,328	502156,143	54,9009432	24,0336168