



Rail Baltica

Geodetic network for Rail Baltica highspeed railway

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Co-financed by the Connecting Europe
Facility of the European Union

Design Speed

249 km/h – passenger trains
120 km/h – freight trains

Standard Gauge

1435 mm

Double-track Electrified

2x25kV AC

Axle Load

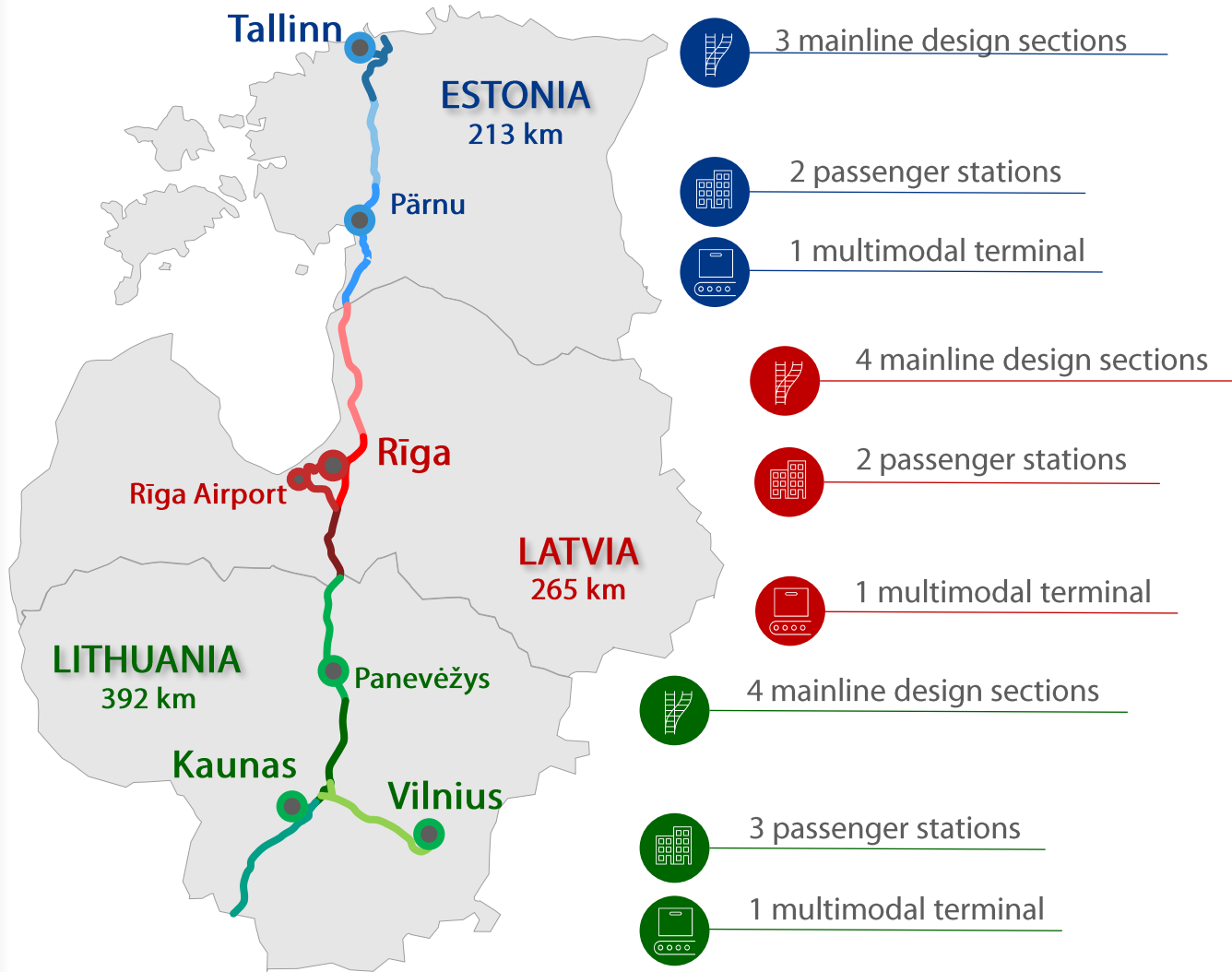
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Traffic Management

ERTMS 2

Max. Freight Train Length

1050 m



Additional requirements for Geodetic works for Rail Baltica railway

- ④ Control network benchmarks must be secured in nature so that they are present until acceptance of the railway construction (at least 10 years).
- ④ To align the measurement area with neighbouring sections of RB project, the consultant shall extend measurement area and shall set up temporary measurement point 2 km on both sides of design section. These will be fixed with concrete foundations and coordinate with adjacent section designers.
- ④ Survey works is coordinated with neighbouring country sections by ensuring that each country sections match with each other and that precision tolerance is according to national standards and regulations. In each side of the country border a permanent geodetic benchmark shall be established.
- ④ Benchmarks shall be able to provide geodetic survey works in both country coordinate system and elevation system. The length of the cross-border corridor section is at least 50m.

Construction of unified Geodetic network

⦿ Reason for implementing new Geodetic network:

- Highspeed railway construction requires external reference network which provides inner precision (relative accuracy of 1 mm).
- In order to perform future maintenance to determine settlements of embankment and deformed tracks an external reference system (geodetic grid) is necessary.

Requirements for Geodetic network.

Coordinate system for construction and maintenance

- Planar coordinates system – Geodetic grid shall have **local coordinates** in every country + unified **WGS84** system.
- Height coordinate system – Heights shall be based on **local height system**. At border section new **unified datum** will be developed to fix differences due to different Geoid models.

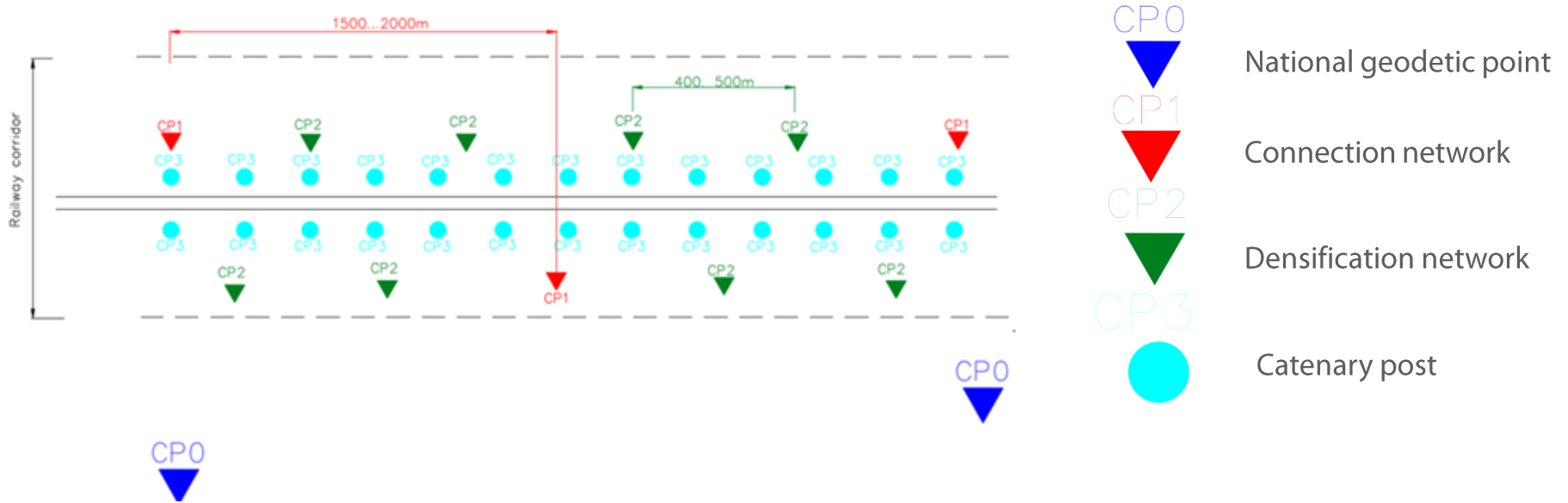
Coordinate system for construction and maintenance

	Planar coordinates	Height system
Estonia	L-EST 97	EH2000
Latvia	LKS-92	LAS-2000,5
Lithuania	LKS94	LAS07

Requirements for Geodetic network geodetic grid

- Constructed Geodetic grid shall consist of 3 different control points (CP) that are connected to national grid (CP0)
 - CP0 – National control points with relative accuracy of $\leq 1,0$ cm.
 - CP1 – Connecting new grid to national geodetic grid. CP1 shall be placed in distance on 1500 – 2000m alternating left and right side of Railway about 50,0m from main line.
 - CP2 – Denisfication network. CP2 shall be built both sides of main line inside railway right on way in distance of 400-500m
 - CP3 – Denisfication network for track construction in order to provide 1,0 mm relative accuracy. CP3 will be located on catenary posts.

Requirements for Geodetic network geodetic grid



Requirements for Geodetic network geodetic grid

⦿ Geodetic grid control point measurement requirements

- CP1 – Measurements shall be done using Relative Static Positioning method (GNSS). Heights shall be archived by leveling from CP0. Required absolute accuracy for planar and height coordinates is $\leq 1,0$ cm.
- CP2 – Measurements shall be based on CP1 using Total Station measurement traversing method. Required relative accuracy is 1,0 mm.
- CP3 – Shall be build using Total Station measurement traversing method after railway superstructure is accepted by Client. Required relative accuracy is 1,0 mm.

Requirements for Geodetic network geodetic grid

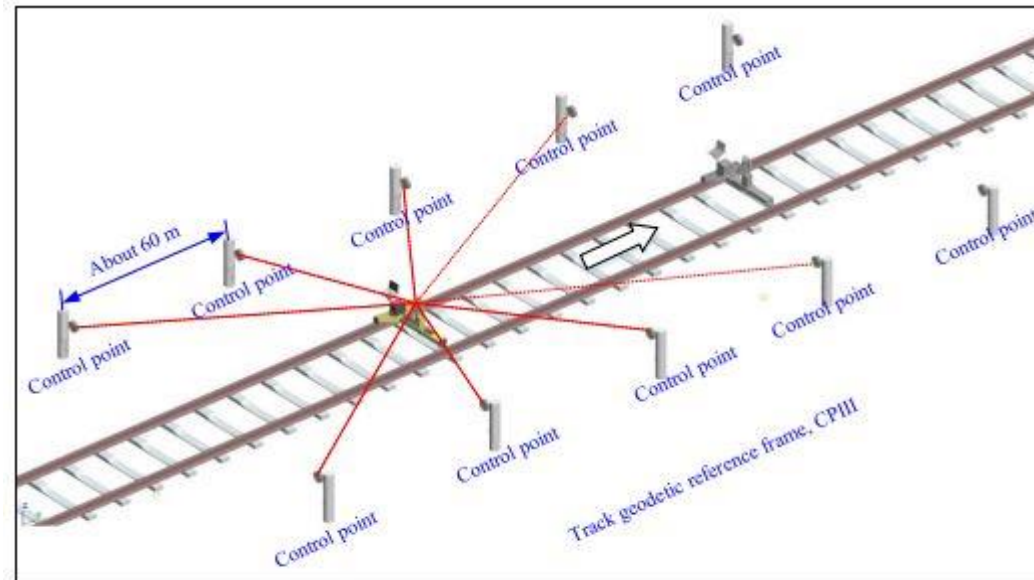
- ④ Cross-Border section.
 - Cross-border is defined as 12,0 km section between neighbouring countries (three CP1 in both countries)
 - Every CP shall have 3 different Coordinates. For example between LV and LT LKS-92, LKS-95 and WGS 84 are required.
 - Contrator shall establish common height system for cross-border section due to different Geoids used.
- ④ Consturction of control point.
 - Design life for control points is 30 years.
 - Construction of CP shall be done according to each country legislation
- ④ Documentation
 - Construction of new geodetic grid shall be documented according to local legislations
- ④ As-build data
 - Relative accuracy for as-build measurements and data shall be 1,0 cm.
 - Plan drawings shall be presented in scale 1:500 – 1:2000 (according to local legislation)
 - Level of Definition (LOD) in as-build models shall be higer than DTD models.
 - As-built information workflow shall be done according to CLSBIM document.

Unified Geodetic Grid for maintenance.

- ⦿ **Issue:** The track condition tends to deteriorate due to external factors, such as the frequent passage of heavy trains and deformation of the track bed. These factors make the railway track drift away from its designed geometric position
- ⦿ **Goal:** Develop geodetic grid for successful running and maintenance of High – Speed Railway
- ⦿ Geodetic grid developed by Contractor will be used
- ⦿ Different measurement methods for maintenance can be used:
 - Track inspection trains/track recording vehicles (only relative information)
 - Lightweight track geometry measuring trolleys (TGMTs)
 - GNSS with inertia navigation system – Best for inner accuracy
 - Total stationing method – Best for absolute accuracy

Unified Geodetic Grid for maintenance.

TGMT measurement device.





**PALDIES!
THANK YOU!
AITÄH!
AČIŪ!
KIITOS!
DANKE!
MERCİ!
DZIĘKUJĘ!**