

CONSTRUCTION BASES MINIMUM REQUIREMENTS

RB068-CMS-ZZ-ZZ-SPC-R-00001

Revision: 1.0

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Date: 21.06.2023

Document History

This document has been issued and amended as follows:

Revision	Issue Date	Author	Issue purpose	Description of changes
1.0	21.06.2023	Alvaro Lopez Pedrosa	First issue	

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1 Introduction

1.1 Objective

This document defines the minimum requirements for the future Construction bases (CB) to be used during construction of the Rail Baltic main line.

The document also includes recommendations to improve the logistics strategy.

1.2 Infrastructure Maintenance facility (IMF) and Construction bases (CB)

Current strategy of implementation of Rail Baltica high-speed project foresees to employ, if possible, the Maintenance facilities as construction bases during the construction phase, and then - once the construction is finished, these facilities will automatically become IMFs.

The use of Construction bases for the construction of greenfield high-speed lines is generally used in other greenfield projects as it offers great advantage from the logistic and construction point of view, serving as storage points for the track material. Besides, in countries, with different track gauges, like the Baltic states or Spain, the use of these CBs become more essential as the track materials will be transported in one gauge (National gauge 1520 mm) and then need to be transferred at some point to be installed in the international gauge. As some material like rails and turnouts have lengths that can only be transported by railway, the only way to transfer these materials from national gauge to the new Rail Baltica project one is to use the CB facilities.

2 Minimum requirements and recommendations

The minimum requirements that the Construction Bases need to include in order to ensure the proper and efficient delivery, handling, and storage of various superstructure materials are the following:

2.1 Construction Base area

2.1.1 1520 mm railway connection

All the construction bases need to have railway access by 1520mm gauge so that construction materials can arrive to the CB and have at least:

- One track with access the ballast storage;
- One track with access to the rail slab (rail storage area).
- One track with access to the turnout slab (turnout pre-assembly area).
- For sleeper unloading, any of the previous tracks could be used if they have enough length, but it is recommended to also have one exclusive track for sleepers unloading.

It is necessary to consider additional tracks for shunting operations, in order to facilitate the correct operation and use of these tracks during construction phase.

2.1.2 Road Access

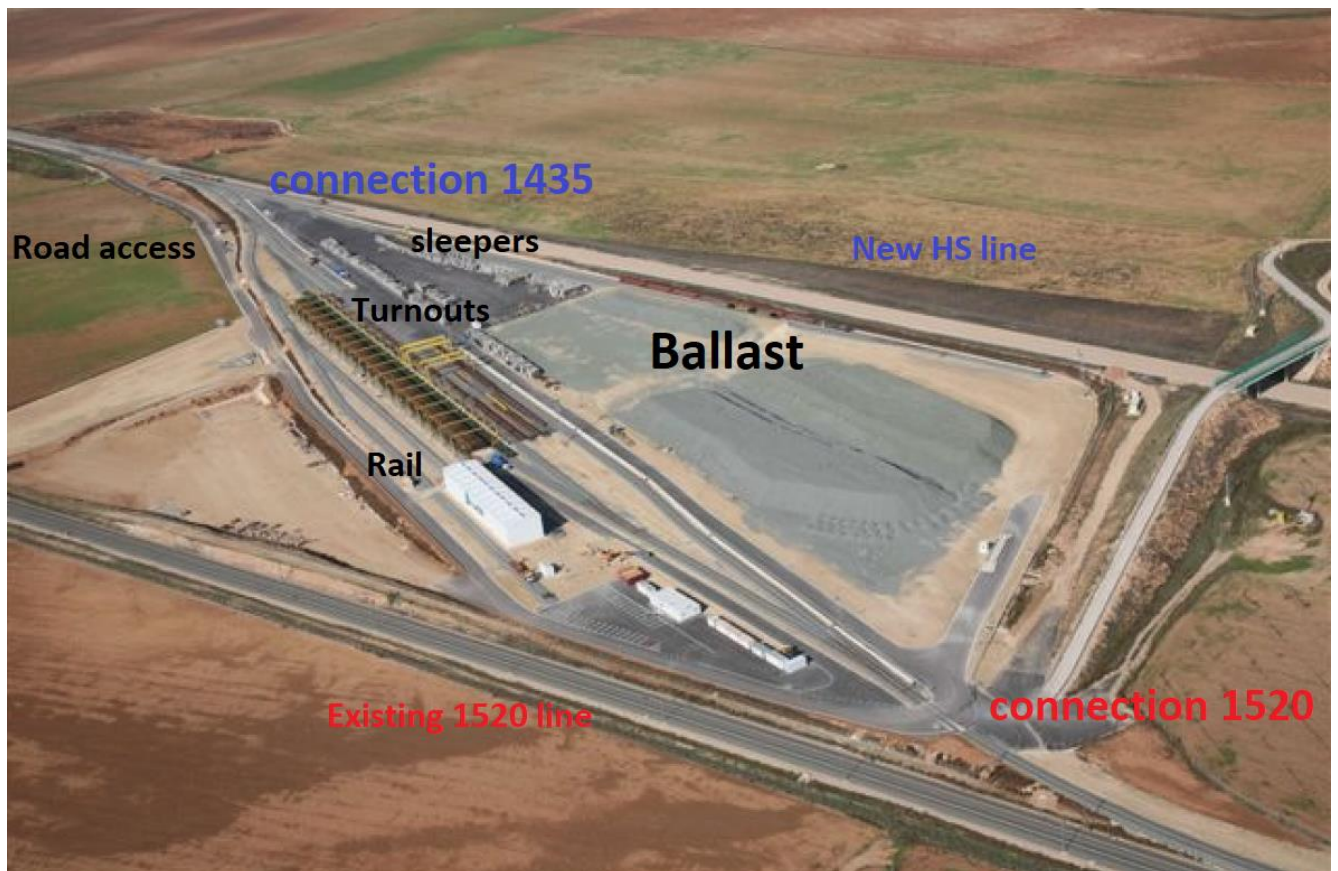
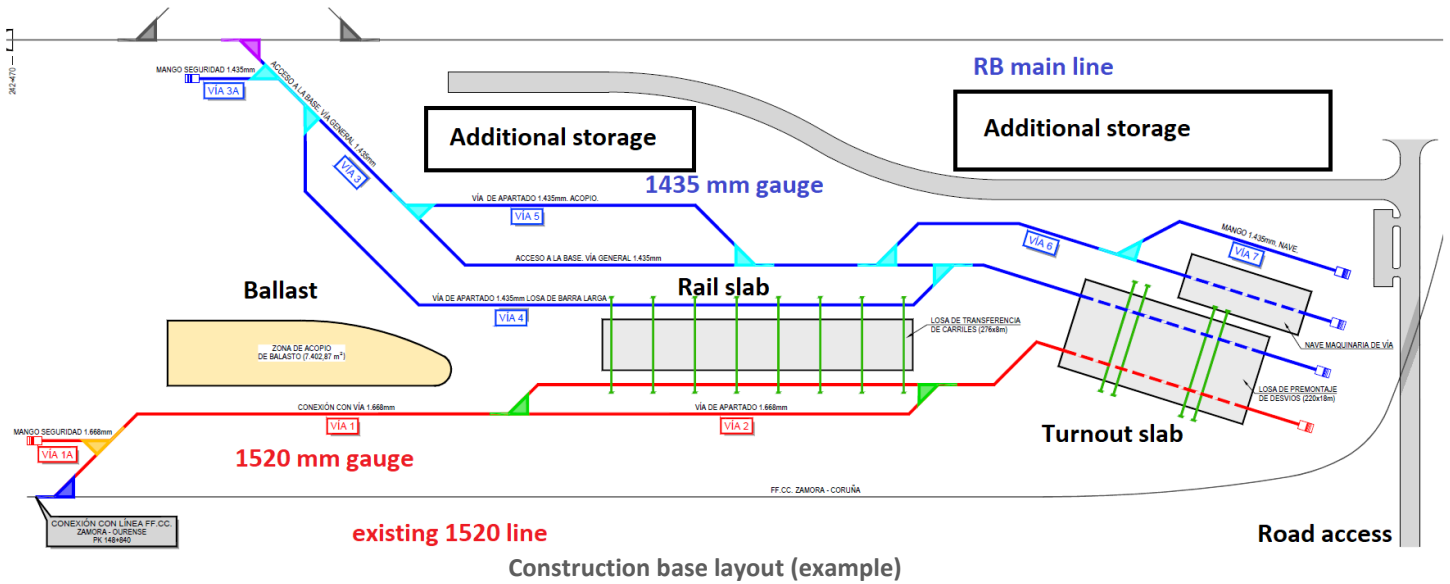
Construction bases also need to have road access (recommended asphalted) for construction material to be delivered by road transport. Road access parameters (minimum width, radius) need to be enough for special truck vehicles with 25 m length transported. The road needs to have access at least to the sleepers and ballast storages, and also to additional storage areas for extra materials (e.g., small turnouts or spare parts delivered to them etc.).

2.1.3 1435 mm railway connection

1435mm track layout will be as per design proposed by Designers, but need to have at least:

- One track for ballast loading;
- One track with access to the rail slab for rail loading (rail storage area).
- One track with access to the turnout slab for turnout loading (turnout pre-assembly area).

It is necessary to consider additional tracks for shunting operations, in order to facilitate the correct operation and use of these tracks during construction phase.



2.2 Ballast

Ballast can be delivered to the construction bases by track or by railway (being the second one the most probable one).

The ballast storage needs to have a minimum useful surface¹ of 20.000 m² to ensure proper stockpiling but it is recommended to have at least 30.000 m² and the ballast storage needs to be placed in a location with access to road and both 1520 mm and 1435 mm railway network.

Ballast storage surface need to be properly executed with a last layer of proper compacted aggregate and need to have proper inclination to ensure rain drainage and avoid ballast contamination.

For unloading ballast by 1520mm railway, the ballast storage must be provided with a high wall that let the hoopers unload by gravity the ballast laterally to the storage area, or something equivalent. The minimum length of the wall must be enough to let a 150 meters hooper train to unload the ballast at the same time.



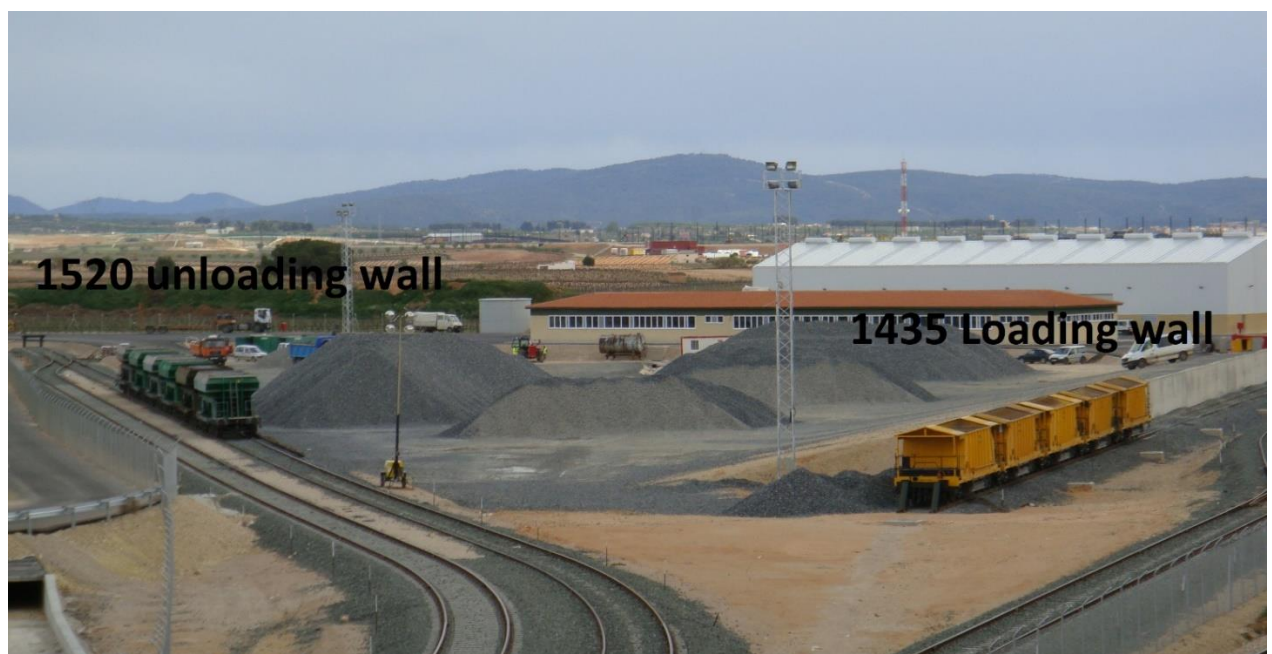
Ballast discharging wall.

¹ Useful surface means an area which is used for a stockpile of material (this case railway ballast) without including the area needed for loading/unloading and maneuvering needs

For loading the ballast on 1435mm hoppers for track installation, the ballast storage area must have a loading wall in the 1435 mm track so the material can be properly loaded on the hoppers. The minimum length of the loading wall must be enough to let 100 meters hooper train be loaded, without needing to move the train.



Ballast loading wall.

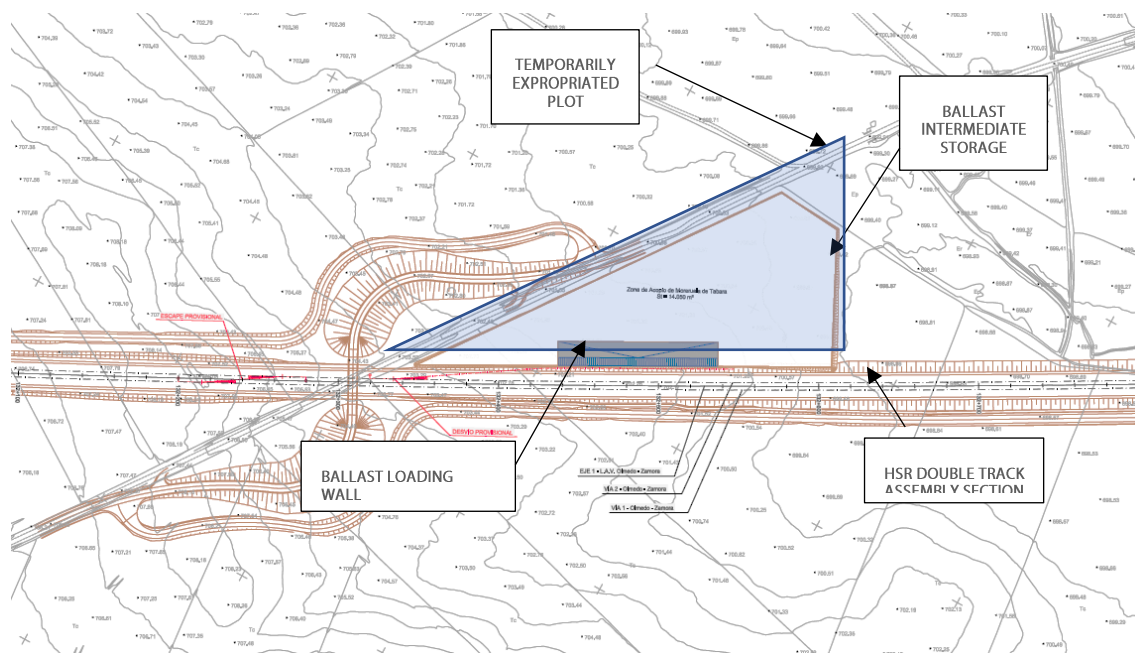


Ballast storage with combination of 1520 mm unloading wall and 1435 loading wall

2.2.1 Intermediate stockpiles (recommendation)

For the distribution of the ballast through the sections of the HSR Line, the option of using intermediate storages for ballast, it is essential to arrange intermediate bases for ballast storage, between every two adjoining Construction bases, distributed at an approximate distance of 20/25 km

The ballast supply to the storage will be carried out by road, transported in trucks from the Construction base ballast storage.



Ballast intermediate storage

2.3 Sleepers

Sleepers can be delivered to the Construction bases by road (truck) or by railway (being the first one the most probable one for RB project).

Within the construction base there must be an available storage area. The storage area surface does not need to be concreted or asphalted but need to have a proper aggregate finish compacted layer and have proper inclination to ensure rain drainage. With these characteristics, usually up to 10 rows of sleeper can be stored with the use of forklifts.

This storage area needs to have access by road and also be located close to the 1520mm track that will be used for unloading the sleepers for the train platforms.

Minimum Useful storage surface should be bigger than 5,000 m²



Sleepers' storage

2.3.1 Distribution of sleeper along the platform (recommendation)

As the sleeper storage capacity in the construction bases is limited, it is recommended, if possible, to distribute the sleepers along the new platform, and this way also simplify the construction works. Also, it is recommended to have intermediate storages for sleepers along the line between Construction bases if the sleepers are not distributed along the platform.



Sleepers' distribution.

2.4 Rails

Rails can be delivered to the construction base by road truck (only 25-meter length) or by railway (being the second one the preferable one and most used).

The stockpiling of rails on slabs in construction bases can be done in long bars (50 m, 100 m or longer length) or in short bars (shorter than 36 m).

2.4.1 Long bars

Long bars (bar longer than 50 meters), whose length requires the use of gantry cranes for unloading, generally arrive at the Construction bases by rail. The slab needs to have at least at one side a 1435mm track and a 1520mm track.

In the Construction bases there must be (at least) a slab for rail stockpile with several gantry cranes to proceed with the unloading of the supply train and after, in construction phase, for the transfer of the bars to the HS track- assembly train.

Long bars can only be piled in the Construction bases equipped with fixed gantry cranes, with 14 (recommended) meters of separation among them, using trolleys with synchronized movements across the lintel and also equipped with lifting pincers.

Long bars are stacked in pyramidal form for structural reasons and according to European railway standards, decreasing a bar for each additional level and forming rows in their construction position, with the skates down and in contact but not mounted on each other.

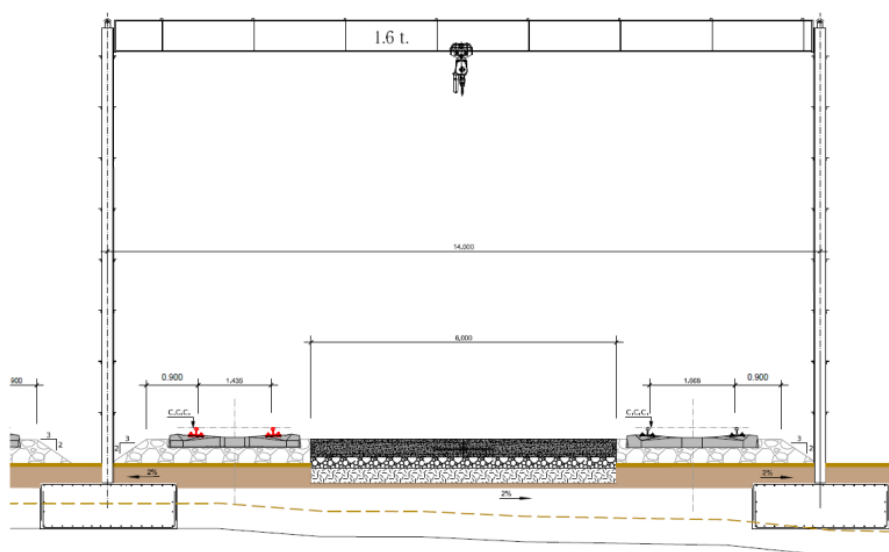


Rail slab

The minimum length of the rail slab depends on the maximum rail length supplied but considering that this slab will be also used for the maintenance and future renewals, it is recommended a minimum length of 125 meters to be able to store 120-meter length rails. Approximately 9 gantries cranes would be required for this rail slab length.

During the construction it is expected to deliver shorter rails (50/60 meters) to the construction bases. Therefore, with a 125 meters rail slab the slab would have capacity to store double set of rails, duplicating the store capacity, what is always advisable and besides the full capacity for 120 meters rails would be available for the maintenance phase.

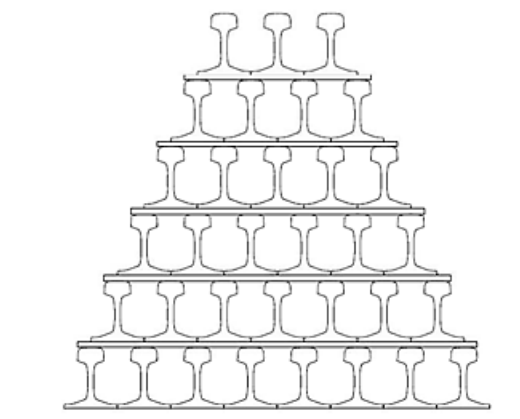
The minimum useful width of the rail concrete slab should be 9/10 meters, and the slab need to reinforce and calculate to bear the weight of the maximum capacity of rails.



Rail slab section

2.4.2 Short bars

When the rail is supplied on a short bar typology (less than 36 m) it can be coupled, in the absence of a slab on horizontally arranged surfaces, stacked in pyramidal form, placing the rail in its work position, with the foot on the bottom so that the rails that integrate them have their feet in contact, not mounted on each other.



Short Rail Storage

2.5 Turnouts

Transport of long turnouts from the factory to the Construction base must be carried out by rail due to the dimensions of the metal components of the turnout. Nevertheless, metal parts under 25m and small turnouts can optionally be transported by road. For dimensions larger than 25 m, rail transport is required.

Additionally, concrete sleepers (bearers) belonging to turnouts, can be supplied from the turnout facility to the Construction base by rail, together with the metal parts, or directly from the facilities of the sleeper manufacturer by road.

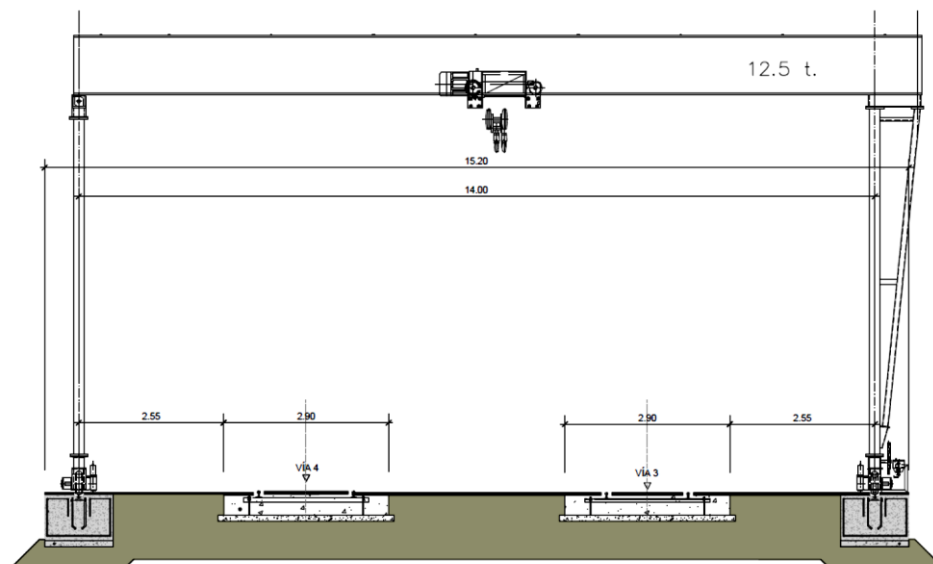
Once the train of platforms arrives at the Construction base, turnouts must be unloaded with cranes equipped with slings, gantries or any other element designed to prevent a sag in the material that could cause permanent deformations.

It is mandatory to carry out the pre-assembly of the long turnouts equipped in the crossing panel with swing nose, using the turnout slab and gantry cranes for this purpose.

The turnout slab must have access to one track in 1435 gauge and another one in 1520 gauge. These tracks are usually slab track type, being the rails embedded in the slab. The slab needs to be calculated and reinforced for the loads applicable.

It is important to note that the biggest HS turnout allows to circulate by diverted track at 230 Km/h and has a point section (switch panel) of 65 m long. This means that four platform wagons are required for its transport. The track layout at the construction base should have a minimum layout radius of 300 m (Both 1520 and 1435 tracks used for transporting this type of turnouts) including the diverted track of switches) to avoid damages of the turnout fastening system during the transport.

The assembly and transfer slab for turnouts needs to be made of reinforced concrete with minimum dimensions of 220 m long, 14 m wide. This would permit preassembling one unit of the biggest type of turnouts or several smaller turnouts.



Turnout slab



Turnout slab picture and rail slab

Finally, for the turnouts motors, locking and detection devices or small pieces, as they are sensitive and expensive material, they need to be stored in a covered storage area like a warehouse, until the installation of these materials on site.

2.6 Summary

Ballast	Surface (m2)		
	Minimum	Recommended	
	20.000	30.000	
Sleepers	Surface (m2)		
	Minimum	Recommended	
	5.000	8.000	
Rail	Rail slab (minimum)		
	Length	width	Approximate nº gantry cranes
	125	9 / 10	9
Turnouts	Turnout slab (minimum)		
	Length	width	Approximate nº gantry cranes
	220	14	2 double gantries

2.7 Checklist

**Reviewed
Date:**

		Construction bases Minimum requirement	Review No. 1	
No	Element	Requirement	Conformity (Y/N)	Remarks
1.1	CB - 1520 mm railway connection	At least one available 1520 mm track with access to the ballast storage		
1.2	CB - 1520 mm railway connection	At least one available 1520 mm track with access to the rail storage (rail Slab)		
1.3	CB - 1520 mm railway connection	At least one available 1520 mm track with access to the turnout slab		
1.4	CB - 1520 mm railway connection	Recommended Availability to access and unload sleepers from 1520 mm railway		
2.1	CB - Road access	Road access parameters (minimum width, radius) need to be enough for the access of special truck vehicles transporting material up to 25 meters		
2.2	CB - Road access	Road access available to ballast storage, sleepers storage and turnout slab.		
3.1	CB - 1435 mm railway connection	At least one available 1435 mm track with access to the ballast storage		
3.2	CB - 1435 mm railway connection	At least one available 1435 mm track with access to the rail storage (rail Slab)		
3.3	CB - 1435 mm railway connection	At least one available 1435 mm track with access to the turnout slab		

4.1	Ballast storage	Minimum useful storage between 20.000 and 30.000 m3		
4.2	Ballast storage	Design of unloading wall in 1520 track		
4.3	Ballast storage	Design of loading wall in 1435 track		
4.4	Ballast storage	Minimum surface layer requirements: 30 cm compacted of good aggregate material + slope for drainage		
5.1	Sleeper storage	Minimum Useful storage surface should be bigger than 5,000 m2		
5.2	Sleeper storage	proper aggregate finish compacted layer and have proper inclination to ensure rain drainage		
6.1	Rail Slab	There is available one exclusive slab for long rail storage with gantry cranes		
6.2	Rail Slab	Access by 1435 and 1520 gauge tracks.		
6.3	Rail Slab	Minimum length of 125 m to permit 120 meters rail bars		
6.4	Rail Slab	Minimum width of 9/10 m		
6.5	Rail Slab	Rail slab need to be calculated and reinforced considering the maximum available weigh of rails.		
7.1	Turnouts	There is available one exclusive slab for turnout unloading and pre-assembly with gantry cranes		
7.2	Turnouts	Access by 1435 and 1520 gauge tracks.		
7.3	Turnouts	Minimum length of 220 m to permit biggest HS turnout preassembly		
7.4	Turnouts	Minimum width of 14 m		