

CASE HISTORY

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RAILWAY BALLAST STABILISATION USING TECHGRID PP BIAXIAL GEOGRID AND TECHGEO NONWOVEN GEOTEXTILE AT CHAVAJ NEAR BHARUCH, GUJARAT BHARUCH, GUJARAT, INDIA



Railway Ballast Stabilization

Client:	Products used & Quantity supplied:
WESTERN RAILWAYS	• TECHGRID PP 3030L - 60,000 SQM. • TECHGEO PN 30 - 60,000 SQM.
Main contractor:	
M/S HARIDAS, VIJAYNAGAR, LALGHATI, BHOPAL, MP	
Manufacturer & Supplier:	Year of construction:
TECHFAB (INDIA) INDUSTRIES LTD.	JANUARY 2021

Introduction:

Bharuch Junction is a railway station on the Western Railway network, located in Bharuch, Gujarat, India. It is part of western line between Vadodara and Mumbai. It is one of the busiest railway lines of the Indian Railways and is fully electrified. The Western line of the Mumbai Suburban Railway operates on the southern part of this route. And Chavaj is nearby location from Bharuch.

Problem:

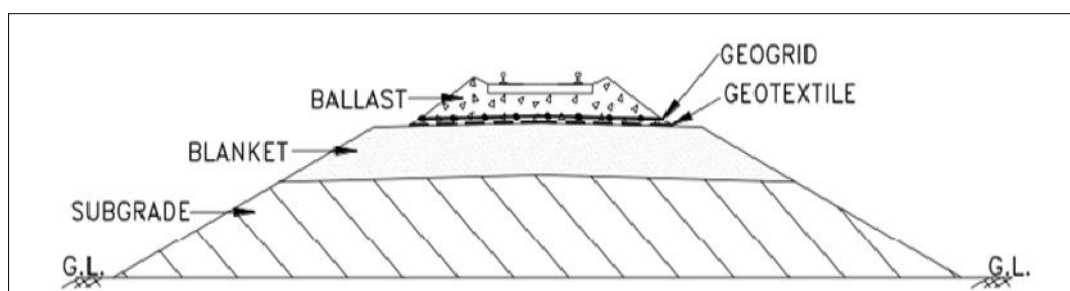
During site visit along the line, it was observed there was development of cracks on the top of formation during summer months. Minor shrinkage cracks were formed in highly shrinkable soil. If not attended on time, these enlarge which may progress to ballast layer, resulting in the settlement of the track. The situation may worsen in the rainy season when water will enter into the formation through these cracks and may cause swelling, resulting in frequent cross level variations.

Formation failure comprises most of the unstable project stretches. Increase in axle load & GMT also have a significant effect on adequacy of bearing capacity of formation. Therefore, strengthening of formation against bearing capacity failure is an important rehabilitation work.

Solution:

Based on the site observations and soil testing, the relevant remedial measure was formulated. Western railway authority suggested formation treatment using GeoGrid & Geotextile for 6.00 Kms project stretch.

Generally, the preferred method for strengthening/rehabilitation of weak/unstable formations is provision of a Blanket layer of suitable thickness. Due to increasing scarcity of good quality fill material, it was not feasible to adopt this method, and only shallow depth of formation is considered to be affected/weak. Alternatively, laying a separator layer of non-woven geotextile and a reinforcement layer of geogrid over it, just below the ballast as shown in proposed typical cross section shall prevent the differential settlements if any caused by underneath weaker formations and minimize the track maintenance.



Typical cross section drawing of proposed remedial measures

Role of Geosynthetics

1. Techgrid PP Biaxial Geogrid -

- The inclusion of PP Biaxial geogrid within a layer of granular material results in strong interaction, mainly through interlocking of particles within the PP biaxial geogrid apertures, which ultimately leads to a significantly enhanced structural capacity.
- Techgrid PP allows faster construction, enhances performance, provides long service life resulting in saving in immediate and life cycle costs as well as increased sustainability.
- The geogrid layer reduces the imposed stress on the subgrade. In addition to this, the cess/side slopes are attended, if needed, to bring them within the standard profile and erosion protection is done, to prevent entry of water into the subgrade. All these measures combined, address the problem of unstable formation due to expansive soil in the subgrade. (As per Specification for Railway Formation Specification no. RDSO/2020/GE: IRS-0004(D) 10.5.2)

2. TechGeo Non-woven Geotextile -

- Non-woven geotextile, will act as a separator layer preventing ballast getting contaminated with fine grained particles below.(As per Specification for Railway Formation10.5.2)
- The non-woven geotextile also acts a drainage layer, preventing the entry of water into the subgrade, thereby preventing alternative swelling and shrinkage of the expansive subgrade soil due to moisture content variation.(As per Specification for Railway Formation10.5.2)

In recent times, the preferred method for strengthening/rehabilitation of weak/unstable formations is laying a separator layer of non-woven geotextile and a reinforcement layer of geogrid over it, just below the ballast along with deep screening work by Ballast Cleaning Machine (BCM), with additional provision in machine for laying of Geogrid/Geotextile.

Installation Method:

- The ballast below sleepers shall be removed manually.
- Sleepers shall then be removed carefully.
- After removing sleeper, excavate further to an extent so that complete PP Biaxial roll and Non woven roll can be placed easily below that sleeper.



Manual Removal of Ballast in Progress



Placement of Sleeper Blade

- After clearing, sleeper blade shall be placed as shown in photos
- One part of chain shall be placed ahead of the blade as shown in picture.
- BCM machine shall come to that point and it shall be attached to the mechanism of chain and blade on ground with machine's chain and blade accessories.
- First trail shall be conducted to check whether the ballast is being removed properly below the sleeper or not. If not, it shall be again adjusted, re-checked and confirmed.
- Roll of Non woven geotextile and PP Biaxial Geogrid shall be inserted below the rail line where the sleepers are removed.
- Rolls of geotextile and geogrid are then attached with matching as shown in photo.
- Machine starts running and simultaneously installation of nonwoven and PP Biaxial will starts.
- Before end of the both rolls, new rolls shall be inserted considering 0.5m to 1m overlap.
- Once the installation completes, the sleeper shall again be reinstalled at the starting point.
- Ballast between the sleepers shall be checked manually and if require it shall be filled and installed properly.
- After completion of installation, measurement of gauge width shall be done and if any rectification is required, it shall be carried out before operation of railway line.



Removal of ballast with BCM machine in progress



Laying of Techgrid PP and Techgeo non woven is in progress



Placement of sleeper back to position



Measurement of gauge width after completion

Conclusion:

Client was satisfied with the quality of product and timely supply of material as per schedule. The technical support provided by TFI team during installation was appreciated.

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