CASE STUDY | Railway Application

TE-BXC30 GEOGRID

WHAT:

Railway track extension at Canadian National Rail. Transcona Yard-Winnipeg, MB Canada

APPLICATION:

The Canadian National Railway (CN Rail) wanted to build an additional 6-track extension at the Transcona yard in Winnipeg, Manitoba. Heavy rail cars were expected to pass over this extension area and CN Rail was looking for an economical, fast, environmentally friendly and technically sound solution for their track extension.

CHALLENGE:

The site had swampy conditions with wet and soft clay soils. In fact when standing on the ground one would easily sink a minimum of 6 inches due to the very low shear strength of the subgrade soils in wet, saturated conditions. Since it was not possible to place a capping layer on these soils, CN Rail was forced to delay construction of the track extension, which was further complicated by continuous heavy rainfall. Additionally, a railway track constructed over soft and plastic subgrade soils may experience progressive shear failure and excessive plastic deformation. This would require frequent maintenance while disrupting operations, reducing efficiency and increasing cost.

The challenge was to design and construct a stable formation on the weak subgrades which could serve as a satisfactory foundation for the rail tracks trafficked by heavy rail cars.

Soil conditions (pre-installation)

CONVENTIONAL SOLUTION:

Conventional solutions for soft soil stabilization include techniques such as excavation and replacement, lime or lime cement stabilization, preloading, vertical drains, sand or sand-lime piles, and stone columns among others. These are cumbersome and expensive. In some cases a working platform may be needed to allow the construction plant and equipment to move around. Due to these constraints and the cost involved, these solutions were not considered appropriate for this site.

TITAN SOLUTION:

Titan proposed a geosynthetics solution as the most suitable for this project. Based on the nature of the subgrade soils and the type of loading, the geosynthetic needed to do three things: separate, filter and reinforce. Given this, Titan proposed its heavy duty bi-axial geogrid composite TE-BXC30. The product consists of TE-BX30PP biaxial geogrid, bonded to a 6oz continuous filament, needle-punched nonwoven geotextile. It was placed directly over the weak and saturated sub-grade and a 600 mm thick granular (< 50 mm limestone) capping/sub-ballast layer was placed and compacted above it.

TE-BXC30 installation in progress

The apertures of the geogrid provide a high degree of interlock with the granular material. The positive mechanical interlock of the geogrid component with the fill particles creates a laterally and flexurally stiff platform. Consequently the TE-BXC30 geogrid composite layer with the first lift of fill acts as a firm working platform facilitating speedy construction. The nonwoven component acts as a separator preventing loss of granular material into the soft subgrade during placement and compaction of the fill. The confinement that this product provides allows the capping layer to be compacted to high density.

Continued on page 2

Titan Soluition Continued

The reinforced granular foundation distributes the heavy dynamic loads evenly and widely and provides a high degree of lateral restraint. This enables the weak subgrade to resist the repeated loads of the rail cars without experiencing progressive shear failure and undergoing excessive plastic strains. The nonwoven geotextile functions as a filter to minimize the pumping of fines from the subgrade into the granular layer and prevent build-up of excess pore-pressures in the subgrade from repeated traffic loads.

Titan's TE-BXC30 biaxial geogrid composite was accepted as the optimal solution for the site and was approved by the project's design engineer. The work was executed successfully, and as expected the product performed very well. It provided a simple, easy to construct, effective, environment friendly and economic solution to a challenging problem.

PRODUCT DESCRIPTION:

Titan's TE-BXC30 biaxial geogrid composite consists of TE-BX30PP biaxial geogrid, bonded to a 6oz continuous fiber, needle punched nonwoven geotextile separator by a precision heat bonding process. The bi-axial geogrid is made of virgin polypropylene through a unique punching and drawing process, resulting in a bi-directional oriented monolithic and an isotropic bi-axial geogrid possessing integral nodes, high tensile and flexural stiffness, high torsional rigidity and junction efficiency. The TE-BXC range creates a composite combo product solution ideal for combined soil stabilization/reinforcement applications with enhanced separation and filtration properties of the non-woven geotextile along with high modulus reinforcement properties of the Titan biaxial PP geogrid. This geogrid composite further enhances the reinforcement function while maintaining the drainage capability of the sub-base to maintain a stable structure. The nonwoven geotextile component very effectively keeps expensive imported material from being contaminated by migration of fines from the saturated base soils.

BENEFITS:

- Reduced maintenance.
- Significant saving in fill thicknesses.
- Minimized differential settlement.
- Reduced rate of permanent settlement.
- Eliminated excavation and replacement with imported fill.
- Reduced elastic deflections with heavy rail car traffic while allowing consistent high speeds to be achieved.

Post-installation showing TE-BXC30 soil reinforcement performance.

PROJECT HIGHLIGHTS:

Project:
Railway track extension: CN Rail Transcona Yard

Location:
Winnipeg, MB Canada

Installation:
Summer 2014

Product Solution/ System:
TE-BXC30 bi-axial geogrid composite

Owner:
CN Rail

Design Engineer:
Aecom

General Contractor:
Raymond Vauclair Projects Ltd.

Product Supplier:
Titan Environmental Containment Ltd, Manitoba, Canada
*(Supplied the products and offered technical/installation guidance)

Contact us for more information:

TITAN ENVIRONMENTAL CONTAINMENT

Toll free: 1-866-327-1957 / Email: info@titanenviro.com / Web: www.titanenviro.com

TRUST. QUALITY. VALUE