



Tensar®



The shallower gradients resulting from raising the track on the approaches to the bridge improved safety and allowed trains to run at higher speeds.

A safer and more comfortable ride

Tensar geogrid removed the need for a sub-ballast layer, improving safety, saving time and money and delivering long-term performance of a railway track in Thailand.

CLIENT'S CHALLENGE

State Thailand Railway faced a number of challenges during the rehabilitation of the Chachoengsao and Khlong Sip Kao Junction line. Derailments often occurred, due to poor track geometry and steep gradients at bridge approaches. The trackbed was to be raised to smooth the approaches but there was limited time for construction.

TENSAR SOLUTION

Geogrid stabilisation of the trackbed was the ideal solution, enabling rapid and straightforward construction. By placing Tensar stabilising geogrid at the base of the ballast layer, the sub-ballast layer in the original design could be omitted, without a loss in performance. The designs were compared using finite element analysis, which confirmed Tensar's solution would meet track level requirements, while being faster to install, reducing construction costs and halving material costs.

Chachoengsao to Khlong Sip Ka Junction

Ballast stabilisation

📍 Thailand

BENEFITS

50% Material savings

by removing sub-ballast layer

Fast construction
minimising line closures

Maintaining track geometry

increasing train speeds,
reducing maintenance

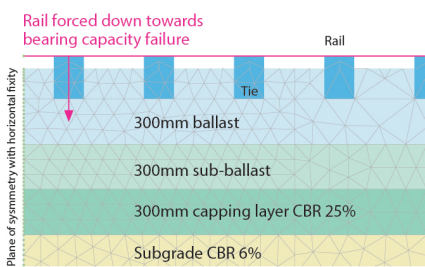
REF TEN407



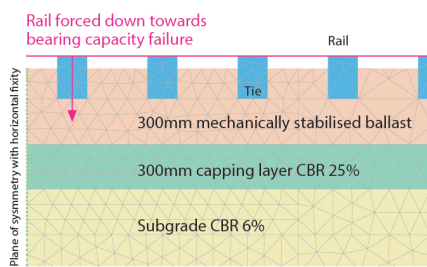
Mechanical stabilisation of the ballast using Tensar geogrid, removed the need for a sub-ballast layer at the transition between the bridge approaches and deck.

PROJECT BACKGROUND

State Thailand Railway needed a solution to reduce the risk of derailments at a bridge on the line between Chacheongsao and Khlong Sip Kao Junction, which were caused by steep approach gradients and poor track geometry. The plan was to raise the track on the approaches, creating shallower gradients that would not only improve safety but would also allow trains to run faster.



FEA mesh for non-stabilised section (without geogrid)



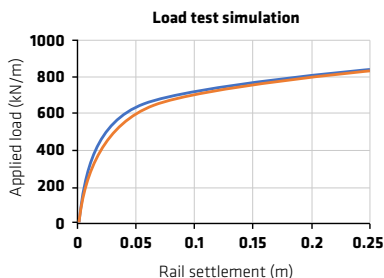
FEA mesh for mechanically stabilised section (with geogrid)

The original design comprised a 300mm thick ballast layer, 300mm of sub-ballast and a capping layer with a CBR of 25%, built over the underlying Bangkok Clay, which had an average CBR of 6%.

However, this approach would have made track levels too high on the bridge approaches, so State Thailand Railway needed an alternative – one that could also be built quickly, to minimise track closures.

Tensar carried out finite element analysis on the original design and on one that omitted the sub-ballast layer but incorporated a Tensar stabilising geogrid in the ballast. Ballast stabilised with Tensar geogrid performs as a composite, due to the interlocking mechanism and particle confinement that occurs under train loading. This mechanically-stabilised layer also mitigates differential settlement, helping to maintain track alignment.

The analysis showed the Tensar solution would deliver similar bearing capacity as the original design, despite removing the 300mm sub-ballast layer. Not only did this solution meet performance criteria, it also meant the track build-up was within level limits. Additionally, Tensar's solution was faster to build, minimising track closures, and cut construction costs, as reduced material quantities were used.



FEA output – Load under sleeper vs settlement profile

— Original solution
— Tensar solution

Client:

State Railway of Thailand (SRT)

Tensar distributor:



PENTATECH CO.,LTD.

“Construction with Tensar geogrid was fast, easy and saved costs, compared to a thicker granular section with sub-ballast.”

SRT Engineer

Tensar International Limited

Units 2-4 Cunningham Court Shadsworth Business Park
Blackburn. United Kingdom BB1 2QX

T. +44(0)1254 262431 | Visit: tensarinternational.com

Tensar International Limited

No 22A, Jalan PJU 5/5, Dataran Sunway, Kota Damansara,
Petaling Jaya, 47810, Selangor, Malaysia

T. +60 3 61483276 | E. enquiry@tensar.com.my

Tensar

Copyright © Tensar International Limited 2020
Registered in England: 503172