TENSAR® | SUCCESS STORY

Building highest standard roads over variable quality soils

Roads & Infrastructure in Mohamed Bin Zayed City Zones D & G Stage 2

Abu Dhabi, United Arab Emirates

Mohamed Bin Zayed City Zones D&G are located over an area of highly variable soils. This had led to premature failure of earlier roads. These were to be reconstructed. Existing soil conditions were to be addressed such that the premature failure conditions would not recur. A Tensar mechanically stabilised layer design was adopted to provide a stable working platform over weak soils, reduce differential settlement over variable soils and over areas of deep ground improvement. In addition, a Tensar stabilised base layer was used over new and reconstructed pavements to increase pavement life.

CLIENT'S CHALLENGE

The client required road and infrastructure for this development to meet the highest international standards. The highly variable soils, containing weak clay, high organic content, and evaporite salt/gypsum deposits had already caused premature failure problems with previously constructed roads. An effective and economical ground improvement solution was needed for the pavement that would mitigate differential settlement, maintain the pavement levels ensuring the serviceability, safety and rideability of the road. In addition, extension of pavement life was needed without increasing costs.

TENSAR SOLUTION

Tensar proposed stiffening the road foundation using a mechanically stabilised layer incorporating Tensar geogrids. This stabilised layer would also mitigate differential settlement. For the higher water table areas, and areas with weak soils extending to depth, the consultant chose deep ground improvement using Controlled Modulus Columns. A Tensar mechanically stabilised subbase was incorporated to limit the differential settlement between the grouted columns within project requirements. To increase pavement life, the design was optimised by incorporating Tensar stabilisation geogrid into the base layer. This provided an increase in design life without increasing pavement thickness and cost.

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PROJECT DETAILS

Application
Subgrade Stabilisation and Pavement Optimisation | No. 567

Constructed in
2021

Client
Musanada

Consultant
Altorath International Engineering

Contractor
National Projects & Construction LLC (NPC)

Distribution Partner
Pioneers of the Middle East LLC

BENEFITS

- **Mitigation of differential settlement** supported by calculations
- **Increased pavement life** without increasing thickness.
- **15% construction cost saving** estimated due to reduced excavation and dewatering.
- **Major time savings** from elimination of excavation and backfilling.
- **Reduced construction carbon emissions** through reduced material handling and transportation.

PROJECT BACKGROUND

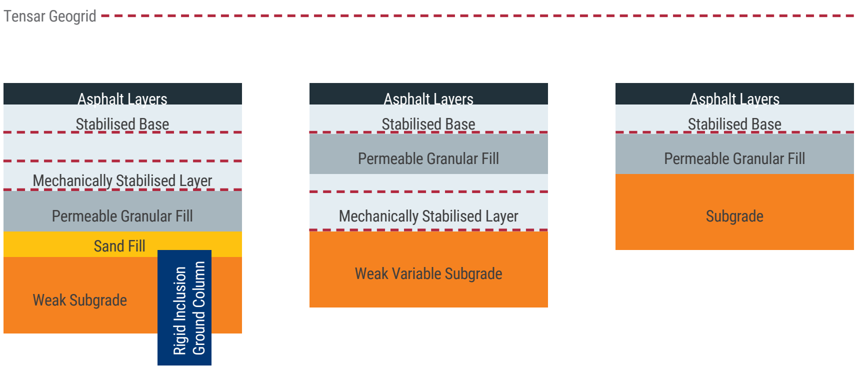
Mohamed Bin Zayed City, locally known as MBZ City is an expanding residential suburb of Abu Dhabi located between Zayed City and Mussaffah. The city is divided into zones. This project, for Zones D & G (Stage 2), covered reconstruction of previously built road sections.

The ground in this area presented challenges. Typical of this region, the soil contains varying deposits of gypsum evaporite, dispersed salt, with weak clay layers and organic content at shallow to intermediate depth.

For areas with a very shallow ground water table and those with deeper zones of weak clay, the decision had been made to use rigid inclusion deep ground improvement. Tensar supported the contractor by proposing a solution for reducing differential settlement over the rigid inclusion. Tensar designed a mechanically stabilised layer, incorporating two layers of stabilisation geogrids, with the maximum predicted differential settlement within acceptable limits.

Elsewhere on the site, for road sections, the conventional decision was to excavate down to water table to remove any gypsum and weak soil and replace with local fill. The remaining weak underlying soils of variable depth with dispersed salt deposits led to concerns of differential settlement. Tensar supported the consultant Altorath, to value engineer solutions. After examining the extensive site investigation data, Tensar proposed mechanically stabilised layer(s) for the road foundation to address weak soil and differential settlement concerns.

Finally, Tensar were given an opportunity to optimise the pavement design for reconstructed sections. The client needed to increase pavement life – following premature failure of previously built sections, without increasing the cost. Tensar optimised the design by incorporating a Tensar stabilised base layer. With this approach, the design life of the pavement was increased, without the need to increase pavement thickness and cost.



Reconstruction with deep ground improvement with mechanically stabilised sub-base and mechanically stabilised base layer.

Reconstruction with shallow ground improvement with mechanically stabilised foundation and mechanically stabilised base layer.

Reconstruction with mechanically stabilised base layer.

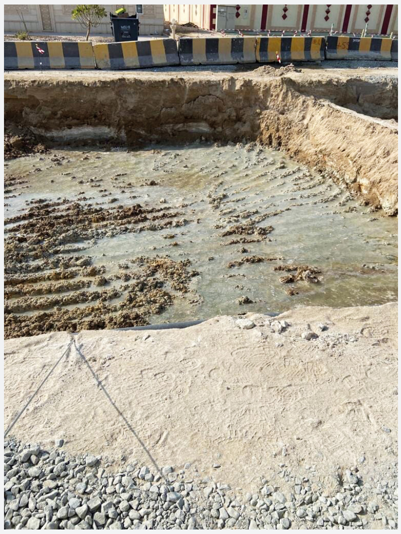


Photo showing site under construction with highly variable soils. Tensar mechanically stabilised granular layers were used to reduce differential settlement.

"The project posed challenging soil conditions with highly variable ground and challenging groundwater levels. Tensar worked closely with us, drawing insight from the extensive soil investigation data to offer shallow ground improvement solutions for individual road stretches within each zone. It is worth mentioning that Tensar geogrid solutions were prepared with careful consideration for construction feasibility and cost effectiveness."

Eng. Magdy Esmail
Geotechnical Manager
Altorath International Engineering

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