

CASE HISTORY

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REINFORCED SOIL WALL WITH WELDED WIRE MESH FACING TO RETAIN THE APPROACHES TO A FLYOVER AT DND - MAYUR VIHAR LINK ROAD PHASE I & II, NEW DELHI NEW DELHI, INDIA



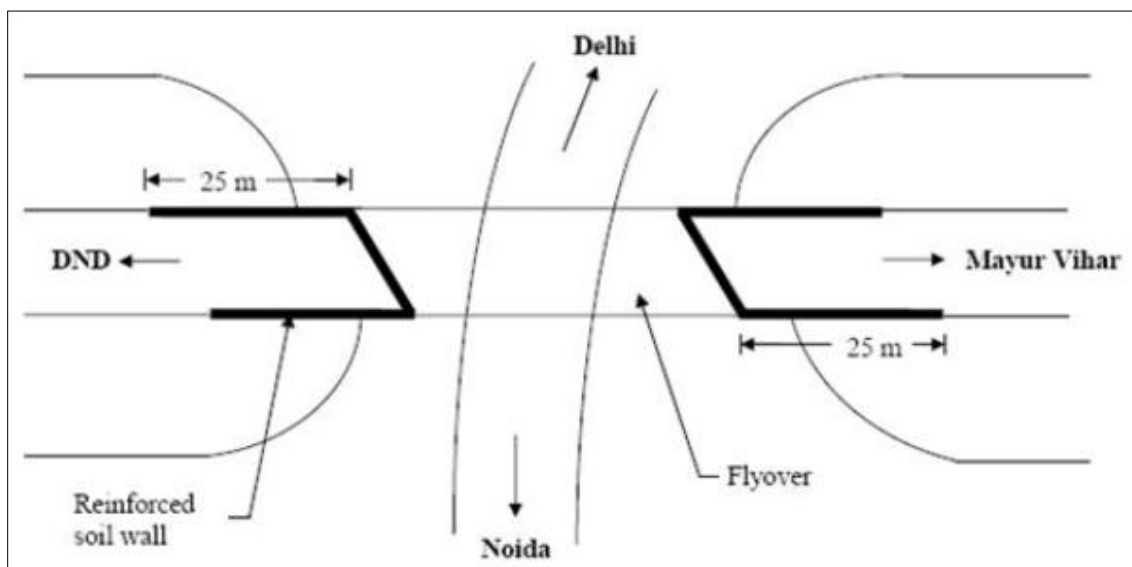
RS Wall with Welded wire mesh facia

Client: NOIDA TOLL BRIDGE COMPANY LTD. (NTBCL)	Products used: • TECHGRID KNITTED & PVC COATED POLYESTER GEOGRID WITH TENSILE STRENGTH OF 40 TO 200KN/m • NONWOVEN GEOTEXTILE
Main contractor: K R ANAND, DELHI	
Manufacturer & Supplier: TECHFAB (INDIA) INDUSTRIES LTD.	Year of construction: DECEMBER 2007

Project description:

The Noida Toll Bridge Company Ltd. (NTBCL) has been promoted by Infrastructure Leasing and Financial Services Ltd. (IL&FS) as a special purpose vehicle to develop, construct, operate and maintain the eight lane DND Flyway (including a bridge across the Yamuna river) connecting South Delhi to Noida on a Build Own Operate Transfer (BOOT) basis. The company's principal source of revenue is from the levy of tolls on commuters on this facility. NTBCL constructed a DND-Mayur Vihar Link Road to attract the large population living in the Trans-Yamuna area of Mayur Vihar to use DND Flyway to increase its revenue.

This DND-Mayur Vihar Link Road required the construction of a flyover, whose approach embankments had a maximum height of 9.0 on the DND end and 14.0 m on the Mayur Vihar End. Since there was no constraint with respect to right-of-way, the approaches consisted of normal embankments. However, retaining walls were to be constructed as closure walls behind the abutment piers and 25 m long return walls at both ends of the flyover.



NTBCL decided to use reinforced soil technology for the construction of retaining walls in view of their proven performance and cost economy. The design of the walls involved several technical difficulties and the construction had to be completed within a short time. After a rigorous evaluation of various aspects, NTBCL accepted the geogrid reinforced soil wall with a welded wire mesh facing proposed by Techfab India as best suited to the project and site requirements and awarded the work to Techfab India with the following scope of work:

- Detailed engineering of the reinforced soil walls and ground improvement including design, material specifications, construction drawings and construction methodology.
- Supply of Techgrid geogrids, galvanized welded wire mesh panels and nonwoven geotextile
- Supervision of construction

The Challenge:

The design of the walls involved several challenges:

- The maximum height of the wall was about 15.0 m on the Mayur Vihar end of the flyover.
- Because the alignment of the flyover was in skew, the closure and return walls were not perpendicular to each other. There were acute angle corners with interior angle between closure wall and return wall of 42° on the DND end and 58° on the Mayur Vihar end. The design and detailing of the soil reinforcement for the acute angle corners, presents several difficulties.
- The facing batter of the closure walls had to be kept as low as possible, to avoid any problems with respect to the design of approach slabs.
- The upper most strata of the ground comprised a 2 to 5 mm thick layer of sandy clayey silts / sandy silts with relatively loose consistency (N = 2 - 5).

Solution:

After a careful evaluation of the project requirements and site conditions a geogrid reinforced soil wall with a welded wire mesh supported wrapped face was finalized as the most optimum solution.

Techgrid knitted and PVC coated polyester geogrids, manufactured by Techfab India at their state-of-the art ISO 9001:2000 certified plant in Silvassa, were used as the soil reinforcement. Techgrid geogrids are manufactured from select grades of high tenacity, high molecular weight polyester yarns using an advanced weft insertion warp knitting process and coated with a specially formulated PVC plastisol. The high performance characteristics of these world-class geogrids, enabled the walls as high as 15 m, to be designed safely and economically.

The facing comprised a geogrid wrapped face supported by L shaped galvanized welded wire mesh panels with galvanized steel ties at 500 mm spacing. A 350 mm thick random rubble packing was provided to enhance the rigidity of the facing and to protect the fill material. A nonwoven geotextile filter was used behind the rubble to contain the fill material, which was a fine sand. The overall inward batter of the facing was approximately 5°.



During Construction Photographs

Salient Features of the Reinforced Soil Walls :

- Wall Facing Area: 1600 Sqm.
- Wall Height: 14.0 to 15.0 m on Mayur Vihar end and 9.0 to 10.0 m on DND end.
- Soil Reinforcement: TechGrid knitted & PVC coated polyester Geogrids with Tensile Strength of 40 to 200 KN/m
- Facing: Geogrid wrapped face supported by galvanized welded wire mesh panels with random rubble backing with batter of 5°
- Fill Material: Sand from Yamuna River
- Design Methodology: FHWA-NHI-00-043
- TFIL's scope of work: Detail Engineering designs & drawings, supply of Geogrids, Welded wire mesh panels and Nonwoven Geotextile & Supervision of construction
- Proof checking: Designs and drawings were proof-checked by IIT Delhi

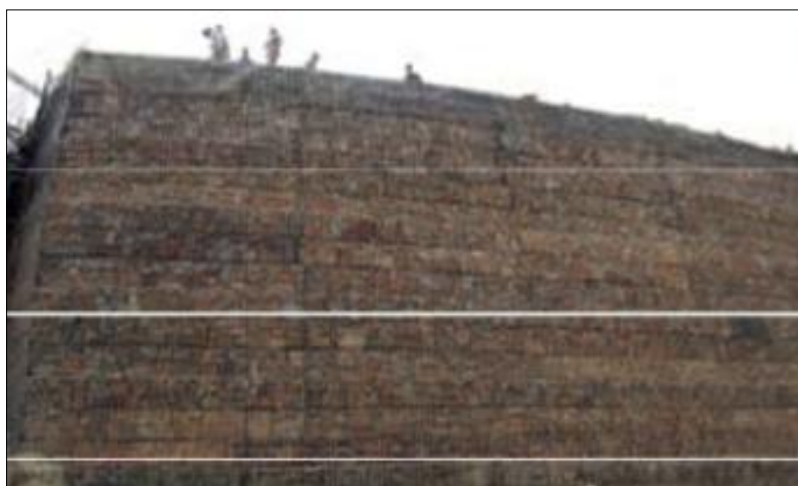
Ability to accommodate appreciable amounts of differential settlements was one of the major reasons for adopting this type of facing.

The fill material was a relatively fine-grained sand dredged from the Yamuna river. The design angle of shearing resistance of the compacted sand was 35°.

The ground treatment consisted of the partial excavation and removal of the upper layer of the loose sandy clayey silt / silt sand and replacement with a compacted layer of sand reinforced with Techgrid TGB-90 biaxial geogrids with a tensile strength of 90 kN/m in both machine and cross machine directions.

The design of the walls was carried out using the FHWA-NHI-00-043 guidelines and comprised checks for external, internal and global stability under static and seismic conditions. The design calculations and construction drawings were proof-checked by Indian Institute of Technology Delhi.

Construction of the wall was carried out under of Techfab India's supervision.



15 m high wall at Mayur Vihar End nearing completion



Conclusion:

The project was successfully completed in December 2007..

For further details kindly contact :

TechFab India Industries Ltd.

711/712, Embassy Centre, Nariman Point, Mumbai – 400021

Tel: + 91- 22 - 2287 6224 / 6225 Fax: + 91- 22 - 2287 6218

E: info@techfabindia.com

W: www.techfabindia.com