

CASE HISTORY

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CONSTRUCTION OF FOUR LANE EXPRESSWAY USING TECHGRID POLYESTER BIAXIAL GEOGRID TGB 80/80 FROM SINDHERJ VILLAGE TO VEJALKA VILLAGE OF AHMEDABAD DISTRICT (CH 22+000 TO 48+520) SECTION OF AHMEDABAD – DHOLERA GREENFIELD ALIGNMENT (NH-751) ON EPC MODE UNDER BHARAT PARIYOJANA IN THE STATE OF GUJARAT
AHMEDABAD, GUJARAT, INDIA



Pavement Stabilization

Client:	Products used:
NATIONAL HIGHWAY AUTHORITY OF INDIA (NHAI)	•TECHGRID POLYESTER BIAXIAL GEOGRID (TGB 80/80)
Contractor:	
HIMALAYAN INFRACORP PVT. LTD.	
Manufacturer & Supplier:	Year of Construction:
TECHFAB (INDIA) INDUSTRIES LTD.	2024

Project Brief & Problem Description:

The Ahmedabad Dholera Expressway (NH 751) is a transformative infrastructure project designed to improve connectivity between Ahmedabad and Dholera Special Investment Region (SIR) in Gujarat. The expressway spans 109 km and is part of a major development initiative to enhance road infrastructure in the region. Currently under construction, it will consist of a four-lane access-controlled road, connecting key locations like the Sardar Patel Ring Road near Sarkhej to the Dholera International Airport at Navagam.

Pavement stabilization plays a crucial role in the successful construction of this expressway due to the dynamic loading conditions and environmental factors that affect the road structure's performance. With increasing traffic loads and variations in environmental conditions, traditional road pavement systems may face durability and stability issues, leading to high maintenance costs. The conventional design approaches necessitate the use of large quantities of aggregates and cementitious materials, making the pavement construction both expensive and environmentally unsustainable. To optimize performance and reduce material consumption, the Ahmedabad Dholera Expressway incorporates innovative reinforcement techniques as outlined in IRC 37:2018 and IRC SP 59:2019, enhancing the stiffness and overall performance of the pavement while addressing the growing demand for road infrastructure in the region.

This project involves "Construction of Four Lane Expressway from Sindhrej Village to Vejalka village of Ahmedabad District (Ch. 22+000 to 48+520) section of Ahmedabad - Dholera Greenfield Alignment (NH-751) consists of three types of stretches namely HS-1 (Km. 22+000 to Km. 28+900) ; HS-2 (Km. 28+900 to Km. 47+200) ; HS-3 (Km. 47+200 to Km. 67+000).



Photo 1 : Ahmedabad - Dholera Expressway

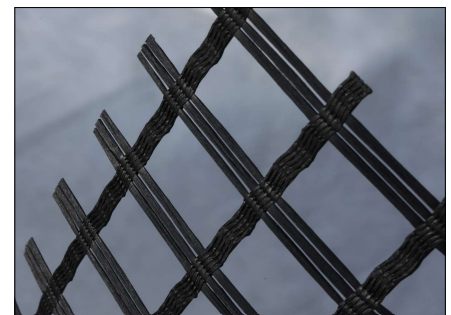
Solution:

To optimize the pavement crust and address environmental and cost concerns, the incorporation of TechFab's Techgrid Biaxial Geogrid (TGB 80) offers a sustainable and efficient solution. By reinforcing the granular layers - namely the GSB and WMM - with high-strength biaxial geogrids, the design eliminates the need for the carbon-intensive CTSB layer. This not only reduces the carbon footprint but also results in significant cost savings.

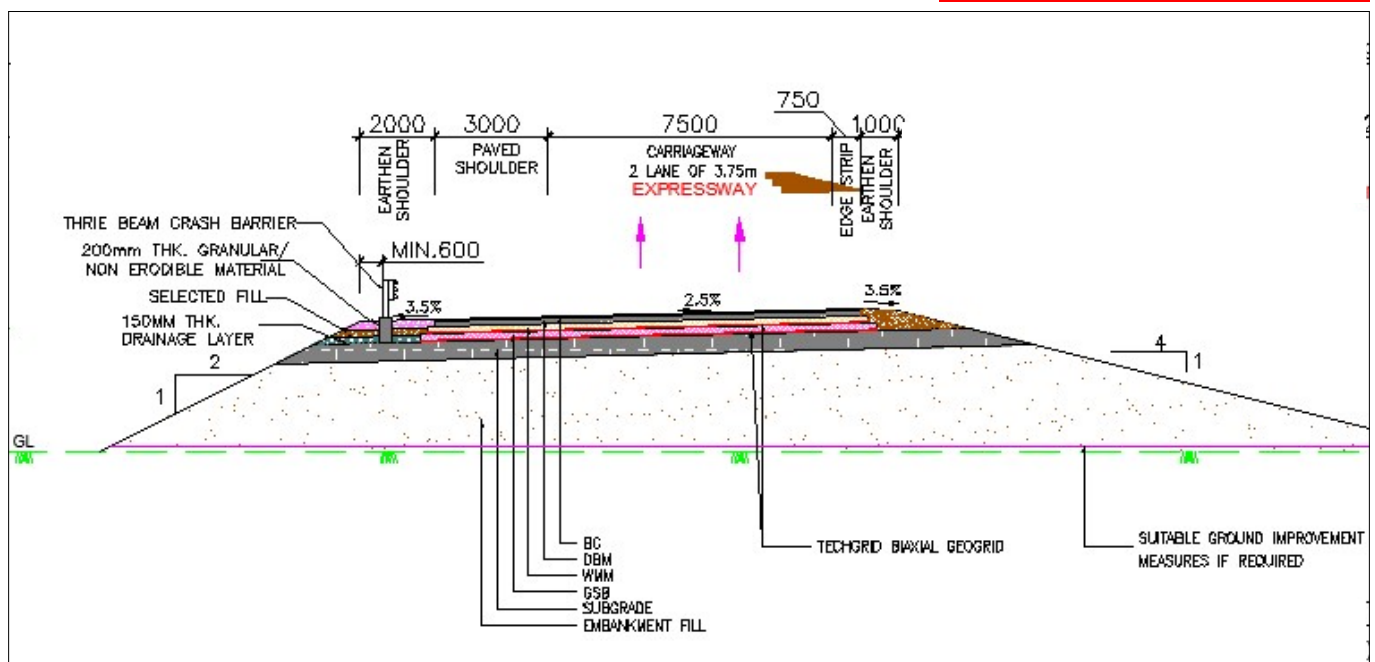
The TGB 80 geogrid, with an ultimate tensile strength of 80 kN/m in both directions, ensures enhanced lateral restraint, improved bearing capacity, and the tensioned membrane effect. These mechanisms optimize the modulus of the granular layers, improving stress distribution and reducing subgrade strain. The adoption of this geogrid reinforcement aligns with IRC SP 59:2019 and IRC 37:2018, which recommend the Layered Coefficient Reduction (LCR) method to enhance resilient modulus for GSB and WMM.

The proposed solution includes two layers of geogrid reinforcement for HS 2 and HS 3 stretches, and a single layer for HS 1 stretch. This configuration ensures optimal pavement performance while minimizing material usage. By integrating this innovative approach, the pavement design meets project requirements with enhanced durability, reduced material consumption, and a smaller environmental footprint, exemplifying a forward-thinking approach to sustainable infrastructure.

The TechGrid Geogrid is formed from the yarns using an advanced weft insertion; warp knitting technology employing state-of-the-art warping and knitting machines. This advanced technology ensures a product with uniform structure and consistent properties. The knitted grid is then given high quality polymeric coating. The coating completely saturates and envelopes the polyester yarn bundles forming a protective cover enhancing dimensional stability of the Geogrid, resistance to installation damage and protection from the environment.



TechGrid Geogrid (TGB)



Typical Cross Section Drawing



Photo 2 : Laying of TechGrid Geogrid



Photo 3 : Overlap of 300mm maintained for adjacent rolls

Execution on Site: :

- Before sub-base laying, prepare the subgrade per Clause 301/305 by clearing vegetation, sprinkling water as needed, and rolling with two passes of an 80 - 100 kN smooth-wheeled roller.
- Once the subgrade is prepared per project requirements, the surface is cleared, grubbed, or leveled to the design grade, removing loose topsoil and vegetation as necessary.
- For reinforced GSB layers, geogrids must be laid smoothly without wrinkles or folds on the prepared surface, ensuring proper alignment and tension for effective reinforcement along the specified stretch.
- Adjacent geogrid rolls shall be overlapped by 300mm width and the roll ends shall be overlapped by 1000mm as per the requirements of IRC SP 59:2019.
- The base end of the biaxial geogrid at overlaps and edges shall be secured using MS rods or wooden pegs placed every 3 - 4 meters in both directions to prevent movement.
- On curves, the geogrid can be folded or cut to match the curve. Folds or overlaps must align with the construction direction and be secured using pins, staples, or fill/rock piles.
- Before placing fill material, the installed geogrid must be inspected and approved by the Engineer. Damages are repaired using a geogrid patch, overlapping the damaged area as directed.
- The fill material shall be placed by end-dumping onto the geogrid, starting from the edge or over an already placed layer, ensuring proper distribution.
- The specified sub-base material and water shall be mechanically mixed using a suitable mixer with controlled water addition, ensuring a homogeneous and uniform mix as per the contract requirements.
- Movement of construction equipment directly over the geogrid shall not be permitted.
- Sudden braking and sharp turns of construction equipment must be avoided on the first fill layer over the geogrid. Any ruts that form should be filled with additional material and compacted to the specified density.
- For a compacted single layer up to 200 mm, compaction shall be done using a vibratory roller of 80 - 100 kN static weight, achieving required compaction. Rolling starts at the lower edge and moves upward for unidirectional cross falls or super elevation. For cross falls on both sides, rolling starts from edges towards the crown. Roller speed should not exceed 5 km/h.
- After completing the GSB layer, the geogrid layer for base reinforcement shall be installed following the same procedure outlined previously, ensuring proper alignment and securement.
- After placing the base course material on the geogrid layer, rolling shall begin with three-wheeled power rollers or tandem/vibratory rollers, each with an 80 to 100 kN capacity. The roller type must be approved by the Engineer following a trial run.
- Once the base course layer is compacted to the required density, further layers shall be constructed as per project specifications, drawings, or as directed by the Engineer in charge.



Photo 4 : Placing the Base Course Material on the Geogrid Layer



Photo 5 : Compaction of the Base Course Material



Photo 6 : Road view after laying of TechGrid Geogrid

Conclusion:

The project was successfully completed, achieving its intended purpose with innovative geosynthetic solutions. It ensured stability, reduced maintenance, and earned full satisfaction from the client and contractor. The incorporation of TechGrid Biaxial Geogrid significantly enhanced pavement performance, minimized material usage, and contributed to a sustainable, cost-effective infrastructure solution.

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