



“GEOSYNTHETIC REINFORCED SOIL WALLS”



TECHFAB INDIA

At the heart of geosynthetic activity

- TechGrid - Knitted and Polymer coated Polyester GeoGrids (CE Marked & BBA Certified)
- TechStrap Polymeric Strips
- TechFab Reinforced Composites (TGC)
- TFI Woven Geotextiles
- TechGeo Needle Punched Nonwoven Geotextiles (CE Marked)
- TechDrain - PVD (Prefabricated Vertical Drain)
- TechDrain Drainage Composite
- TechCell GeoCell
- TechFab Metal Gabions

Geosynthetic reinforced soil walls are internally stabilized earth retaining structures with face inclination steeper than 70, where soils or other fills are reinforced with discrete horizontal layers of geosynthetic reinforcement.

The important components of reinforced soil walls include – soil reinforcement, facing, connection between facing and soil reinforcement, reinforced fill, drainage media, levelling pad, coping etc. Careful attention to selection of the appropriate materials, design and construction ensures an optimal solution with desired performance.

TechFab India manufactures a wide range of world-class geosynthetics, which are used in the construction of geosynthetic reinforced soil walls.

Soil Reinforcement

- TechGrid TGU Knitted and Polymeric Coated Polyester Geogrid
- TechStrap Geostrips
- TGC Reinforced Nonwoven Composite Geotextiles

Facings

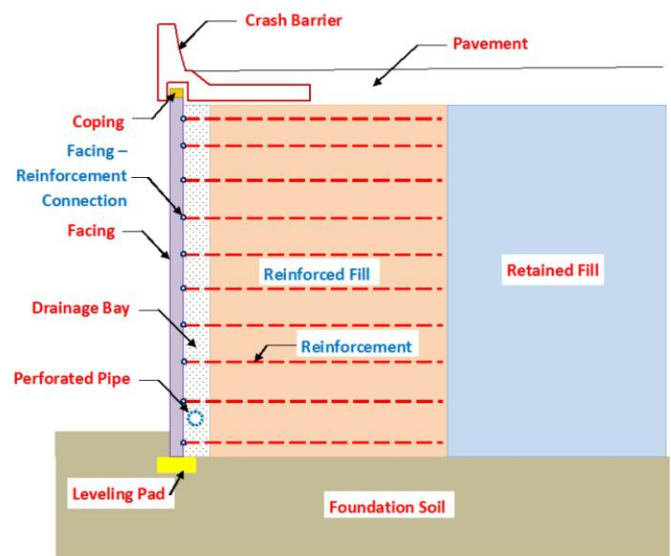
- TechGrid Polyester Geogrid
- TechFab Metal Gabions
- TechCell Geocells

Drainage and Filters

- TechDrain Drainage Geocomposites
- TechGeo Nonwoven Geotextiles

Ground Improvement

- TechGrid PP Biaxial Geogrids
- TechCell Geocells
- TFI 3000 High Strength Polyester Woven Geotextiles
- TechDrain Pre-Fabricated Vertical Drains

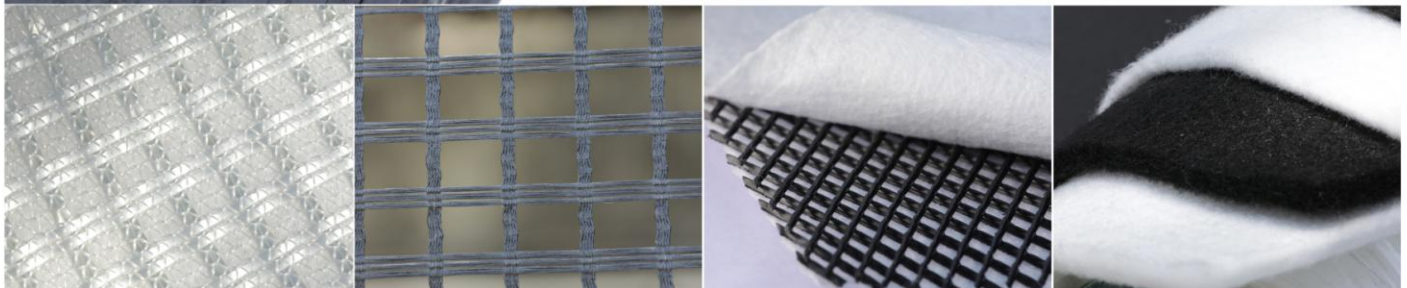


Applications of Reinforced Soil Walls

- Approaches to bridges, flyovers, underpasses, road over rail bridges, road under rail bridges and rail flyovers
- Roads, railways and airports in hilly areas
- Site grading and development for residential, commercial, institutional and industrial projects
- River bank protection and water front development
- Reinstatement of landslides
- Noise barriers
- Solid waste landfills
- Mining

Advantages of Reinforced Soil Walls

- Flexible structures which can accommodate appreciable amount of differential settlement
- Proven ability to withstand earthquakes
- Less embedment and lower foundation costs
- Wide range of facings to suit project requirements and site conditions
- Choice of aesthetics – concrete, stone, vegetation
- Easy and fast construction
- Economical
- Sustainable solutions



TechGrid TGU geogrids, are knitted and polymeric coated polyester geogrids produced at TechFab India's state-of-the-art facilities at Silvassa and Daman in the Union Territory of Dadra & Nagar Haveli. Manufactured from superior quality materials using highly advanced technologies and tested to stringent international standards, TechGrid TGU geogrids are world class products engineered for demanding soil reinforcement applications. Over the last fifteen years, several hundred thousand square meters of reinforced soil structures have been constructed using TechGrid geogrids in India and overseas.

TechGrid geogrids are manufactured from the finest quality raw materials in our state-of-the-art ISO 9001:2015 certified manufacturing facility subject to stringent quality control processes at all stages of production. Both the raw materials and finished product are regularly tested at our state-of-the-art in-house quality control laboratory which is accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) and Geosynthetic Accreditation Institute Laboratory Accreditation Program (GAILAP).

TechGrid geogrids are extensively tested at independent accredited laboratories in India and overseas. The reduction factors for creep, installation damage and durability and coefficients of interaction have been determined based on extensive tests conducted at leading internationally renowned independent accredited laboratories. TechGrid Geogrids have CE certification and are certified by the British Board of Agreement (BBA).



Reinforced Soil Wall during construction (TechGrid)

Advantages of TechGrid GeoGrid

- Consistent and assured product quality
- Proven performance
- Wide range of tensile strength (40 – 400 kN/m)
- Excellent Durability
- Roll width up to 6.2 m
- Easy, safe and fast installation
- Design and technical assistance
- Delivery schedules to suit product requirements
- High production capacity

| LOG TIME (hr) | RUPTURE STRENGTH (%LTS) |
|---------------|-------------------------|
| 1.5 | 85 |
| 2.5 | 80 |
| 3.5 | 78 |
| 4.5 | 75 |
| 5.5 | 72 |
| 6.5 | 70 |
| 7.5 | 68 |

TechStrap Geostrips are geosynthetic strips (polymeric strips/straps with a flat webbing like structure) specifically engineered for the reinforcement of soils and other fills for the construction of reinforced soil walls. TechStrap Geostrips comprise a core of closely packed and tensioned high tenacity polyester filament yarn tendons encased in a sheath of linear low density polyethylene.

The polyester yarn tendons are the load-carrying elements and comprise select high tenacity polyester filament yarns with high tensile strength and modulus, low creep, high molecular weight (> 25,000 g/mol) and low carboxyl end groups (< 30 mmol/kg) to ensure excellent performance and durability. The sheath consists of a custom formulation of superior grades of linear low density polyethylene and additives to enhance resistance to ultraviolet rays. The composition and thickness of the sheath is specifically engineered to provide a high level of dimensional stability and protection from weathering and exceptional resistance to installation damage. The surface texture of the sheath ensures a high degree of frictional interaction with the fill to mobilize high pullout resistance.

Advantages of TechStrap

- High tensile strength and modulus
- Low creep
- High resistance to weathering
- High resistance to installation damage
- High chemical and biological resistance
- Excellent frictional interaction with fill
- High long-term design strength
- Low short-term and post construction deformations
- High coefficient of interaction in pullout
- Economic Design with Assured Performance



TechStrap Polymeric Strip



Packaging of TechStrap



Reinforced Soil Wall during construction (TechStrap)



Reinforced Soil Wall during construction (TechStrap)



Reinforced Soil Wall during construction (TechStrap)

General Considerations

Facing contains and confines the fill during construction, enhance the effectiveness of soil reinforcement, imparts surficial stability and erosion protection, and provides aesthetic finish to the reinforced soil wall. Facing is an important component of the reinforced soil wall and requires careful attention to selection, design, detailing and construction. A wide range of facings used are:

- Full height concrete panels
- Discrete concrete panels
- Small concrete blocks
- Large concrete blocks
- Gabions
- GeoCells
- Welded wire mesh with stone
- Wrap-around with vegetation

Important factors to be considered in the selection facing

- Functional and structural requirements of reinforced soil wall
- Design Life
- Geometry of the reinforced soil wall – height, facing batter, longitudinal profile
- Location
- Wave or current loads
- Type of reinforcement
- Type of fill
- Expected settlement of the foundation strategy
- Seismicity
- Climate

Precast Concrete Discrete Panels



Panel Wall



Precast Concrete Segmental Blocks



Reinforced Soil Walls with Wrap Around Facing



Reinforced Soil Walls with Gabion Facing



Reinforced Soil Walls with Welded Wire Mesh Facing



Reinforced Soil Walls with TechCell Geocell Facing



A good connection between the reinforcement and facing is one of the most important requirements for the satisfactory performance of reinforced soil walls. Poor quality connections are reported to be one of the most common causes for failures of reinforced soil walls. The connections need to be designed considering all relevant factors including type of facing, type of reinforcement, design life, environmental conditions, compressibility of the fill etc. and ensuring strength, serviceability and durability requirements.



Discrete panel – Geogrid connection details



Discrete panel - Strap connection details



Segmental block - Geogrid connection details



Gabion - Geogrid connection details

Drainage

Entry of water into the reinforced and retained fill zones results in an increase in lateral pressures and reduction in shear strength of soils. Flow of water could also lead to internal erosion and piping failures. Hence, adequate drainage is one of the important considerations in the design of reinforced soil walls. Drainage arrangement need to be designed considering the amount of infiltration, ground water table, type of fill, possibility of flooding or inundation, water bodies etc. Drainage measures include drainage behind facing, below and behind the reinforced fill zone. Filters should also be provided to prevent the clogging of granular drains and to prevent the loss of fines through the wall face.

TechFab India – Geosynthetics for Drainage and Filtration

TechDrain Drainage Geocomposites

- Drainage behind Concrete Panel Facing
- Drainage blanket below Reinforced Fill
- Chimney drain behind Reinforced Fill

TechGeo NonWoven Geotextiles

- Filter strips to cover the joints between facing panels
- Filter for granular drainage media



TechDrain Drainage Geocomposite for Reinforced Soil Walls



TechGeo Nonwoven Geotextiles for Reinforced Soil Walls

Fill

Select granular fill is ideal for the construction of reinforced soil walls. The fill should meet the relevant specifications with respect to gradation, fines content and other requirements. Care must be taken to use appropriate values of angle of shearing resistance, reduction factors for installation damage and durability and interaction factors in design. With proper precautions, materials like pond ash also could be used for many applications. In some cases, it may be possible to use poor or marginal fills with appropriate geosynthetic reinforcement and facing, adequate drainage measures and exercising due care in design, detailing and construction.

Ground Improvement

Where reinforced soil walls are to be constructed on poor foundation strata, ground improvement may have to be carried out before starting the construction of the reinforced soil wall. The stability and serviceability of the reinforced soil wall need to be assessed with respect to sliding, bearing capacity, global stability, liquefaction and settlement and wherever required appropriate ground improvement should be carried out.

TechFab India Products for Ground Improvement

- TechGrid PP Biaxial Geogrids
- TFI 3000 High strength woven polyester geotextiles
- TechCell Geocells
- TechDrain PVDs

Design and Construction

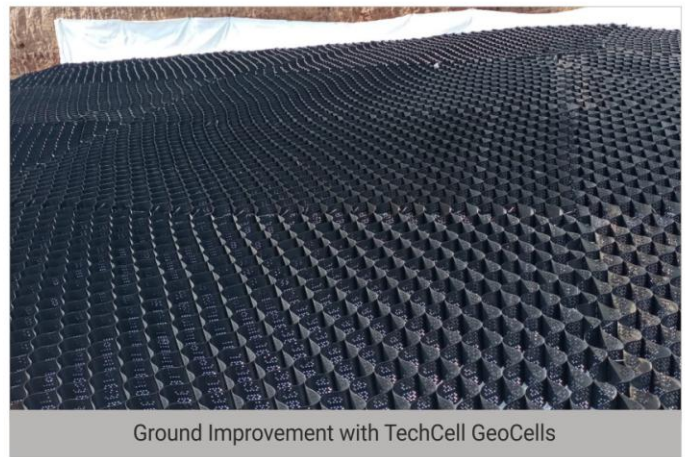
Design of reinforced soil walls involves check for external stability, internal stability, compound and global stability, facing stability and serviceability. Design input data include wall geometry, surcharge loads, characteristics of fill and foundation strata, ground water, seismicity and characteristics of geosynthetic reinforcement and facing. Important design parameters for geosynthetic reinforcement are long-term design strength, isochronous creep curves, coefficients of interaction which are furnished by the manufacturer. Major activities in the construction of reinforced soil walls are ground excavation/ preparation/improvement, erection of facing, placement and compaction of fill and installation of geosynthetic reinforcement and drainage.



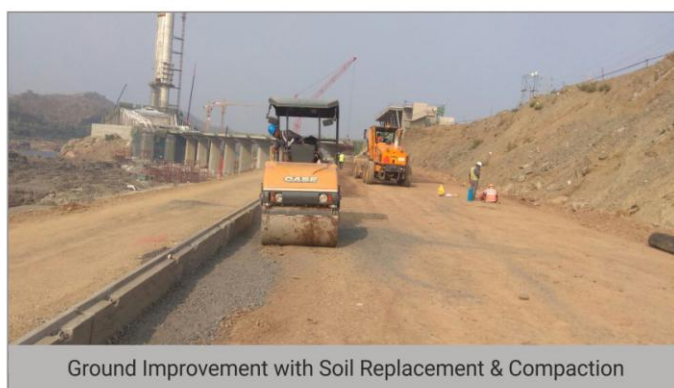
Ground improvement with TechDrain PVD



Ground improvement with TechGrid Geogrid



Ground Improvement with TechCell GeoCells



Ground Improvement with Soil Replacement & Compaction



Ground Improvement with TFI 3000 Geotextiles

Largest Manufacturer of Geosynthetics in India

TechFab India is the largest manufacturer of geosynthetics in India in terms of both the range of products and installed capacity. We manufacture all types of geosynthetics which are used in reinforced soil walls. We have huge production capacities to cater to meet even demanding delivery schedules. With Techfab India our customers have the unique advantage of procuring all the geosynthetics from one trusted source.

Products of Highest Quality and Proven Performance

Our products are world-class in terms of quality and performance and our customers may use our products with complete confidence.

- Finest quality raw materials
- State-of-the-art production facilities
- Stringent quality assurance and control
- Regularly tested at our 3 state-of-the-art in-house quality control laboratories which have NABL and GAILAP accreditation
- Extensively tested at reputed independent accredited laboratories in India and overseas
- CE Certification
- BBA certification for TechGrid TGU Geogrids
- TFI 3000 Woven Polyester Geotextiles and TechGeo Nonwoven Geotextiles evaluated by AASHTO NTPEP

Prompt and efficient services

We have a dedicated team of highly experienced and competent engineers and technicians to guide, assist and support our customers and cater to all their needs at all stages of the project.

- Guidance on selection of appropriate products
- Concept and preliminary designs
- Pre-bid services
- Pre-sale and after sale support
- Detailed designs and construction drawings
- Guidance for construction



Products from TechFab India for Reinforced Soil walls

Soil Reinforcement

- TechGrid TGU Knitted and Polymeric Coated Polyester Geogrids
- TechStrap Geostrips (Polyester Straps)
- TGC Reinforced Nonwoven Geotextiles

Facing

- TechFab Zinc and PVC Coated Steel Gabions
- TechCell Geocells

Drainage and Filtration

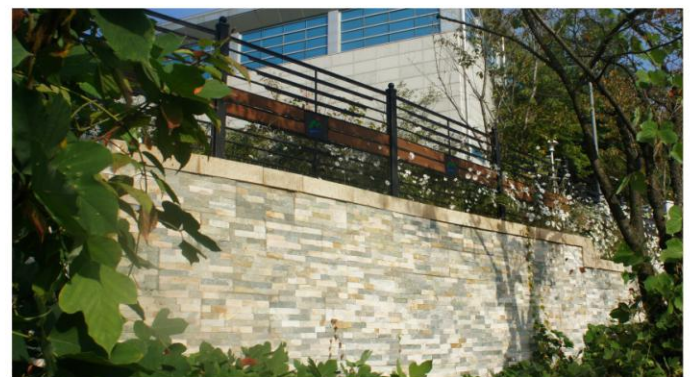
- TechDrain Drainage Geocomposites
- TechGeo Nonwoven Geotextiles

Ground Improvement

- TechGrid PP Polypropylene Biaxial Geogrids
- TechCell Geocells
- TFI 3000 High Strength Polyester Woven Geotextiles
- TechDrain Prefabricated Vertical Drains

Proven Performance

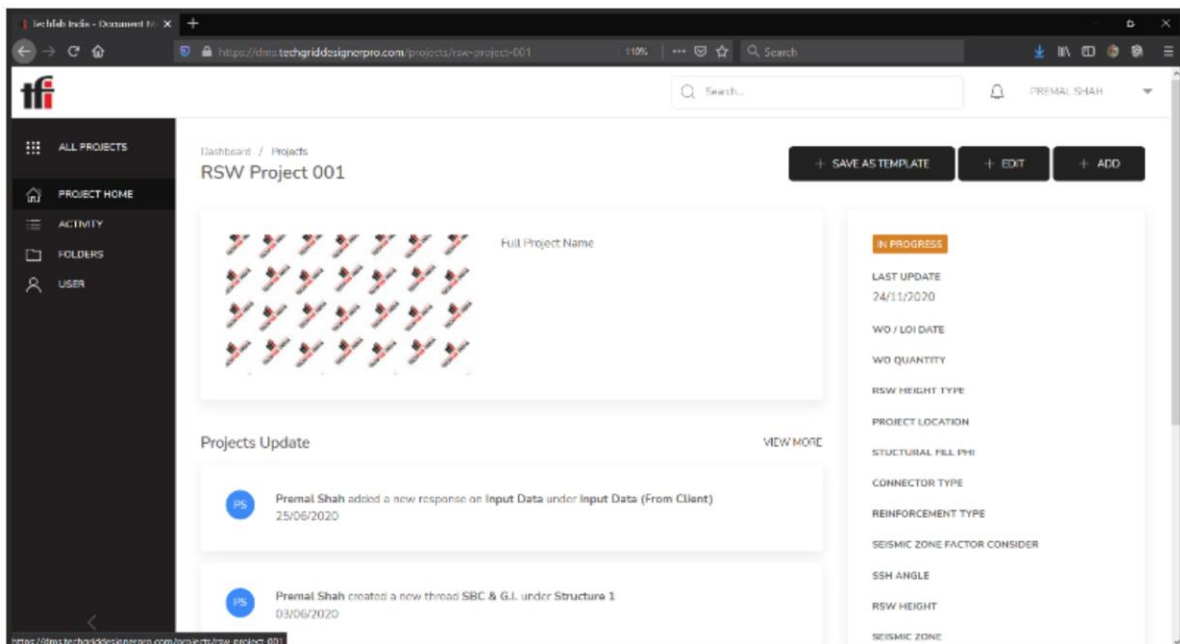
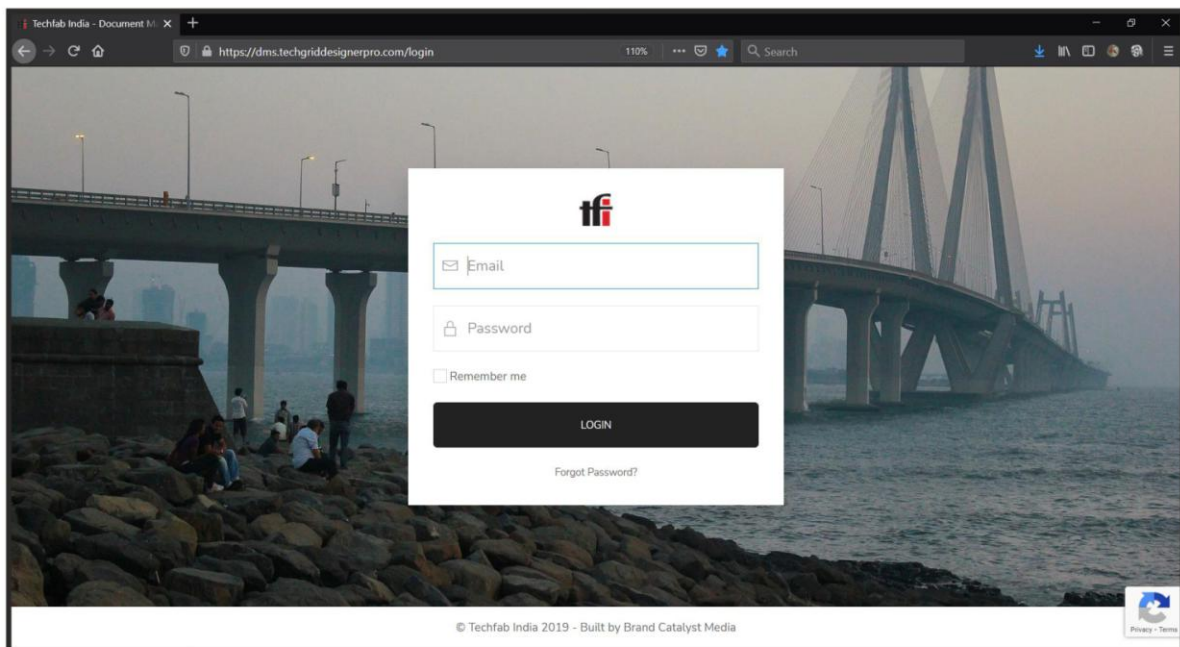
- More than 180 successful Reinforced Soil Walls Projects
- More than 4.5 million square metres of Wall Face Area
- More than 22.5 million square metres of TechGrid Geogrids installed



TechFab India – The Preferred Technology Partner for Reinforced Soil Walls

An innovative platform – TechFab Data Management System (TFI DMS) – have been developed for efficient, organised and secure transmittal and storage of the TFI project data.

- All running and completed project's data is securely stored on cloud through DMS.
- Client can log-in and have access to data uploaded in DMS with version history for their projects anytime 24x7, 365 days.
- For efficient data management, Project have folders / subfolders / Threads. And content will be uploaded to the system through relevant threads.
- Communication is facilitate through comments feature. This will also enable to have clear track record of important communications between client and TFI design team.
- The attributes, tags and advance search options makes it easy to look for any required and relevant data across past or running projects effectively.
- Users are alerted through email notifications for all updates on running project instantly.



TechFab India – The Preferred Technology Partner for Reinforced Soil Walls

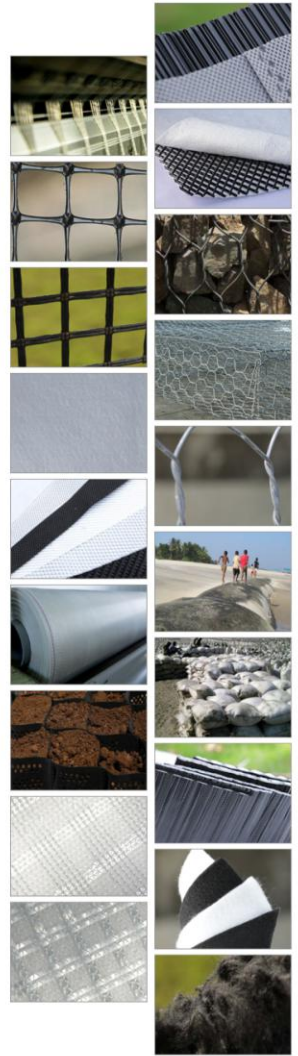
We have been scaling up our manufacturing capacities to meet the growing demand for geosynthetics in infrastructure projects. An illustration of how our present manufacturing capacities are geared up to meet the demands in the road sector is given in the table below.

| Product | Application | Quantity of Facility which could be constructed Using TechFab India's Annual Production Capacity |
|--|---|--|
| TechGrid Knitted and Polymeric Coated Polyester Geogrids | Soil Reinforcement for Reinforced Soil Walls and Slopes | 60 Lakhs Square Meters of Wall Face Area |
| TechStrap Polyester Geostrips | Soil Reinforcement for Reinforced Soil Walls | 15 Lakhs Square Meters of Wall Face Area |
| TechGrid PP Polypropylene Biaxial Geogrids | Reinforcement of Granular Base/Subbase | 1400 lane km of road |
| TechGeo NonWoven Geotextiles | Subgrade Separation / Stabilization | 15500 lane km of Road |
| TechCell GeoCells | Subgrade Stabilization & Stabilization of Granular Base/Subbase | 680 lane km of road |
| TechPave Paving Fabric | SAMI and Moisture Barrier for Bituminous Overlays | 15500 lane km of Road |
| TechGlass AIC Fiberglass Interlayer | Reinforcement of Bituminous Pavement Layers / Overlays | 2350 lane km of road |
| TechDrain Drainage Composite | Subsurface Drainage Layer for Pavements | 2450 lane km of Road |
| TechDrain Prefabricated Vertical Drains | Ground Improvement for High Embankments | 2160 km of High Embankment (Four Lane Road) |

TechFab India is manufacturing India almost all types of geosynthetics meeting global quality standards and our production capacities are sufficient to fully meet the demands of the road sector. We request all the stakeholders to encourage the use of geosynthetics in building better infrastructure in India.

ABOUT TECHFAB INDIA INDUSTRIES LTD

TechFab India was founded in 2003 with the objective of providing world class geosynthetic products and services to serve the needs of manufacturing development in India. From a modest beginning with the setting up of a manufacturing facility for woven geotextiles in Silvassa, we have rapidly grown to become the largest manufacturer of geosynthetics in India. Today we manufacture a wide range of products at our factories in Silvassa and Daman. Details are as under:



- TechGrid Knitted and polymer coated Polyester Geogrids (CE Marked & BBA Certified)
- TechGrid-Base Reinforcement Geogrids (CE Marked)
- TechGlass - GlassFibre Geogrids with modified Bitumen Coating (CE Marked)
- TechGlass AIC (Asphalt Interlayer Composite)
- TechGeo Needle Punched Nonwoven Geotextiles (CE Marked) AASHTO NTPEP evaluated
- TFI 3000 Woven PET (CE Marked & AASHTO NTPEP Evaluated)
- TGC Reinforced Nonwoven
- TechPave Paving Geotextiles
- TechFab Metal Gabions
- TechDrain - Prefabricated Vertical Drains (CE Marked)
- TechTube Geotextile Tubes & Bags
- TechDrain Drainage Composites
- TechGrid PP Biaxial Geogrid
- TechCell GeoCells
- TechStrap Geostrips
- Tech Fibre - PP Staple Fibre



| World-class Geosynthetics Manufactured in India by Techfab India Industries Ltd. | | | | | | | | | | | | | |
|--|-------------------------|-------------------|------------------------------------|----------------|------------------------------|---------------|--------------------|-----------------------------|--|----------------------------|------------------------------|---------------------------|------------------|
| TFI Woven Geotextiles | | TechGrid Geogrids | TGC Reinforced Nonwoven Composites | TechDrain PVDs | TechDrain Drainage Composite | TechGlass AIC | TechGlass Geogrids | TechGeo Nonwoven Geotextile | TechFab Metal Gabion Double twist wire mesh products | TECHTUBE & Geotextile Bags | TechGrid PP Biaxial Geogrids | TechStrap Polymeric Strip | TechCell Geocell |
| Polypropylene Multifilament | Polyester Multifilament | | | | | | | TechPave | | | | | |

TechFab In house laboratory is accredited With ISO/IEC - 17025:2005 & GRI-GAILAP



TFI Woven Geotextiles



TECHFAB INDIA

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