IMPROVEMENT / WIDENING TO TWO LANING WITH PAVED SHOULDER OF AGARTALA UDAIPUR SECTION FROM KM. 6.800- 55.000 OF NH44 UNDER SARDP-PHASE A, TRIPURA
TRIPURA, INDIA

TECHFAB INDIA

Subsurface Drainage

Client:	Products used & Quantity supplied:
NATIONAL HIGHWAYS & INFRASTRUCTURE DEVELOPMENT CORPORATION LIMITED (NHIDCL)	TECHDRAIN DRAINAGE COMPOSITE TDC 55130 - 2,00,000 SQM.
Main contractor:	Design Approval:
KMC CONSTRUCTIONS LIMITED	CENTRAL ROAD RESEARCH INSTITUTE (CRRI)
Manufacturer & Supplier:	Year of construction:
TECHFAB (INDIA) INDUSTRIES LTD.	2018

Abstract:

This case study discusses the possible causes of flexible pavement failures with poor subsurface drainage under high infiltration and capillary rise conditions, recommends TechDrain Drainage Composite for subsurface drainage instead of conventional gravel drainage.

Project Brief:

Special Accelerated Road Development Program for North East (SARDP-NE) for North Eastern Region and Sikkim is a specially designed high way development program for the North Eastern region. Ministry of Road Transport and Highways has formulated SARDP – NE for enhancing road facilities in the North-East region.

Objectives of the scheme are up-gradation of National Highways connecting State Capitals with 2 lane or 4 lane roads. Under this project NH 44 was planned to be improved to a two lane road from km 6.800 to 55.000.

There were some major challenges to achieve the objectives as the availability of aggregate for construction of pavement structure was scarce and even the available resources were of marginal quality.

Fig 1 : Preparation of subgrade before laying granular layers.

Project Challenges:

The state of Agartala is one of the high rainfall area and performance of pavement majorly depends on the effective drainage of infiltered subsurface water out of the pavement layers. The detrimental effects of water in the pavement system are significant. AASHTO (1993) reports:

- Water in the asphalt surface can lead to moisture damage, modulus reduction and loss of tensile strength. Saturation can reduce the dry modulus of the asphalt by as much as 30 percent or more.
- Added moisture in unbound aggregate base and subbase is anticipated to result in a loss of stiffness on the order of 50 percent or more.
- Modulus reduction of up to 30 percent can be expected for asphalt-treated base and increase erosion susceptibility of cement or lime treated bases.
- Saturated fine -grain roadbed soil could experience modulus reductions of over 50 percent.

Most of the water in a pavement section infiltrates through the pavement surface during rain events. The incorporation of open-graded, free draining base/sub base layers into the pavement section as shown provides excellent drainage. For this the requirement of good quality graded aggregate is a must, whereas the project site conditions contradict the requirements. The available aggregate was of marginal quality which needed to be stabilized to achieve desired modulus values. In the process of stabilization, it was of utmost importance to ensure proper drainage requirements.

Solution proposed:

After a careful evaluation of the project requirements and site conditions, Central Road Research Institute (CRRI) has carried out detailed analysis and approved the usage of Techdrain Drainage Composite TDC 55130 which is in accordance with the requirements of MoRTH specifications section 704. The pavement designs submitted to CRRI were reviewed using IIT Pave software and permissible strains were computed using IRC 37:2012 and the layer thicknesses were recommended as tabulated below:

S. No	Type of Layer	Layer Thickness
1.	Bituminous Concrete with VG 30 Bitumen	40 mm
2.	Dense Bituminous Macadam with VG 30 Bitumen	60 mm
3.	Paving Fabric – SAMI Layer	As per MoRTH Section 708
4.	Stabilized Base Course	175 mm
5.	Geocomposite Drainage Layer	As per MoRTH Section 704
6.	Stabilized Subbase Course	150 mm
7.	Prepared Subgrade	500mm

As per IRC 37 Clause 7.2.2, it is required that the stabilized soil layer should retain the permeability when water is likely to enter into pavement from shoulder, median or through cracks. It was therefore recommended that Techdrain Drainage Composite which possess required permeability and facilitates the subsurface drainage shall be laid between base and sub base layers.

It was ensured that the drainage composite layer is running upto the end of the toe for sub base layer including shoulders. Following is the typical cross section of the pavement structure adopted for construction.

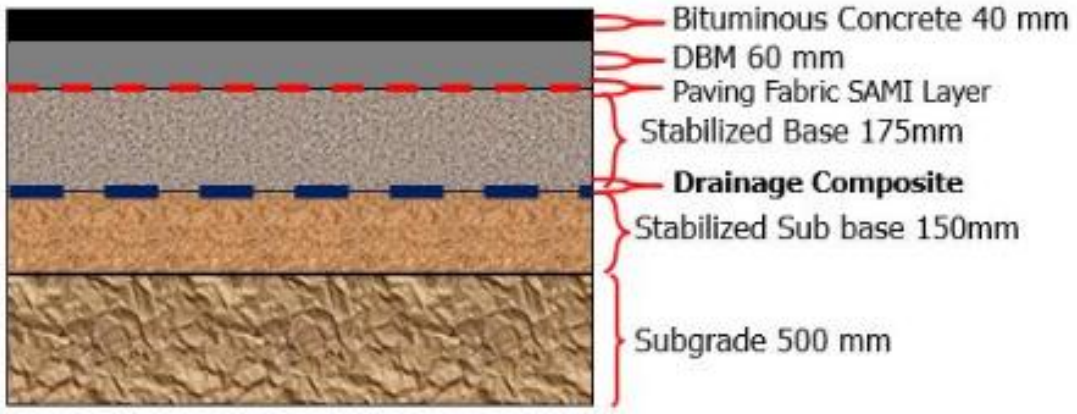

Figure 2 : Typical Cross Section of the pavement

Execution on Site:

Storing and Handling:

- Never drag the Drainage Composite Rolls, it may lead to damages.
- The recommended method of unloading is, to use the Stout Bar. A Bar can be passed through the roll tube & attached via chain, which in turn can be lifted by Hydra Crane or Forklift. The sequence for the same is shown in figure below.
- The forks of a fork lift should never be used, under any circumstances, to unload rolls, this would incur heavy damage to the roll.
- The Drainage Composite shall be kept dry and wrapped such that it is protected from any damage during shipping and storage. If stored outdoors, it shall be elevated and protected with a cover.
- The Rolls should also be carefully handled when being deployed from storage to their position just prior to installation.

Figure 3 : Handling of Geosynthetic Rolls

Installation of TechDrain Drainage Composite:

The following sequence shall be adopted for the laying of Non-Woven Geotextile:

- The site should be cleared, stripping other unsuitable materials. Isolated pockets on the sub base layer shall be filled.
- Once the surface along a particular segment of the road alignment has been prepared the Installer shall handle the Drainage Composite in such a manner as to insure it is not damaged in any way.
- The Installer shall place the Drainage Composite in the proper manner at the elevations and alignment as shown in the construction drawings and as directed by the Engineer.
- The Drainage Composite should be unrolled in close proximity to the final position as per the marked layout. Once the roll is in the correct position, then the next adjacent roll can be unrolled.
- The Drainage Composite may be folded, overlapped, or cut to confirm to curves in the design. The direction of the fold or overlap should be in the direction of the construction and can be held in place using sandbags or any blocks.
- Fill material shall be back dumped onto previously placed fill from trucks or front-end loaders riding on top of the previously placed fill. At no time will equipment be allowed to drive directly across the drainage composite. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure.
- Joints of the Drainage Composites shall be butted together and the geotextile of adjacent geonet core rolls overlapped along the roll, see Figure 4.

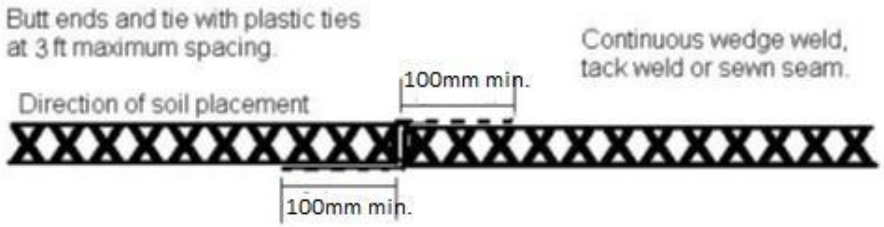

Figure 4 : Butt connection and Overlaps

- Adjacent Geocomposite rolls shall be joined together by tying the geonet cores with plastic fasteners or polymeric braid. The ties shall be spaced every 3 feet along the roll length.

Fig 5 : Unrolling of TechDrain Drainage Composite on the Compacted GSB Layer

Fig 6 : Spreading and Compaction of base course on theDrainage Composite

Fig 7 : Laying of Bituminous layers

Product Details:

TechDrain Drainage Composite:

Drainage Composite is a specifically designed drainage composite to meet the drainage and protection requirements in structurally demanding water draining applications. Drainage Composite effectively eliminate hydrostatic pressure by collecting and conveying groundwater to a drain pipe for discharge. Drainage composites are prefabricated sub surface drainage products which directly replace the granular drainage layer. The formed polymer core encapsulated in a bonded geotextile filter fabric retain soil particles while allowing water to freely enter the drainage core and convey to designated outlets.

Figure 8 shows a typical Drainage Composite which are made of lightweight three-dimensional, high-compressive strength polymeric core and nonwoven geotextile, provided on both sides.

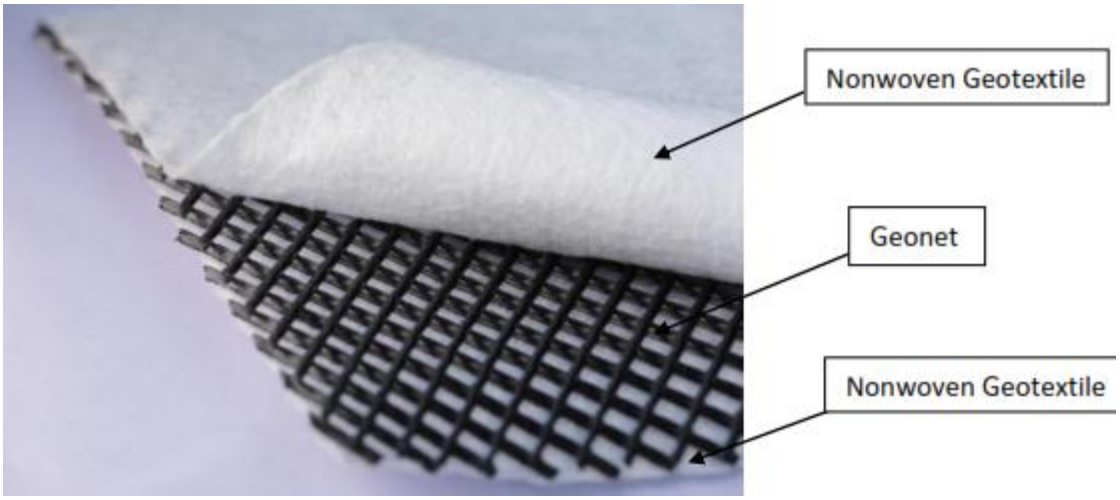

Figure 8 : Typical Drainage Composite

Drainage composites provide effective solution over conventional drainage layer. Some of the inherent advantages of drainage composite are:

- Extremely effective solution compared to traditional stone drainage layer
- Being light in weight, it is easy to handle and install them quickly.
- Made of PP and PE, so they are durable and chemical resistant
- High flow capacity as compared to conventional gravel drain
- Acts as drainage as well as protection layer due to its high puncture resistance
- Filtration properties are suitable for most soil types
- Highly compressive strength core
- Drainage Composite being factory manufactured product, it is very easy to install and suitable for wide range of soil gradation.
- Drainage Geocomposites have a filter geotextile layer attached to its drainage core which shall not allow the clogging of drainage core and thus ensures requires in-plane flow capacity and proper functioning.
- Robustness prevents puncturing and tearing during installation
- Since these are factory manufactured products, high quality can be assured
- The burden on natural resources for gravel/aggregate is also reduced.
- There is also a reduction in emission of greenhouse gases due to reduction in blasting and crushing of rock aggregates.

Fig 9 : Finished road stretch open to traffic since June 2018

Present Status:

Techfab India has supplied the entire quantity of TechDrain Drainage Composite within the stipulated time and meeting all the quality requirements. The road construction has been completed by KMC Constructions Ltd. and is open to traffic. The project met the desired objectives and road is functioning well

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