

Geocells For Pavement Reinforcement



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Roads are essential for the economic growth of the country, and unlike the railway network, various classes of roads—from expressways to rural road, assure last mile connectivity. India's growing economy requires expansion of existing carriageways into multi-lane expressways, new road routes and development of rural roads for motorised vehicles instead of animal-drawn carts. However, difficult subsoil conditions, high economic and social cost of diversions, dearth of good construction material and environmental constraints pose major challenges for road development.

Scarcity of good material often requires flexible pavements to be constructed from marginal materials. Pavements supported on weak soils with low California Bearing Ratio (CBR) would require further engineering beyond the established standardised norms. There are instances where marginal material is required to be used even where the CBR is very low. Such conditions require a paradigm change in the design of the pavement section using geosynthetics.

Geocell to the rescue

At Strata Geosystems, we have used geosynthetics like geocells (StrataWeb®) and geogrid (StrataGrid™) for ground improvement, reinforced soil walls, embankment protection etc. We rehabilitated a damaged stretch of a National Highway NH-44 connecting the North-Eastern states with the rest of the country. It became operational in a record time of 15 days and was acknowledged by the Assam PW (Buildings and NH) Department in the following words: "The NH-44 at Churaibari once infamous for mud and slush is now transformed beautifully, and this has been made possible by the use of Geocell in its construction."

NH-44 near the Assam-Tripura border traverses forested undulating terrain. The sub-grade is highly plastic, with weak, clayey soil of low permeability. This region experienced very heavy rainfall from March to September 2016 and completely damaged about 500m of the stretch, reducing it to a swamp (Fig.1). Conventional repairs were unsuccessful and traffic disruption created a crisis



Figure 1: Condition of NH-44 before rehabilitation

with commodities becoming scarce and expensive in Tripura.

Strata Geosystems designed the pavement using StrataWeb® geocells within the pavement section (Fig. 2). The CBR was as low as 0.5% and the traffic intensity considered was 20msa. A Modulus Improvement Factor (MIF) OF 2 was conservatively considered. Granular material was available within reasonable lead and used as infill, ensuring drainage of ingressed water.

The pavement section was completed up to the granular base by August 15, 2016 in a record 15 days. Traffic was allowed to ply immediately over the granular base component because of the following reasons:

- The social crisis did not merit any further delay of normal traffic flow
- It was not prudent to lay the top bitumen components during the continuous rainfall
- The work was done under trying conditions and behaviour of the road left unpaved was monitored for a short period.



Figure 2: Schematic of section adopted



Figure 3: : Heavy trailers hauled over the unpaved road in extreme conditions



Figure 4: The paved pavement in 2017 after another spell of heavy rains

The procedure proved successful. Fig. 3 illustrates heavy vehicular traffic plying the unpaved pavement without distress, notwithstanding the wet conditions. After being paved, the stretch has further

withstood the heavy brunt of the 2017 monsoons (Fig. 4).

Geosynthetics are an important facet of geotechnical engineering. Geocells can be utilised for rapid construction of emergency roads as well as roads over difficult

subgrades and terrain even where the CBR value of the subgrade may be as low as 1%. Where life cycle costs are concerned, earth structures and pavements with geosynthetic reinforcement score well over conventional designs. ●