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Functional Performance of Unpaved Roads Reinforced with Treated Coir Geotextiles

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Abstract : One of the most important and complicated factors influencing the functional performance of unpaved roads is traffic loading. The complexity of traffic loading is caused by the variable magnitude and frequency of load, which causes unpaved roads to fail prematurely. Unpaved roads are low-volume roads, and as peri-urbanization increases, unpaved roads act as a means to boost the rural economy. This has also increased traffic on unpaved roads, intensifying the issue of settlement, rutting, and fatigue failure. This is a major concern for unpaved roads built on poor subgrade soil, as excessive rutting caused by heavy loads can cause driver discomfort, vehicle damage, and an increase in maintenance costs. Some researchers discovered that when a consistent static load is exerted as opposed to a rapidly changing load, the rate of deformation of unpaved roads increases. Previously, some of the most common methods for overcoming the problem of rutting and fatigue failure included chemical stabilisation, fibre reinforcement, and so on. However, due to their high cost, engineers' attention has shifted to geotextiles which are used as reinforcement in unpaved roads. Geotextiles perform the function of filtration, lateral confinement of base material, vertical restraint of subgrade soil, and the tension membrane effect. The use of geotextiles in unpaved roads increases the strength of unpaved roads and is an economically viable method because it reduces the required aggregate thickness, which would need less earthwork, and is thus recommended for unpaved road applications. The majority of geotextiles used previously were polymeric, but with a growing awareness of sustainable development to preserve the environment, researchers' focus has shifted to natural fibres. Coir is one such natural fibre that possesses the advantage of having a higher tensile strength than other bast fibres, being eco-friendly, low in cost, and biodegradable. However, various researchers have discovered that the surface of coir fibre is covered with various impurities, voids, and cracks, which act as a plane of weakness and limit the potential application of coir geotextiles. To overcome this limitation, chemical surface modification of coir geotextiles is widely accepted by researchers because it improves the mechanical properties of coir geotextiles. The current paper reviews the effect of using treated coir geotextiles as reinforcement on the load-deformation behaviour of a two-layered unpaved road model.

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