THE MISUSE OF THE GIROUD-HAN DESIGN METHOD FOR GEOSYNTHETIC-REINFORCED UNPAVED ROADS

Unpaved structures are commonly known as gravel (resource) roads. However, it should be acknowledged that the structures are also designed for drill pads, and industrial yards that carry heavy axle loads and intense trafficking.

As with any engineering design, an appropriate design methodology must be utilised when geosynthetics are being considered to provide cost effective alternatives to traditional construction methods. They will primarily help to reduce the aggregate thickness while preserving the quality and performance of the unpaved surface.

For use of geosynthetics in unpaved structures, Dr. J.P. Giroud and Dr. Jie Han published their method in two parts (Giroud and Han, 2004a, b) in the ASCE Journal of Geotechnical and Geoenvironmental Engineering. The method (a design tool) has subsequently been included in the “Geosynthetic Design and Construction Guidelines” manual by the Federal Highway Administration (FWHA, 2008).

Due to the complexity of the method, they provided a summarisation of its characteristics in the Geosynthetics Magazine (2012, Volume 30, Numbers 1 and 2). This provided much needed clarification for consultants and geosynthetic manufacturers on the difference between generic and calibrated equations and the steps on how to calibrate them for a specific geosynthetic.

Over the past few months, Nilex Inc. has unfortunately seen and been made aware of the misuse of this method, indicating a thorough lack of understanding associated with this design tool by mixing the design steps with the inclusion of a different design methodology, and using potentially inadequately calibrated equations. The aforementioned article aims to provide a few points that should be noted if this method is to be used as a design tool. Statements from this document (2012, Volume 30, Number 1):
“Index tests of physical or mechanical properties are not universal indicators of the performance of unpaved roads, and higher-strength geosynthetics do not necessarily perform better in unpaved road applications.”

“If several geosynthetics appear to be similar, the method must be calibrated for each one. Furthermore, the applicability of the method for each of these geosynthetics must be validated using full-scale tests.”

“Calibration based only on small-scale tests and the index properties of the geosynthetic could lead to a false sense of security that the unpaved road design will meet performance expectations.”

Based on the limitations of the G-H method, as presented in the article, the designer should always verify that geosynthetic-specific full-scale testing along with case histories, for which a calibrated and validated G-H equation was utilized, resulted in satisfactory performance of the constructed unpaved road.”

Furthermore, the consultant (designer) should know that the method has the following boundary conditions:

- Limited to < 10,000 passes
- Minimum aggregate depth = 100 mm (4”)
- Base : Subgrade Modulus Ratio ≤ 5.0

Upper constraint for:

- Axle Loading ≤ 178 KN (40 kips)
- Rutting ≤ 75 mm (3.0 inches)
- Subgrade CBR ≤ 5.0

It is imperative for the consultant (designer) and the owner to obtain evidence from the geosynthetic manufacturer that their product has been calibrated by following the steps of this method; and should they want to surpass the boundary conditions, they should seek case histories/full-scale testing (i.e. as conducted to calibrate the SpectraPave4 – Pro Software package) and/or a stamped design by a registered professional for the project location.

Should you require further clarification on this design methodology, please do not hesitate to contact:

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