## Synergizing Seismic Insights: Exploring the Dynamic Response of Reinforced Slopes incorporating Commercial and In-House 3D Printed Geocells

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Abstract

The application of geocell layers extends significantly in reinforced and retaining structures, while providing tensile strength when used as reinforcement or passive resistance when employed as a fascia or retaining component. Provision of geocell layers also play a crucial role in improving the bearing capacity and controlling soil erosion on slope faces. The choice of selection of geocells for any specific application is largely guided by its cell height, welding spacing, geometric configuration and aspect ratio. While application of geocell layers have proven the efficacy in slope stabilization under static and pseudo-static loading scenarios, their utility under seismic conditions is also noteworthy to be explored. However, obtaining these responses through full-scale field-scale studies is practically challenging. Therefore, shake table testing is employed to study the effects of incorporating geocell layers within scaled-down models of soil slopes. The direct application of commercially available geocells in scaled-down shake table models is a convenient approach, yet it may lead to a pitfall as only the geometry is scaled down, while the inherent mechanical properties of geocell layers are retained. To address this issue and bring out a parity in scaling down both the geometry and mechanical characteristics, in-house 3D printed geocells with scaled-down properties are developed and utilized in the present study. Geocell-reinforced model slopes are fabricated within cuboidal Perspex tanks or laminar boxes and their seismic responses are obtained through embedded contact or non-contact instrumentations. This exercise would help in further exploration of the comparative assessment of both commercial and 3D printed geocells in model testing. The planning and execution of such experimentation is time-demanding and, hence, it needs to be sufficed with suitable numerical investigations to decipher intricate insights into the seismic response of geocell reinforced slope along with various parametric scenarios. In this regard, numerical investigations have been conducted to elucidate the responses of geocell-reinforced slopes under pseudo-static and seismic scenarios, in terms of seismically induced stress and strain distributions. The ultimate goal of the study is to establish an emphasization the use of 3D printed geocell layers with scaled-down properties in lieu of the responses of field-scale slopes employing commercial geocells.

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