Different innovative foundation techniques have been suggested for controlling the detrimental volume change behavior of expansive soils. Granular pile-anchors (GPA) are an innovative foundation technique, devised for mitigating heave of expansive clay beds and improving their engineering behavior. In a granular pile-anchor, the footing is anchored to an anchor plate at the bottom of the granular pile. This makes the granular pile tension-resistant and enables it to absorb the tensile force caused on the foundation by the swelling clay. The efficacy of granular pile-anchors in controlling heave of expansive clay beds and improving the engineering behavior of the ambient soil has also been reported, based on the results obtained from laboratory model tests. To suggest granular pile-anchor foundation for installation in field practices, however, an in situ study of the behavior of granular pile-anchor is also required as a support to the laboratory study. This research work presents an extensive field study of the behavior of granular pile-anchor foundation of expansive clay beds.
Field study was performed for studying the rate of heave, reduction of heave and variation of heave with radial distance and with depth. Heave was found reduced by about 90% upon installation of granular pile-anchors. Final heave of reinforced soil bed was reached in about just half of the time required for final heave in the case of un-reinforced expansive clay bed. Improvement in the engineering behavior of the ambient clay was studied through Proctor needle penetration tests and unconfined compression tests. It was found that a maximum increase of about 120% was observed in penetration resistance in the case of expansive clay beds reinforced with granular pile-anchors.

This study also presents the results of a field-scale test program conducted to study the response of granular pile-anchors in compression embedded in expansive clay beds. Plate load tests were conducted on un-reinforced expansive clay beds and clay beds reinforced with granular pile-anchors to compare their compressive load response. Bulging pattern of the granular pile-anchors was also studied.

It was found from the field load tests that expansive clay beds reinforced with granular pile-anchors showed higher load-carrying capacity and improved compressive load response than un-reinforced clay beds. The effect of length of granular pile-anchor is more pronounced on increase in maximum bulge length than that of diameter.
An understanding of the amount of uplift resistance offered by the granular pile-anchor (GPA) is of paramount importance in the design of granular pile-anchor foundations (GPAF) in field situations causing tensile forces on foundations such as in expansive clay beds. Hence, this study also presents the results of a field-scale test program conducted to study the pullout response of GPAs embedded in expansive clay beds. Pullout load tests were conducted on GPAs of varying lengths and diameters. It was found from the field pullout load tests that granular pile-anchors of higher surface area resulted in higher pullout capacity.

The encouraging results of this research involving full-scale tests on granular pile-anchors show that granular pile-anchors can be suggested as an effective foundation technique in expansive soils for practice in situ. The results suggest significant reduction in heave and also improvement in engineering behaviour, compressive load response and pullout load behaviour of expansive clay beds following installation of granular pile-anchors in situ.