



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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This dissertation reports about the overall response of isolated and interfering shallow footings located on or near the slope. 2-D and 3-D Finite element analyses have been resorted to for conducting the numerical investigations for deciphering the bearing capacity and failure mechanisms of the foundations located on slopes. Foremost, the ultimate bearing capacity and failure pattern of square footing resting on dry sandy-soil slope has been investigated by altering the various geotechnical and geometrical parameters. In this regard, the influence of dilatancy has also been vividly studied and highlighted. Further recognizing the prevalent presence of $c-\phi$ soils in most of the hilly terrains, the study was extended for the square footings resting on such sloped. Apart from square footing, strip footing being the other most common typology of shallow foundations for buildings in hill-slopes, the previous study was further extended to recognize the bearing capacity and failure mechanism of the same. From practical scenario, it is revealed that single isolated strip or square footing does not represent the building foundation characteristics. In this regard, the impact of interference of strip footings located on crest of $c-\phi$ soil slope on their bearing capacity and failure mechanisms has been examined. In all the simulations of various typologies, the influence of the geotechnical and geometrical parameters was vividly studied. With the aid of ANN technique, the quantitative influences of the geotechnical and geometrical parameters were used to develop expressions for bearing capacity prediction. These expressions can serve as a ready-made handy tool for the geotechnical engineers for assessing the bearing capacity of isolated and interfering shallow footings located on the hill-slopes. Further, with the aid of a case study, the overall stability of a hill-slope, supporting an electric transmission tower, has been investigated. Based on the outcomes, recommendations to enhance the bearing capacity of commonly adopted isolated footings has been provided through the application of alternative typologies of interconnected shallow footings. The study has been further extended to study the bearing capacity of complex arrangement of shallow footings that may be suitably adopted to harness their benefit of enhanced bearing capacity and lessened outward deformation of slope when placed on the crest of a slope.