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Optimal Cost-Analysis and Design of Circular Footings

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Abstract

The study pertains to the optimal cost-analysis and design of a circular footing subjected to generalized loadings using sequential unconstrained minimization technique (SUMT) in conjunction with Powell's conjugate direction method for multidimensional search and quadratic interpolation method for one dimensional minimization. The cost of the footing is minimized satisfying all the structural and geotechnical engineering design considerations. As extended penalty function method has been used to convert the constrained problem into an unconstrained one, the developed technique is capable of handling both feasible and infeasible initial design vector. The net saving in cost starting from the best possible manual design ranges from 10 to 20 %. For all practical purposes, the optimum cost is independent of the initial design point. It was observed that for better convergence, the transition parameter δ should be chosen at least 100 times the initial penalty parameter r_k .

Keywords: optimal cost analysis, sequential unconstrained optimization technique (SUMT), powell's conjugate direction method, penalty function method, circular footing

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