Constrained optimization with linear approximation (COBYLA) and reliability index calculation is. implemented in Python language and Open TURNS [27,28], open-source software for probabilistic modeling and uncertainty management.Reliability-based optimization (RBO) is a great technique for optimizing geotechnical-related design problems satisfying to a predefined criteria (such as economy in construction) while explicitly satisfying the design requirements and accommodating the unavoidable uncertainties [10].Sayed et al. [11] performed a parametric sensitivity analysis of reinforced soil wall to investigate the effect of material uncertainties under static and dynamic loading.Wu et al. [21] presented a reliability-based analysis of MSE wall considering wall performance (maximum wall face deformation) by using Monte Carlo Simulations and finite difference based numerical simulations.Basha and Babu [14] used reliability based approach for design optimization of geosynthetic reinforced soil walls considering external stability under seismic loading.Zhao et al. [18] used Artificial Bee Colony (ABC) algorithm to optimize the reliability-based design of gravity retaining wall and spread footing.Chalermyanont and Benson [15] used Monte Carlo simulation to develop a reliability-based design for external stability of MSE walls.Santos et al. [19] reported reliability-based design optimization of geosynthetic-reinforced soil walls using Ant Colony Optimization (ACO) algorithm.Introduction The geotechnical engineering systems inherit risks and uncertainties and in order to apply sustainable design approach it is essential to quantify these uncertainties to rationalize the practice [1,2,3,4,5,6,7].Traditional deterministic methods in geotechnical engineering are considered insufficient due to uncertainties inherently associated with geotechnical materials [8].Zhang et al. [17] used the Mean First-Order Reliability Method (MFORM) to optimize the reliability-based design of gravity retaining wall and spread footing.Mahmood [20] proposed two-loop constrained optimization technique and demonstrated its application on a gravity retaining wall considering external stability.Welded wire mats, metal bars, geosynthetics, or other anchorage systems are used as reinforcement to improve the mechanical properties of the soil mass.The aim of present study is to find an optimum design of the MSE wall using constrained optimization considering the external stability for a target reliability (or target failure probability).The uncertainties in the design of geotechnical systems come from applied loading, geotechnical properties of soil, and the models used in calculations [8,9].The external stability includes sliding, eccentricity, bearing capacity and overall stability checks.The MSE walls used in transportation applications are designed according to the load and resistance factor (LRFD) design as per AASHTO specifications [24].Empirical safety factors used in traditional deterministic design cannot incorporate effect of the uncertainties of design variables on the overall performance.In recent past, several studies report the reliability-based design (RBD) as well as reliability-based optimization (RBO) of retaining structures.Yang et al. [16] presented a reliability-based design procedure for external stability of narrow MSE walls.In United Stated, more than fifty percent of the retaining structures used in transportation .[infrastructure consist of MSE walls [23].[25,26

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