Recent developments on earth-retaining structures through optimisation metaheuristics

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ABSTRACT

The growing interest for the environmental balance and the preservation of natural resources has led the engineers to the application of metaheuristics for the optimisation of material in reinforced concrete structures. The featured study presents the analysis of earth-retaining buttressed walls used in the civil and building engineering. Different metaheuristics have been used in our research group to minimise the economic cost, the emissions to the atmosphere and the energy consumption. Initially, the simulated annealing algorithm (SA) has been widely applied in earth-retaining buttressed walls [1,2] and included in the teaching syllabus of concrete engineering studies [3]. The hybrid harmony search algorithm has been recently applied in cost optimization and carbon emissions (in press), and the strategy of VNS-Threshold Acceptance for CO2 optimization design [4]. Additionally, comparative studies of cantilever walls were developed using Threshold Accepting and Harmony Search at civil engineering graduate lectures [3]. Our last analyses focused on the assessment of the life cycle environmental impacts of earth-retaining buttressed walls, which highlighted the differences in not only global warming, but other impacts covered by Ecoindicator 99. In that sense, a parametric study of LCA for the height of walls has described the contribution of each construction unit to each environmental impact [5]. It all leads to a wider knowledge of the which processes involve greater effects on each impact and therefore focus the objectives for structural design.

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