Mathematical Approach to Simulate Soil Behavior Under Shallow Compaction

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Abstract

Surface or shallow compaction is one of the earliest, cheapest and commonly used techniques to improve the physical and
mechanical properties of loose soil specially for imported structural fill. It is simply rearranging of soil particles to reduce air ratios using
surface static or vibrating mechanical effort. Usually, shallow compaction procedure includes subjecting the loose soil to certain number of
compacting equipment passes to archive the accepted compaction level; this number of passes is a function of many parameters such as
type of soil, initial soil parameters, compacting equipment characteristics and thickness of soil lift. International codes, specifications and
handbooks include just guidelines about the required number of passes; accordingly, it is usually determined based on personal
experience and field trials. This research has two goals, the first is to estimate the properties improvement of certain natural surface loose
soil under certain surface compaction procedure by calculating the enhancement in soil properties after each pass and updating the soil
properties for next pass calculations. The second goal is to use the previous approach to develop set of equations to design surface
compaction procedure for imported structural fill, this includes calculating minimum compaction equipment characteristics, maximum lift
thickness and minimum number of passes to enhance certain imported fill from certain initial condition to certain final condition. The
proposed approach for the first goal was verified using case studies and showed good matches, and the developed designing equations for
surface compaction procedure were verified using case studies and showed good matches.

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