

Comparison of Various Landfill Ground Improvement Techniques for Redevelopment of Closed Landfills to Cater Transport Infrastructure

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Abstract : Construction of infrastructure above or adjacent to landfills is becoming more common to capitalize on the limited space available within urban areas. However, development above landfills is a challenging task due to large voids, the presence of organic matter, heterogeneous nature of waste and ambiguity surrounding landfill settlement prediction. Prior to construction of infrastructure above landfills, ground improvement techniques are being employed to improve the geotechnical properties of landfill material. Although the ground improvement techniques have little impact on long term biodegradation and creep related landfill settlement, they have shown some notable short term success with a variety of techniques, including methods for verifying the level of effectiveness of ground improvement techniques. This paper provides geotechnical and landfill engineers a guideline for selection of landfill ground improvement techniques and their suitability to project-specific sites. Ground improvement methods assessed and compared in this paper include concrete injected columns (CIC), dynamic compaction, rapid impact compaction (RIC), preloading, high energy impact compaction (HEIC), vibro compaction, vibro replacement, chemical stabilization and the inclusion of geosynthetics such as geocells. For each ground improvement technique a summary of the existing theory, benefits, limitations, suitable modern ground improvement monitoring methods, the applicability of ground improvement techniques for landfills and supporting case studies are provided. The authors highlight the importance of implementing cost-effective monitoring techniques to allow observation and necessary remediation of the subsidence effects associated with long term landfill settlement. These ground improvement techniques are primarily for the purpose of construction above closed landfills to cater for transport infrastructure loading.

Keywords : closed landfills, ground improvement, monitoring, settlement, transport infrastructure

Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development

Conference Location : Chicago, United States

Conference Dates : December 12-13, 2020