

Characterization of Lahar Sands for Reclamation Projects in the Manila Bay, Philippines

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Abstract : Lahar sand (lahars) is a material that originates from volcanic debris flows. During and after a volcano eruption, the lahars can move at speeds up to 22 meters per hour or more, so they can easily cover extensive areas and destroy any structure in their path. Mount Pinatubo eruption (1991) brought lahars to its vicinities, and its use has been a matter of research ever since. Lahars are often disposed of for land reclamation projects in the Manila Bay, Philippines. After reclamation, some deep loss deposits may still present and they are prone to liquefaction. To mitigate the risk of liquefaction of such deposits, Vibro compaction has been proposed and used as a ground improvement technique. Cone penetration testing (CPT) campaigns are usually initiated to monitor the effectiveness of the ground improvement works by vibro compaction. The CPT cone resistance is used to analyses the in-situ relative density of the reclaimed sand before and after compaction. Available correlations between the CPT cone resistance and the relative density are only valid for non-crushable sands. Due to the partially crushable nature of lahars, the CPT data requires to be adjusted to allow for a correct interpretation of the CPT data. The objective of this paper is to characterize the chemical and mechanical properties of the lahar sands used for an ongoing project in the Port of Manila, which comprises reclamation activities using lahars from the east of Mount Pinatubo, it investigates their effect in the proposed correction factor. Additionally, numerous CPTs were carried out in a test trial and during the execution of the project. Based on this data, the influence of the grid spacing, compaction steps and the holding time on the compaction results are analyzed. Moreover, the so-called "aging effect" of the lahars is studied by comparing the results of the CPT testing campaign at different times after the vibro compaction activities. A considerable increase in the tip resistance of the CPT was observed over time.

Keywords : vibro compaction, CPT, lahar sands, correction factor, chemical composition

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