

Thesis : Statistical Analysis Of Geotechnical Properties Of Jet Grout Cut-Off Wall

Candidate: Vishnu V.V.

Guide: Dr. Akanksha Tyagi, Asst. Professor, Dept. of Civil Engineering

ABSTRACT

In recent the decade, jet-grouting technique has gained popularity as cut-off walls or barriers for dam construction and rehabilitation. The jet-grouted improved ground is usually characterized by high degree of spatial variability in properties such as strength and permeability that occurs due to the variation of in-situ soil, mixing parameters, installation methods, geometric imperfections etc. In this study, the field data for unconfined compressive strength (*UCS*), bulk unit weight, and permeability of the jet-grouted ground under downstream and upstream cofferdam of a major multipurpose irrigation project in India, are collected and analysed.

The dataset comprises over 1000 points for *UCS* and bulk unit weight, as well as more than 500 points for permeability across both upstream and downstream coffer dams. Fitting the data to distributions is a critical step in statistical analysis, enabling a deeper understanding of the data's underlying distribution and facilitating result interpretation. This step is particularly crucial in analyzing *JG* ground due to its inherent variability influenced by various factors. To assess goodness of fit, Kolmogorov-Smirnov (*KS*) test is conducted to check for normal, lognormal, and gamma distributions. Additionally, bootstrapping methods is also employed to identify the most appropriate distribution fitting for specific datasets.

The study also calculated the spatial parameters, such as the mean, standard deviation and coefficient of variation in strength, bulk unit weight, and permeability. Furthermore, using the *UCS* data points, the characteristic strength and confidence level were determined following the statistical approach. The results indicate that the actual confidence level was higher than the recommended value of 90% for jet grouting works. The inter-relationship between the *UCS*, permeability, curing period, and depth of sampling were also analysed.

This study provides valuable insights into the variability of jet-grouted ground properties, particularly *UCS*, bulk unit weight, and permeability. The findings suggest that the lognormal distribution is a more suitable fit for the data compared to other distributions.

By using statistical methods such as bootstrapping, practitioners can evaluate the inconsistency of ground properties and design more efficient projects. By better understanding *JG* ground properties and employing data distribution fitting techniques, this research provides valuable insights. The findings aid stakeholders in optimizing jet grouting works for increased cost-effectiveness and efficiency in ground improvement projects.

Keywords: Characteristic strength, coefficient of variation, cut-off wall, jet grouting, permeability, scale of fluctuation