

## Modeling of Geotechnical Data Using GIS and Matlab for Eastern Ahmedabad City, Gujarat

**Authors :** Rahul Patel, S. P. Dave, M. V Shah

**Abstract :** Ahmedabad is a rapidly growing city in western India that is experiencing significant urbanization and industrialization. With projections indicating that it will become a metropolitan city in the near future, various construction activities are taking place, making soil testing a crucial requirement before construction can commence. To achieve this, construction companies and contractors need to periodically conduct soil testing. This study focuses on the process of creating a spatial database that is digitally formatted and integrated with geotechnical data and a Geographic Information System (GIS). Building a comprehensive geotechnical Geo-database involves three essential steps. Firstly, borehole data is collected from reputable sources. Secondly, the accuracy and redundancy of the data are verified. Finally, the geotechnical information is standardized and organized for integration into the database. Once the Geo-database is complete, it is integrated with GIS. This integration allows users to visualize, analyze, and interpret geotechnical information spatially. Using a Topographic to Raster interpolation process in GIS, estimated values are assigned to all locations based on sampled geotechnical data values. The study area was contoured for SPT N-Values, Soil Classification,  $\Phi$ -Values, and Bearing Capacity (T/m<sup>2</sup>). Various interpolation techniques were cross-validated to ensure information accuracy. The GIS map generated by this study enables the calculation of SPT N-Values,  $\Phi$ -Values, and bearing capacities for different footing widths and various depths. This approach highlights the potential of GIS in providing an efficient solution to complex phenomena that would otherwise be tedious to achieve through other means. Not only does GIS offer greater accuracy, but it also generates valuable information that can be used as input for correlation analysis. Furthermore, this system serves as a decision support tool for geotechnical engineers. The information generated by this study can be utilized by engineers to make informed decisions during construction activities. For instance, they can use the data to optimize foundation designs and improve site selection. In conclusion, the rapid growth experienced by Ahmedabad requires extensive construction activities, necessitating soil testing. This study focused on the process of creating a comprehensive geotechnical database integrated with GIS. The database was developed by collecting borehole data from reputable sources, verifying its accuracy and redundancy, and organizing the information for integration. The GIS map generated by this study is an efficient solution that offers greater accuracy and generates valuable information that can be used as input for correlation analysis. It also serves as a decision support tool for geotechnical engineers, allowing them to make informed decisions during construction activities.

**Keywords :** arcGIS, borehole data, geographic information system (GIS), geo-database, interpolation, SPT N-value, soil classification,  $\phi$ -value, bearing capacity

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