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Modelling of Geotechnical Data Using Geographic Information System and MATLAB for Eastern Ahmedabad City, Gujarat

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Abstract : Ahmedabad, a city located in western India, is experiencing rapid growth due to urbanization and industrialization. It is projected to become a metropolitan city in the near future, resulting in various construction activities. Soil testing is necessary before construction can commence, requiring construction companies and contractors to periodically conduct soil testing. The focus of this study is 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 steps: collecting borehole data from reputable sources, verifying the accuracy and redundancy of the data, and standardizing and organizing the geotechnical information for integration into the database. Once the database is complete, it is integrated with GIS, allowing 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, Φ-Values, and Bearing Capacity (T/m2). Various interpolation techniques were cross-validated to ensure information accuracy. This GIS map enables the calculation of SPT N-Values, Φ-Values, and bearing capacities for different footing widths and various depths. This study 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.

Keywords : ArcGIS, borehole data, geographic information system, geo-database, interpolation, SPT N-value, soil classification, Φ-Value, bearing capacity
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