

◆ Research Paper

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# Engineering Geological Highway Structural Failure Assessment and Modeling of its Geotechnical Parameters: Case Study of Failed F- 209 Pavement, Southwestern Nigeria

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**Abstract:** Engineering geological investigation of the soil domain along the highway alignment of F-209 connecting Akure and Ado-Ekiti Southwestern Nigeria, had been investigated to assess the structural failure of the highway. Findings showed that the subsoil delineated is characterized by resistivity ranging from 135 – 711 ohm-m (avg. 385 ohm-m) composing sandy clay and clay sand (predominant). The soils are of intermediate plasticity/compressibility; and montmorillonite clay mineralogy group. The soaked CBR/in-situ CBR values are generally less than 10% minimum specification for subgrade materials. The GI values (avg. 13) corresponded to poor subgrade soil. Based on the GI and CBR values, the recommended thickness of the pavement should range from 267 mm (good segment) to 521 mm (for the weak segment) (avg. 401 mm, but are far above the present thickness of 159 – 210 mm. Therefore the present design thickness of the highway can't sustain the vehicular loads/haulage activities on the highway. The SNG contribution of the soil as subgrade material (avg. 0.48), strength coefficient of the soil as subbase (avg. 0.0671) and base (avg. 0.0357) in terms of SN/SNC and SNP are less than 0.5 minimum required for pavement strength/layer contribution. Parameter modelling showed all showed strong positive correlations except soaked CBR Vs in-situ and RD Vs DCPI which displayed weak

positive correlations. The validity of the models is based on applicability and accuracy. Therefore, the highway failure can be attributed to weak geologic and engineering properties, coupled with inadequate design thickness and lack of drainage facility at the shoulders.

**Keywords:** CBR, penetrative index, elastic modulus, geotechnical, structural number, subgrade modulus.



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