IMPROVED DESIGN OF EMBEDMENT DEPTHS FOR TRANSMISSION POLE FOUNDATIONS SUBJECT TO LATERAL LOADING

Investigators: Sivapalan Gajan and Cassie McNames

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RESEARCH STATEMENT/MOTIVATION

The embedment depths for transmission pole foundations are usually estimated by simple “rule-of-thumb” methods in current civil engineering practice. Most simple methods used in practice do not include the type of soils and soil properties of the site. However, when the pole is subjected to lateral loading, the depth of embedment required for the stability of pole depends on pole type, geometry, soil properties, and loading conditions. This research evaluates the effects of different soil types and soil properties on depths of embedment of transmission poles that are subjected to lateral loading, and proposes improved methods to calculate the embedment depths.

RESEARCH METHODS

The embedment depths for pole foundations are calculated by using the analytical methods available for laterally loaded piles, which includes the passive resistance of soil. Different soil types (sand, silt, and clay) and site conditions (dry and saturated) are considered in the analysis. The analytical expressions for the passive resistance of soils depend on basic soil strength parameters such as friction angle and undrained shear strength, which may not be evaluated accurately using simple site investigation methods. The current analysis classifies soils into different groups and proposes expressions for embedment depths that are easy to use, yet includes the effect of important soil properties.

MAJOR RESULTS and CONCLUSIONS

The embedment depths calculated by the proposed improved methods are compared with the estimations obtained by using the simple rule-of-thumb methods. The comparisons reveal that, for stronger soils, the simple methods are slightly over-conservative, and for relatively weaker soils, the simple current methods dangerously under predict the embedment depths. The proposed improved methods include the effect of important soil properties and do not require extensive site investigation, as soils are classified into groups based on their strength properties. Thus, the proposed methods can easily be used by engineers to improve the performance of transmission poles.

Contact Information: e-mail, website address (link): s.gajan@ndsu.edu
http://www.ndsu.nodak.edu/ndsu/gajan/