

Bachelor Thesis

Topic:

Derivation of experimental static p-y relationships for guardrail-posts embedded in roadway shoulder material

Introduction:

As a part of a research project for the German Federal Highway Research Institute (BASt), the soil-structure interaction of vehicle restraint systems is being investigated. In this research, the guardrail posts (vertical elements embedded in soil) are tested experimentally in various road shoulder materials under static and dynamic horizontal loads to evaluate the influence of the variation of soil material and post properties on the structural post response. The tested posts are instrumented using strain gauges, wire potentiometers and a load cell to measure the strains in the embedment, displacements above the ground and the applied force respectively. Using these measurements the lateral soil reaction per unit length versus the pile displacement at discrete depths (known as p-y curves) can be derived. These investigations should help to define the soil-structure interaction of guardrail posts as well as small-diameter piles in shallow layers.

Assignment:

First, a literature review shall be conducted to cover the fundamentals and the different approaches for the analysis of horizontally loaded piles. This review should include; the calculation of the pile reaction and deformations using the p-y method, as well as the derivation of the p-y curves from experimental measurements. In the next step, the measurements from the executed static horizontal loading tests shall be analyzed to derive depth-dependent p-y curves for different post sections. Finally, to validate the results, these shall be implemented in a beam on non-linear springs model or by other suggested methods. The resulting beam deformations from the model shall be compared to the experimental measurements and discussed.

Special knowledge and skills required:

- Basic knowledge of soil mechanics and design of deep foundations
- MATLAB or Simulink programming skills are of advantage.

The thesis can either be written in English or in German.

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