

# MASTER'S DISSERTATION AT GEOTECHNICAL ENGINEERING

DEPARTMENT OF CONSTRUCTION SCIENCES | FACULTY OF ENGINEERING LTH | LUND UNIVERSITY



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## IN COOPERATION WITH

HOFOR A/S and  
SWECO SVERIGE AB

**THE WORK IS PERFORMED AT  
GEOTECHNICAL ENGINEERING, LTH**

## BEARING CAPACITY CALCULATIONS OF PILES IN CLAY TILL

### BACKGROUND

Globally many standards are available for bearing capacity calculations of piles. Both Denmark's and Sweden's bearing capacity calculations are based on the Eurocode standard. However, Eurocode gives the possibility to choose the partial coefficients over a range and these choices are made on the basis of each country's conditions. Denmark and Sweden have not chosen the same partial coefficients for the calculation of the bearing capacity of piles. When it comes to non friction soils Denmark and Sweden also have chosen to handle the shaft resistance and the toe resistance differently. In Denmark it is assumed that both the shaft resistance and the toe resistance contribute to the bearing capacity while in Sweden it is assumed that only the shaft resistance is relevant.

Experiences from geotechnicians in Sweden suggest that Sweden's foundations often are overdimensioned, especially in Sweden's region Scania which has similar soil conditions as Denmark. It is therefore of interest to compare Denmark's bearing capacity and Sweden's bearing capacity to evaluate whether or not Sweden's choices, in Sweden's region Scania, systematically underestimate the bearing capacity compared to Denmark's choices. Moreover, the growing amount of collaboration between Denmark and Sweden has created a demand for a clarification of the differences between Denmark's and Sweden's bearing capacity calculations

This master thesis at LTH is based on an ongoing road construction project in

Sweden's region Scania where piles will be used. The road construction project is a collaboration between Sweco Sverige AB and Sweco Danmark A/S. The soil conditions, peat and clay till, at the road construction site exist in both Sweden's region Scania and Denmark.

### AIM

The aim with this master thesis is to calculate two safety factors. One safety factor for Denmark's bearing capacity calculations and one safety factor for Sweden's bearing capacity calculations. Using these safety factors, it will be evaluated whether or not Sweden's bearing capacity calculations systematically underestimate the bearing capacity compared to Denmark's bearing capacity calculations. Additionally, an evaluation will take place to show how the different choices in Denmark and Sweden impact the safety factors.

### METHOD

Initially, two manual calculations of the theoretical bearing capacity are made, one using Sweden's choices and one using Denmark's choices. These manual calculations are followed by finite element method analyses made using the program Plaxis. The results from the manual calculations and Plaxis will be compared. The bearing capacity of test piles will be calculated from in situ CAPWAP measurements. With the help of the manual calculations, Plaxis and in situ results safety factors will be calculated.



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