

Correctly modelling deep excavations in overconsolidated clay has proven very difficult by means of the commonly used material models. The time-dependent, undrained behaviour in combination with dilatancy is not even allowed since this behaviour will produce infinite strength. Several models like the Hypoplastic Cam-Clay model, which are still under development and only available as an user defined model in Plaxis, look very promising in solving this and other limitations.

In Antwerp plans for the Oosterweel Link are under development. This link will close the R1 ring road around Antwerp to reduce traffic congestion, accidents and improve the quality of life in the city's region. The closing link consists for several kilometres of a stacked tunnel under the harbour of Antwerp. Excavations up to 30 m are necessary at het deepest positions. The everywhere present overconsolidated Boom clay layer has a major impact on the design.

For a better understanding of the mechanics of this clay layer a thorough laboratory program and a trial excavation with an extensive monitoring program were initiated. The monitoring results were used to develop a safe parameter set for the HSsmall model which fitted the results nicely. The limitations, however, had to be accepted or workarounds had to be found where this might not have been necessary with a more fit for purpose model.



Figure 1. Photograph from bottom excavation

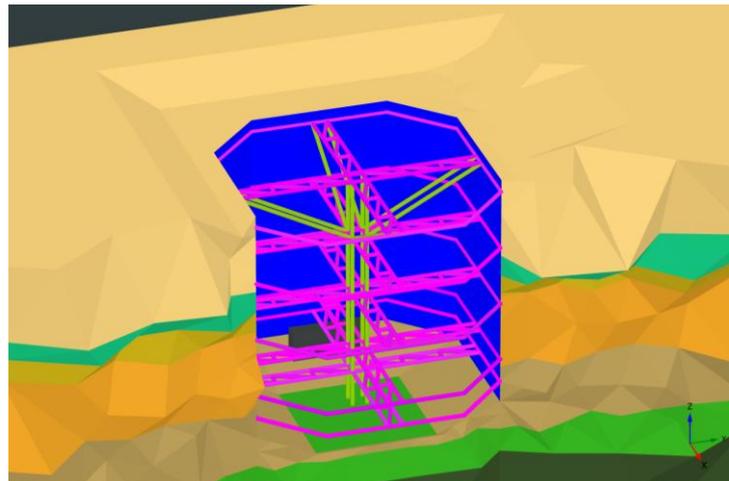


Figure 2. Trial-excitation in a 3D FEM model

### Research objective

This research aims to further validate the soil models which are under development, based on the unique monitoring results of the full-scale trial excavation. Further development of, one of, the models and the guidelines for parameter determination can be considered.

### Witteveen+Bos

Witteveen+Bos is an engineering consultancy operating in ten countries. We offer our clients valuable advice and state of the art designs regarding water, infrastructure, construction and the environment. Our engineers are pioneers in their field, working on the Amsterdam North-South line, the Jakarta Master Plan and closing the Antwerp Motorway Inner Ring (Oosterweel). In Antwerp Witteveen+Bos works in a joined venture with Sweco for our client Beheersmaatschappij Antwerpen Mobiel.

### Are you interested? Please contact:

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