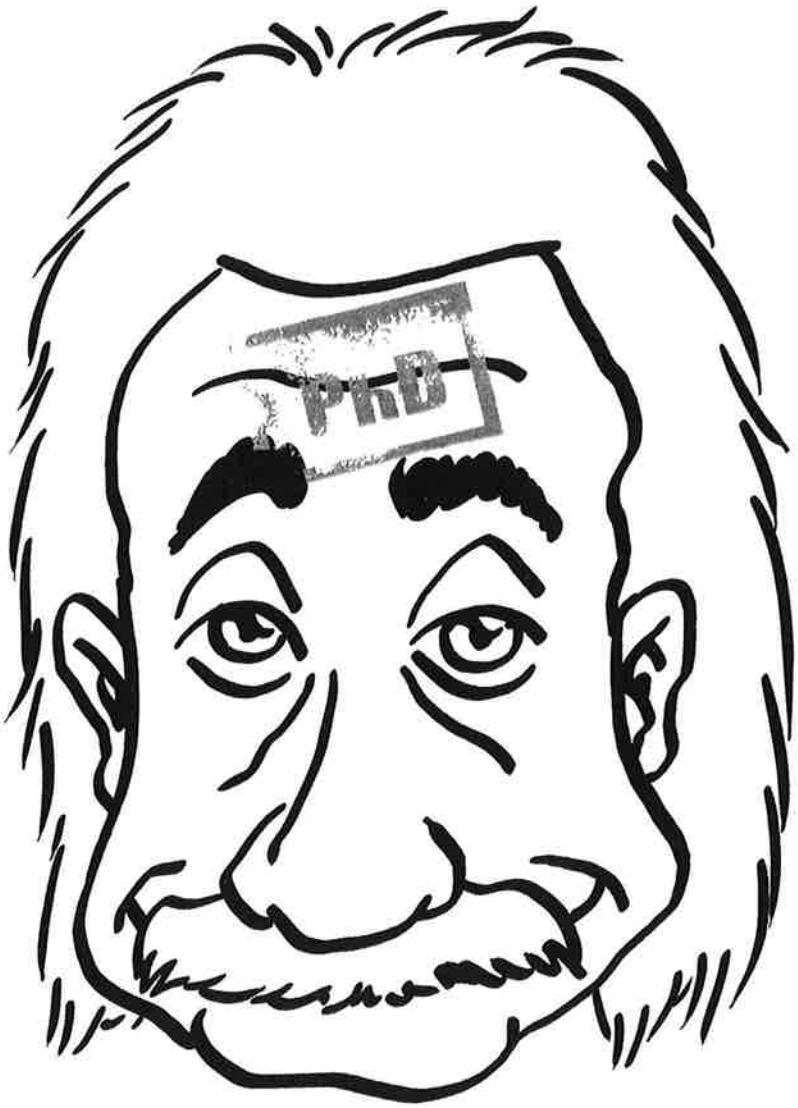
11de FirW Doctoraatssymposium



"The true sign of intelligence is not knowledge, but imagination"

FACULTY OF ENGINEERING

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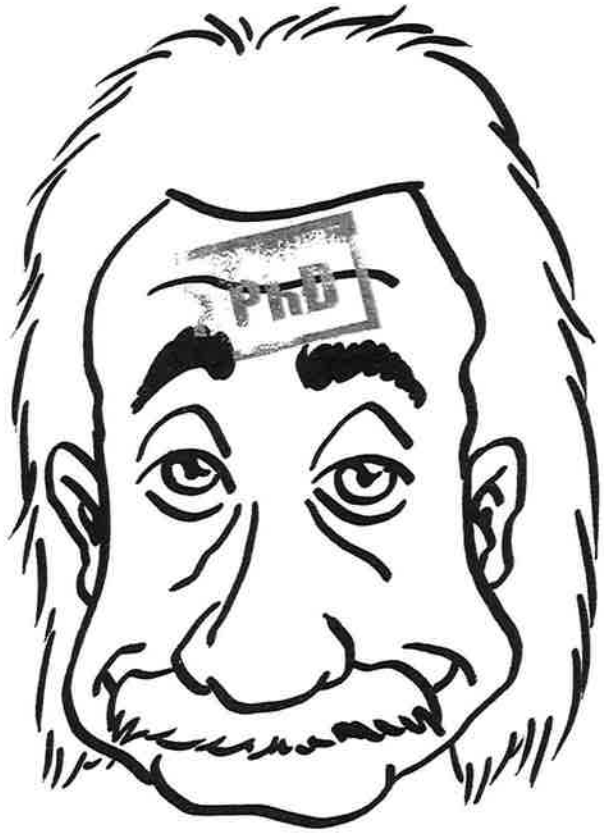

11de FirW Doctoraatssymposium

Aula, 1 december 2010

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Implementation of strain and ovalisation measurements in precast concrete tunnel linings

Ken Schotte

Supervisor: Philippe Van Bogaert

I. Introduction

Since many years, various theoretical models are used to design bored tunnels [1]. However, estimating the accuracy of the theoretical model output in comparison with the actual in situ behaviour remains very difficult, since few measurement results of actual tunnel lining behaviour are available.

The start of two large infrastructural projects has been an excellent opportunity to accompany the boring process with an experimental monitoring program. Through strain gauge measurements and ovalisation measurements at several cross-sections of the tunnel lining, the experience with and the specific knowledge of large-diameter shield tunnelling in soft soil is enhanced.

II. Strain Measurements

A. Measurement Projects

First measurements were completed in the Diabolo tunnel, a 1084 m long twin tube tunnel, shield driven below the runways of Brussels Airport. Currently the second measurement program is in progress. As part of the Liefkenshoek Rail Link Project, two single-track tunnels with an individual length of 5,970 m are to be created, undercrossing the River Scheldt and the Canal Dock.

B. Measurement set-up

Each tunnel ring constitutes 8 curved precast concrete elements. At specified cross-sections of the tunnel lining each such segment is equipped with strain gauges attached to the reinforcement bars and inner concrete surface. After installation, the continuous data logging allows for assessment of the real-time behaviour of the concrete segments under numerous loading conditions.

Figure 1. Precast concrete segments.

III. Ovalisation Measurements

In cooperation with the Department of Geography, ovalisation measurements are carried out at the same cross-sections using laser scanning. Comparison of both strain and ovalisation measurements forms a relevant part of this doctoral research.

IV. Conclusions

Results will show that despite the rough conditions on site, strain monitoring proves an important aid to evaluate both the applied construction materials and the theoretical models for tunnel design.

References

[1] ITA WG General Approaches to Design, *Views on structural design models for tunnelling*, Advances in Tunnelling Technology and Subsurface Use, Vol. 2 Nr. 3 pp. 153-228, 1982.

Ken Schotte is with the Bridge Research Group of the Civil Engineering Department.