Search[Home](#)[Copyright](#)[Preface](#)[Acknowledgements](#)[Committees](#)[Table of Contents](#)[List of Reviewers](#)[Author Index](#)[Search](#)[Help](#)

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QUANTIFICATION OF INSTALLATION INACCURACIES AND THEIR EFFECT ON THE DESIGN OF SEGMENTAL TUNNEL LININGS

KEN SCHOTTE¹, ALAIN DE WULF², PHILIPPE VAN BOGAERT¹, and HANS DE
BACKER¹

¹*Dept of Civil Engineering, Ghent University, Ghent, Belgium*

²*Dept of Geography, Ghent University, Ghent, Belgium*

ABSTRACT

The design of segmental tunnel linings requires a clear identification of loads during construction. Displacement monitoring of the Liefkenshoek tunnel in Belgium has shown important deformations occur in the first week after installation. Afterwards no significant deformations are measured. The manually-operated segment installation causes significant imperfections in joints between segments. These remain present during the lifetime of the structure, permanently disrupting the natural force transfer between individual tunnel segments. The joint irregularities obtained from ovalization measurements were used as input in an FE-model. Calculations showed that the resulting deformations do not correspond to the classical predictions. The installation imperfections cause a transfer of normal forces to the neighboring rings via friction in the ring joints. At the same time the bending moments show a distinctive disturbance in respect to the perfect tunnel ring. These results prove that the effect of installation imperfections should not be neglected in the design of segmental tunnel linings.

Keywords: Shield tunneling, Precast segments, FE-analysis, Ovalization monitoring.

[BACK](#) [Full Text \(PDF\)](#)

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- Home
- Copyright
- Preface
- Acknowledgements
- Committees
- Table of Contents
- List of Reviewers
- Author Index
- Search
- Help

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