



Delft University of Technology

Forensic analyses and hindcasting of the Breitenhagen levee failure

Kool, Job; Kanning, Wim; Jommi, Cristina; Jonkman, Sebastiaan N.

Publication date

2017

Document Version

Final published version

Citation (APA)

Kool, J., Kanning, W., Jommi, C., & Jonkman, B. (2017). Forensic analyses and hindcasting of the Breitenhagen levee failure. 11-12. Abstract from 7th International Conference on Flood Management 2017, Leeds, United Kingdom.

Important note

To cite this publication, please use the final published version (if applicable). Please check the document version above.

Copyright

Other than for strictly personal use, it is not permitted to download, forward or distribute the text or part of it, without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license such as Creative Commons.

Takedown policy

Please contact us and provide details if you believe this document breaches copyrights. We will remove access to the work immediately and investigate your claim.

Seventh International Conference on Flood Management (ICFM7)

5 - 7 September 2017

“Resilience to Global Changes - Anticipating the Unexpected”

University of Leeds, UK

Book of Abstracts

Oral Presentations

93. Forensic analyses and hindcasting of the Breitenhagen levee failure

Kool, J.J.^{1}, Kanning, W.* , Jommi, C.* , Jonkman, S.N.**

** Delft University of Technology*

1 j.j.kool@TUDelft.nl, Delft University of Technology, Faculty of Civil Engineering and Geosciences, Stevinweg 1, 2628 CN Delft, the Netherlands

KEYWORDS: Flood defences, Forensic analyses, Statistical analyses

ABSTRACT

The hindcasting of levee failures can provide valuable information about levee strength, strength models and dominant factors that contribute to failure. It is however not always clear how and why a levee failed as evidence (such as detail subsoil composition) is not present anymore.

This paper discusses a levee that failed in 2013 near Breitenhagen in Germany, which is called “the Breitenhagen case”(Grubert, 2013). The Breitenhagen levee failed due to long lasting high water level causing an inner slope instability slide. The resulting flood caused severe damage in the hinterland.

In order to investigate the failure, both visual analysis and sensitivity analysis is used to identify the most likely failure modes and most likely contributions to failure. The visual analysis is based on photo and video footage which makes it possible to provide markers that help to understand the whole system and reveal all possible causes of this particular levee. With the help of different sensitivity analyses a comparison is made between several different models, failure models(e.g. Bishop, 1954) in which mean values and upper and lower bounds are considered in order to determine which modelling choices would lead to (modelled) failure. The analyses contain next to the soil parameter variations, the influence of the roots of a nearby tree, the influence of long term high water and the influence of an old levee reparations which disturbed the soil structures.

The results show that best estimated of parameters do not necessarily explain the failures of the levee. It is likely that the main factors that help explain failure are transient effects and roots.

REFERENCES

Bishop, A. (1954), The use of the slip circle in the stability analysis of slopes, First Technical Session: General Theory of Stability of Slopes, 7-17

How do our flood defences perform during floods? Ten years of lessons learned and putting them into practice

*Flikweert, J.^{*1}, Hollingsworth, C.**, Burdett, S.*** and Simm, J.*****

** Royal HaskoningDHV*

*** Environment Agency*

****Royal HaskoningDHV*

*****HR Wallingford*

¹ *Rightwell House, Bretton, Peterborough, PE38DW, +44 7887 632814, jaap.flikweert@rhdhv.com*

KEYWORDS:

- Flood events
- Asset management
- Lessons learned and continuous improvement
- Flood defence performance

ABSTRACT

Flood defences are only called into action a few times in their life, so if a large flood does occur, it is important to learn from their performance. The Environment Agency have carried out a structured review of defence performance after each of the major events since the 2007 Summer floods, up to and including the winter 2015/16 floods. These reviews have focused on lessons learned for asset management, at both local and national scale. This presentation will look back over the six reviews carried out in that period, drawing out overarching conclusions about how English flood defences perform during floods based on real life experience, and how this has driven and is driving improvements to asset management and design, supported by research.

The six reviews covered all major breaches or near-breaches, but also assessed assets that survived against the odds. Each review typically started with site visits to collate factual information but also to understand the local asset managers' point of view and collect anecdotal evidence, essential to establish the story of the flood event. This was used to determine the failure modes that occurred, supported by hydraulic/geotechnical modelling as required.