



**Forschungsprojekt "Beanspruchung von tiefen
Schächten in Deponien" (Phase 1)**
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Summary

The loads on leachate collection shafts are due to very large settlements of the waste causing shear stresses by negative skin friction and symmetrical and asymmetrical stresses as well. Damages as large inclinations of the shaft axis and deformation or even destruction of the shaft lining have been observed.

The stability of an unlined shaft in the waste is investigated in this project with the help of centrifuge model technique. Considering a shaft with a stiff lining, the amount and distribution of shear stresses caused by negative skin friction is investigated with special interest.

The modelling of an unlined shaft demonstrates an important bearing capacity of the waste which is activated by large deformations. The stability of the unlined shaft can be calculated using a simple plasticity approach and deformation dependent shear parameters to describe the shear strength of the waste.

Tests modelling a stiff shaft with direct contact between lining and waste show that the radial stress acting from the waste on the lining is characterized by K_0 - conditions found to $K_0 = 0.3$.

The placement of gravel between lining and waste has a contradictory influence on the stress and strain behaviour of the lining under symmetrical and asymmetrical loads. Under symmetrical loads the placement of the gravel leads to an increase of the radial stress and to an increase of the shear stress by negative skin friction acting on the lining. Under asymmetrical loads the ununiform distribution of the radial stresses can be reduced about 50 % by the placement of the gravel between lining and waste .

These results confirm the conclusions from field observations of existing shafts in landfills. Due to the variation of the boundary conditions in the field there is still some uncertainty concerning the design of such leachate collection shafts. The presented results show that centrifuge model tests are a powerful tool to investigate the interaction behaviour of shaft lining, gravel and waste, which is necessary to formulate design criteria.