Geotechnik im Bauwesen
Geotechnical Engineering
Univ.-Prof. Dr.-Ing. Martin Ziegler

Geotechnical Engineering

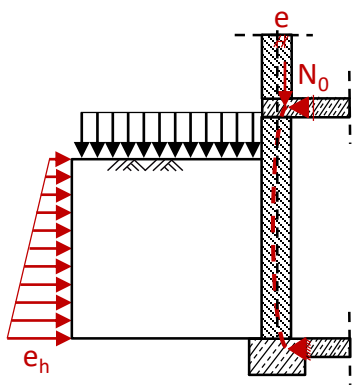
RWTH AACHEN UNIVERSITY

Investigation on the earth pressure load on lightweight masonry basement walls

Aim of the research project

The design of masonry basement walls is regulated in EC 6. Through the assumption of an eccentric normal force a curved pressure line in the masonry structure sets up. Besides a sufficient normal force this so-called “arc model” requires a gaping joint in the masonry structure. To achieve this requirement a sufficient flexibility of the basement wall is mandatory. Consequently a linear active earth pressure load is assumed for masonry basement walls. DIN 4085 classifies basement walls overall as almost rigid and therefore recommends to apply an increased active earth pressure load. The earth pressure distribution is affected by the supporting conditions of the basement wall and the compaction of the soil.

A holistic consideration of the material behavior, the earth pressure distribution and especially the interaction between soil and masonry is not included in the series of standards. EC 6 does not consider the effect of the soil properties and supporting conditions on the earth pressure distribution. DIN 4085 does not differentiate between the structural characteristics of different basement wall materials. The aim of the research project thus is the investigation on the load-bearing and deformation behavior of masonry basement walls and the occurring earth pressure load. Regarding the interaction between soil and masonry a suitable dimensioning approach shall be created.



Approach

On the basis of large-scale laboratory tests the load-bearing and deformation behavior of masonry basement walls and the occurring earth pressure distribution are investigated at a realistic scale. The implementation of the laboratory tests are separated in three phases. Initially, the masonry wall is raised and the normal force is induced on the top of the wall. Afterwards the soil is backfilled and an external load is applied on the soil in the final condition. To investigate the influence of boundary conditions test series with different bricks, mortars and loads on the top of the masonry wall as well as different soils and alternatives of backfilling and compaction are progressed. Besides the laboratory tests a numerical analysis will be implemented. By the means of a hypoplastic material law the tested soils are simulated to enable a determination of the described interaction between the soil and the masonry structure. Furthermore, boundary conditions are investigated beyond the experimental setup in the numerical analysis. Concluding the research project a dimensioning approach for lightweight masonry basement walls shall be created due to the experimental and numerical results.

Partner: ibac Institut für Bauforschung Bauwerkserhaltung und Polymerkomposite

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Contact

Jonas Willing, M.Sc.

Geotechnical Engineering
RWTH Aachen University
Mies-van-der-Rohe-Str. 1
52074 Aachen

Phone: +49 / (0)241 / 80-24172
willing@geotechnik.rwth-aachen.de
www.geotechnik.rwth-aachen.de

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