

## Safety against Hydraulic Failure with consideration of adhesion

Safety against Hydraulic Failure of an excavation pit bottom is regulated by DIN EN 1997-1 and DIN 1054:2010-12. To verify the resistance to failure by hydraulic heave and uplift it is possible to consider cohesion when sufficient user-expertise and –experience is given. The cohesion has to be reduced by applying an adjustment factor, if it is taken into account to verify safety against uplift in justified cases. Are both verifications necessary (heave and uplift) to ensure stability of the excavation pit in cohesive soil a consideration of cohesion/adhesion between the excavation wall and soil is appropriate. A high cohesion of soil has a significant influence on the values of soil resistance against hydraulic failure. The neglect of secured cohesion/adhesion of soil leads to uneconomic dimensions of the excavation pit due to safety against hydraulic failure. The standards applied do not deliver reliable instructions to consider cohesion/adhesion. The aim of this research project is the determination of the effective adhesion between pit wall and soil and the inclusion in the verification of resistance to hydraulic failure.

Gained experience, collected data and soil samples in the course of construction the sewer „Emscher“ will be used to complete the research project. Based on a literature research a testing program and a appropriate testing method for direct shear tests of the emscher-marl sheared against the surface of a slurry wall will be developed to determine the adhesion.

To measure the vertical displacement of the marl along the embedment depth as a result of unload by excavation und water pressure/flow pressure a extensometer chain is installed near to a slurry wall of one excavation pit. Reflecting the results of the direct shear tests of marl against a slurry wall surface conclusions concerning the activated shear stress are possible. To consider the influence of hydraulic action “uplift-tests” are provided. Those tests will investigate the effective adhesion in cases of hydraulic failure and shall be correlated to the shear tests.

### Projectpartners and sponsors:



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