

ANALYTISKA MODELLER FÖR BERÄKNING AV TJÄLLASTER MOT SPONTKONSTRUKTIONER

Naima Ozims^A, Staffan Risberg^A

^A KTH, Kungliga Tekniska Högskolan

Abstract

Earth retaining structures may experience increased loads due to frost heave in the soil. Frost heave occurs in cold climates when soil freezes, often leading to a volume expansion. If the expansion is constrained, frost heave pressures develop, which may cause failure in retaining structures. Eurocode 7 dictates consideration of frost action in design of geotechnical structures, but provides no further directions on how it should be incorporated. Although frost heave is a widely recognized phenomenon, anticipation of its interaction with retaining structures remains a challenge given its complex nature and strong reliance on local conditions.

To incorporate frost action in the design of sheet pile walls, some quantitative estimation of frost heave forces are required. Although this may be achieved through numerical modeling, the substantial uncertainties in data favours more simple analytical or empirical approaches grounded in readily quantifiable variables. These may include soil frost susceptibility, wall stiffness, and sustained freezing index.

The work presents two analytical models for a single- and multi-anchored sheet pile wall, respectively. The models incorporate the interaction between the frost heave and the resulting frost heave induced pressure through an iterative calculation scheme. Calculated frost heave forces were compared with measured anchor loads from two case studies. The results showed variation and some overestimation of anchor loads. Additional data is required though, before the presented model can be either validated or rejected.