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Abstract of the doctoral theses by MSc ENG Bartłomiej Olek

Quasi-filtration phase of consolidation identification in terms of the new interpretation method of consolidometric test

Magnificent, uncoupled Terzaghi's theory of consolidation depends on number of assumptions that deeply restrict ability to predict applied analytical model in the engineering. Despite developed more complex models, the solution of Terzaghi is still popular among the engineers involved in predicting rate and amount of the settlement of cohesive soils, because of its simplicity and universal acclaim. For the main purpose of present investigations was to examine key aspects of the accepted theory of consolidation and to elaborate proper methods of interpretation of laboratory test to account for filtration and rheological factors determining the final result of the analysis. For this purpose, the authorial application using Microsoft EXCEL – ConAnalys 2016©, has been developed and described in details.

ConAnalys 2016© software represents a rich package of analytical tools available to the user, where in a simple and a quick way we can get basic parameters of consolidation such as: coefficient of consolidation (c_v), coefficient of permeability (k_v), compressibility index (C_c), secondary compression index (c_α) and coefficient of volume compressibility (m_v). ConAnalys 2016© package was created in a modular system, where each module responds a single interpretation tool. Four of the eight modules enables user to examine for determination of coefficient of consolidation. Available methods are mainly based on the curve fitting procedure (8 methods) and they are classified as classic graphic methods. "*Compare Consolidation behaviour*" which is a separate module, forms an analytical tool which allows to estimate the authoritativeness of determined consolidation parameters, taking into account the degree of compliance of the experimental and theoretical course of this process. The prime criterion was the requirement of quasi-established of coefficient of consolidation, which involved the investigation of its variation, treated as a function of degree of consolidation (U). A relevant advantage of this module is the ability of comparison of the experimental and theoretical course of consolidation on single diagram $\log_{10}(H^2/t)$ – U. Theoretical curves $\log_{10}(H^2/t_{theor})$ – U are drawn automatically and they enable user to check accuracy of predicted value of coefficient of consolidation which have been determined by various methods. The use of multi-criteria analysis approach allows the separation of the curve in the region of quasi-filtration behaviour and it was based on the separation from the measurement data at range, where this process takes place in a manner most similar to

the theoretical solution. Quasi-filtration consolidation phase is characterized by constant values of coefficient of consolidation for a significant subsidence progress. In this kind of case the soil is treated to be complied with the theory and it can be defined as „Terzaghi's soil". The modelling which is based on the course of uniaxial strain, a quasi-filtration phase of consolidation appears after application rectangular excess pore-pressure distribution, in the axis of the sample. Parabolic distribution is proper for distribution of pore pressure and it is based on values obtained from a series expansion of the solution, when the degree of consolidation (U) is defined by registered values of pore pressure.

Using the results of a well-programmed experimental investigation on clay paste and clay-sand paste, factors that affected the progress of quasi-filtration consolidation have been studied and described. Except realizing cognitive goals, the methodological recommendations connected to interpretation of IL type testing have been elaborated and they can be successfully used for every type of cohesive and organic soils and for others that cannot be determined by classic interpretation methods.