Abstract

The aim of the doctoral thesis was to analyze the stability of slopes with diversified geological structure covered by landslide processes. Such analyzes are usually carried out for landslides on which structural protection and construction works are planned. An important element is proper documentation of parameters that should form the basis for stability calculations. For the purposes of this dissertation was used GEO-5 program - a modulus of slope and slope stability, which is very popular program.

In the first part of the work, the main goal and sub-objectives were defined, and research hypotheses were formulated. Current geological surveys concerning landslide areas of southern Poland were also discussed. The general characteristics of 9 research areas on which inclinometer columns were installed have been presented.

In the second part, landslide test methods were characterized, which were carried out in accordance with the scheme: field works, laboratory tests, inclinometer measurements and slope stability calculations for selected computational cross-sections.

The third part presents the characteristics of individual areas and geological conditions of mass movements in southern Poland. Landslides that were analyzed are located within the outer Flysch Carpathians, included in the Magura tectonic units (Maków Podhalański - Hospital, Stary Sącz – Stroma Street, Kąclowa), Silesian series (Jaszczurowa, Jasło-Podzamcze), under Silesian series (Ochojno), Grybów series (Kurów), as well as the Miechów Basin (Sadów) and the Carpathian Depression (Chełm). A geological structure as well as hydrogeological conditions have been characterized for each landslide.

The fourth part presents a detailed description of selected 9 landslides. Each of the selected landslides was recognized surface and in depth. This diagnosis allowed to create a landslide model based on geological research. As a result of a detailed analysis of the drill cores and the detected shear surfaces in the form of clear mirrors, the main slip surfaces have been determined. In each of the discussed landslide areas, inclinometer boreholes were installed in which measurements of depth displacement were carried out using the probe.

The fifth part presents the results of laboratory tests and inclinometer measurements. The results obtained from laboratory tests have been compiled in parameter tables characteristic for individual series and geological engineering layers. For each landslide area, stability calculations were performed, where the slip surfaces was modeled on the basis of data on the shear areas from field works and laboratory tests. For the assessment of the impact of the selection of the parameters of geological-engineering on landslide slope stability calculation

was carried out using the draw method (B) the results of the standard PN-B-03020: building soils-direct foundation structures-static calculation and design. The verification of the assumptions was carried through the calculation taking into account the data from inclinometer measurements. The resulting displacement depths have been introduced on the calculated cross-sections from inclinometer measurements and calculations were made by comparing the obtained results. Calculations were also carried out by reducing the strength parameters resulting from the hydration of landslide colluvium. Adjusting the slip plane resulting from the development to the result models from laboratory tests and inclinometer measurements results are very similar for most landslides. It should be stated that through appropriate documentation of landslides and neighboring areas, the depths of the slip surface can be determined by locating the shearing surface, which can be later monitored e.g. by mounting inclinometer tubes in the boreholes. The impact of geological structure in reference to the location of landslides within tectonic units has great importance when activating such areas. On the basis of the analyzes carried out, shale and normal flysch areas, as well as hillsides made of clayey rocks, are exposed to further landslide processes, such as landslides in Sadów, Stary Sącz and Jasło. The results of the analysis indicate clearly, not to carry out the analysis of stability using strength parameters of the PN-B-03020, because for each area obtained larger values stability indicator in relation to the calculations performed on parameters from laboratory studies.

In the work are proposed procedures for the preparation of geological and engineering documentation on landslides. Too shallow geological survey is the most common cause of incorrect documentation of such areas. Proper drill technology with double core allows to eliminate errors of too shallow or incorrect identification of the ground and is recommended for research especially in the Carpathian flysch.