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The Characterization of Flysch Rock in Albania with Field and Laboratory Testing

Ardita Malaj*, Ilda Rusi, Anastas Meço, Danjel Faca, Skender Allkja

A.L.T.E.A & Geostudio 2000 ltd, Tirana, Albania

Abstract

Albania has approximately 2/3 of its surface of flysch rocks. In areas where these rocks are present, are built several important objects, such as roads or hydroelectric power plants. These rocks are problematic for the slopes stability. The authors of this paper, to provide technical solutions for slopes stability of roads and the parts of hydropower objects (dam power house), have performed a significant amount of field and laboratory tests. On site testing included: quantitative description of discontinuities in rock masses; orientation, spacing, persistence, roughness, edge strength, aperture, filling, seepage, number of sets, block size and drill coring. Laboratory testing included: water content, porosity, density, absorption, swelling pressure, uniaxial compressive strength, point load test (PLT), Brazilian tensile strength (BTS) and direct shear test (DSH). A.L.T.E.A. & Geostudio 2000 l.t.d has been conducting 800 m drilling to determine the quality of flysch rocks. More than 100 samples, of flysch rocks (mudstone and sandstone), from the formations that form the Devolli and Osumi valleys, were taken and tested. The geotechnical calculations for the stability conditions of the slopes are made based on the data, obtained by the test results. The slopes of Devolli and Osumi valleys are monitored by means of inclinometers, which indicate any movement that has taken place, through time and weather conditions' changes.

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Keywords: discontinuities; rock masses roughness spacing; drill core; inclinometer swelling; uniaxial compressive strength; Brazilian tensile strength; direct shear test; point load test

* Corresponding author. Tel.: +355689027743.

E-mail address: ardita.malaj@alteageostudio.com

1. Introduction

The authors have studied the flysch deposits, in Albania, in two valleys, those of Devoll and Osum's rivers, located in the central part of Albania. Due to the numerous, important, engineering projects, such as: roads, hydro-electrical power stations and an international gas pipeline, various detailed geological and geotechnical studies, have been undertaken, for these regions. [1] The region of Devolli & Osumi valley, is composed of flysch rock, from the top, down to the bottom of the valleys. The flysch rock mass is characterized by lithological heterogeneity, due to the frequent vertical and lateral alternation of the different lithological sequences. Morphologically, they are "V" shaped valleys with steep slopes. Most of the slopes are stripped of vegetation. Knowing the factors of influence, it is also possible to predict the necessary engineering measures that will need to be deployed for slope stabilization. Geotechnical studies are essential, in order to determine the physical and mechanical properties of present rocks and soils.

2. Geotechnical analysis

Geotechnical analysis aimed to estimate the physical and mechanical rock mass properties organized in:

- Engineering-geologic survey, see Fig. 1, Fig. 2, Fig. 6
- Drilling, sampling, inclinometer measurements (in our cases see the results for one year period measurements), see Fig. 4, Fig. 5 and Fig. 6.
- Laboratory testing and results, see Fig. 7 up to Fig. 9 and Fig. 12
- Results interpretation of field and laboratory testing, Fig. 8, Fig.9, Fig. 10 and Fig. 11,

Engineering-geologic survey was performed with the aim to evaluate engineering-geologic conditions of the study site, to obtain soil and rock characteristics in the area, as well as initial data acquisition for carrying out works on protection of engineering constructions against aggressive impact of the environment. Based on the results, geological planning, geological mapping and cross sections were conducted. We determined the rock structures, in our case, they are mainly composed of sandstone and mudstone, Pg_3^1 , Pg_3^2 , Pg_2^2 , see Fig. 1. a), Fig.1. b), Fig. 2, Fig. 3 and Fig. 6.

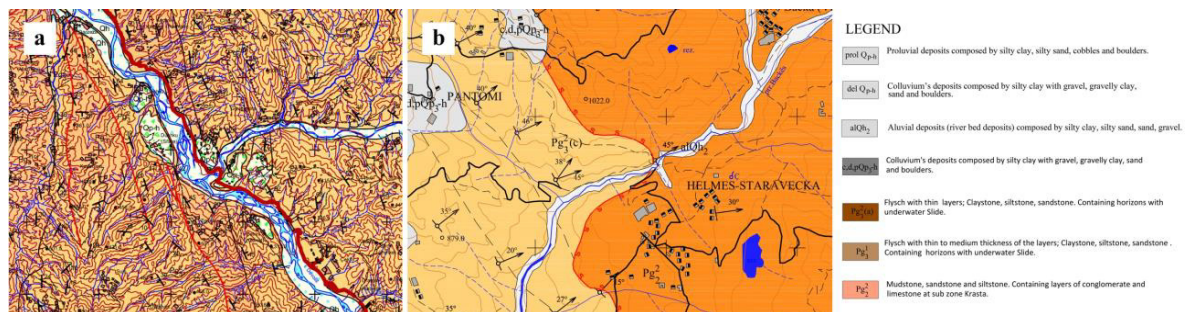


Fig. 1. Geological maps of the studied zone (a) Devolli valley; (b) Osumi valley.

The following cross-sections show the two main situations that can be encountered, in terrain, in both valleys:

- On the left side of Devoll's valley, Fig. 2a, conditions favor slope stability as the geological layers dive in the opposite direction of the slope.
- On both valley sides of the river Osum Fig. 2b, conditions do not favor slope stability, because the layers dive in the same direction as the slope. [1]

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