SEISMOLOGICAL ENGINEERING STUDIES FOR ROCK FOUNDATIONS OF PROPOSED DAM SITES, SOUTH SINAI PROVINCE, EGYPT

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The seismic refraction survey was conducted to obtain the ground models at 5 individual sites, South Sinai province. They are proposed locations for dams. For each site, the foundation parameters for civil engineering purposes were evaluated. These are: the N-value, the concentration index, and the foundation material bearing capacity and the stress ratio.

The mechanical properties of rocks were evaluated for the different sites using seismic refraction technique. The amplification characteristics of SH-waves in the layered soil were calculated using the multiple reflection method.

A seismic coefficient was obtained using the peak acceleration on the ground surface which was estimated using the fault parameters of the hypothetical Gulf of Aqaba earthquake with $M = 6.9$.

Keywords: foundation; rock properties; seismological engineering; Sinai peninsula

Introduction

The seismic refraction technique, at the present time, is considered as the most accurate geophysical method to investigate the shallow structures of a zone. This method can be applied for engineering seismology, as building of tunnels, dams, in case of exploiting landslides, quarries, roads, reclaimed lands, caves and cavities.

The seismic parameters are important for solving problems for various civil engineering purposes. Therefore, SH-wave can be used to study the vibration characteristics of the subsurface layers which are important for earthquake resistant structures design (Kanai 1983).

Description of seismic profiles

The seismic refraction survey was conducted at 5 individual sites in South Sinai province, which were planned to be locations for dams. The survey was done to obtain the P- and SH-waves.

At each site two profiles were done perpendicularly to each other, each one is 91 meters long with an interval of 7 meters between a pair of geophones. Each profile has three shot points, from the two ends of the profile and in the mid point. Figure 1 shows the locations of the study sites.

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Interpretation of seismic refraction data

Many interpretation techniques are published in seismic refraction data analysis; each of them depends on the character of the refractor. The travel time–distance curve can easily be obtained, the constructed time–distance curve contains a number of linear segments, and each is corresponding to a subsurface layer. The depth of the individual interface can easily be determined. The seismic signals are recorded using engineering seismographs. The P- and SH-waves were picked up as first arrivals. A detailed analysis was applied to calculate the velocities of P- and SH-waves and the depth of the interfaces. The travel time–distance curves and the corresponding cross-sections for P-waves were obtained for the different shotpoints. The depth of the interfaces is obtained from the P-waves travel time–distance curves. The following results are obtained for the different sites: