GEOLOGY SEMESTER IV

GT 403 – ENGINEERING GEOLOGY AND ENVIRONMENTAL GEOLOGY

Topic : Canals – site investigation

Site investigation

By geological mapping

At the initial stage of site investigation, study of aerial photographs gives a quick appraisal of the morphological and geological features of the area.

Geological mapping of the area is then undertaken along the canal alignment extending over at least 50 m on both the sides.

The geological map will show the soil-covered area and rock outcrops. The boundaries of different types of soil are to be demarcated, and the types of rock and their degree of alteration, attitudes, and weak structural features are to be plotted.

If any cultivated land falls within the canal alignment, it is to be delineated in the map. During mapping, care should be taken to plot the slide-prone areas where slope stability measures may be necessary.

The areas of tectonic disturbances, pervious grounds, boggy areas, quicksand, and subsiding grounds are also to be plotted, and care should be taken to avoid such unfavorable grounds wherever practicable.

The geological map will provide the base for further exploratory works by trial pits and drill holes for the canal alignment.

Exploratory work

Pits may be dug where the canal grade is available within a couple of meters below the ground level. The type, in-situ density, and field permeability of the soil are measured in the pits.

Drill holes are made at 300–500 m intervals up to a depth of 3 m below the estimated level at canal invert. However, if fresh rock is available at the upper horizon and geological knowledge indicates continuation of the same rock at depth, the drill hole should be restricted to only 3 m in fresh rock.

If there are variations in soil or rock types, additional holes, even at intervals of 50 m, may be drilled to cover the varied types of strata.

Diamond core bits are required for obtaining cores for study of rock features at depth and laboratory tests for rock properties. While drilling in soil, samplers may be used to collect undisturbed soil samples from depths down to canal level.

The soil samples obtained from canal grade from pits and drill holes are tested for various parameters, especially those related to soil stability analyses.

If there is any anticipated major weak feature (e.g., fault)continued at depth for a long stretch, seismic survey is carried out to determine how far it has affected the canal media.

The seismic survey reveals the thickness of overburden and bedrock profile. Electrical resistivity survey helps in the detection of pervious strata such as sandy and silty beds.

The logging of soil or rock cores will provide data on the soil or rock type and the condition of rock including the thickness of soil zone formed by in-situ decomposed or alteration of bedrock and the dip of bedding, intensity of joints, and weak zones such as a fault.

The samples of rock and soil obtained from drilling are sent to the laboratory for quantitative data related to their strength parameters and other engineering properties. The swelling index and clay minerals present in the canal bed are determined in the laboratory.

A cross section along the alignment is prepared based on surface mapping and drill hole data to portray the subsurface rock or soil condition up to a depth of 3 m below the canal floor.

The approximate extent or volume of rock or soil cutting required for the canal can be estimated from this geological profile.

The data on soil and rock cuttings helps in the estimation of cost for contractual purpose.

The more the bore holes, the more will be the accuracy of the estimate. The geological section and data of subsurface explorations are needed for the design of the canal.

Source :

- Peter T. Bobrowsky_ Brian Marker - Encyclopedia of Engineering Geology-Springer International Publishing (2018)
- Subinoy- Gangopadhyay- Engineering Geology, first edition, (2013)