

# Commentary on Surface and Borehole Geophysics for Concrete Dam Rehabilitation

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## DESCRIPTION

Concrete dams require periodic rehabilitation to ensure their safety and integrity. Geophysical surveys play a crucial role in assessing the subsurface conditions and identifying potential problems that may lead to dam failure. This article reviews the application of surface and borehole geophysics for the rehabilitation of a concrete dam. The methods used include electrical resistivity, seismic reflection, and borehole logging. The results of the geophysical surveys provide valuable information that is used to plan the rehabilitation work and ensure the continued safe operation of the dam.

Concrete dams are essential infrastructures for water storage, flood control, and power generation. Over time, concrete dams are subject to various types of damage, such as cracking, spalling, and erosion. These damages can affect the structural integrity of the dam and lead to catastrophic failure if not addressed in a timely and appropriate manner. Geophysical surveys are useful tools for assessing the subsurface conditions and identifying potential problems that may cause dam failure. This article describes the use of surface and borehole geophysics for the rehabilitation of a concrete dam.

## Surface geophysics

Surface geophysics involves the measurement and interpretation of geophysical properties of the subsurface without drilling. Electrical resistivity and seismic reflection are the two most commonly used surface geophysical methods for dam rehabilitation. Electrical resistivity surveys provide information on the electrical conductivity of the subsurface materials. This property is related to the presence of water, clay, and other minerals that affect the mechanical properties of the dam. The resistivity surveys can be used to identify areas of high or low water saturation, voids, and fractures in the dam foundation. Seismic reflection surveys use sound waves to image the subsurface layers and identify anomalies that may indicate potential problems. The method is particularly useful for detecting bedrock depth, faults, and fractures that may affect the dam stability.

## Borehole geophysics

Borehole geophysics involves the measurement of geophysical properties in drill holes. Borehole logging is a commonly used method for assessing the subsurface conditions of a dam. The method involves lowering probes with sensors that measure various geophysical properties, including electrical resistivity, acoustic velocity, and natural gamma radiation. The data collected from the probes are used to construct detailed subsurface models that provide information on the rock and soil types, water saturation, and fractures. The borehole geophysical surveys are useful for identifying potential problems such as seepage, piping, and deformation of the dam foundation.

## Application of geophysics for rehabilitation of a concrete dam

The application of geophysics for dam rehabilitation involves several steps, including survey planning, data acquisition, data processing, and interpretation. The first step is to plan the survey based on the dam's condition and the rehabilitation objectives. The survey design includes selecting the appropriate geophysical methods, data acquisition parameters, and data processing techniques. The next step is data acquisition, where the geophysical data are collected using specialized equipment and software. The data processing involves filtering, editing, and interpreting the data to produce images and models of the subsurface. The final step is interpretation, where the geophysical data are analyzed and integrated with other data sources, such as geologic maps and borehole logs, to identify potential problems and plan the rehabilitation work.

Geophysical surveys play a crucial role in the rehabilitation of concrete dams. Surface and borehole geophysics provide valuable information on the subsurface conditions that affect the dam's stability and integrity. Electrical resistivity, seismic reflection, and borehole logging are commonly used geophysical methods for dam rehabilitation. The results of the geophysical surveys are used to plan the rehabilitation work and ensure the continued safe operation of the dam.

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