Medicon Engineering Themes
Volume 6 Issue 6 June 2024
Article Type: Short Communication
ISSN: 2834-7218

# Gypsiferous Soils and *Gypsum* Beds

**Hayder A Al-Bahadily***

*Department of Geology, Iraq Geological Survey (GEOSURV), Iraq*

***Corresponding Author:** Hayder A Al-Bahadily, Department of Geology, Iraq Geological Survey (GEOSURV), Iraq.

**Received:** April 11, 2024; **Published:** May 31, 2024

Civil Engineers encounter serious problems when dealing with structures (buildings, roads, dams, etc.) built on gypsiferous soil or near-surface *gypsum* beds. However, *gypsum* ($CaS0_4.2H_2O$) in soil with small quantities is beneficial for plants, due to its soluble properties in the water. So it has two impacts on our lives; negative and positive. This article sheds some light on the economic impact of soil with high *gypsum* content. Such soil is distributed worldwide and some examples from Iraq are presented afterwards.

In north Iraq, rainfall in the mountainous regions dissolves considerable amounts of *gypsum* beds of the Miocene age (ended about 5.33 million years ago). In vast areas of lowlands and plains, dissolved materials are redeposited with fine-grain sediments, forming (secondary) *gypsum* or gypsiferous soils.

When surface water infiltrates the soil, the *gypsum* can be easily dissolved and discharged leaving voids of different sizes and depths in the soil. The evolution of such voids continues with time passing forming subsurface cavities that are connected together and following the groundwater paths of movement.

Al-Mosul Dam, the largest dam in Iraq with a capacity of 11.1 billion cubic meters, is located in the mountainous area in the north of Iraq. This dam was constructed on the Fatha Formation, which is composed of thick beds including anhydrite (the same chemical composition of *gypsum* without $H_2O$) beds. The water in the dam lake penetrates through fractures and dissolves the deep *gypsum* beds leading to water leakage. Some regions around the dam banks showing surface depressions due to the subsidence of the overlying layers.

In the plains and lowlands, where eroded *gypsum* is redeposited, buildings constructed on gypsiferous soil will suffer from differential subsidence (see the photo below, from Kirkuk Silo, north Iraq) that causes exorbitant economic damage and considerable (geological) risks. Such dissolution also causes floor depressions, wall and roof cracks, and vertical and horizontal wall displacements.

Geophysics can participate in delineating the locations of subsurface cavities and other weak zones using a gravity survey. The survey detects small-scale density contrasts in the subsurface, where cavities and other weak zones are denoted by low (or negative) gravity anomalies.

The locations of these anomalies assist civil engineers in doing their treatments on the affected site. Such treatments are usually performed by cement injection a process known as grouting. Preventing groundwater movement by inserting sheets around the site could stop groundwater drainage and limit the dissolution of *gypsum*.


Photo on the top of the main building of Kirkuk Silo showing cracks and a horizontal displacement resulted in differential subsidence and rotation (note the pen as a scale). The photo was taken by Hayder A. Al-bahadily.

**Volume 6 Issue 6 June 2024**