Journal of Research on Archaeometry, 2019; 5 (2):35–46

Journal of Research on Archaeometry

DOI: 10.29252/jra.5.2.35

URL: http://jra-tabriziau.ir/

Original Paper

Investigation of the clay resources in Chogazanbil area for preparation of the mud bricks optimized for the restoration purposes

Soheila Zakavi *

M.A. of Conservation-restoration, Head of laboratory, Choghazanbil and Haft Tappeh world heritage department, Khuzestan, IRAN

Received: 11/06/2019 **Accepted: 13/10/2019**

Abstract

The largest known architectural work of Ilam civilization is the temple of Choghazanbil from Medieval period, in Southwestern Iran (Khuzestan Province), dated to the 13st century BC. The temple has been made by terrestrial soil that has been taken, along riverbanks whose water content is unlimited, indicating wood for directional burning various uses, especially brick firing (and suitable soil for the production of bricks and mortar).That was done however more or less the same as today. The largest volume consumption of materials in Choghazanbil was based on clay that is a major element in the construction of architectural structures. The major architectural elements of historic site of Choghazenbil were bricks and adobe that have been covered in past marbles, but have become dull as time goes by. This research undertake for identifying appropriate clay reserves for optimal restoration purposes of the monuments. The material has been studied quantitatively and qualitatively by physical and chemical methods, in order to clarify what are the affecting factors for selection the best clay based soil for optimal restoration. In this regard, geological formation around Chogazanbil have been studies based on the previous research and in the highlighted locals as A, B, C, D, E, G. Investigations on alluvial deposits of R1, R2 carried out by XRD, XRF, grading, hydrometric and Aterberg boundary. Based on the obtained diagrams, the non-sandy soils contain most of the silty fine grains. This will assume the highest paste index or PI corresponds to sample C and the lowest PI to sample R1. Inflation potential was also found in pastures B, D, E, R1, R2 based on paste index. However, the swelling potential of C and G3 mines was moderate. The results of mineralogical experiments showed that calcite and quartz are the most minerals in the studied soils samples. Calcite in the soil, besides being a deterrent to inflation and divergence due to the presence of clay minerals, can also increase the strength of clay materials. The soils were poor quality in terms of high quality clay minerals such as kaolinite and montmorillonite. XRD analyses show that the amount of silica, in sample E is optimal for clay preparation. This effect makes the clay with high adhesion and strength coefficient produced by calcite. The amount of chlorine and sulfate ions in the soils of B, C, D, E, and G3 areas were also higher than the permitted amount. Sodium and potassium chloride have an important role in swelling and divergence of clay because of monovalent ions in their crystal chemistry. Indeed the soils were divergent soils, due to their salt content and therefor, show little resistance to humidity and water. Discriminating of that, excessive calcite in the samples can be considered as a deterrent agent for rapid inflation. Sulfate can also cause adhesion in the vicinity of moisture and by the latent phenomenon of fracture. The coherence factor of clay structures can effects of this phenomenon and probably most damages on the clay based structure of the Choghaznabil area are the result of this point. Based on the results obtained, the soils reservoirs around Choghaznabil are far from common daily standards for norm brick making, but after refining and valuable preparation, followed by processing, molding and drying can optimally have better mechanical behavior and

* Corresponding author: zakavi105@gmail.com

might be reused for construction. Moreover, the soils samples from R2 and G3 have appropriate grain size than other soils around the area. In this case of study, the best recipes can be achieved by mixing this kind of soil with sand and straw for avoiding the cracks, which had considerable deterioration factor in the vicinity of the humidity and moisture. Optimum handling and processing of the clays from R2 and G3 areas are capable to improve the mechanical behavior of the repaired clay for reusing in the restoration of Choghazanbil.

Keywords: Choghazanbil, Clay resources, Restoration mud brick, XRD, XRF