

Air pollution and soil mechanics affected on the architectural installations, as applied to the fountain of king farouk's palace in El-rakan, Helwan, Egypt

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Abstract

The corner palace of King Farouk is located on the eastern side of the Nile River, and the fountain, which is the subject of this research is located in the palace in the outer courtyard, where it consists of a central octagonal axis that stands out from four facades, four heads of which are seven heads in a perpendicular position, and four human statues are based, two of them for two children, and the other for two men with aesthetic proportions in them. The anatomy, where we find the bodies represented in an artistically complete picture with no defects in sculpture.

The fountain suffers from a high percentage of minerals appearing in the form of salts on the surface and the multiplicity of shapes and sizes of their crystals for their diversity, including sulfur, carbon, and chloride minerals, in addition to the effect of mechanical movement of the fossil soil mass (subject of research).

Where the fountain is eclipsed in the courtyard of the palace in an industrial area, which is Al Tebeen, where factories are abounded without a filter to purify the air of the resulting gases such as carbon dioxide, sulfur dioxide, and others.

In addition to the traffic from heavy and light trucks, which leads to damaging effects on the fountain, as the road is next to the palace.

Aim of the research

This research aims to work on restoring the fountain, by restoring and treating all aspects of damage that appeared on the technical, engineering, and construction components of the fountain.

Introduction

The Helwan Corner Fountain, which is located inside the courtyard of the palace (Rukn Museum in Helwan), is one of the most important and beautiful designs of archaeological marble fountains in terms of structural and artistic design.

.*Soil mechanics and weathering have played a big role in damaging that fountain, so serious manifestations of damage have appeared, including the decomposition of the surface of the fountain statues and the appearance of some cracks and blooming salts on the surface from the influence of the capillary property in addition to the chemical reaction that occurred as a result

of the presence of that fountain in an environment with a high percentage of acidic gases like carbon dioxide, sulfur dioxide, carbon monoxide, and oxygen in addition to the high evaporation rate, in the area .

The palace is located on the eastern side of the Nile, in the form of a boat anchored on the eastern bank of the Nile.

Due to its presence near the Nile directly, it becomes clear the reason for the transmission of water under the surface by leaching and soreness with the occurrence of swelling in clay soils, under the mass of the marble fountain.

It is clear from the foregoing the importance of restoration, treatment and preservation operations. This rare effect consists of a statue of two men and two children interchangeably, where the water comes out of the mouth of each of them, but with the succession of time the fountain stopped working.

Deterioration factors and symptoms

Symptoms

- 1) The emergence of cracks and disassociation of the external octagonal component of the fountain basin.
- 2) Crystals of salts appear on the surface, including fibro, needle, and bulk, which appear clearly on the facades of the statues.
- 3) The emergence of a decomposition of the components of the marble (carrara) and its decomposition in the form of weak powders from the effect of weathering factor.
- 4) The high percentage of moisture in the statues to the highest point of the influence of the poetic characteristic of the height of chemical solutions from the soil to the statues' body. This has worked on the appearance of black, brown and green color on some places, all statues, especially the two men statues.

Secondly, the factors that led to damage:

- 1) Air pollution and the activity of polluted gases that come out of the factory nozzles of the Helwan region, including:

* HCOOH, and also produces water. This gas industrial importance is not necessarily always malignant gas*Carbon monoxide: produced from the partial oxidation process (incomplete combustion of carbon) and organic compounds such as coal, and this occurs when oxygen is scarce, or when combustion with very high temperature and is considered one of the highly toxic gases and is a form of carbon and also some Oils and fats from machines and compounds, which is one of the heterogeneous diatomic molecules, because it contains two different components, carbon and oxygen. This gas can also burn, completing its incomplete combustion process, and it produces a blue fire, which can be produced in laboratories also by breaking up the acid,

* Carbon dioxide: is produced from fermentation of sugars, whether by chemical methods or by microorganisms, from decomposition of carbonates, and from the combustion of organic materials used in various industries, especially those that include some stages the interaction of water vapor with hydrocarbons, as well as from the complete combustion of organic materials, the dissolving of Carbon dioxide in the air in rainwater creates carbonic acid.

Results:

Through studying the factors that caused the damage, the study presents the application plan for treatment and maintenance:

- 1) Washing baths for the fountain body with water and brush were used to raise the carbon and dust materials sticking to it.
- 2) Make compresses of the clay and sand mixture after assembling inside a container to make a solution using brushes to form a layer on the body to absorb welded and calcified salts inside the fountain marble.
- 3) Washing with distilled water was used to remove the clay and the salts and minerals it contains in the form of salts, after 48 hours repeat this process and then test the rinsing water with a silver nitrate solution to ensure that the trace is free of salts and minerals that are in the form of salts and clean the body completely from all the planktons on it.
- 4) The body of the marble fountain is isolated using wax and polished with a piece of felt to isolate future damage factors.
- 5) For the broken arm, the arm has been wickered in the form of a circular triangle. Farmers were assembled and used an epoxy (from polymers recognized by global conferences) and it was left for 72 hours, farmers suspended it with a piece of gauze

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