

# The General Principle of the Authenticity and the Foundations of Monuments

## La Principe Général d'Authenticité et les Fondations des Monuments

C. Tsatsanifos

Pangaea Consulting Engineers Ltd., Athens, Greece

### Abstract

In general, authenticity in the restoration techniques has been considered only for the super-structures of historical monuments and not for their foundations. However, in some cases, the type of the foundation itself is a historical monument. In these cases, the type of the foundation might be preferred to keep its originalities. Hence, when we compare several methods of treating foundation system to conserve the historical structures, we recommend inclusion of the argument on the authenticity as well as those on cost, reliability, and technical difficulty.

**Keywords**—*Anastylosis, authenticity, foundations, monuments*

### INTRODUCTION

In his General Report of the Technical Session 4c: Preservation of Historic Sites of the 16<sup>th</sup> ICSMGE Iwazaki [1] quoted “Historic monuments of generations remain to the present day as living witnesses of their age-old traditions. People are becoming more and more conscious of the unity of human values and regard ancient monuments as a common heritage. The common responsibility to safeguard them for future generations is recognized. It is our duty to hand them over on in the full richness of their authenticity”.

The principles on the conservation and restoration of historic monuments were initially set at the 1<sup>st</sup> and 2<sup>nd</sup> International Congresses of Architects and Technicians of Historic Monuments held in Athens (1931) and Venice (1964) respectively, which adopted the so-called “The Athens Charter” and “The Venice Charter”.

“The Athens Charter” defines *anastylosis* as the conservation method that intends to keep the authenticity of the monuments: “In the case of ruins, scrupulous conservation is necessary, and steps should be taken to reinstate any original fragments that may be recovered (*anastylosis*), whenever this is possible; the new materials used for this purpose should in all cases be recognizable”, while in “The Venice Charter” it is stated that: “The process of restoration is a highly specialized operation. Its aim is to preserve and reveal the aesthetic and historic value of the monument and is based on respect for original material and authentic documents. ... Where traditional techniques prove inadequate, the consolidation of a monument can be achieved by the use of any modern technique for conservation and construction, the efficacy of which has been shown by scientific data and proved by experience”. In other words, *anastylosis* is nothing more than a reassembly of “existing” but “dismembered parts” which could be put together again provided that the material used for integration always be identifiable. Furthermore, “its use should be the least that will ensure the conservation of a monument and the reinstatement of its form” [2].

Balanos was the first and then his student Orlandos, both Greek Civil Engineers (Orlandos studied later on Architecture and Archaeology), who applied the theory of *Anastylosis*, Balanos for the restoration of the Acropolis of Athens monuments (Parthenon etc.) and Orlandos for the Poseidon Temple at Cape Sounio.

The authenticity principle was concluded in “The Nara Document on Authenticity”, drafted by the participants at the Nara Conference on Authenticity in Relation to the World Heritage Convention, held at Nara, Japan, 1-6 November 1994. Accordingly, the authenticity should be determined in a manner respectful of cultures and heritage diversity to include any variation of the regional tradition of conservation of heritage.

According to “The Athens Charter”, “The Venice Charter” and “The Nara Document on Authenticity”, reconstruction is to be “ruled out a priori”. However, reconstruction is extensively used for the “restoration” of ancient monuments in some parts of the world.

### AUTHENTICITY OF THE FOUNDATION

Generally, the authenticity has been discussed for the super-structures of historical monuments and not for their foundations. Interventions on the foundations have not usually been deemed necessary, while, some times, the foundations were not considered as one of the elements that consist historical monuments.

However, there are many examples where either the type of the foundation was developed in some special way according to regional characteristics, or the foundation itself was historical heritage. In these cases, the type of the foundation might be preferred to keep its originalities.

It was the summer of 1932, after a very dry season, that the lowering of the water level of the Kastoria Lake, Western Macedonia, Greece, revealed the existence of a great number of wooden piles at the south shore of the lake. Extensive archaeological excavations brought up about 2,000 piles (see Fig. 1), embedded by 0.20 m to more than 2 m in the soil, which consisted the foundations

of a Neolithic settlement of the 6<sup>th</sup> millennium B.C. [3]. It is obvious that these foundations are historical heritage by themselves and any interventions should take into account the materials and the methods of construction in the period of the original construction. Fig. 2 shows the reconstruction (not the *anastylosis*) of a part of the settlement.

Based on the authenticity and *anastylosis* principle, one could argue that also in the case of foundations only repositioning of all of the original material is allowed for



Figure 1: Wooden piles after the archaeological excavations at the site of the Dispilio Neolithic settlement at the Kastoria Lake, Western Macedonia, Greece



Figure 2: Reconstruction of part of the Dispilio Neolithic settlement at the Kastoria Lake, Western Macedonia, Greece

the restoration of monuments, however minute in size, to which only a limited number of new pieces, always identifiable should be added as absolutely necessary for the operation. However, over the years of the life of the monument, disrupting agents introduce changes in the prevailing geotechnical conditions of the site. “Natural agents like torrential rains, flooding or earthquakes, even tsunamis in coastal areas, may reduce shear strength or increase applied stress leading to bearing capacity failures. Anthropogenic agents can be equally disrupting and are mainly related to man – induced changes in water content within soil masses like leakage from cisterns, sewage water supply lines, construction of dams or channels, or, among others, excavations in neighbouring sites, con-

struction of buildings in the vicinity or tunnelling under the monument” [4]. Hence, the complete compliance with the authenticity and *anastylosis* principle is not always possible and major interventions have to be made in order to strengthen the foundation of the monument.

One of the main tasks of the ISSMGE Technical Committee TC 19 Preservation of Historic Sites is the development of a set of guidelines on the Geotechnical Aspects of the Preservation of Monuments and Historic Sites.

In his draft on the TC 19 Guidelines - General Principles of the Interventions, D’ Agostino [5] excellently presents the necessary procedures for the interventions on the monuments’ foundations having in mind the authenticity and *anastylosis* principle. He states:

“... it is necessary to analyse the global stability of the soil - structure unit, and of its immediately surrounding area. If the results are not satisfactory, stabilization measures need to be taken. Such stabilizations measures, however, should not modify the soil - structure relation and they must respect any archaeological finds that may be present.

Interventions on the foundations will have to seek to be uniform throughout the load – bearing area, with preference being given to the conservation of the existing foundation structures. In general, with a view to the best possible soil – structure relation, and assuming that there are no archaeological finds, it is preferable to consolidate the foundation system applying modern Geotechnical engineering methods of analysis and techniques.

The use of piles or micro-piles is to be avoided as they significantly alter the construction design and the state of stress of the underpinned structure and they require the introduction of extraneous structures for the distribution of loads into the ancient ones. Moreover, a different behaviour is induced between the underpinned zones and those where the original foundations have been saved, and this has often proven to be the cause for future structural damages. And finally, using piles definitively alters the location of the building itself and conceals forever any archaeological find that were to be present.

Where there are archaeological items and the foundations are in need of support (or reinforcement), the existing structures will have to be underpinned. Great care needs to be exercised in perfectly identifying the portions to be underpinned, and in carrying out the excavations.”

Stabilization measures concerning either the subsoil or the foundation of the monument may be attained by means of one of the following methods (or combination thereof) [6]:

- Strengthening of the foundation body
- Increase of the foundation bearing area
- Increase of the footing level of the foundation
- Provision of a slab underneath the monument or a box - type foundation in the underground area of the monument
- Provision of additional supports
- Underpinning of foundation by means of oscillated piles

- Underpinning of foundations by means of board piles constructed through body of foundation
- Subsoil improvement (cementation, silication, chemical and electro - chemical strengthening, high pressure grouting capable of stabilising the soil mass, deep soil mixing, etc.).

In addition to the aforementioned strengthening measures, further stabilization measures could include:

- Underexcavation (as for the Tower of Pisa and for the Mexico City Cathedral cases)
- Induced changes in the pore water pressures by local injection of water or by electro - osmosis
- Isolation or separation trenches.

From the above methods only those of strengthening the foundation body, increasing the foundation bearing area, increase of the footing level of the foundation, underexcavation and use of isolation or separation trenches seem to comply with the authenticity and *anastylosis* principle. The rest, in one way or another, alter either the soil conditions or the original soil – structure system. Iwasaki [1] presents some examples of the application of the *anastylosis* principle for the restoration of monuments (Borobudur, Angkor, Tower of Pisa, Floating Shrine at Hiroshima), as well as some others, where the principle has not been taken into account.

In any case, in treating the foundations of monuments, it is advisable to follow the general recommendations provided by “The ISCARSAH Charter” (International Scientific Committee for Analysis and Restoration of Structures of Architectural Heritage) of ICOMOS (International Council on Monuments and Sites) [7]:

- Each intervention should be in proportion to the safety objectives set, thus keeping intervention to the minimum to guarantee safety and durability with the least harm to heritage values.
- The design of intervention should be based on a clear understanding of the kinds of actions that were the cause of the damage and decay as well as those that are taken into account for the analysis of the structure after intervention; because the design will be dependent upon them.
- The choice between “traditional” and “innovative” techniques should be weighed up on a case-by-case basis and preference given to those that are least invasive and most compatible with heritage values, bearing in mind safety and durability requirements.
- Each intervention should, as far as possible, respect the concept, techniques and historical value of the original or earlier states of the structure and leaves evidences that can be recognised in the future.
- Intervention should be the result of an overall integrated plan that gives due weight to the different aspects of architecture, structure, installations and functionality.

The authenticity principle can be somehow violated in the case of interim or temporary remedial measures. For example, ballast, applied on certain areas in a monument or next to it to introduce corrective settlement to

compensate inclinations and tilts, is conceived as a temporary solution (e.g. at the Tower of Pisa and at many buildings in Mexico City) [3].

Finally, Iwasaki [1], in the presentation of the papers from the Technical Session 4c of the XVI<sup>th</sup> ICSMGE, considers the following factors for the evaluation of the proposed intervention:

- Cost
- Easiness
- Reliability
- Authenticity

In the case of the old building at Tartu University, Estonia, the comparison of the available methods of intervention shows that the underpinning with jacked piles is preferred because of several reasons including availability of manpower, simplicity, as well as cost. However, as far as the authenticity is concerned, reconstruction of the original wooden raft pile foundation is the best method to preserve the traditional type of the foundation.

In the case of the Northern Library, Bayon Temple in Angkor Thom, the best intervention method was to build concrete retaining wall inside the foundation. However, based upon the principle of the authenticity, soil mound is the best solution. The reliability of the soil mound is doubtful, because of the very steep angle with high height of the mound of 5 m. Slacked lime improved soil is more chemically stable than cement mixed soil. Keeping the authenticity of the manmade fill, soil mixed with slacked lime was selected for the reconstruction method of foundation mound.

## CONCLUSIONS

When we compare several methods of treating foundation system to conserve a monument, it is strongly recommended to consider the argument on the authenticity of the method to be used further to the obvious arguments concerning cost, reliability, and technical difficulty.

Furthermore, in selecting the suitable intervention technique we should keep in mind that a poorly designed intervention, that has not considered the principle of authenticity and *anastylosis*, could alter totally the behaviour of the soil – structure system, and this has often proven to be the cause for future structural damages.

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