# Excavation, restoration and conservation of archaeological sites - *Villa dei Quintili* on the Appia Antica in Rome

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## Abstract

In previous decades the dichotomy between archaeological research and engineering techniques had lamentable consequences for the restoration of archaeological monuments. Ignoring the latter's status as records of material history, interventions all too often reinterpreted ancient artefacts in terms of a modern structural outlook, producing alterations which proved to be highly damaging for the structural conservation of numerous outstanding monuments.
This paper presents the methodology and guidelines for intervention in the various phases of the excavation, restoration and conservation of archaeological sites. The theory and criteria it outlines are exemplified in the research project currently under way regarding the restoration of the grandiose Villa dei Quintili situated on the Appia Antica in Rome.

## 1 Introduction

In Europe our heritage of historical buildings constitutes the most tangible record of how civilisation has evolved. For thousands of years existing buildings were considered a sort of "artificial nature", to be refashioned according to the latest social and architectural requisites. They have thus undergone repeated transformations, recognisable as a systematic stratification: the imprint of history can be discerned both in the configuration of the buildings and in their materials. Yet at the same time our building heritage also conserves the essential features of its development, revealing the itinerary of the history of architecture from earliest times right down to the present.

Following the rediscovery of the ancient Roman cities of Herculaneum and Pompeii and the vogue for neoclassical culture, ancient monuments came to be seen as aesthetic records to be "conserved" just as they had come down to us, albeit corrupted and incomplete; indeed there were often attempts at recovering the original structure and even grandiose schemes of rebuilding "*à l'identique*". This was the culture that prevailed in the course of the 19th century, and the conception of the architect's craft continued to rely on the typologies and materials used by the ancient builders.

The revolution in building that has characterised our century has brought about an abrupt mutation in both the conception of the architect's craft and in the typologies used, as witness the mass building that has gone on in post-war reconstruction and the urban sprawl that has spread outwards from the historic town centres. This revolution has been aided by the rational conception of architecture based on the introduction of "industrial" building materials such as steel and concrete which have transformed building methods until constructions are subject to the criteria and calculations of state of the art engineering.

As a result our historical heritage, incompatible with this technological era, has come to represent the culture of a bygone age and has to be treated as an archaeological remnant. Historical city centres are now regarded as monuments in their own right, and indeed they are tangible records containing the richest heritage of material history available to mankind.

## 2 Material conservation of artefacts and building culture

Thus the conservation of our historical heritage of buildings requires expert attention, although over the last half century architects have been singularly unwilling to tackle the problem, obsessed as they were with the new credo of rational architecture. It was invariably treated as a mere question of structural engineering, in which the new construction techniques dictated the rules. Ancient artefacts were regarded as material to be remoulded, modifying the conception that lay behind their construction and using materials and techniques based on the new assets of steel and reinforced concrete. Such a blinkered, technique-bound approach, combined with a building culture deformed by the post-war reconstruction boom, did irreparable harm to our historical building heritage, which was subjected to wholesale cementification. The results can be seen even on the most prestigious archaeological monuments, including the Sphinx, the Parthenon, the temples at Paestum and Agrigentum, the Colosseum and the rich urban infrastructure of ancient Pompeii.

From the mid-eighties a different conception of the conservation of the historical building heritage has gradually asserted itself, based on the recognition that this heritage is an immense archive of material history, preserving thousands of years of building culture and innumerable traces of historical events [1] [2]. At the same time the exponents of this new conception have begun to fathom the conservation requisites by which so many monuments preserved their identity for centuries, paying attention in particular to the archaeological context in its entirety [3]. This new methodological approach has won widespread consensus,

with its emphasis on the structural and constructive investigation and re-evaluation of the historical building heritage as archaeological heritage [4], using stratigraphic samples and studies drawing on the latest technology correctly applied. Yet all too often the restoration techniques endorsed by the public institutions responsible for our heritage continue to ignore the data of material history and operate in a hidebound technological perspective.

## 3 Guidelines for the conservation of artefacts

As we have seen, the archaeological artefact rarely survives in its original conformation: over time it has taken on different forms as a result of a complex series of influences, both human and natural, which have left it mutilated and in a state of decay. Its geometry needs to be studied in order to establish the dimensions and shapes of the whole complex and have a clear idea of the building's spatial conception. Other studies, both on site and in the laboratory, will complete the technical and scientific picture, clarifying the relationship between the artefact and its immediate surroundings, especially when there are other constructions below ground, and including a survey of the bedding plane and the hydrogeological characteristics of the surrounding area.

It is particularly important to determine the stratification of construction periods for the artefact, identifying the various architectonic typologies that may be present and also the morphological, functional, material and technical features of each successive period in the site's long history. This investigation, which often requires follow-up research work, must also include the building up of a "case history" which records the interventions that were carried out during the artefact's functional life, and the more recent ones constituting the history of its conservation and restoration.

The stratification of the construction should be complemented by a profile of its static behaviour. In the case of ancient buildings this behaviour was part and parcel of the design and original execution of the building, but it then probably underwent a series of revisions in subsequent phases of the artefact's life before falling into decay over years and even centuries of neglect. It is this last period which is of particular interest, although frequently difficult to study because both human and natural disturbance, often involving the removal of materials, will have altered the static characteristics almost beyond recognition. The structural engineer is called on to establish both the current static conditions to ensure stability and also, taking into account the state of material decay, a reliable safety coefficient. All too often the decision to proceed with maintenance work leads to excessive rebuilding, whereas the absence of regular maintenance can mean sudden collapse.

A specific study should be dedicated to building materials and techniques. Unfortunately here too it is difficult to undertake comprehensive research projects before urgent maintenance work has been carried out, and this all too often involves significant modification of the artefact. Accurate research into ancient building materials can contribute much to our understanding of building techniques. Such research is often pursued in an archaeological context as an aid

to dating the remains, while failure to consider mechanics and physical chemistry is bound to lead to serious decay in time. For without accurate research into ancient building materials it is difficult to identify modern materials – not necessarily state of the art, for they may well be traditional – which in the long term will be compatible with the ancient materials used. This is particularly the case for mortars. Having moved beyond the era of cementification, at least in the most prominent sites, it is now possible to work with microinjections of slow-setting colloidal mortars, suitable for consolidating an uneven and fractured masonry structure. Yet there is still need for adequate measures of quality control for these industrial mortars, particularly concerning the problems of ageing over a timespan of several centuries.

The criteria we have set out also provide for static interventions to be based on critically interpretative data. The primary guideline for any intervention is that it should be minimal, ensuring the conservation of the ancient artefact without detracting from its value as a record of material history.

## 4 *Villa dei Quintili* on the Appia Antica in Rome

Villa dei Quintili stands on a more or less rectangular site between the Roman roads of Appia Antica and Appia Nuova. The site is about 700 metres long and 340 metres across from one road to the other, and thus covers about 24 hectares. The area still has the characteristic features of Roman countryside, with large areas of grazing land, and has remained remarkably free of modern encroachments. The so-called Villa was a large residential complex dating from the second century AD belonging to the Quintili brothers, who served as consuls in 151 AD and were executed in 182 by the emperor Commodo, who seized their property and turned the site into an imperial residence. Very little is known about what use was made of the area in subsequent ages, although a considerable quantity of pottery has come to light dating from medieval times, when some parts of the Villa were fortified. During the 18$^{th}$ century some excavations took place to retrieve objects of antiquarian interest or valuable materials used in the building's construction and decoration, while Piranesi, and later Labruzzi and Rossini, made engravings of the Villa in its rural setting. These prints are obviously an important source for documenting the process of degradation that led to the state of the ruins we know today. It was not until the 1820s that systematic excavations and surveying of the property were undertaken by its owners, the Torlonia family. In the early years of this century Ashby [5] made the first study of the buildings and identified various building phases and five distinct nuclei in the grandiose complex. In the mid-eighties the site was properly investigated and at the same time archive research was pursued and the sculptures that had come to light were catalogued, while sample excavations were carried out in different site areas. One of these produced a brick with a dated seal demonstrating that this site area postdates the year 125 AD, strengthening the hypothesis that the oldest part of the Villa went back to the era of Hadrian [6]. Over the last few years the Soprintendenza Archeologica di Roma has launched an extensive and complex project to recuperate, restore and

render accessible this huge ancient monument as the centrepiece of the Appia Antica Archaeological Park [7].

A survey of the site was carried out by the geological and cartographic laboratory of the Soprintendenza with the following objectives: to identify the area's geomorphological structure; study and safeguard the natural environment; investigate the spatial organization of the site in view of public access; determine appropriate action to enhance the area's appearance and free the masonry from vegetation; and finally to decide on simple maintenance operations with the least possible environmental impact. The survey included aerial photography and drilling a series of cores to identify both the stratigraphic pattern of the water table, to organize site drainage, and any previous archaeological remains in order to map the nature and bedding of the foundations. It was decided to discontinue grazing on the areas of open land and maintain them as greensward with periodic mowing in the interests of the visiting public. All the masonry suffered from the encroachment of vegetation over the centuries, and in some places trees have sprung up. This was tackled by mechanical cutting back, and where the roots had penetrated into the subsoil chemical eradication will be performed, but using great care.

It is not possible to proceed with archaeological excavations throughout the site because a large part of it must be open to the public during the Jubilee celebrations in the year 2000 when Rome is expecting millions of visitors. Fortunately the area's configuration and the absence of modern constructions made the excavations relatively straightforward from the geotechnical point of view. They were preceded by stratigraphic sampling which demonstrated that there were no stratified remains. Thus it was possible to work with mechanical diggers down to a depth of about 1.60 metres, after which excavation continued manually in the last remaining strata before the floor area and structural elements were reached.

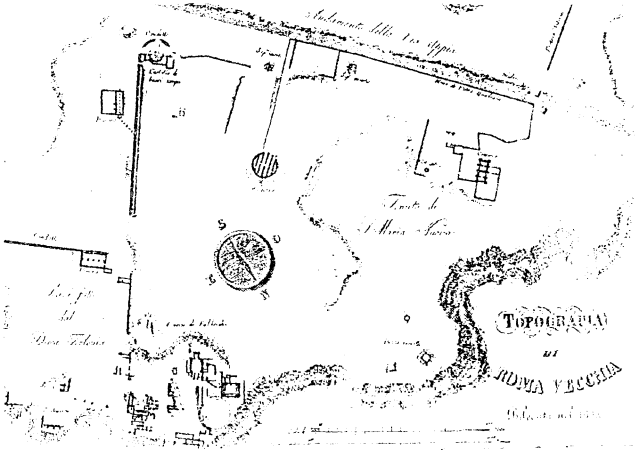


Figure 1 Planimetry of *Villa dei Quintili* in Rome

### 4.1 Conservation of the ruins

The above account should give an idea of the unique character of this site, both for its significance in the history of ancient architecture and for its pristine condition, for it remained isolated and free from human disturbance over the last century. Villa dei Quintili stands as a paradigm for the conservation of ancient buildings in a state of ruins, requiring interventions which will impinge as little as possible on the monument as a record of material history, still to be adequately investigated. At the same time the ruins, which are unusually large both in terms of surface area and height, have suffered over the centuries from repeated structural collapses, caused by both natural and man-made events. Many of these episodes can still be identified and once the phenomenon has been accurately recorded the debris has to be removed because it bears down on the structures underneath. It is undeniable that in archaeological and landscape terms the monument as it now stands is very striking, and to the eye of a structural engineer it presents an extraordinary catalogue of collapse mechanisms; however, as decay progresses, the structural configurations constantly seek new states of equilibrium which, in the interests of safety, have to be consolidated in the form in which we now find them.

In what follows we will discuss three specific cases which illustrate the problem areas outlined above and the solutions that have been adopted on the basis of minimum intervention.

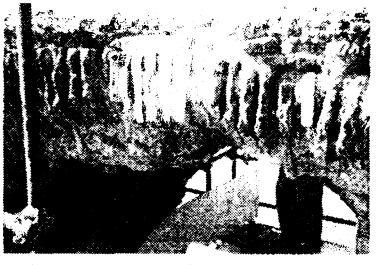
#### 4.1.1 Monumental residential quarters A2

The original site was sloping, with a drop of 20 metres laid out in various terraces. The owners' residential quarters were built on the highest ground and here all the roofing had caved in and the debris had to be removed. Extensive excavation work and restoration work are under way, the latter mainly to strengthen the masonry in the core structures and wall facing and refurbish the vaulted rooms. It is obvious that such work requires continuous consultation between the archaeologists, the architects and technical staff, the structural consultant and the site workers. The end product would suffer irretrievably if any one component was allowed to act autonomously.

In the monumental quarters one feature requiring emergency attention is the great arch, a gateway with a straight extrados. At its apex, on the southwest side, a gap has opened up connected with a fracture in the keystone so that the gateway is actually formed of two separate blocks of masonry leaning against each other. The whole structure is in an advanced stage of surface decay with erosion of the facing while the southeastern wall is between 8 and 10 cm. out of true.

In the first place we calculated the stress status in the structure as it stands and found that the mere weight of the two halves of the arch, which as separate entities act against each other, gave a particularly low safety coefficient. Another factor was the resistance to traction of the material comprising the arch, which given the present configuration of the ruins was only to be expected [8]. Thus we made a schematic representation of the structure as an arched gateway and

hypothesised two load conditions, specific weight plus wind and specific weight plus seism (second class in the Italian seismic classification). The calculation was performed on the basis of material resistant to traction and produced the following behaviour: maximum compressive stress at the base of the gateway, maximum traction stress at the base of the gateway and in the keystone. Thus it was considered essential to repristinate the arch in its entirety and advisable to bring the external façade of the ruined structure back into true. In accordance with the criteria set out above, these operations were carried out using traditional materials, see figs 2 & 3.



Figures 2 & 3 Illustrations prior and subsequent to the treatment of the keystone

The completion of the arch at its apex was achieved by means of graded toothing of the bricks.

**4.1.2 Baths hall**

In the above case the safety of a ruined structure was ensured given that, in the near future and as a result of natural phenomena, a new collapse mechanism would undoubtedly have developed, resulting in greater damage and further impairment of the monument's identity. In this case, on the other hand, we have evidence of a quite recent collapse in terms of the site's centuries-long history. It concerns the masonry structures of the southwest façade of the so-called *Piscina* (bathing pool), see fig. 4.

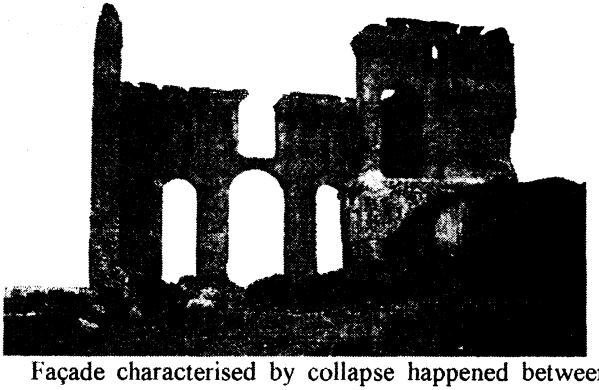


Figure 4 Façade characterised by collapse happened between 1910 and the eighties

An engraving by Labruzzi, published by Ashby in 1909, shows the whole of the lefthand side of the façade still standing, and thus we can be sure that the great collapse took place between 1910 and the eighties.
At present the façade is badly damaged and the lefthand pillar of the only vault still extant on the first floor shows severe erosion of the wall facing which has drastically reduced the supporting cross-section. Here too an effective strengthening of the facing is needed to integrate the remaining support.

### 4.1.3 Baths hall B

This is one of the most interesting architectonic structures in the whole complex. Its excavation is nearing completion, and it has brought to light various highly significant decorative features, such as the polychrome marble floor, and also construction elements. The large central vaulted ceiling has collapsed but it is possible to reconstruct its form and dimensions. The small vault in the apse presents a series of gaps which can be filled in, while the erosion of the wall facing on the northern side has reached a stage at which only a series of "pillars" are left supporting the remaining wall surfaces, creating a strikingly theatrical effect, see fig 5.

Figure 5 Baths hall B. The present form of the ancient construction

Extensive in-filling of the masonry would cancel all trace of the long process by which the ruins have reached their present condition and which is of particular interest from the historical and construction point of view. Thus any work we undertake must be carefully calibrated in order to halt the progress of decay, which at some time in the future is bound to provoke further collapses, and at the same time to avoid riding roughshod over the monument's historical evolution with indiscriminate rebuilding.

The study of such an important architectonic complex may take several years and reveal surprises. Both excavation and antiquarian research may come up with significant decorative elements such as columns, capitals, debris, etc., and in proceeding with the necessary restoration work to ensure the safety of the site care must be taken not to cancel any traces of material history. In this respect the masonry façade to the southeast of the hall is paradigmatic. In the portion which is above ground, there is a large virtually rectangular hole 8 metres wide by 5 metres high, with in the top corners two incomplete small arches each standing on a curved base. The case history that we have been able to build up indicates that the structure has existed in its present state for several decades, and possibly even for some centuries. At the present stage of our research it is not possible to establish the entire architectonic form of the wall facing, but from the construction standpoint it is a large masonry gateway with traces of an arch, or rather a vault, towards the top. This is another emblematic case of the configuration of a ruined monument clearly revealing masonry that is resistant to traction. A cursory static analysis of the gateway shows that merely the weight of the masonry subjects it to perfectly allowable compressive stress while in terms of traction the safety coefficient is rather low even allowing for the artefact's unusual geometry. Furthermore careful examination of the wall facing has revealed high up on the lefthand side a fracture which in future could lead to the lower part of the panel collapsing and forming an arch, and horizontal crazing along the mortar joints in the lower part of the panel, precisely where adequate resistance to traction is an essential condition of stability.

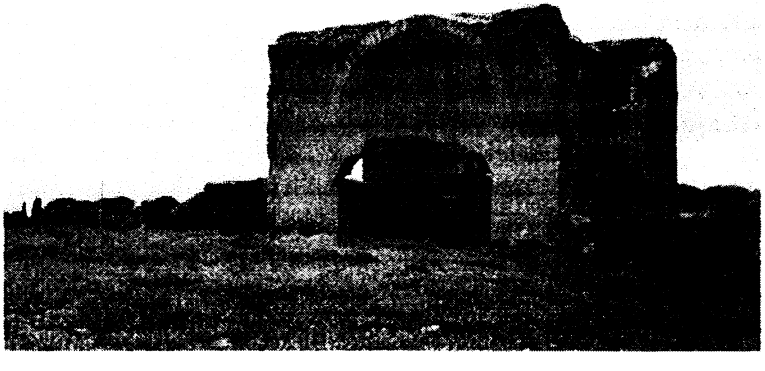


Figure 6 Baths hall B An unusual geometry for masonry vall

Thus the current situation requires restoration work that must nonetheless give due attention to archaeological and architectural considerations. There is no

doubt that the first step is to inject mortar to reintegrate the masonry structure. Thereafter a range of interventions are possible. Once the masonry structure has been consolidated using injections of cement-free mortar and also wall binding where necessary, the panel may be reconstructed including blind arches in the upper part to match those still extant on the wall opposite. However, this solution needs a scientific knowledge of the architectonic conformation which at present still eludes us. Such an extensive and pioneering restoration project requires further studies and comparisons. Alternatively we may choose to leave the consolidated structure in its present state, monitoring it to see how it evolves in the course of time. Or again we might design a provisional supporting structure to ensure the safety of the wall panel. In any case the most suitable technical solution must be pursued without detracting from the ancient monument's legibility.

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