ARTICLE

Conservation measures for an archaeological site at risk (Herculaneum, Italy): from emergency to maintenance

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ABSTRACT

For nearly three years, the Herculaneum Conservation Project has been running a continuous campaign of urgent works in the areas at risk throughout the archaeological site of Herculaneum. The instability of the standing structures and the fragility of the decorative features after years of neglect had made it evident that the site could not wait for long-term conservation proposals to be developed. In this article, the authors discuss the reasoning behind the establishment of the campaign and the methodologies adopted. They conclude that, although many useful lessons have been learnt about emergency works on large archaeological sites at risk, the biggest challenge remains: that of translating the emergency campaign into a structured and sustainable maintenance programme of continuous care such that the neglect of the site characteristic of the late 20th century never recurs.

INTRODUCTION

The principal focus of the Herculaneum Conservation Project in 2002 was the development of long-term conservation strategies for one urban block of the ancient city, the Insula Orientalis I [1]. Within the first year of work on this case study, it became evident that the fragile nature of the site after years of neglect required a broader and more flexible approach. As a result, one of the project’s more prominent initiatives has become a site-wide emergency campaign to safeguard the site by slowing down the decay and eliminating, where possible, the causes of the decay that had become so serious. Interventions have been prioritised in the areas of the site most at risk but, as the site is made more stable and manageable, this campaign is gradually translating into a programme of continuous care which will be a fundamental component of the long-term conservation strategy for the site. In this article we introduce the issues that this evolving campaign has faced in undertaking conservation of the structures and their decorative features.

EMERGENCY WORKS IN ARCHAEOLOGICAL SITES

Emergency works in archaeological sites are usually carried out during the phase in which they are excavated. When the remains of the past are uncovered, the factors that led to their destruction or ruin are also exposed. The trauma, the effects of which become visible, might have been a disaster, an earthquake, war or simply abandonment. Working on conservation while excavating sites means working with fragments – walls, decorations, objects. The overall vision that we normally have when dealing with even a very decayed site is absent when working with on-going excavations.

In these circumstances, salvaging that which has survived requires a view of what is still standing and what has collapsed. It is the archaeologist who studies the building in its entirety, and who draws academic conclusions from it. However, it is the architect, conservator-restorer and engineer who attempt to restore the archaeological remains to good health, and who need to understand swiftly what they have in front of them.
of them, the nature of the structure and which pieces of the puzzle are still missing. This information, even if not completely accurate, allows well-timed interventions to be carried out. However, in most cases, those who are searching for a ‘first-aid’ solution cannot always gain an overview of the problem they are working on.

It is for this reason that reflection on the nature of these interventions is so crucial, not only in excavation situations but in all circumstances that require so-called ‘emergency’ works. A catastrophic event can hit an archaeological site even after it has been excavated, and an excavated but unprotected site can suffer from a variety of traumas. Among these, a long period of neglect, such as that experienced in Herculaneum [1], can produce the same effects as a single disastrous event, bringing with it the added risk of losing understanding and an excavated but unprotected site can suffer from a variety of traumas. Among these, a long period of neglect, such as that experienced in Herculaneum [1], can produce the same effects as a single disastrous event, bringing with it the added risk of losing understanding of the site formation processes. In these cases emergency works prove equally necessary [2].

**The approach: respect and limits**

Conservation of cultural heritage requires knowledge and rigour. However, when approaching a site with many emergency situations, there is the risk of not always being able to respect internationally accepted principles for conservation interventions (minimum intervention, legibility of the additions, reversibility or retreatability, etc.). For this reason, decisions should not be taken from a position of ‘superiority’ to the site. The work of preserving a site should be developed alongside time in its natural progression, respecting the passage of the elements and of time itself on structures and surfaces, limiting the intervention so as to anticipate the possibility of greater decay and reduce its causes and damage where possible.

Initial evaluations are the most important in the process of approaching a site and taking decisions; these have repercussions on the entire intervention, determining its success or failure. This means that it is not only necessary to have faith in this first assessment, but also to be able to re-evaluate it throughout the entire course of the work, adjusting the intervention according to potentially unforeseen events, and always be ready to reformulate the initial plan according to the needs of the site itself. Trying to analyse every issue in depth with the necessary care is certainly the best approach to take, but in most conservation work, financial realities never allow sufficient time or resources for such study and evaluation. In the case of emergency works, the very nature of the situation means there simply is no time.

In the case of a complex archaeological site, rich in finds and well-preserved architectural decorations, the capacity to synthesise the issues and to evaluate the problems and the options is more difficult. One cannot think of unconditionally saving all the surfaces; not all the spaces can be given protective roofs; nor can problems related to water drainage be resolved quickly; the soluble salts that cause paint layers to come away cannot be eliminated. However, everything possible should be done to gain a good understanding of the site and study how it may be managed in the future with the resources available to the heritage authority.

It goes without saying that the focus cannot be on a single cause of alteration or on an intervention designed only to obtain a ‘beautiful’ result. The focus must be necessarily on the causes that have provoked the decay. The objective is to eliminate or mitigate these causes or at least to reduce their effects over time, because we are aware that a definitive intervention (or at any rate a fairly long-term solution) is rarely possible on an archaeological site [3].

**THE CASE OF HERCULANEUM**

The uniqueness of the site of Herculaneum lies in the variety and fragility of its archaeological features that have miraculously survived to the present day, thanks to the nature of the burial it underwent following the eruption of Mount Vesuvius [1]. During the 20th century, a major excavation campaign, over a 30-year period, uncovered over five urban blocks of the ancient city [4], and recently (since 1982) the ancient shoreline of the city has been exposed (see Figure 3 in [1]) along with the nearby site of the Villa of the Papyri. In comparison to the other Vesuvian sites nearby, the decorated rooms at Herculaneum are not the most spectacular, but there are many of them and the remains of wall plaster and flooring, together with evidence of upper floors, the water distribution system, threshold stones and other architectural features, provide an important picture of Roman domestic life. Herculaneum is today an archaeological site visited annually by thousands of people (a large proportion of whom are school groups of all ages) [5] and has been given World Heritage status.

From a conservation point of view, what was achieved with the campaign led by Amedeo Maiuri during the 20th century [4] was quite exceptional. By reinstating infrastructure and restoring archaeological structures,
while also considering the legibility of the result for visitors, he improved the image of the ruins and visitor understanding of them. His homogeneous approach to integrating new elements with full respect to the existing has guaranteed the revival and preservation of the site in the widest sense. The integrated modern elements were essential for the protection of the ancient structures and decorations, and their removal cannot be considered a realistic option. Maiuri’s modern additions and his enhancement of the site as an open-air museum have become part of the recent history of the ancient city [4], and also contribute to its worldwide identity.

Conversely, the image of Herculaneum at the start of the 21st century was that of a site in ruins, with three-quarters of it closed to the public, where the visitors struggled to move between the barriers and structural shoring that blocked access to the many dangerous areas (Figure 1). Many of the wall paintings and mosaics were in such a state of decay as to cause us to forget their perfect state of conservation when first excavated (Figures 2–4).

The issues dealt with in the course of the emergency works at Herculaneum are analogous to those that are found after a disaster occurs in a city. Maiuri’s excavations and restorations resulted in a site that is equivalent in volume to a modern settlement: many of the houses and shops are covered by a roof or floor plate; some have a second floor or a basement. Moreover, ancient and modern structural elements often exist side by side (Figure 5). The existence of roofing [6] and the mixture of ancient and modern (restored) structures have meant that there are problems not only of materials progressively deteriorating, but also of the structures disintegrating, with cases of collapse and subsidence of a kind normally seen only after earthquake activity (Figure 6).

Then there is the scale of the situation: Herculaneum is, even today, a city. As such, it originally had a series of functional ‘life support’ systems that kept it going. Maiuri, in turn, reused some of these systems (such as drainage channels), adapting them to a smaller section of the town which now makes up the excavated area. The decay, malfunction and breakdown of these systems have greatly affected the speed of decay and led to the above-mentioned critical situation.
Since there is no restricted perimeter of a surface or a single building to limit the scale of the interventions, it was necessary to conceive and plan the work in a way that could function on a large scale, codifying interventions before implementing them so as to make the approach repeatable in the future and to be able to extend it to all other similar situations.

The mechanisms that define the priorities

The first question is: *where to begin?* This question comes even before *what to do*, and is two-sided: the choice of priorities (which house? which wall painting?) and the

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**Figure 3.** Damage to unique wall decorations caused by water ingress, 2003. Reproduced with permission from Monica Martelli Castaldi/HCP.

**Figure 4.** An example of the severe state of conservation of an unsheltered mosaic at Herculaneum, 2006. The arrow shows a layer of tesserae which is detached from the ground; other tesserae are scattered in a large lacuna. Reproduced with permission from Alessandra De Vita/HCP.

**Figure 5.** Modern iron lintel with the remains of the original carbonised wooden beam attached, the House of the Tuscan Colonnade, 2005. Reproduced with permission from Paola Pesaresi/HCP.

**Figure 6.** A collapsing ceiling at the House of Bicentenary, 2005. Reproduced with permission from Paola Pesaresi/HCP.
criteria for precedence (the roof or the mosaic first?). At first, these criteria seem to be directly dependent: once the choice of which house or room has been made, the next step is to decide what intervention to carry out first. In reality, the decay has already defined what the criteria for precedence are: the functional decay of a structure (for example, a roof) or of a system (water drainage) can in fact create a chain effect that makes it a priority to intervene first in certain areas and with specific tasks in order to ensure that the subsequent interventions are effective.

Once it has been established that almost everything that must be done is urgent, defining priorities implies making choices and, inevitably, some of these choices can lead to the loss of archaeological features, albeit indirectly. Accepting this reality from the outset improves the identification and management of constraints (principally time and resources) and the definition of priorities. Historic and artistic value, uniqueness, archaeological importance, as well as the complexities of the work required, are some of the criteria to evaluate when deciding not only where to intervene but also what could be necessarily lost. Above all, it is operational safety that often has precedence: in emergency works it is not possible to dissect and operate on different parts of the ‘patient’: an ancient wall painting can only be saved if the conservators are able to approach it safely, and a dilapidated lintel can only be worked on if the ancient wood has first been adequately secured.

The Herculaneum Conservation Project campaign has attempted, and continues to try, to improve these decision-making processes. Defining the priorities of intervention has been entrusted to different specialists’ evaluations, since it was certain that one category of specialists alone would be insufficient to identify the priorities. The tendency of architects and engineers to focus on structures, reintegration and roofing, or of conservator-restorers to favour only the surfaces, or of archaeologists to discriminate against the features of less historical importance, was overcome by working in unison in the definition of priorities.

Indeed, all the planning of activities of the Herculaneum Conservation Project [1] is conditioned primarily by the real needs of the site. This is not the case in most interventions on Italian cultural heritage sites, where the work carried out is often determined by the limited financial resources available and/or by the operational flexibility of the client organisation.

At Herculaneum today a core team composed of an archaeologist, a conservator-restorer and an architect (with the support of a structural engineer [7]) is constantly working on the site-wide campaign to define conservation priorities and strategies. Not all the advantages of this collaboration are immediately evident: the presence of an archaeologist after a site has been excavated and needs to be conserved is rare, especially, as in the case of Herculaneum, if excavations took place long ago. Even rarer is the continuous involvement of the archaeologist in conservation decision-making [4, 8–10]. In Italy, a constant and equal collaboration between conservator-restorers and architects is also unusual: during excavation conservator-restorers are often called to be on-site for regular emergency interventions or for the protection of structures and decorative features, but architects are requested only for specific tasks such as planning protective roofs or anastelosis projects. After an excavation, when funding and time are frequently running out, it is often an architect alone who is asked to plan the conservation interventions for both structures and decorative surfaces, without the help of a conservator-restorer and when it is too late to take certain measures [11].

At Herculaneum, the decorative features and the elements that complement them (wood, metal, terracotta, etc.) are the outstanding feature of the site. They cause wonder for the remarkable state of post-exavcation conservation of these materials, despite being exposed to the open air. The fragility of a wall painting or a mosaic, or the decomposition of a wood fragment that has survived the volcanic eruption, is an evocative image that attracts attention but also causes concern at the prospect of its potential loss.

Decorative features can be seen as the ‘skin’ of a monument, the point of contact between its surface and its environment, and they constitute its most delicate part, the place where most of the decay phenomena emerge: it is here that one can first read the signs of decay. Conservator-restorers are physically the closest figures to this ‘skin’ every day during their work. Consequently, they are in a privileged position to listen, investigate and understand the problems and needs of the surface, and thus to contribute in an essential way to an interdisciplinary debate about causes of decay and wider problems for the survival of the monument.
In the Herculaneum Conservation Project a larger team of specialists (surveyor, chemist, water and humidity expert, geologist, etc.) is also available on a request basis to assist the core team (archaeologist, conservator-restorer and architect) in defining priorities, particularly in the later stages. Their contribution ensures a better framework of understanding for the entire conservation decision-making process.

Thanks to this active collaboration, the process of defining priorities has gone beyond the needs of the emergency works, being extended to all decision-making processes, both during the planning phase and during interventions. Since 2004, the private partners of the Herculaneum Conservation Project have been allowed to commission works directly [1], and the team has been extended to include specialist contractors. Since late 2004, a company of conservator-restorers has been operating all year round on the site with a team numbering from 6 to 15. Since early 2005, a general works contractor has been operating continuously on-site, employing a team that has varied from 8 to 25 workers depending on the works under way.

The planning phase: mapping decay as an operational tool

The usual outcome of a conservation survey for a whole site is a study that aims to define types of decay, the research to be carried out, intervention priorities and methodologies. In the case of an emergency, this study becomes more of an operational tool than anything else, focused on priorities for the decorative surfaces and for the standing structures, with a detailed description of general criteria of intervention but without specifying in detail each type of intervention to be accomplished, and without assessing larger issues for complete conservation interventions.

At the beginning of the campaign, a first survey of surfaces in serious danger and evaluation of their state of decay was carried out by the conservator-restorers at the same time as the first emergency work trials [12]. The survey identified areas of risk in the site, representing either danger to people (workers or visitors) or danger to the architectural or decorative features themselves, and also gave some general indications on the main causes of decay, such as those related to the water drainage system (accumulation of rainwater on floors, infiltration into ceilings or walls, damaged or inefficient collection points, channels, etc.) or those related to the presence of the public.

This survey, based on observations made during initial visits around the site, was transformed into a map which allowed the ‘geometry’ of the manifestations of decay and their location within the archaeological area to be seen. The map proved essential for comparing data with those produced by other specialists and for illustrating the connection between causes and effects. It was thanks to this initial mapping that it became evident that numerous decay manifestations were concentrated in specific areas of the site, thus confirming the need to eliminate their causes.

Following these initial results, the team decided to use decay mapping as visual documentation of the conservation survey, as a tool to prioritise interventions and as a monitoring tool (through regular updates). Various overlapping levels were employed within the maps, each indicating what needs to be protected (archaeological significance, recent historic layers, etc.) and specific decay indices (paint layer flaking on wall decoration, the blocking of an ancient drainage channel, etc.), consequently underlining the areas where the higher risks coincide with the most precious remains. The decay mapping has been developed (a) to define the areas characterised by major risks and (b) to identify types of intervention. Separate maps are constructed by different specialists, depending on the types of decay (e.g. problems due to drainage systems and archaeological features (decoration, roofs, masonry, etc.).

Geographic Information System (GIS) technology is useful in this type of prioritisation process, handling and comparing a large amount of data and allowing it to be visualised on a map. Indeed, the layers in the initial mapping work anticipated the advantages of GIS. However, creating and implementing a full GIS requires time and financial resources. In addition, its structure needs to be based on the project experience already gained. As a result, it is often impossible to have this tool available from the beginning of a project. At Herculaneum, the two-dimensional site-wide GIS is currently being completed and, although it was embarked upon relatively late in the project [13–14], this has brought advantages in terms of ensuring that it is properly tuned to the types of data it needs to manage and the questions the team needs to ask it. In addition, a GIS database is only as good as the
team input provided in constructing it, and in this case the long gestation period has ensured that every specialist has contributed. As a common forum (with a standardised language of reference for all areas of the site) that requires the engagement of all members of the team, it is gradually proving itself a vital tool in rationalising documentation work (with post-operam work being produced directly within the GIS as work proceeds), facilitating data comparison (e.g. different manifestations of decay and the causes of deterioration), and analysing and delivering objective parameters for prioritisation and monitoring procedures within the emergency campaign. It is allowing us to advance our understanding of long-term, general site management and maintenance issues.

With regards to architectural elements, the mapping of decay for specific types of structure (e.g. roofs, walls, etc.) has been carried out individually in order to identify distinct conservation problems rapidly. Mapping has identified roofing and other modern architectural elements that were constructed during the excavations and are now in a state of disrepair, the state of deterioration being classified using numeric values. Interventions and priorities were then identified based on the presence of decorative features, their state of decay, their archaeological value, and the resources available. This planning process has the advantage of establishing a framework, an almost repetitive methodology, resulting from the systematic identification of those common building typologies and invariable mechanisms of decay.

As for decorative features, following the preliminary site-wide decay mapping, more detailed mapping of problems was carried out, both for single ‘functional units’ (houses, public buildings, specific areas or streets, etc.) and for single emergency or assistance interventions to be carried out throughout the site. These latter interventions required action within a short time interval, thus the mapping was carried out swiftly by simply drawing the extent of the surface to be treated and the level of seriousness of decay on a photograph of the area in question [15]. Each map was accompanied by a technical chart and a detailed report on the general intervention criteria and the specific annotations for the treated area. Details of the individual operations were not indicated since they were repetitive. A preliminary, simple standard form was established (and then further developed later) which rapidly became the tool for planning emergency interventions and for systematically recording the work done. General site-wide maps of danger points for the decorative features are updated every two months, based on visits around the site and on reports from custodians or other team members.

The first decay map was used from the outset to structure the first interventions, namely a series of small, dispersed operations with the aim of improving the life expectancy of a large number of structures and decorations. Further study of specific areas identified as priorities led to the definition of more complex interventions which were carried out at the same time as the ‘light’ dispersed interventions. Comparison between the results of decay mapping of structures and of decorative features helped define the two parallel campaigns (one directed by the architect, the other by the conservator-restorer) and to prioritise interventions in common areas and establish an order of precedence in the operations.

**Precedents: recognising and eliminating the causes of decay**

The true impact of neglect reveals itself only gradually and gives rise to a series of mechanisms that are entangled and overlapping, and which result in widespread decay that can vary in seriousness and has a seemingly incoherent geography. During the process of mapping decay and recognising associated risks, it was possible to highlight some of the mechanisms that have more aggressive effects. Indeed, certain conditions provoke a domino effect that induces and feeds various types of decay [16]. Recognising these mechanisms and identifying these conditions is the first step towards reducing decay.

In Herculaneum, as in most archaeological sites, water represents the main cause of decay, both for structures and for decorative features. Rising damp provokes the erosion of the tuff blocks, the most common form of masonry fabric [17–19]. The large quantity of decorative features (not only mural paintings and mosaics, but also simple renderings, floors made of crushed brick, etc.) suffer badly from water action, both through the ground and from above (rain, pooling on floors or roofs, etc.) (Figure 7).

Indeed, it is this dual attack that makes water damage particularly consequential. Rain wets surfaces and produces mechanical damage when hitting or streaming over decorative features. Infiltration, either through...
broken roofs or as rising damp from the ground, travels within the structures. The problem often only becomes legible when it is too late and the first signs of deterioration are evident in the wall fabric and decorative features. Salt crystallisation during evaporation leads to slow but steady decay of the component materials, with erosion of stones and bricks, and detachment and crumbling of plasters, wall paintings and floor coverings.

Therefore, trying even partially to solve the problem of water management on the site is one of the main challenges of the emergency campaign that is tackled on many fronts. In particular, the condition survey and plans — developed in close collaboration with the experts for humidity and water — to reinstate, where not counterproductive, the use of the original Roman water collection and disposal system and make integrations where necessary [19] (Figure 8). A major operation to repair and substitute existing protective shelters and to erect new temporary shelters (with a low impact on the present image of the site) is being carried out [6]. Studies are being launched to address the problems of uncovered areas (gardens, peristyles, incomplete buildings, etc.) where a shelter is not needed or justified but where water collection and relocation (through infiltration and rising damp) is proving detrimental to the surrounding structures and decorative features.

On a larger scale, the most visible cause of deterioration of the whole site is, as already mentioned, the lack of maintenance over a long period of time [1]. One aim of the emergency campaign is to facilitate future maintenance and reduce its cost by, among other things, improving work access to the site. The 20m difference in level between the modern and ancient city is not the only problem: the escarpments left after the earlier excavations are almost vertical and some of the volcanic layers are extremely unstable (Figure 9). Due to adjacent modern constructions, private property and roads, extending the site boundaries or redesigning sections of the escarpments is not a practicable option in the immediate future. The fertile nature of the volcanic material making up the escarpments stimulates plant growth that aggravates its powdery consistency and leads to safety problems around the perimeter of the site. Continuous work on the stability of the escarpments is carried out within the campaign in collaboration with other projects of the Soprintendenza Archeologica di Pompei (the heritage authority) [22]. Strips of land at the edges of the site...
have been regained by removing the landslide and vegetation, and these provide a platform for allowing vertical access to the various levels. Semi-permanent access towers have been installed, together with routes to reach these areas. The benefits of mechanical means of transportation and a ramped access to the site are being evaluated.

Another cause of site deterioration, in particular for decorative features, is the presence of the public. Work still needs to be done to improve visitor sensitivity as to how to move in the site without damaging floors, painted surfaces and walls. The establishment of pre-selected and rotating visitor routes, together with the installation of additional protective measures (to avoid abrasion of painted surfaces, etc.), will also contribute to reducing risks. The domestic scale of many of the buildings (narrow routes for visitors) means protective measures are not always possible and this has put even more onus on programming an annual season of preventive conservation measures before the peak season of visitors and school groups each spring.

The preparatory stages: the problem of time
Inevitably, the fundamental variable in emergency works is time (see above). The time available is limited, in fact it is often a negative factor, as interventions are carried out when it is (almost) too late. Conversely, one of the characteristics of conservation work is precisely its ‘slowness’, which stems not only from the meticulous and complex nature of the work to be carried out, but also from the accuracy of the preparatory stages and initial research. It therefore becomes easy to confuse an emergency with hurrying, and the rush to save a fragment or a structure becomes the primary and (dangerously) the only aim of an operation that should be complex and nuanced. A comparison can be made with the medical sector, as in deciding what should be done to save a patient’s life when every second counts. For this reason the competence of the professionals involved, and the ability to decide what to do before intervening, becomes crucial, even if the time frame available for this preparatory ‘planning’ stage is very limited.

It is also important to reflect on the actual worth of this preparatory stage, and of all its component parts, in an emergency situation. Which studies need to be carried out in order to decide what to do? Are we capable of making a decision when we still do not have all the relevant data?

In the case of Herculaneum, rapid deterioration processes had started that did not leave time margins for trial works or specialist studies within the site-wide emergency campaign (with the exception of the following: the mapping and prioritisation process, the data management strategy described above and some limited scientific analyses of materials and the most diffuse forms of decay (salts, mortars, conservation products, etc.) [21]). However, the campaign did benefit from the initial or mid-term results of more in-depth studies and site investigation being commissioned elsewhere within the project, either as part of the long-term conservation strategy being developed for the case study project, Insula Orientalis I [1, 6] or within the broader attempt to document the site better. These include: the development of the first accurate general site plan, photographic and documentary archive research, geomorphological research [22], urban studies on the impact of shelters, focused archaeological site analysis and 3D modelling using traditional and scan laser surveying techniques [23], GIS data management trials [14], in-depth research on problems posed by the decay of carbonised wood (Figure 10) and paint layers. Conversely, the site-wide campaign team were careful to monitor how pivotal this additional information was in the planning stages since it was vital to establish a light and flexible methodology that was applicable in situations where such resources were not available.
The limited time factor in the site-wide campaign also meant that the preparatory planning stage for one set of interventions overlapped with the implementation of numerous others. It became evident that working on a large number of archaeological features simultaneously actually helped in defining general strategies and approaches. Normally, an emergency can be seen as a peak on a chart: its exceptional nature means that it does not really fit into a category of its own. However, sites that have been hit by disaster or neglect, such as Herculaneum, have a regular occurrence of emergencies and therefore have regular peaks on their charts. This means that a curve can be drawn to join the peaks, and in this way something can be learnt from them. The results acquired from emergency works indicate when, where and why certain conditions occur, forming a fundamental tool for their future prevention and the foundation for a long-term maintenance programme.

Planning the interventions and defining priorities
Once the process of solving the causes of decay had been started and an overall works strategy developed, specific interventions on the structures and decorative features themselves were planned. The structures/features in the worst conditions were the first to be addressed, but among these priority was given to those with the greatest artistic, historic or technical value, also taking into account weather conditions and the programme of other team members.

In the case of the decorative features, in addition to the campaign of dispersed emergency interventions throughout the site (see above and Figure 11), more systematic emergency operations were developed on a house-by-house basis (Figure 12). In these instances, the need to define priorities was linked with the need to improve programming, and a detailed survey of the conservation state of decorative features was carried out for individual building units [24]. The result was a more detailed mapping of individual buildings, in which all decorations present (on walls, floors and ceilings) were

Figure 10. This example of original in situ timbers in the portico along the Decumanus Maximus shows some of the conservation problems that arise from the materials and methods used in previous interventions. The carbonised wood was treated in some cases with paraffin wax which has a melting point of 60°C; the photo shows the paraffin wax dripping from this lintel which is exposed to the sun all day long, 2007. Reproduced with permission from Alessandra De Vita/HCP.

Figure 11. Dispersed emergency works. The dots on this plan denote the more substantial interventions of the phase of dispersed emergency works within the site-wide campaign on areas at risk. Areas with fewer dots generally correspond to areas with few decorative features. It is notable that the most serious cases of decay requiring immediate action were distributed within the houses closed to the public. However, there has also been a substantial need to intervene in the areas open to the public, particularly during the spring when visitor numbers are highest. Reproduced with permission from Ines Maddaloni/HCP.
Other secondary criteria were also considered:

- presence of roofing (intervention on sheltered surfaces is often less urgent)
- special types of risk (broken gutters, landslide, structural collapse, water pooling, etc.)
- coordination with structural works and other project activities (for example taking advantage of scaffolding already built for other work)
- climate factors requiring programme changes because of delays to work [26]
- the general economics of work, to reduce costs of moving materials.

In order to evaluate priorities for decorative features less subjectively, as with structures, a simple numerical system was devised. Interventions indicated in the first decay survey (2004–2005) and in the following periodic updates correspond to ‘points’ of serious danger that had to be dealt with immediately. Each intervention point corresponds to a tabular chart which identifies the area and schematic indications of the decay conditions found during the site visit. The chart is filled in by a conservator-restorer and then catalogued on the basis of intervention priority: a number that emerges from a calculation of values that correspond to various primary and secondary parameters. On the basis of the number obtained, the chart is filed as of immediate, mid or low priority, and works begin at an opportune moment.

The preliminary standard form used as the planning and recording tool for emergency interventions was thus developed further to integrate this additional, more systematic analysis.

The scope and lifespan of interventions within an emergency campaign

Emergency operations on archaeological structures are usually considered short-term interventions; for instance, the use of props or shoring, or other means of support, conveys the idea of a safe temporary solution to the problem. If successfully applied, a scaffold, prop or buttress is an evident improvement: it can be installed in a very short time, does not require extensive planning, and is considered reversible. However, temporary shoring is, in reality, rarely temporary; nor can it be considered in any case a solution. In civil engineering, temporary shoring is considered to function for...
a maximum of three months. In general, the time that it is needed should be considered the shortest possible until the long-term solution is delivered (Figure 13). The time and resources spent in installing a shoring system should be invested in understanding the nature of the problem so that a longer-term measure can be swiftly adopted. If the ‘temporary solution’ remains in place, the prop can easily become an additional risk: if the load and pressure of the structure begin to force the shoring, the latter becomes part of the structure and is no longer removable.

When the emergency campaign on structures began in Herculaneum, most of the closed areas of the site were filled with scaffolding props that supported leaning walls, collapsing roofs and damaged lintels. Many of them had been installed as a preventive measure, even where signs of structural problems were not visible. These areas were ‘protected’, or at least seemed to be so, waiting for their long-term conservation project. Due to the difficulties the heritage authority faced in contracting large and expensive conservation works, areas have remained in that condition for years, closed to the public and practically ignored [27].

The current campaign on structures has adopted a different approach, applying, where possible, a mid-term or even long-term solution. More time has been invested in understanding the nature of collapse or other anomalous behaviour of the structures, in order to act, case by case, with made-to-measure solutions. Reinforced concrete lintels, put in place during the earlier excavations and now heavily deteriorated, were preserved by treating the iron elements and applying a new external covering. Where possible, waterproof layers were repaired in order to avoid continuous penetration of water; without replacing the structure, collapsing roofs were dismantled and floor finishes protected by other means [6]. When shoring was still considered necessary, it was monitored in order to prevent any adverse effects. More generally, where the cost outlay required for a short-term repair was close to that required for a more permanent solution, the latter was applied.

There are common threads with works strategies adopted for decorative features: following the decision to extend work from the initial case study of a single urban block to the entire archaeological area, a larger expenditure of energy and human resources was inevitably required, raising issues of economic efficiency and output [28]. Works on decorative features, even if of an emergency nature, can in fact be more expensive than interventions on building structures. This is due to the precise and laborious work methods and the great quantity of floor and wall coverings at risk. Analysis of the first mapping of decay showed that it would be necessary to vary the level and the location of interventions. As mentioned above, it became evident that a certain number of one-off emergency interventions spread throughout the site needed to be complemented by more complete work plans for areas where decay was acute and archaeological value high. In these areas, often corresponding to a single house unit, consolidation and emergency measures were carried out not only on decorative features at extreme risk but on all the features. The aim was to improve the state of

![Figure 13. Shoring to support a tilting wall at the entrance to the palaestra in Herculaneum: the propping system had been in place for some years until recent interventions, 2006. Reproduced with permission from Paola Pesaresi/HCP.](image)
conservation of the entire house and reach a manageable and maintainable status quo, which in some cases — combined with structural works — could even allow public access. While part of the conservation team remained employed on works in a single house unit (of an average duration of two to four months), other conservator-restorers worked throughout the rest of the site on one-off, localised interventions in order to avoid the loss of precarious surfaces (Figure 14). In addition, the team had to integrate these dispersed ‘first-aid’ emergency interventions with providing assistance on the decorative features in the areas where the building contractor was working on structures, for instance taking protective measures for the newly exposed decorative features during removal of the landslide at the foot of the escarpment [29].

Apart from the balance between the choices to be made and the resources available, the main challenge has been the balance between the type of intervention and the information available. The mid- and long-term solutions for structures or the more comprehensive localised approach to decorative features were in fact applied only if measures did not significantly limit future conservation proposals for the area, and if archaeological information and archaeological value supported the solution chosen (Figures 15–17).

Progress of the site-wide campaign and returning the site to the public

The emergency campaign has evolved to become a multiple operation composed of emergency works on
structures and decorative features, interventions on the general infrastructure of the archaeological site (such as the reinstatement of the ancient sewer system, building a vertical connection to the modern city level, etc.) and follow-up maintenance with different grades of intervention (ensuring the scope and lifespan of the solutions implemented now define the intensity of long-term continuous care in each area). As a result, the general conditions of the areas closed to visitors have rapidly improved and the impact of the campaign on the site is today evident [30].

In two years of intensive site operations on structures (2005–2007), and in three years of interventions on decorations (2004–2007), much has been achieved. For structures, emergency works have been carried out in all the areas closed to the public (about 20,000m²) (Figure 15), medium-term roofing solutions have been provided in five different locations (houses, shops, public buildings) (Figure 16) and long-term interventions have been carried out wherever intensive planning was not necessary (mainly involving masonry repairs; about 6,000m²) (Figure 17). Detailed plans for an ambitious campaign of repair and substitution of existing roofing are in place [6]. Site-wide maintenance initiatives on structures and infrastructure have begun in the following sectors: vegetation removal, escarpment maintenance, ancient shoreline vegetation control, and sewer reinstatement and completion. The impact of the works is often hard to illustrate, either because it is hidden (e.g. underground drains) or because of the light touch of the interventions.

Similarly, the campaign of dispersed interventions on decorative features to date (emergency measures, assistance to other teams and maintenance) has taken place all over the site (Figure 11), in areas both open and closed to the public. The planning stage for the interventions on a more complete, house-by-house basis has been completed for those properties on-site with substantial decoration and closed to the public. Over half the emergency works defined as immediate or mid
priority have been carried out and, for the remaining areas, the implementation stage awaits further work to make the surrounding structures safe to permit access (Figure 12). In addition, those decorative features that have undergone initial consolidation work are now the object of a maintenance campaign so as to lengthen the life of the intervention until specific treatment or structural repairs are possible. So far, systematic maintenance strategies on decorations have been tested on the site, with structural repairs being possible. So far, systematic maintenance strategies on decorations have been tested, especially on exposed mosaics or walls continuously vulnerable to water damage. Recurring problems in these areas (water from above and below) have also confirmed that the future of the decorative features depends heavily on the improvements to urban infrastructure (roofing and water management) that the architect and engineer are working on.

Much of this work has allowed areas of the site to be returned to the public after years of barriers, danger signage and access being forbidden. Reopening areas and buildings in Herculaneum that are currently closed to visitors is not one of the specific objectives of the Herculaneum Conservation Project campaign. Nevertheless, a limited or conditional reopening (on rotation, for example) of partially conserved areas after emergency works is now being tested (circulation within the site is now possible along all the ancient roads, and about 1,400m² of houses and public buildings have been reopened to visitors). Interestingly, the closing of many of the houses and spaces to visitors, especially along the site’s borders, has produced a chain effect in a relatively short space of time (the last 30 years). The closed areas, inaccessible and no longer monitored in any way, have seen an exponential worsening of their state, becoming a refuge of pigeons and a dumping ground for materials left over from occasional repair and demolition works elsewhere on the site. The problems go unnoticed, multiply and spread to other communal spaces, such as streets or neighbouring houses. Strangely, a reasonable presence of visitors can actually contribute to the preservation of the archaeological remains. A moderate use of the floors reduces the biological growth on them. The presence of visitors can, in some cases, decrease the average humidity in underground spaces (there has been a substantial increase in microbiological growth on floors and walls in the Suburban Baths since the building was closed to the public in 2005 due to the partial collapse of a vault). Monitoring by custodians and warnings by tourists prevent critical situations from getting worse [31].

Above all, the greater choice of visitor routes and the larger area now open to visitors are helping lower the pressure on the previously open areas, which had become seriously affected by the wear and tear of surfaces due to the heavy visitor traffic [1].

The achievements of the first three years of the site-wide campaign are also stimulating changes in the approach to long-term conservation, both within the team and within the wider thinking of the Soprintendenza Archeologica di Pompei. As the site-wide campaign proceeds, debate is taking place regarding the possibility of transforming the Soprintendenza’s large, ambitious and expensive projects for single buildings, which inevitably have to wait longer to obtain funding and approval, and subdividing them into smaller groups of interventions spread over the site [1]. This would result in a longer timescale for the overall completion of a project but would deliver greater results for the site in the short term. A process of limited but specific interventions would eliminate the worst causes of decay and aid the continuous monitoring of conditions to inform the next stage. It should also allow access to areas for researchers and visitors to be reinstated, where appropriate.

**Philosophy and intervention criteria**

Emergency works are swiftly followed by measures to deal with the causes of the decay and, soon afterwards, by consolidation and more in-depth conservation. Interventions must be carried out quickly and soundly using materials and methods that do not create complications for later conservation work. This approach is particularly critical for the most frequent interventions.

Basic mortar repairs, especially capping and core work, constitute the most major activity of the site-wide campaign on structures and provide a good example of the general methodological approach with this part of the campaign [32]. Capping of high walls is vital for the safety of visitors, while repointing of the walls is
rarely necessary. This is a result of the compact nature of the masonry used in antiquity in Herculaneum (mostly opus reticulatum). In order to protect the top of walls as much as possible, a sacrifice layer is often applied but only in correspondence to the core of the wall, so as not to disrupt visually the face of the wall with reintegration. This sacrifice layer is created from lime mortar made of local lime putty and volcanic sand, with the addition of polypropylene fibres. The addition of fibres helps the strength of the new mortar and slows down the setting process that, in the often dry climate of Herculaneum, can be extremely accelerated. The use of fibres also allows the legibility of the new intervention in the future. The same mortar has been adopted for all the capping works on site, so as to easily recognise the modern interventions spread around the site.

The emergency interventions on decorative features are light, simple and minimal. They constitute that which is just sufficient to prevent loss of the unsafe surfaces. They are not definitive but prolong the resistance of the decorations until ‘complete’ conservation work becomes possible. For wall decorations, renderings, mosaics or marble floors, frequent interventions include stabilising original mortar layers by grouting voids between the preparatory layers and applying plaster repairs along the edges of the decorative fragments. Holes or cracks in the surface are filled with plaster in order to facilitate the flow of rainwater over the surface and avoid penetration.

The plastering interventions employ mortars prepared on site which are mixed specifically to be ‘not hard’ so that they decay together with the original surfaces. Their composition and behaviour has to be similar to the original. Materials employed are slaked lime and inert fillers (with the addition of hydraulic lime to help it set if weather is too humid) which are not overly compacted within voids in order to behave as similarly as possible to the adjacent fragile areas. Following the same principle, the mortars used to substitute missing material and to consolidate the internal preparatory layers must not create areas of less porosity or greater hardness: materials used are hydraulic lime and ventilated ‘pozzolana’ (local volcanic earth). Emergency measures on plasters and to fill voids must support and ‘accompany’ the ancient surface, without differing in terms of hardness or compactness, or in offering variable resistance to the migration of water and salts. In order to reduce the movement of salts inside walls and surfaces, in all operations the minimal amount of water possible is used, taking care to ensure only the necessary humidity inside a void needed for the hydraulic mortar injections to harden. The products used are chosen not only on the basis of the nature of the problem to be resolved, but also on the basis of availability, ease of application and cost. Roles vary within the team of conservator-restorers since some tasks are extremely repetitive, some consist of basic support roles (scaffold erection, material transport, etc.) and others require extreme experience and competence.

Previous conservation interventions (Amedeo Maiuri [4] and others) on decorative features and on structures, in some cases, have used unsuitable materials or aesthetically problematic solutions. However, considering the overall picture of general decay, their removal cannot be considered a high priority unless their continued presence can be harmful to the original archaeological remains (e.g. heavily oxidised iron elements, hard cement plaster fillings). The new interventions, therefore, do not aim to change the overall aspect of the existing condition found, even if it is difficult to read. For example, the colour of new mortars is matched to the existing mortars; and where edges of decorations have already been repaired, unless the mortar is weak and unstable it is not removed; instead local integrations are made. If previous interventions are numerous and cannot be removed, the new repairs are blended in with the latest ones. If, instead, they are minimal, we adopt the modern criteria by which interventions are recognisable and discreet.

For decorative features, as with the structures, it was decided to reduce to a minimum, provisional or short-term interventions. So props and protective facings (in cotton gauze or Japanese paper) have only been used in extremely serious cases, where workers are potentially at risk and cannot complete the intervention, or where the decorative surface is so fragile that it could fall off during the consolidation intervention. For the rest, fill or edge plastering and injections of hydraulic mortar take place directly, interventions that can be considered ‘definitive’ in as much as they do not need removing.

**Documentation and research**

As for documentation, an enormous quantity of data is being produced on site daily. Planning and post-operum
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The documentation and statistical data being collected are the point of departure for the future programme of continuous care of the site that will continue long after the project has come to a close. For example, the information available from the emergency works standard forms in use by the conservator-restorers for the last two years is providing data of the following kind:

- technical information, e.g. the commonest types of intervention and where they are located
- programming factors, e.g. how the seasons influence work priorities (preventive measures before the peak period of visiting school groups, identification of covered areas to work in during wetter months)
- operational parameters, e.g. which areas of the site require the conservator-restorers to have support from a general contractor or vice versa [33]
- cost management information, e.g. areas or operations that require more resources per square metre of site or of decorative feature
- health and safety factors, e.g. where access is problematic or impossible
- the impact on output of qualified skilled operators on site and competent professional supervision.

It is too early to show the results of this process since data entry of previous documentation is still under way, some operations of the campaign began later (structures and infrastructure work) [12] and documentation strategies are still being refined to work better with the potential of the GIS database.

In the emergency works campaign, the support from the scientific research team (mentioned earlier) is kept to a minimum and emphasis is placed on the most critical and common problems, such as testing of water, sand and other basic materials supplied locally and used on site, or on consolidation mortars that are currently available on the market (such as those for treating wall plaster). Needs are generally identified by those who are best placed to judge them: those working in the field – in this case the core team of archaeologist, architect and conservator-restorer. This helps avoid extraneous research and guarantees that new data resulting from research and analysis is actually applied in order to improve methods on site. The tracking of where samples are collected and the gathering and analysis of data are much facilitated by the GIS database [34].

Subdividing conservation measures: different levels of intervention and grouping typologies of intervention

Generally, in conservation, complete interventions are programmed so that an entire process is carried out that includes conservation, aesthetic presentation and improving legibility [36]. However, too often there is limited consideration of how long the intervention itself will last in the environmental conditions to which the object will be exposed. Maintenance programmes are rarely planned to follow conservation interventions and, unfortunately, the causes of decay are seldom adequately controlled meaning that they soon recur, limiting the success of the completed work.

In terms of structures and decorative features, the Herculaneum Conservation Project has adopted a different way of working, subdividing works not geographically but by other parameters. For structures and infrastructure, the experience of the site-wide campaign has demonstrated that stepping away from the traditional programming of complete conservation works for a specific house and, instead, increasing flexibility and responsiveness with site-wide measures addressing specific types of problems en masse (lintels, wall crests, roof repairs, etc.), can be more effective in meeting the needs of the site and matching the resources available.

In the case of decorative features, programming according to the scope of the intervention (i.e. choosing to intervene with only a series of limited initial conservation interventions, e.g. consolidation of detached plasters, without moving on to the next conservation stages, e.g. cleaning, integrations of lacunae) and on a site-wide basis, instead of programming complete conservation measures for groups of surfaces (normally a single house), is guaranteeing the survival of a greater number of features. Essentially, the change is that of introducing emergency measures and maintenance before and during the planning and implementation stages of longer-term measures.
This shift in approach is making work respond more closely to conservation priorities (rather than, for example, to aesthetic reinstatement following a complete intervention). This approach can improve value for money and guarantee the survival of more archaeological features. In some ways, emergency works bring economic advantages because, with the sum of money necessary for completing works on a single building, it is possible to keep more structures and surfaces 'alive' (as long as continuity of care is guaranteed). Notwithstanding the obvious advantages, this type of approach often meets external resistance: emergency works are not of great visual impact, the time and the resources spent do not produce evident changes and the difference between the before and after is often recognisable only to conservation specialists.

Towards continuous care: issues that are still open

The mid-term objective of the Herculaneum Conservation Project is to stabilise an extremely deteriorated situation and make the site manageable from a conservation and maintenance point of view with the site-wide campaign. In addition, it is envisaged that the site-wide campaign, together with other project activity [1], lays the necessary foundations for future longer-term interventions (on, for example, conservation of decorations and structures, protection from environmental agents, visitor management, long-term maintenance, etc.). Once the worst dangers of unforeseeable and uncontrollable loss have been resolved by the site-wide campaign, we plan to maintain this level with regular works of continuous care and gradually transfer this programme to the Soprintendenza Archeologica di Pompei. The Soprintendenza’s future works programme is being developed in unison to ensure the necessary public resources for maintenance and continuous care are allocated in a staged process over the next few years in correspondence with the gradual downsizing of the Herculaneum Conservation Project’s activities in this area.

The survival of the site depends on a programme of continuous care where high quality constant interdisciplinary monitoring of the conservative conditions of the archaeological remains is guaranteed, and actions recommended (emergency works and maintenance) can be implemented swiftly by skilled teams capable of intervening on structures and decorative features. Currently, a minimal continuous care programme for a site the size of Herculaneum requires a sizeable team of conservation consultants and specialist contractors, as the site-wide campaign is yet to bring the entire site to a stable situation (critical work on roofing and drainage is still under way). If the main risk factors persist (shelters that are absent, partial or defective, uncontrolled ground humidity, pigeons, areas closed to the public, uncontrolled group visits, etc.), the progress of decay is rapid, particularly after a period of heavy and continuous rain, in dry and hot months, or after peak periods of the holiday season. This will allow us to gradually reduce the size of the team necessary for sustaining the continuous care of the site. Continuous care is useful and sustainable only if the causes that determine decay continue to be tackled.

The experience of the Herculaneum Conservation Project is demonstrating that it is possible to change thinking towards a different methodological approach. The traditional approach adopted in Herculaneum of subdividing site care into long-term conservation works on a geographical, house-by-house basis is being questioned by the experience of the site-wide campaign. The results of the campaign are showing that subdividing work on decorative features by the scope of the intervention (i.e. initial immediate emergency interventions to keep the decorative feature stable), and work on structures by typology (a campaign of repairs of roofing, of lintels, etc.) and on a site-wide basis can be more effective if the primary goal is the preservation of the site in a sustainable way with the optimum use of resources. With this approach, Herculaneum’s structures and wall paintings still look in poor condition today (masonry erosion, salt crystallisation on plasterwork, illegibility of decorations, etc.) but most of them are no longer continuing to collapse and will still be in situ to be admired and better preserved in the future.

CONCLUSIONS

Herculaneum raises a number of issues found in many large archaeological sites, both in Italy and abroad, and can thus provide a useful example for establishing approaches to conservation and maintenance that are potentially applicable elsewhere. It is a particularly
prolific context in which to understand how archaeological structures suffer over a long period of time after excavation.

Within the Herculaneum Conservation Project emergency campaign, the initial 'first-aid' conservation activities on the site are gradually translating into a programme of continuous care of both ordinary maintenance work and emergency measures. The experience gained in recent years has revealed that, when dealing with an archaeological site in jeopardy, where levels of decay are spiralling out of control, an extensive but light and well-structured campaign of works distributed all over the site area can contribute substantially to the basic survival of the archaeological remains. If connected with maintenance, research, small-scale projects and site trials of more 'complete' conservation, this campaign can also help in reinstating a status quo that is feasibly sustainable in the long term.

Continually (re-)defining priorities has been crucial when working on a large scale with countless emergency situations. Graphically mapping the decay of the whole site has identified areas at great risk and helped to programme intervention typologies. Diverse approaches have been developed to stabilise and safeguard the archaeological standing structures (where possible adopting mid- or long-term solutions) and the decorative features at risk (generally lighter interventions that require more intense maintenance). These works have been united with a campaign to improve the city infrastructure (protective measures, drainage and site access) and together form a coherent investment for the future of the site, all carried out in a setting where more definitive conservation measures and presentation issues await the moment when the site reaches a more stable status quo and a situation of 'emergency' no longer exists.

Finally, defining different levels (in terms of lifespan) and different types (maintenance, emergency works, site trials, monitoring programmes, etc.) of interventions has also proved crucial, not only in improving the general conditions on the site but also in providing the foundations for future, more exhaustive conservation projects and for a sustainable model of long-term site management and maintenance that can successfully be taken forward by the heritage authority in a staged handover.

The Herculaneum Conservation Project has provided an unusual opportunity for a team of qualified specialists, coming from the public and private sector alike, to work intensely and in unison on a single archaeological site for a continuous period of time. The experience of the site-wide campaign is demonstrating that the strong site presence of an interdisciplinary team of skilled conservation professionals results in such an increase in both the quality and quantity of results delivered for the survival of the archaeological site, and the increased capital investment in expertise is more than compensated in the long term.

Perhaps the most important lesson to date has been, however, how much can be learnt from the archaeological site itself and how important it is to work with and not against its own existing equilibrium, respecting the effect of the passage of time on structures and decorative features, and limiting ourselves to anticipating the possibility of greater decay and reducing its damage where possible.

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3. The aesthetic impact of the site-wide campaign is of marginal concern at the moment. Naturally, the aesthetic consequences of the interventions are discussed, with the aim of not creating new elements that are visually disturbing, but all work that is not aimed solely at improving conservation is being delayed until the site has had its most serious problems resolved.


5. Visitor numbers can be found on the official website of the Soprintendenza Archeologica di Pompei at www.pompeisites.org in the section 'SAP', and then 'Dati visitatori' (please note that this information is only available in the Italian language version of the website, not in the English translation).


11. This is particularly frequent in Italy, where current legislation still obliges private and public agencies to contract an architect for the supervision of conservation works, even for works on decorative features.

12. Mapping of decay began in 2004 with the decorative features, whereas the mapping of the structures started later and addressed both the archaeological structures and the edges of the site.

13. The two-dimensional GIS, currently under development for the whole site by Akhet Srl, an archaeological company specialising in documentation and survey, was preceded by a three-dimensional GIS of the case study area (*Insula Orientalis I*), developed during the first phase of the Herculaneum Conservation Project, when the focus of the project was mainly on one urban block of the Herculaneum site; see [14].


15. Four categories of seriousness were identified (low, medium, high, extra), corresponding to a detailed evaluation of the work required and the costs (labour and materials) carefully estimated on a square metre unit-price basis.


17. Both the lower and upper portions of the existing walls in Herculaneum are in most cases original, due to the particular destruction process of volcanic surges and flows. During the AD 79 eruption, Herculaneum was hit at an incredible speed by fairly fluid volcanic flows that mostly demolished the walls (depending on their position in respect to the direction of the flow) in their central sections.


20. The Soprintendenza Archeologica di Pompei is currently launching a project of stabilisation and enhancement of the northern edge of the site.


24. As of today 21 entire building units have been examined, out of about 100 (of which many do not have significant decorative features), choosing those with greater problems or with more important decorative features.

25. Description of necessary operations, analyses of costs per square metre, extent of surfaces, degree of decay, economic evaluation of the time and cost of execution.

26. We had to identify covered areas of the site to work on during rain so as not to lose the momentum of the emergency campaign.

27. Once an area of Herculaneum is closed to the public, even regular checks by custodians cease. The area is considered unsafe and nobody is allowed to enter. In this way, structural conditions rapidly worsen and future conservation interventions become more complicated.

28. Even if work proceeds in defined areas, the supply of materials, movement within the site and creation of access routes are very costly in terms of time and manpower. So the types of workers required, as well as time and costs, needed to be assessed in relation to the priorities of the site-wide campaign and the objectives of the entire project set by the project partners, both public (the ‘owners’ of the site) and private (the commissioning client).

29. To intervene on decorative features after the building work has been completed allows conservation work to be carried out in safety, it lengthens the life expectancy of the interventions, and it decreases future maintenance. On the other hand, intervening before a protective shelter is erected or a wall repaired helps to protect fragile decorations and to make the shelter design itself more efficient. In an emergency campaign these decisions have to be taken constantly, since the structural problems and those of the decorative features are interconnected and inseparable, both in terms of time and management.

30. After one year of the site-wide emergency campaign on structures (work started in July 2005 following emergency work tests in the case study area in March–June 2005 led by Gionata Rizzi), most of the closed houses had been secured and cleaned, and the escarpments were cleared of vegetation and monitored. At this point about 2,000m² of the site had been reopened to the public (roads, houses, public buildings). See Avvisati, C. L’HCP argina l’eruzione, le acque e il calpestio: proseguono i lavori di salvaguardia del sito sostenuti dal Packard Humanities Institute. Giornale dell’Arte 255 (2005) 49.

31. The contribution of the Soprintendenza site custodians to the widespread emergency works has been very encouraging, once they had overcome their initial wariness. They now work closely with the Herculaneum Conservation Project team, involving them every time that they notice decorative surfaces being damaged by tourists or in process of collapsing in areas closed to the public.

32. Reintegration of the existing masonry (both original and Maiuri’s) is reduced to the minimum necessary for stabilisation purposes, and as far as possible it is carried out by working on the inner core of the structure without touching the surface or façade. It has rarely been necessary to reintegrate the actual wall facings in order to guarantee their stability, although in planning such operations we have had to reflect on how to deal with past reintegrations (particularly those of Maiuri who chose to use a Roman technique that was not, however, used at Herculaneum in antiquity). After careful consideration we decided to use the original techniques belonging to each specific wall (opus reticulatum, opus mixtum, etc.) instead of replicating Maiuri’s technique or creating a new approach. The presence of fibres in the mortar and careful...
documentation will allow our reintegrations to be recognised. The debate is still open over how to reconstruct large portions of masonry in the case of new excavations.

33. Mutual on-site assistance between the various teams has been central to delivering a works strategy that responds to the needs of the site. This has required the formulation of flexible elements in the works contracts and constant dialogue within the team.

34. The results of this research will be made available to the Soprintendenza for when they take over responsibility for them.


● Mesures de conservation pour un site archéologique en péril (Herculaneum, Italie): de l’urgence à l’entretien

Paola Pesaresi et Monica Martelli Castaldi

RÉSUMÉ

Depuis presque trois ans, le Projet de Conservation Herculaneum mène une campagne de travaux d’urgence dans les zones en péril du site archéologique d’Herculaneum. L’instabilité des structures anciennes et la fragilité des éléments décoratifs suite à des années de négligence ont montré que le site ne pouvait pas attendre que des propositions de conservation à long terme soient développées. Dans cet article, les auteurs discutent le raisonnement qui a conduit à l’établissement de cette campagne de travaux, et aux méthodologies qui ont été adoptées. Elles concluent que, même si de nombreuses leçons ont été retenues sur les travaux d’urgence dans un site en péril de grandes dimensions, le principal défi existe encore : celui de traduire la campagne d’urgence en un programme d’entretien structuré et durable qui permette des actions continues, afin que la négligence du site qui a caractérisé la fin du XXème siècle ne se répète jamais.

● Medidas de conservación para un sitio arqueológico en riesgo (Herculano, Italia): de la emergencia al mantenimiento

Paola Pesaresi y Monica Martelli Castaldi

RESUMEN

Desde hace casi tres años, el Proyecto de Conservación Herculano ha realizado una campaña de trabajos de emergencia en las zonas en peligro del sitio arqueológico de Herculano. La inestabilidad de las estructuras antiguas y la fragilidad de los elementos decorativos demostraron que el sitio no podía esperar al desarrollo de propuestas de conservación a largo plazo. En este artículo, las autoras discuten el razonamiento que condujo al establecimiento de esta campaña, y a las metodologías adoptadas. Concluyen que incluso si se retuvieron numerosas lecciones de los trabajos de emergencia en un sitio de grandes dimensiones en peligro, el desafío principal aún permanece: el de traducir la campaña de emergencia en un programa de mantenimiento estructurado y sostenible, que permita acciones continuas de modo que la negligencia que fue característica del sitio a finales del siglo XX no se repita jamás.