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PROTECTION AND PRESENTATION OF EXCAVATED STRUCTURES

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The problems of preserving and presenting *in situ* archaeological and architectural remains are among the most difficult faced today by archaeologists and architectural conservationists. The basic difficulties are that structures in a ruinous state are no longer suited for exposure to the elements and that all man-built structures are in a dynamic state of change towards an equilibrium with the forces of nature.

Ruins are structures which are in an advanced state of deterioration. Various preservation interventions can be made in an attempt to arrest the deterioration process through structural stabilization, reconstruction, restoration and sheltering from the effects of weathering. A large quantity and variety of open archaeological excavations and architectural ruins exists throughout the world, each with a separate history, physical context and conservation potential. In many cases similar treatments for preservation can be used to extend the life of building remains; however, the problems of any two sites are never exactly alike. Climatic situation alone, whether in hot arid, temperate, tropical or frigid areas, radically affects the preservation and presentation interventions which can be used at a given site. Despite the large number of variables, some basic approaches to archaeological site conservation problems can be applied. Concerned individuals and organizations can now more than at any previous time learn from a variety of site conservation efforts which have been tried in the past.

Planning

Planning for at least the contingency of site preservation and presentation should begin in the formulation phase of any archaeological programme. This can present a difficult task since one rarely knows what will be discovered in the excavation process. A series of both short- and long-term objectives for preserving and presenting a site should be developed and updated throughout the planning process. An example would be the early programmatic decision made at some excavations to erect a field house for use by the excavation team, which can be later adapted to become an interpretive centre and museum for the site. Or, perhaps the decision can be made at the start to erect a permanent shelter so as to protect a site both during excavation and later when the site is presented. This approach was used by the U.S. National Park Service at Dinosaur

National Monument in Utah where excavation of palaeontological remains continued while also being on display within a permanent shelter.

After excavation, an objective and comprehensive evaluation of the site should be made. On assessing all the problems and potentials, an initial question might be "should the site be presented at all?". Given the technical difficulties and costs that can be encountered in preserving and presenting sites, it may well be that the best solution is to backfill carefully the excavation and let its description be by secondary means such as publications, exhibitions, models or perhaps a facsimile (for backfilling and temporary protection of excavations, see also Mora, Chapter 8, and Alva & Chiari, Chapter 9).

A second question might be "to what level should one intervene in preserving a site and its structures?". Should an undermined foundation or a leaning wall in precarious condition be structurally consolidated? Most would agree that it should be. But on intervening, at what point should one stop restoring? Perhaps the most practical and theoretically defensible policy is that of the Ancient Monuments Board of the Department of the Environment in England which attempts simply to arrest the process of decay at the time when a monument falls under the stewardship of the Department. This usually involves attempts to structurally consolidate and weatherproof a monument in its 'as found' condition, and to present the remains to their best advantage within the context of the site.

Preliminary objectives for preserving, presenting and maintaining a site should be agreed upon and budgeted as early in the archaeological process as possible. A principal reason for this is that the excavation can then be carried out with site preservation and presentation in mind. Depending on the nature and condition of a site, archaeologists should consider that only a minimum of occupation periods can be effectively presented lest there be confusion on the part of visitors in their interpretative efforts. The decision whether to present the archaeological evidence of a site as it might have been in its heyday or all its successive occupations is largely a question for the archaeologist and historian. At this stage the opinions of other specialists including conservators, architects, museologists and site planners should be consulted. The team approach involving appropriately experienced personnel is critical to effective archaeological site preservation and presentation. Such an approach may result in important programmatic decisions, for instance that the site should be presented essentially as one 'period,' with the more complicated issues of its historical and morphological development being explained in a nearby interpretive centre and museum.

Methodology

A thorough knowledge of all aspects of an archaeological site and its remaining structure is prerequisite to any decision-making for site conservation and interpretation. It is of vital importance to understand the design intent and construction methods of the original builders.

Planning for the preservation of archaeological remains and their interpretation is largely an issue of site planning. Visitor circulation and its control should, where possible, be guided by inherent circulation provisions within a site. For instance, site access for the modern visitor should be from the same direction as that of an original inhabitant (for instance, access to the Parthenon via the Propylaea, and to Mycenae through the Lion Gate). The key features of a site should be readily discernible to the scholar, to the inquiring visitor and to the recreational visitor. At sites where successive occupations existed, as far as possible one period of occupation should be primarily featured, with other periods given a secondary presentation. For example, where above-grade walls are situated on older foundations, these walls can be featured with inspection pits for viewing the earlier wall-footings.

Although one period of a site may be emphasized, by no means should a site be cleared of all subsequent archaeological evidence. Experience has proven that this is not a wise attitude if an honest interpretation of a site's history is ultimately desired. Excavation is in any case a destructive process, so the careful retention of control strata for reference and eventual display is important.

A fundamental fact in archaeological site conservation is that reburial of exposed archaeological remains is the nearly optimum preservation solution. The many lessons learned at Pompeii, a virtual laboratory for archaeological and preservation methods for more than 200 years, has proven that no matter which preservation methods were used, nothing remains better preserved than the unexcavated portions of the site! All perishable archaeological remains survive longer in the constant environment provided by surrounding earth, sand and water, than if subjected to atmospheric exposure. Therefore, so far as conservation is concerned, the more a site is buried or unexcavated, the better it is preserved.

Quality control of field work during the restoration process is extremely important. The lack of a comprehensive plan can often lead to work being done in a piecemeal fashion or on an "as needed" basis which in the long term has often proven to be more costly and more difficult to manage. Effectively consolidating *in situ* ruins requires skilled craftsmen under able direction. Where possible, structural interventions should be discreet, as when reinforcing masonry walls using grout injections and stainless steel reinforcing rods buried within the wall core. The joining of old and new fabric and detailing should usually be discernible at close range and not noticeable from a distance.

It is essential that all physical changes to a site during excavation and conservation be thoroughly and accurately recorded. The documentation should include details of any previous repairs and the performance of materials then used.

Materials conservation

Consolidating exposed brick and stone masonry structures should be done in most instances using traditional masonry construction techniques with perhaps some minor modifications. In consolidating and restoring ruinous walls, special attention must be

given to protecting the inner wall core and all joints from moisture penetration. An effective solution for weatherproofing wall tops is to add either stone capping or metal cap flashing with drips which direct moisture away from the walls. Though efficient, this type of solution can have unacceptable aesthetic consequences except, perhaps, when used on high walls. In most cases where ruinous masonry wall tops of varying heights are to be consolidated,the best approach is to re-set the top three or four courses in a visually compatible mortar setting-bed, with slightly recessed joints which are pointed so as to shed water away from the wall centre. In some cases the new mortar can be more durable than that which exists. However, mortars used in the repair and consolidation of historic masonry should never be significantly more dense or with greater bonding capacity than the softest masonry component which is being repaired. There is no need to flatten all wall tops of an exposed wall, with the possible exception of cases involving mudbrick masonry consolidation. The levelling of wall heights compromises the visual integrity of a structure in ruin.

Many attempts have been made to reinforce and waterproof ruined structures using chemical solutions and additives. Included among those solutions used for masonry consolidation are silicates, acrylic polymers, polyurethane resins, vinyls, waxes, silanes, asphalt emulsions and epoxies. Chemical additives include portland cement, hydrated lime, concrete hardeners and glues. Although apparently successful in some instances, the majority of such interventions have proven to be failures. Applications can be expensive and on several occasions have been known to cause irreversible damage – a most lamentable situation where irreplaceable cultural resources are involved. Failures are generally due to new and old materials having different strengths, coefficients of expansion, porosities, colours and durability. Incorrect product mixing and inexpert applications pose sizable problems in themselves. Where one may care to experiment, chemical solutions and additives should be thoroughly and scientifically tested at the site over a period of at least one year. Many promising possibilities exist for the successful use of chemical consolidants and waterproofing substances for exposed archaeological materials but as of yet no cure-all formulae have been developed. Until they are, more "organic" traditional methods of building repair should be relied upon and a healthy skepticism of new products should be maintained.

Exposed ruins after excavation may also be protected by roofs and sheds of different types and materials. In designing these, it is important – as in other engineering and construction projects – that the materials be specified. The roof must, first of all, be able to protect itself and the specifications must take account of, for instance, the need for rust-proofing and fire resistance. Clear specifications are no less necessary for temporary protective roofs, bearing in mind the tendency of the temporary to become permanent.

Landscape restoration

Restoring landscape features based on archaeological evidence can be highly effective in site presentations. Restored horticultural elements such as trees, gardens and

parterres can offer the practical advantages of shade and windbreaks while also directing visitor flow through a site. Only plant and tree species native to the area should be used; they should be carefully placed, with preservation of the site the main objective. Large-rooted trees and clinging ivy should not be placed in close proximity to old masonry walls. If vines are to be allowed on a ruin, they should be planted in specially built pockets, and be of the twining or running variety.

Grass lawns over either unexcavated or backfilled areas of the site can often define a floor plan as well as, if not better than, the original flooring. In high-traffic or shaded areas, gravel walking surfaces offer the same advantage with less maintenance. Vegetation growth beneath gravel areas can be prevented with the help of recommended herbicides.

Restored water features can also contribute greatly to the effectiveness of a site presentation. Reactivating dormant water displays such as fountains and restoring water bodies and edge conditions, as has been done for some European castle moats, can add a pleasant vitality to the stillness frequently found at uninhabited sites. In some cases original water collection and distribution systems can be rehabilitated for continued service (for example, in an urban setting, the Roman bath building at Bath, England).

The presentation of some sites is primarily a question of landscape restoration, as in cases where original landscape elements, and occasionally complete gardens, remain. A less horticultural example would be the restoration of a battlefield consisting mainly of earthworks. This sort of presentation usually requires practical revisions to what would otherwise be an authentic restoration. Timber revetments should be treated with chemical preservatives and embankment slopes should both resist erosion and be more easily maintained than the original builder would have intended.

Building reconstruction

The use of restraint in architectural design for ruins preservation is of great importance. The history of archaeology and architectural restoration contains many instances where both architects and archaeologists have been over-zealous in reconstructing vanished structures. The only conceivable situation where complete reconstruction might be undertaken is when there is complete or very nearly complete archival or archaeological evidence, for example where accurate pictorial records exist or perhaps where a natural catastrophe preserved a structure *in situ*, such as the mud slide inundation of Herculaneum and the volcanic explosion of Santorini in Greece. Otherwise reconstruction should be limited to anastylosis (see Mertens, Chapter 10).

Hypothetical reconstructions using identical materials often cause more confusion than anticipated. Complete reconstruction does, however, offer the advantage of enclosing a structure again, and thereby offers more efficient protection, for example the reconstruction of the Stoa of Attalus in Athens (plate 3a) and parts of the Palace of Minos at Knossos, Crete (plate 3b). Given the practical and philosophical issues raised by this practice, an approach involving more understated suggestions of a structure's

size and shape would now generally be preferred. If the condition of a site requires sheltering systems as well, then sensitively designed shelter structures should probably be used that do not detract significantly from the natural qualities of a site and its building remains. Or, as an English architect once put it, "a properly presented site should be made as photogenic as possible."

Examples of site protection

There are many examples of sheltering and protecting *in situ* archaeological ruins, most of which date from the last 100 years. A range of possibilities exists which can be placed on a scale of intervention ranging from the simplest, most practical approach to those which are more technically and theoretically complex (figure 1).

The method used for presenting mosaics at an imperial Roman villa discovered at Woodchester in Gloucester, England, may be the most practical, cost-effective and preservation-conscious of all solutions. An area of 256 m^2 of mosaic flooring is uncovered for public display during the summer months on a regular basis every tenth year. When on display, a walkway bridges the mosaic, one of the largest and most elaborate in Northern Europe. Interested visitors are only able to visit a few times in their lives and there is something rather special about the local tradition centred around the excavation and reburial events.

Figure 1. A SELECTION OF ARCHAEOLOGICAL SITES REPRESENTING A POSSIBLE SCALE OF PHYSICAL INTERVENTION

1. Discovered sites that remain unexcavated:
   - Unexcavated portion of Pompeii
   - Photo-mapped sites in Turkey
   - Second Funeral Barge Pit at Cheops Pyramid,Giza, Egypt
   - Etruscan tumuli at Cerveteri and Tarquinia, Italy
2. Backfilled sites which are periodically presented:
   - Mosaics at Woodcester, Gloucester, England
3. Above-ground ruins left "as found":
   - Plaza of the Seven Temples, Tikal, Guatemala
   - Rosewell Plantation, Whitemarsh, Virginia, U.S.A.
4. "Abstract" presentations which preserve archaeological fabric:
   - Ben Franklin House, Philadelphia, Pennsylvania, U.S.A.
   - Facsimile of below-grade ruins, Nara, Japan
   - Wolstenholme at Carter's Grove, near Williamsburg, Virginia, U.S.A.
5. Temporarily protected excavations:
   - Regia in Roman Forum (under shed roof)
   - Can Hasan, Turkey (excavated beneath pneumatic shelter)
   - Lawson Indian Site, Ontario, Canada (use of tent structures in inclement weather)
6. Stabilized and/or partial ruins *in situ*:
   - Fountains Abbey, Yorkshire, England
   - Colosseum, Rome, Italy

   - Nalanda temples and monasteries, Rajgir, India
   - Windsor Plantation, Port Gibson, Mississippi, U.S.A.
   - Hadrian's Wall, North England
   - Macchu Picchu, Peru
   - Mycenae, Greece
   - Pyramid Complex, Mexico City, Mexico
   - Persepolis, Iran
7. Stabilized ruins with an adjacent site museum:
   - Paestum, Italy
   - Tarquinia, Italy
   - Tintern Abbey, near Monmouth, Wales
8. Ruins protected beneath or within shelters:
   - Tomb of Chin Shih Huan, Shen Si Province, China
   - Piazza Armerina, Sicily, Italy
   - Fishbourne, Sussex, England
   - Roselle, Italy
   - Casa Grande, Arizona, U.S.A.
   - Kara Tepe, Turkey
   - Dinosaur National Monument, Utah, U.S.A.
   - Lullingstone Villa, Kent, England
   - Akrotiri, Thera, Greece
   - House of Dionysos, Paphos, Cyprus
9. Ruins incorporated into other structures:
   - Theatre of Marcellus, Rome, Italy
   - Dome of the Rock (Second Temple platform), Jerusalem
   - Lord Byron's Home, Nottingham, England
   - Baths of Diocletian, Rome, Italy
   - Sugar Mill Conversion, National Park of Culture and Rest, Havana, Cuba
   - Roman Baths and Museum, Bath, England
10. Completely restored ruins:
   - Curia, Rome, Italy
   - Temple of Hatshepsut, Deir el Bahari, Egypt
   - Arch of Titus, Rome, Italy
   - Gymnasium and Synagogue, Sardis, Turkey
   - Queen's Megaron, Knossos, Greece
   - Colonia Ulpia Traiana, Xanten, Germany
   - Cardiff Castle, Wales
11. Relocated archaeological monuments:
   - Abu Simbel, Eyptu
   - Philae Temples, Egypt
   - Ramesses II Obelisk, Place de la Concorde, Paris, France
   - Temple of Dendur, Metropolitan Museum of Art, New York, U.S.A.
12. Archaeological reconstructions:
   - Stoa of Attalus, Athenian Agora, Greece
   - Colonial Williamsburg, Virginia, U.S.A.

Sites under excavation and open for exhibition for short periods can be easily and economically enclosed in any of several types of temporary structures (plate 4a). Protective shelters can range from pneumatic structures to more durable prefabricated metal-clad structures. Pneumatic structures are practical at sites where ongoing excavation requires short-term protection. A pre-formed continuous membrane of plastic sealed around its base with air-locked entrances can be kept inflated over an extended period of time by small gasoline or electrically powered fans. With balanced ventilation, such a structure can actually serve to provide a more or less air-conditioned space and both the excavation and its excavators can be protected from direct sunlight (Weaver 1973).

Fibre-reinforced membranes can also be stretched over lightweight structural frames which can span over 20 metres. Among the choices of structural systems for such spans are space-frame trusswork and tensegrity-type structures which support tent-like forms.

The excavated site of Roselle, a 7th-century BC Etruscan hilltown site in central Tuscany, has a simple shelter over its most significant area (plate 1a). The structural system consists of round steel columns placed at approximately eight-metre intervals and a roof structure made largely of a grid system of steel angles. Green corrugated fibreglass panels form the roof sheathing. Gutters and directional rain leaders divert water away from excavated portions of the site. Ruined wall tops are consolidated, with some serving as pathways for visitors, and a modern cast-concrete footbridge spans one portion of the exposed ruins. This strictly functional sheltering system effectively protects the excavated areas from direct sunlight and rain, and its colour and low height are sufficiently neutral and visually recessive so as not to detract significantly from the natural character of the site.

More durable features at the site such as a polygonal stone roadway and standing stone walls have been reconstructed, and throughout the site restoration work is discernible on close inspection. The date of restoration work was occasionally stamped into the new mortar work.

A more permanent form of open-air shelter was erected over historically important bilingual inscriptions at Kara Tepe in Turkey (plate 4b). The structural system and roof, of reinforced concrete, should require less maintenance than a metal and fibreglass structure, for example; however, there is a risk that the shelter appears monumental in relation to the site.

The discovery of important mosaic floors during excavation of an imperial Roman palace at Fishbourne near Chicester, England, was an important archaeological discovery which merited complete presentation. It was enclosed in a new shelter which also accommodated an interpretive display. The complex dated from AD 75 when it was destroyed by fire. The most significant mosaics at the site and other archaeological remains were consolidated and are presented within the modern enclosure; outside it is an archaeological park. The well-kept grounds have restored landscape features such as trellises and topiary. In addition subterranean foundations in other areas of the site are "lined out" at grade level with pre-cast concrete pavers. Mounted bronze information plaques offer interpretations of the few archaeological features which are exposed to the weather (plates 1b, 2a).

The protective shelter at Fishbourne is a clear-span structure with window walls. Inside, an elevated walkway with carefully located footings allows visitor viewing from above (plate 2b). From the design and interpretation point of view, the complex is highly effective. Some problems, however, due to groundwater conditions are evident in parts of the sheltered remains. Rising damp is present in some of the most fragile archaeological fabric. The wooden thresholds and plasterwork were not re-set in impervious setting beds, as were the mosaics, leaving them vulnerable to rising damp. Moisture in these elements is evident from the tell-tale presence of biological growth. In this case, lowering the groundwater table through the installation of dry wells or similar means may not be the preferred solution because of the differential settlement potential for the foundations of the new structures. The present moisture problem at Fishbourne is relatively minor compared to the many successes, though it does underscore the issue that archaeological ruins, even if presented in carefully controlled interior environments, are not always exempt from deterioration problems.

The shelter system used to cover important mosaics at Piazza Armerina in southern Sicily represents an enclosed protective structure which abstractly reconstructs volumes of major portions of the 3rd-century AD villa (plates 5a, 5b). The modern structure encloses a complex of rooms which surrounds a central courtyard. Restored mosaics and consolidated walls which are no higher than two metres can be viewed from within the enclosure from a meandering, elevated metal walkway centred over ancient walls. In the place of the original walls and roofs are translucent panels of plastic attached to lightweight metal framing. Much of the wall area consists of panels of fixed louvres for ventilation. Suspended panels of plastic create flat ceilings in certain areas, reduce heat transmission and glare, and also create a ventilated attic space.

Built in the 1950s, the structure was the first of its kind to enclose *in situ* archaeological remains using contemporary materials to recreate the geometry of a vanished building form. The shelter functions well in protecting the exhibition of mosaics and was installed with a minimum of intrusion to the original building fabric. The prefabricated structure can also be easily dismantled. There has, however, been material failure in the exterior sheathing as sunlight has discoloured the plastic of the panels. During the summer months visitors have also complained of uncomfortably high temperatures despite what would seem to be adequate ventilation designs (Fitch 1982).

Another unusual approach towards preserving and presenting archaeological remains was used in 1975 at the Benjamin Franklin House in Philadelphia, Pennsylvania. Architects Venturi and Rauch, retained by the U.S. National Park Service, constructed an abstraction or a "ghost" of Franklin's long-since demolished home and carriage house in their original locations (plates 6a, 6b). Although archaeologists and archivists yielded a wealth of artifacts and written descriptions concerning the building and its ground, there was insufficient archaeological or pictorial evidence to reconstruct

the two buildings accurately. This lack of information was the basis of a decision to construct only an outline of the two structures in a framework of square steel sections. Entrances, rooflines, gables and chimneys are represented in their supposed size and shape. The ground level walls and the first floor rooms are defined in a pattern of bluestone and granite pavement, with either grass lawns or brick paving used at other areas of the site. The actual foundation walls of the house and cellar remains can be viewed immediately below grade by looking into several periscope-type inspection pits.

The plan of each ground floor room is clearly delineated by different colours and textures of paving. Adding to its interest are excepts from Franklin's correspondence pertaining to each room inscribed in the bluestone paving. A typical example reads, " '... in the front room which I designed for guests I have the bed you sent from England, a chamber mahogany table and stand.' Deborah Franklin to Ben, Paris, Fall, 1765." Such a device adds a valuable human element to the site. In addition to this open-air presentation, an interpretive museum describing aspects of Franklin's life and accomplishments is located in an adjacent underground facility. The unique presentation used at the Franklin house attracts an average of one million visitors a year and serves as one of the nation's major exhibitions of American history.

Summary

As the fields of archaeology and architectural conservation have matured, there has been a certain development in attitudes about preserving and presenting *in situ* archaeological remains. Attitudes towards site conservation have evolved from a general "laissez-faire" approach, through an interest in scholarly reconstructions, to preserving and presenting ruins, in a practical manner, with the aid of improved conservation and interpretation techniques.

There is a continued role for discreet interventions where there is a high appreciation for historical authenticity. This is not to say that bold interventions are not sometimes warranted – all possibilities should be considered, so long as in each case preservation is the main objective.

Experience at preserved and presented sites has proven that stabilization and restoration efforts can never be permanent measures in themselves since deterioration is a never-ending dynamic process. At exposed sites, a long-range commitment is needed, not so much to keep the resource unchanged as to mitigate the effects of time. Realizing this, it must be accepted that maintenance is an essential part of preservation. New developments in science and preservation practice must always be involved in the efforts to conserve sites.

The many potential aspects which each site poses require detailed planning for satisfactory solutions – the principal reason for using a multi-disciplinary approach. As knowledge and experience continue to accumulate, the success rate for archaeological site preservation and presentation efforts will only improve.

ACKNOWLEDGEMENTS

Figure 1 is based on the "Scale of Intervention Concept in Historic Preservation" originally developed by J. M. Fitch. The following kindly supplied photos: C. Erder (plates 3b and 4b), R. M. Organ (plate 4a), D. Mértens (plate 5a), and J. M. Fitch (plates 5b and 6b); remainder by the author.

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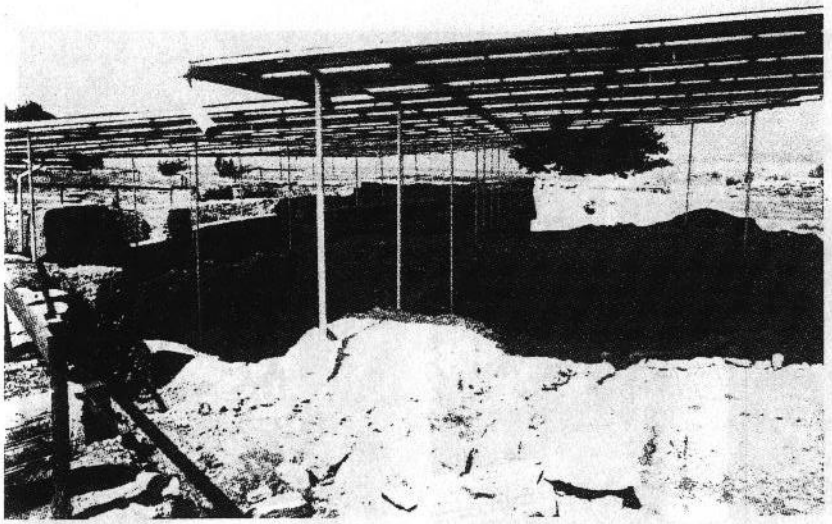


Plate 1a. Simple shed covering at Roselle, Tuscany, Italy.

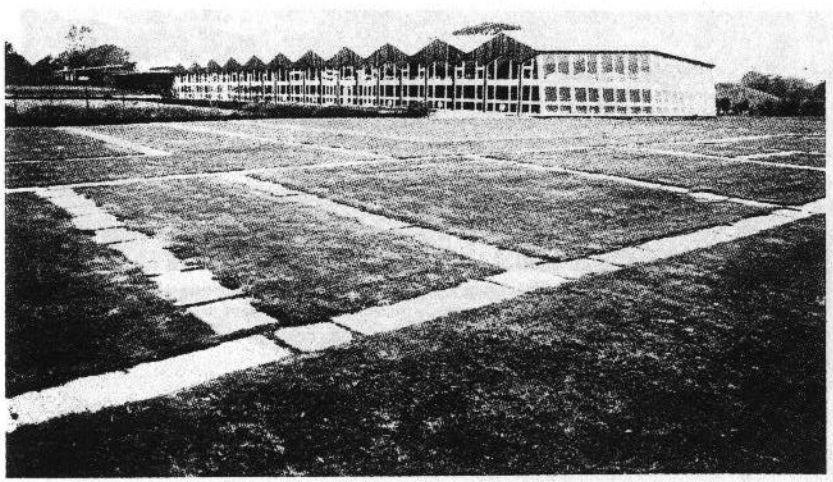


Plate 1b. Fishbourne Palace Museum, Sussex, England, showing "lined-out" subterranean structures.

Plate 2a.

Consolidated archaeological remains at Fishbourne.

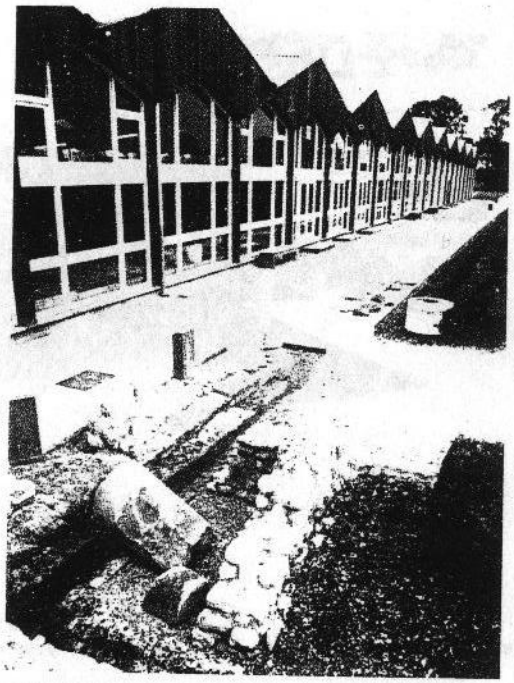
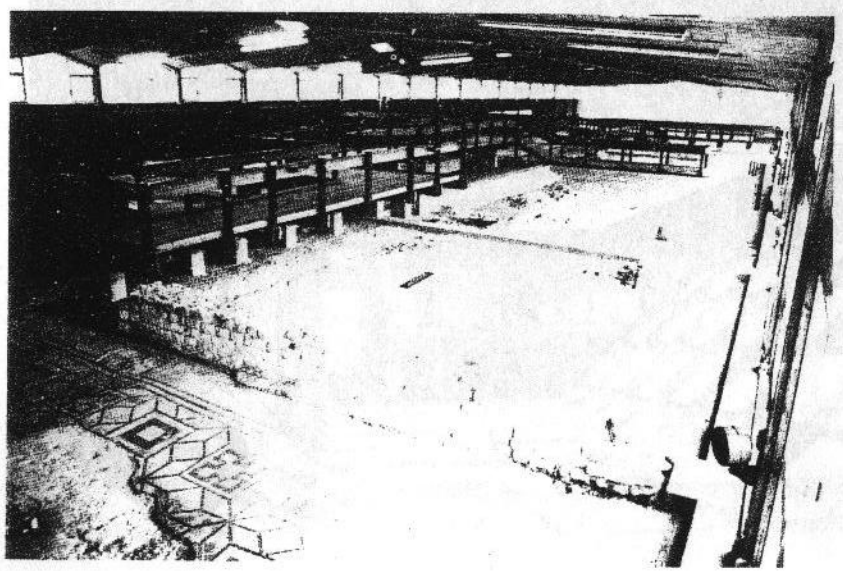


Plate 2b.

Clear span structure sheltering mosaic flooring and wall remains, Fishbourne.



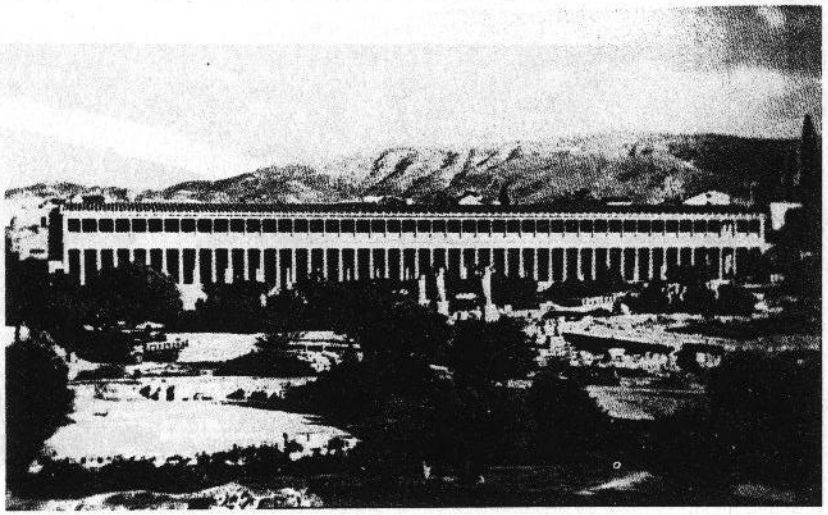


Plate 3a. Reconstruction of the Stoa of Attalus, Athens.

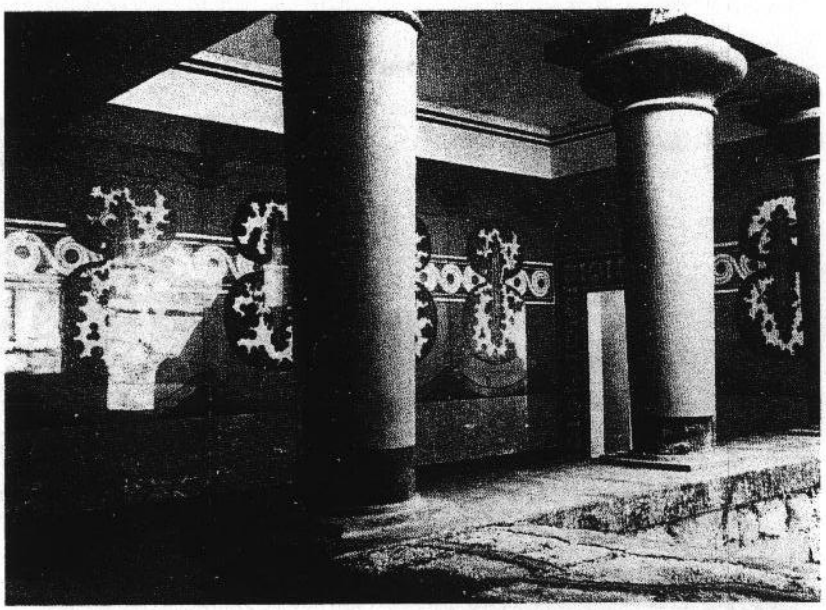


Plate 3b. Knossos, Crete. Reconstruction of royal apartments, Palace of Minos.

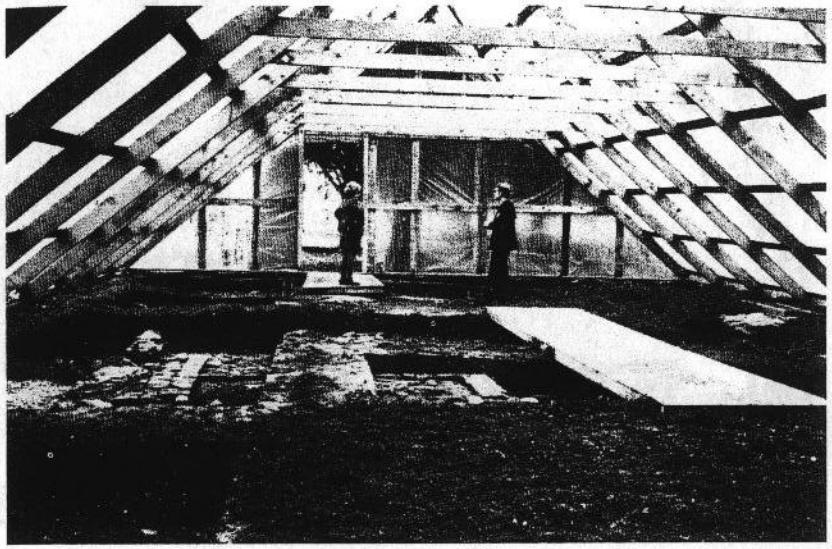


Plate 4a. St. Mary's site, Maryland, U.S.A. Temporary roof of polythene and wooden framework over excavation.

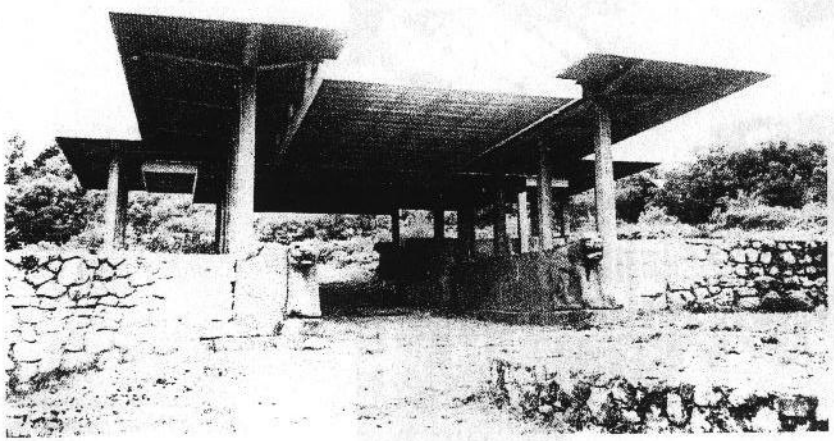


Plate 4b. Kara Tepe, Turkey. Concrete roof over ruins.

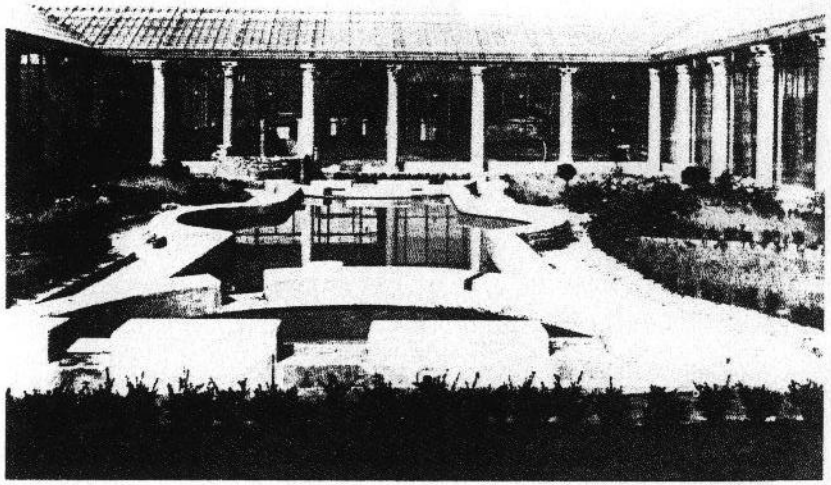


Plate 5a. Piazza Armerina, Sicily. Form of Roman villa recreated using Plexiglass.

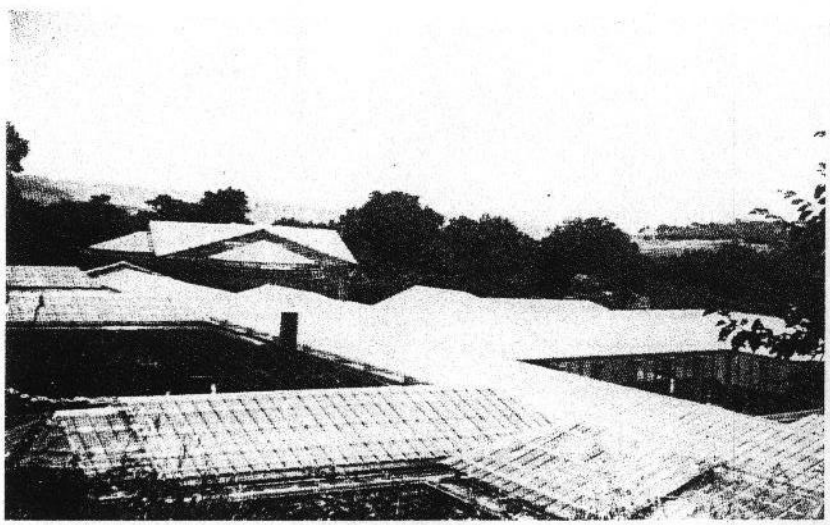
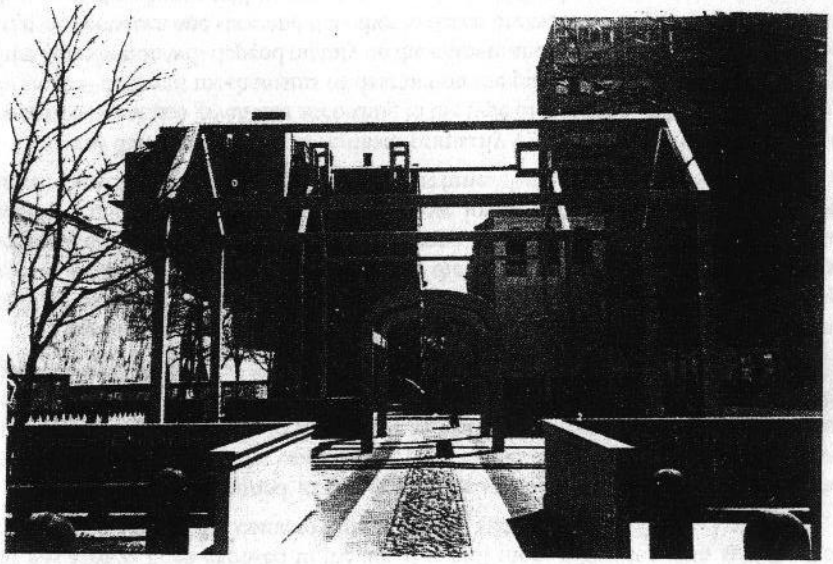
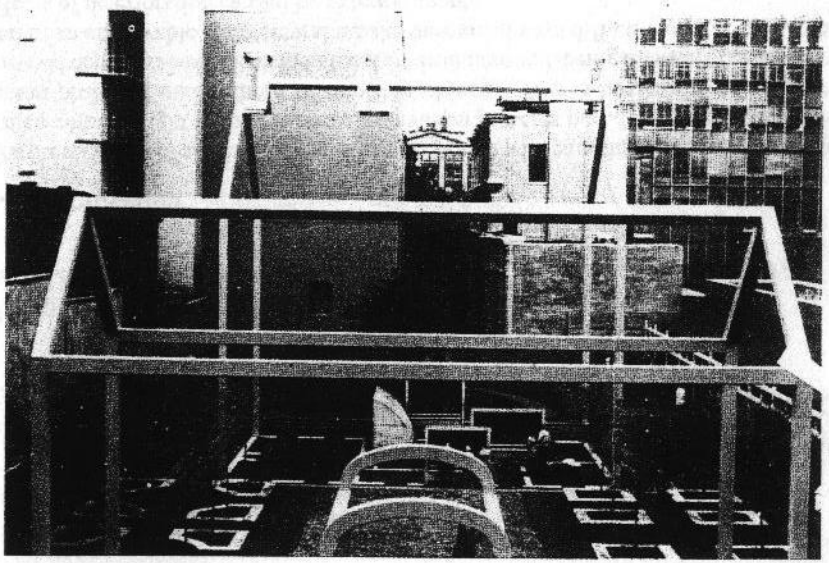


Plate 5b. Piazza Armerina. Protective shelter abstractly recreating spatial volumes.





Plates 6a, 6b. Abstract reconstruction of Benjamin Franklin home and carriage house, Philadelphia, Pennsylvania.