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Anastelosis of Greco-Roman Temple Remains in Western Anatolia: Principles, Implementations and Assessment

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ABSTRACT

Anastelosis, which is defined as the reassembly of a structure by bringing together its existing original fragments, is a technique of conservation and presentation in archaeological sites. The aim of this study is to contribute to the conservation and presentation of the structures and to determine the basic principles to be considered during the implementation by analysing and evaluating the anastelosis implementation at temple structures in Western Anatolia, Turkey. The authors examined on-site evidence, archival and literature review. Analysis criteria were determined as emphasis of the structure within site scale and in original state, structural and visual integrity of the monument, authenticity, reliability, distinguishability, visual and material compatibility, reversibility and re-treatability. As a result, it was pointed out that the principles of reversibility/re-treatability and distinguishability should be managed while providing reliability, compatibility/structural and visual integrity in line with the preservation of authenticity.

KEYWORDS

Archaeological heritage; anastylosis; archaeological site; conservation approaches; temple; ancient Greek; Roman

Introduction

Anastelosis is a technique of conservation and presentation in archaeological sites defined as the reassembly of a structure by bringing together its existing original fragments that have fallen for any reason such as natural disasters or otherwise as well as unearthed in excavations (ICOMOS 1931 art. VI; Carta del Restauro Italiana 1931 art. 3; ICOMOS 1964 art. 15; Italian Restoration Charter 1972 art. 7.3; Gazzola 1972; Sanpaolesi 1972a, 1972b; Feilden 1982; UNEP PAP/RAC 1990 art. III; Feilden and Jokilehto 1993; Mertens 1995; Schmidt 1997; Hueber 2002; Woolfitt 2007; White 2007). The use of original elements and the identification of their original locations is essential in the implementation. Anastelosis ensures that the ruined and randomly scattered elements of an archaeological structure are arranged in such a way that ruins become observable, comprehensible and that the architectural fragments are better preserved than their dispersed state. The anastelosis implementation is a common preferred technique in the conservation and presentation of archaeological sites throughout the world, as it provides information about the original state of the structure. The term, which is widely known as anastylosis, first appeared in Greece to describe re-erection applications. The

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term was introduced at the International Conference on the Protection and Conservation of Artistic and Historical Monuments in Athens in 1931 and recognised by the Carta del Restauro Italiana (1931) and Venice Charter (ICOMOS 1964). However, when the term was translated to other languages, there occurred a spelling mistake. The misspelling of anastylosis was corrected by Dimacopoulos (1985) to anastelosis in his work 'Anastylosis and Anasteloseis'. Thus, in this study the authors choose to use the term anastelosis.

As the reassembly of the original architectural elements should follow the principle of determination of the correct position of each component, the remains must have recognisable shapes in order to determine their original locations. The original construction traces on the remains as well as toppling positions of the stones help identify where they belong. For this reason, even though anastelosis is applied worldwide, more practices can be seen on Mediterranean and Near Eastern archaeological sites (Woolfitt 2007) where there are many cut stone architectural remains of ancient Greek and Roman constructions connected with dowels and clamps without mortar as a dry masonry technique. The term is used only for reassembled structures in archaeological sites (Feilden 1982; Hueber 1991; Philippot 1996). Anastelosis, an approach which can indeed serve to protect the original material in certain circumstances, also illustrates the special role of the fragment in archaeological heritage management as well as the particular significance of conservation work in this context.

The aim of anastelosis practice should be to conserve the integrity of the structure and maintain its original values. The practice is designed to transfer the knowledge of the structure as three dimensional. It is difficult for a layman to imagine the previous state of the demolished structure, by seeing its scattered elements on the ground. Unlike restitution drawing on paper, anastelosis provides physical integration of fragments. For anastelosis application, the use of the pieces which are on the ground, also helps to organise the archaeological site and provides a better exhibition and circulation. In this way technical measures for the conservation of pieces can be made easier (Hueber 1991; Melucco Vaccaro 1996; Hueber 2002; Torun and Ercan 2013).

The implementation of anastelosis differs from the other reconstruction and restoration applications considering the authenticity as the primary principle. Reconstruction which is the rebuild of the destroyed structure or parts of a structure, applied in situations where the structure has been completely destroyed or has been left with little part of the original building elements. The reconstruction in the archaeological sites is an experimental study and presentation; which should be carefully planned to avoid damage to the original remains and should not create a misleading image by bringing an imitation of the authentic structure and should not cause the structure to dominate the site (ICOMOS/ICAHM 1990 art. 7; Mertens 1995; ICOMOS 1996 art. 7). Some applications, which had been planned as anastelosis work, might have turned into reconstruction due to the usage of excessive new material. Restoration is defined as the preservation of authentic elements, in a way that reveals the aesthetic and historical value of the building, bringing the structure back to an earlier known state (ICOMOS 1964 art. 9; ICOMOS 1999a art. 1.7). Controversy over the concept of restoration still continues and it was used as a roof term to cover all kinds of conservation interventions in Latin languages (Feilden and Jokilehto 1993). The term is used in this study to describe the re-erection application involving new materials and interventions more than in the anastelosis. Although the difference between reconstruction and restoration is stated as no usage of new material in

restoration (ICOMOS 1999a art. 1.8), since it might be necessary to use new materials even in an anastelosis implementation, it is very unlikely to be able to perform restoration without using new materials. As in restoration and reconstruction applications, anastelosis application is possible if reliable information on the original condition of the structure is provided (Carta del Restauro Italiana 1931 art. 2; ICOMOS 1964 art. 9; UNEP PAP/RAC 1990 art. III). The new material used in anastelosis, even in small quantities, should be visually and structurally compatible with the structure but distinguishable, as in other applications.

Aim and Method of the Study

Informative presentation of archaeological sites and the opening of archaeological sites to visitors requires a deliberate planning process. Today, however, decision-making processes are rapidly being implemented and applications are being made in many archaeological sites. This leads to the misrepresentation of the archaeological site and to the misleading impression about the structures. There are many archaeological sites where the excavation and research work is still ongoing, work of re-erection is also being carried out. In Turkey, quickly completed re-erection applications serving tourism industry are being observed. However, the re-establishment works that play an influential role in promoting the site, should be carefully planned.

The international conservation charters, recommendations and documents on anastelosis are very few and inadequate for information gathering. In order to understand and determine the basic principles of anastelosis, the opinions and experiences of the experts in the publications need to be considered.

When the anastelosis applications in archaeological sites in Turkey are examined, in some cases it is observed that where the basic principles of anastelosis have not been followed. Besides that, restoration and reconstruction applications are also incorrectly referred to as anastelosis. As the outcome of the anastelosis works are not always assessed, unfortunately it is becoming apparent that these applications start posing a threat to the structures. For example, deterioration in joining materials used in anastelosis and uncontrolled moisture in the site, can create new problems. These are the consequences of the lack of planning and monitoring stages.

The aim of this study[1] is to contribute to conservation practices in archaeological sites and to evaluate the practices of anastelosis in order to establish general principles to be considered during the implementations. In this respect, in the scope of this study, anastelosis practices in temple structures in selected archaeological sites have been evaluated in accordance with the principles set out in international charters, agreements and experts' opinions. In order to compare the implementation techniques used in the anastelosis of similar architectural structures among the selected examples, the approach adopted is to select the same building type (Toköz 2018). Examples of applications in the study have been identified as temple structures in archaeological sites in Western Anatolia. Re-erection implementations in temples that were named as anastelosis by excavation or project team were chosen. These are; the Temple of Athena at Assos (~530 BCE, Behramkale, Ayvacık, Çanakkale), the Temple of Athena at Priene (4th century BCE, Güllübahçe, Söke, Aydın), the Temple of Leto at Letoon (160–130 BCE, Kumluova, Seydikemer, Muğla), the Temple of Apollo at Smintheion (2nd century BCE,

Gülpınar, Ayvacık, Çanakkale), the Temple of Apollo at Side (2nd century CE, Side, Manavgat, Antalya), the Temple of Trajan at Pergamon (114–129 CE, Bergama, İzmir) and Temple A at Laodikeia (2nd century CE, Eskihisar, Denizli). Excavation reports prepared by the excavation team and other publications concerning anastelosis were examined for the anastelosis application processes of the structures. Also, the site survey of the temples was carried out between 2016–2018; the anastelosis implementations at present were documented by observations and photographs taken at the site and in the structure scale.

When analysing and evaluating the selected examples, principles of emphasis of the structure within site scale both in the archaeological site and in original context, structural and visual integrity of the monument, authenticity, reliability, distinguishability, visual and material compatibility, reversibility and re-treatability have been taken into consideration that are discussed in literature and international documents.

Literature Review

Researches and publications on anastelosis are varied in the examination of the term and principles of anastelosis (Sanpaolesi 1972a, 1972b; Dimacopoulos 1985; Mertens 1995; Hueber 2002; Vacharopoulou 2005a, 2005b; Lambrinou 2010), the evaluation and comparison of different applications (Schmidt 1993; Jokilehto 1995; Starosta 1999) and lastly introduction and evaluation of single applications (Yorulmaz, Çılı, and Ahunbay 1989; Nohlen 1999; Patricio 2011; Patricio and van Balen 1993; Paul 1996; Ercan, Patricio, and van Balen 1997; Van Balen, Ercan, and Patricio 1999; Ioannidou 2007; Mallouchou-Tufano 2006a, 2006b, 2007; Masino et al. 2011; D'Andria 2012, 2016; Sobra 2012a, 2012b; Masino 2012; Mighetto 2012; Masino and Sobra 2012; Mentzini 2017).

The aforementioned publications related to principles of anastelosis try to provide information about the keys needed to be considered during the implementation. Studies of Sanpaolesi (1972a, 1972b), Mertens (1995), Hueber (2002) form a base on the theoretical frame of anastelosis. Also in these studies, positive and negative sides of the implementation examples were explained and discussed. Dimacopoulos (1985), traces the etymological root of the word anastelosis and explains the first introduction of the word into conservation area. Schmidt (1993) and Starosta (1999) mostly emphasise the technical and structural aspects of anastelosis by comparing different re-erection applications. Publications on introduction of single implementation provide thoughts about different implementation approaches, materials and techniques used in anastelosis. Some of these are aimed at discussing conservation interventions in archaeological sites including anastelosis, while some of them introduce and explain single applications. This study differs by determining basic principles of anastelosis and evaluating examples based on these principles rather than conservation values or opinions of visitors and experts. In this study, providing a holistic approach between site scale and monument itself, and also the original context of the structure and its present situation in the site by realising the anastelosis implementations or evaluating them was achieved. This study has a significant importance as it investigated the implementation history of the selected examples in detail and comparisons were made between different anastelosis approaches.

Some Specific Anastelosis Implementations over the Course of Time

The first anastelosis works were realised in Acropolis of Athens from 1898 onwards and for forty-five years by N. Balanos (Dimacopoulos 1985). After independence of the Greek State from the Ottoman Empire in 1830, restoration of national monuments was seen as promotion of a new independent state. In the first period of interventions, later added medieval structures were removed since the aim was revealing pure Greek values. Balanos was charged with restoration of all monuments at the Acropolis which are Parthenon, Propylaia, Erechtheion and the Temple of Athena Nike, after removal of later medieval additions. The works of Balanos were introduced as anastelosis to the International Conference on the Protection and Conservation of Artistic and Historical Monuments in Athens in 1931. The interventions of Balanos should be considered important in the field of conservation for the period (Mallouchou-Tufano 2006b). These are important studies in terms of conservation although scattered blocks were replaced to random places rather than their original positions, some of original blocks were reused as filling material and extremely heavy iron reinforcement members were placed in order to support structural systems by hollowing out the original blocks. Within a few years the negative effects of iron reinforcements which caused destruction of marble due to oxidation, were noticed and they were changed with stainless steel materials by A. Orlandos in the 1940s (Dimacopoulos 1985; Mallouchou-Tufano 2006b). However, randomly replaced stone members were reset much later in recent anastelosis works carried out since 1975. Continuous work of restoration and anastelosis of Acropolis monuments are ongoing with contemporary technologies. By regarding dry masonry construction systems of the monuments and principles of reversibility, titanium clamps and dowels are used. By regarding authenticity, when necessary, penthelic marble extracting near original quarries are used as with the original blocks. Using marble in the production of new pieces also provided material and visual compatibility with the original stones (Zambas 1992; Mallouchou-Tufano 2006b; Ioannidou 2007; Lambrinou 2010; Mentzini 2017).

The ancient city of Ephesus in Turkey, due to display different re-erection implementations executed between 1957–1978 on Hellenistic and Roman period ruins is a distinct archaeological site. A variety of approaches and implementations along the axis called Curetes Street can be observed on the so-called Temple of Hadrian (1957–1959), the Fountain of Trajan (1962–1963), the Memmius Monument (1963), the Monument of Sextilius Pollio (1966), the Fountain of Domitian (1970–1971), the Library of Celsus (1970–1978) and the Terrace of Domitian (1976–1977) (Demas 1997). While the Temple of Hadrian displays an approach to ensure visual and structural integrity, in the Fountain of Trajan, a fragmental approach was preferred since the vertical elements were missing. Horizontal elements were placed on truncated supports without completing with the missing pieces. In the Memmius Monument, the Fountain of Domitian and the Monument of Sextilius Pollio, a deliberately incompatible approach was displayed with the missing elements completed using concrete, and the original composition was indirectly shown with the existing pieces. In the re-erection of the Library of Celsus conducted by F. Hueber, some of the missing elements were produced by using reinforced concrete, covered with marble and carried by a steel structural system considering the earthquake risk (Hueber 1978; Demas 1997; Schmidt 1997). Because of this new structural system, it can be

evaluated as re-erection rather than anastelosis, even though the original blocks were used.

The anastelosis project of the Temple of Trajan at Pergamon, İzmir was conducted between 1979–1994 by K. Nohlen. Missing parts were completed with marble crushed white cement and combined with titanium reinforced stainless steel bars and epoxy (Nohlen 1999). A new structural system was not introduced; newly produced parts were joined by regarding ancient structural dry-masonry system.

Anastelosis works realised in Aphrodisias, Aydın and Hierapolis, Denizli Turkey, stand out with high authenticity ratio of original architectural members. The Tetrapylon at Aphrodisias in Aydın, Turkey was re-erected by K. Erim at the end of the 1980s with 80% of its original material by using fibreglass dowels in joining; white cement and artificial stone in missing pieces (Paul 1996). Anastelosis application of the first floor of the *scaenea frons* and *proscenium* below the stage of the theatre at Hierapolis in Denizli, Turkey as a part of restoration studies which began in 1982 with the directory of F. D'Andria, was carried out with a high amount of original material and reached 90%. Fibreglass bars and Afyon marble similar to the original material were used in joining and completion of missing blocks (Masino 2012).

Another site where fibreglass rods were used as a contemporary material in order to provide better compatibility with original members, is Sagalassos. In recent anastelosis studies performed in different structures such as Hellenistic Nymphaeum, Antonine Nymphaeum, Northwest Heroon and the Arch of Claudius at Sagalassos, Burdur started in 1991 by K. E. P. van Balen, T. C Patricio, E. Torun and S. Ercan, were realised in order to provide a positive contribution to the silhouette of the ruins. After determining the location of each stone, the integration of the architectural elements was made with fibreglass rods. Thus, in the moment of an earthquake, the fibreglass rods will be broken rather than the original stone members. Rods that are easy to change afterwards make it possible to intervene without damaging the structure. The original construction system was considered by using clamps and dowels when joining individual stone blocks. The missing parts in the stones were completed with the pantograph method, that is, the stone completion method with stone, and the colour of new pieces was left light. (Ercan, Patricio, and van Balen 1997; Van Balen, Ercan, and Patricio 1999; Patricio 2011; Torun and Ercan 2013).

Principles of Anastelosis

The principles of anastelosis application were determined primarily by examining international charters, agreements and recommendations. Since there are only a few charters on anastelosis: the *Athens Charter for the Restoration of Historic Monuments* (ICOMOS 1931), *Carta del Restauro Italiana* (Carta del Restauro Italiana 1931) and *International Charter for the Conservation and Restoration of Monuments and Sites* (the Venice Charter ICOMOS 1964); literature on this subject was also consulted.

Authenticity

The basic principle of anastelosis is to reassemble the structures using their original architectural elements. In practice, as the original elements are used in the anastelosis work, the original placement of these elements should also be determined based on detailed studies and they should be placed accordingly. In each application, the purpose is not to provide the structural integrity of the complete structure, but to focus only on the sections of the structure where the original parts are in excess amount. In the implementation, the sustainability of the construction technique and structural authenticity of the building is as important as its material authenticity. However, as the necessity of using new structural systems in implementation is due to the fact that not every element of the structure survived to the present day and the remains are fragmented; resistance against earthquakes needs to be ensured (ICOMOS 1931 art. VI; Carta del Restauro Italiana 1931 art. 3; ICOMOS 1964 art. 5, 9, 15; Sanpaolesi 1972b; ICOMOS/ICAHM 1990 art. 7; ICOMOS 1994 art. 13; Mertens 1995; ICOMOS 1999a art. 4; Petzet 1999; Starosta 1999; Van Balen, Ercan, and Patricio 1999; English Heritage 2001; Hueber 2002; ICOMOS 2003 art. 3.7; Woolfitt 2007; Lambrinou 2010; Torun and Ercan 2013).

Integrity

It is important to ensure structural integrity as well as visual integrity when structures are re-erected. The structural function of the building should be regained by reuniting architectural elements that have survived, if it is not possible, the new structural system should be designed in order to be reassembled. New materials may be used in small amounts to achieve visual and structural integrity. New material may not be added if the present original elements can come together seamlessly. The use of new material should not get ahead of original elements of the structure, and it should not disturb the ratio of authenticity (Carta del Restauro Italiana 1931 art. 4; ICOMOS 1964 art. 10; Mertens 1995; ICOMOS 1999a art. 4; Starosta 1999; ICOMOS 2003 art. 3.7; Woolfitt 2007).

Reliability

As in the case of reconstruction and restoration, it is necessary to make anastelosis based on reliable documentation. By conducting research and examinations, information such as original volume, form and height should be calculated and the placement of scattered architectural elements should be precisely determined. When such information about the structure cannot be determined, intervention should be avoided. The research study also reveals the authentic values of the work, contributing to the understanding of the history and its construction periods, as it will increase reliability (Carta del Restauro Italiana 1931 art. 2, 8; ICOMOS 1964 art. 9, 12; Italian Restoration Charter 1972 art. 7.3; Sanpaolesi 1972b; UNEP PAP/RAC 1990 art. III; Hueber 1991; Feilden and Jokilehto 1993; Philippot 1996; ICOMOS 1999a art. 3.2; English Heritage 2001; Hueber 2002; Torun and Ercan 2013).

Compatibility and Distinguishability

The important detail to note when using new materials is that the material should not draw attention at first sight; but should be in harmony with the structure's original elements. The use of new material in excessive amounts can cause the creation of a new structure by breaking the authentic and historical value of the structure. The use of new material should be compatible with the original material, not only physically but also structurally. The most suitable materials should be determined after the analysis of the original material characteristics has been carried out in the laboratory. Completion of missing parts should be done for structural necessity, and the aim should not be reaching the full volume of the structure in every case (ICOMOS 1931 art. VI; Carta del Restauro Italiana 1931 art. 3, 8; ICOMOS 1964 art. 12, 15; Italian Restoration Charter 1972 art. 7.1; Sanpaolesi 1972a; ICOMOS/ICAHM 1990 art. 7; Feilden and Jokilehto 1993; Mertens 1995; Philippot 1996; ICOMOS 1999a art. 20, 22, 2003 art. 3.7, 3.10, 3.12; English Heritage 2008; Hueber 2002; Lambrinou 2010).

Reversibility and Re-treatability

Implementation of anastelosis may lead to errors in practice even if it is done in the light of reliable sources. In addition to this, due to developing material technologies, it may be possible to carry out applications in later periods that did not exist in the past. Even the materials that are considered modern at that time can be damaged over the long-term. For these reasons, the application of anastelosis should be reversible. Reversing should be done without damaging the original elements. However, since reversibility remains as an unrealistic concept and an impossible task to be fully achieved without damaging original elements, the term of re-treatability is preferred. The integration of the architectural elements is made with breakable bars which can break in case of earthquake, so later on these materials can be changed without damaging the original elements (Feilden 1982; Feilden and Jokilehto 1993; Mertens 1995; ICOMOS 1999a art. 15.2; Van Balen, Ercan, and Patricio 1999; Hueber 2002; ICOMOS 2003 art. 3.9; English Heritage 2008; Lambrinou 2010; Torun and Ercan 2013).

Emphasis of the Structure within Site Scale

Anastelosis contributes to the exhibition of the structures in their original form. During the application, not only the structure, but also the authenticity of the site is taken into consideration. Integrity in the anastelosis should also be assessed by foreseeing the effect that the structure will have on the archaeological site after the anastelosis; the significance of the structure from the beginning in context should be parallel to the situation that will occur after the application. For this reason, the relation of the structure with the site should be handled as much as the integrity of the structure itself. Also when the anastelosis work is to be executed in cases where other structures in the archaeological site are mostly standing, the outcome of the anastelosis might not stand out in the site however, in cases where most of the structures in the archaeological site are in ruins, the outcome of the anastelosis on

one particular structure might be striking (Carta del Restauro Italiana 1931 art. 6; UNESCO 1968 art. 9; Sanpaolesi 1972a; UNESCO 1972 art. 5; ICOMOS/ICAHM 1990 art. 1, 2; Feilden and Jokilehto 1993; Schmidt 1993; Jokilehto 1995; Mertens 1995; ICOMOS 1999b art. 2.1, 2.6; English Heritage 2001; Hueber 2002; Torun and Ercan 2013).

In conclusion, amongst the basic principles of anastelosis, authenticity principle comes to the forefront. As being a distinctive principle from restoration and reconstruction, it is also essential that maintenance of structural and contextual authenticity is as important as material authenticity. In order to sustain the contextual components of the structure after the anastelosis implementation, it should be handled within the original setting. The effect of the re-erected structure on the archaeological site should also be considered so as not to disturb other ruins in their landscape and create a harmonious image with the ancient site. The new material, used only in a small amount, is expected to provide material compatibility while being noticeable/distinct from the original material and not to break the visual integrity. The new structural system, designed when it is not possible to re-erect the structure with its original structural system, should also not harm the authentic features and should regain its structural integrity. Since it is not possible to reverse interventions without damaging the original structure, they should be re-treatable in order to reintervene in case of finding new information or material technologies or else any mistake in previous implementation.

Examination of Implementation Examples

Within the scope of the study, the survived structures in the ancient cities were introduced. Then excavation and re-erection studies including the first excavations and present-day practices in the city were examined chronologically.

Temple of Athena at Assos (~530 BCE, Behramkale, Ayvacık, Çanakkale)

The *peripteros* style temple was located at the highest point of the city in the acropolis. There are 6 columns on the short sides, and 13 columns on the long sides, surrounding the inner cella wall on two-stepped crepis. Doric and Ionic elements made of local andesite stone were used together (Wescoat 2012) (Figure 1).

In the first re-erection work at the temple which was conducted by Ege University, three columns in the south and two columns in the north of the temple were re-erected to the top level of capitals by using original and reinforced concrete elements between 1990–2005 (Arslan 2008). Since the reinforced concrete elements used in the re-erection work weathered over time and threatened the durability of original materials, it was decided that parts of the temple would be dismantled and anastelosis work would be performed with new stone material (Arslan 2008). In a recent study, carried out by Çanakkale Onsekiz Mart University, reinforced concrete blocks were removed, new andesite stone blocks were used, which are the same as the original, and joining material was not placed between the capital and the drums, but lead plates were placed between the old eroded drums when necessary (Arslan et al. 2011) (Figure 2). New stylobate blocks

Figure 1. Current situation of the Temple of Athena from north-west, Assos.

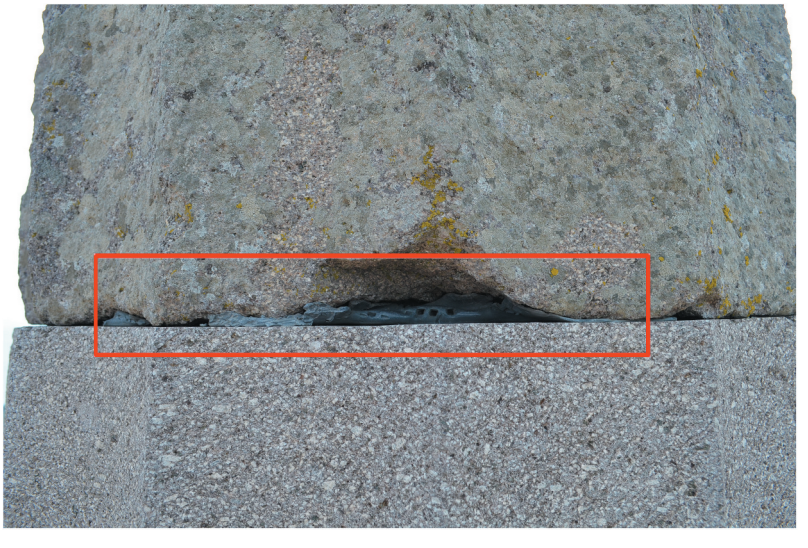

Figure 2. Lead plates between column drums, Assos.

were produced smaller than the original size so that they could be distinguished from the original ones (Arslan 2012). In the on-site examination in October 2016 and June 2017, it was determined that the north-western pediment of the cella was joined to the floor of the temple (Figure 3).

Figure 3. Reduced sized stylobates on east side, Assos.

Temple of Athena at Priene (4th Century BCE, Güllübahçe, Söke, Aydın)

The temple is located at one of the highest points of the city, in the Sanctuary of Athena with propylon, altar and Doric gallery. On the three-stepped crepis, there are 6 columns on the short sides and 11 columns on the long sides of the *peripteros* style temple. The temple has an Ionic order and the building material was marble (Rumscheid 2000; Hennemeyer 2013; Koenigs 2015).

When the German Archaeological Institute (DAI) began excavation works in 1977, five columns on the northern side of the Temple of Athena were re-erected (Koenigs 2015) (Figure 4).

Figure 4. Original drums of the columns of the Temple of Athena on north side, Priene.

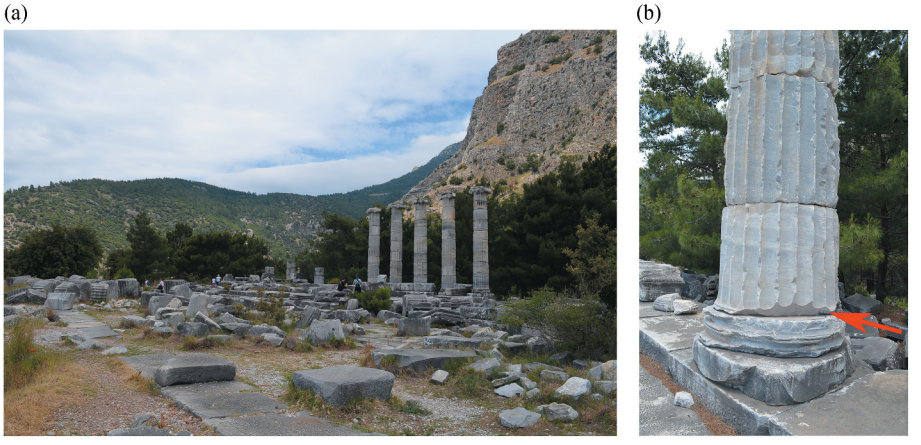

Figure 5. Re-erected columns of the Temple of Athena with reduced height in the sanctuary and missing torus, Priene.

The re-erection work carried out by Turkish authorities in 1965/66, no scientific preliminary work was undertaken, the torus parts of the column bases were not used and the columns were re-erected to a height of 8 m, short by 3.5 m from the original height considering possible earthquakes (Bauer 1969; Rumscheid 2000; Koenigs 2015). In this study, no material was placed between the drums for joining. After this re-erection, documentation studies were started in 1977; to ensure the preservation of existing parts and to avoid loss of ornamentation (Koenigs and Raeck 2001; Koenigs 2015) (Figure 5).

Temple of Leto at Letoon (160–130 BCE, Kumluova, Seydikemer, Muğla)

The Temples of Leto, Artemis and Apollo were built side by side on rocks in the Sanctuary of Letoon. The temple, which is peripteros but has pseudo-dipteros plan features on the front façade, has Ionic order. On the three-stepped crepis, there are 6 columns on the short sides and 11 columns on the long sides (Hansen 1991; Atik Korkmaz 2016). The main material was limestone (Des Courtils and Laroche 2002) (Figure 6).

Excavations began in the Temple of Leto in 1962 (Metzger 1964); since 2/3 of the colonnaded section, 80% of the cella wall blocks of the temple survived to the present day, anastelosis work was carried out in the name of the French Institute for Anatolian Studies (IFEA) between 2000–2007 (Atik Korkmaz 2016). In order to perceive the mass of the structure, partial anastelosis was decided to harmonise the temple with the appearance of the site as a ruin and not to have an overwhelming effect on the Temples of Apollo and Artemis with its new mass. It was decided to complete the cella walls to middle height and re-erect lower parts of the three columns at different heights in the eastern side just to make the plan setup understandable. The focus was the northern part which would perceive the original façade image. The new blocks were produced from limestone similar to the original blocks. Completions were only done where necessary. Vertical clamps were produced from

Figure 6. The Temple of Leto at Letoon. Temples of Artemis and Apollo on the left as two dimensional, Letoon.

Figure 7. New column bases for two-dimensional plan layout, Letoon.

iron, horizontal clamps were made from bronze, and the surroundings were covered with lead in accordance with authenticity and reversibility principles (Laroche and Bernard 1998; Des Courtils and Laroche 2000, 2003; Laroche 2007; Des Courtils and Laroche 2009) (Figures 7 and 8).

Figure 8. Completed blocks in the interior of the cella, Letoon.

Temple of Apollo at Smintheion (2nd Century BCE, Gülpınar, Ayvacık, Çanakkale)

The pseudo-dipteros Temple of Apollo Smintheus was built in the sanctuary. The temple, which has Ionic order and 11 steps, is surrounded by 8 columns on short sides and 14 columns on long sides (Rumscheid 1995; Gökçe 2000). Columns called *columna caelata*, which are last drums under the capitals, are ornamented with reliefs staged from the Iliad epic. The temple was built with three types of stone materials: tuff, andesite and marble (Özgünel 2001) (Figure 9).

Figure 9. Current situation of the Temple of Apollo from south, Smintheion.

Excavation of the tuff foundation structure began in 1980 and restoration work was conducted by Ankara University in cooperation with Middle East Technical University (Özgünel 1983). For the restoration of the steps, the south-west edge was chosen since it was very damaged and had lost its original volume. It was proposed to consolidate the original foundation with concrete here to reach to original stylobate level. The andesite basalt imitation steps were prepared with Portland cement, water, red stone brass, red soil paint and fine-coarse sand mixture. The marble imitation steps were produced using white cement, marble chips and water and put on top of the concrete foundation (Özgünel 2001).

On the artificially prepared steps and stylobates, three columns of six drums were attempted to be re-erected, but due to wear on the drums, the columns could only be re-erected as five, four and three drums (Özgünel 2001). A new project was prepared for restoration work in 2003. It was aimed to re-erect the architectural

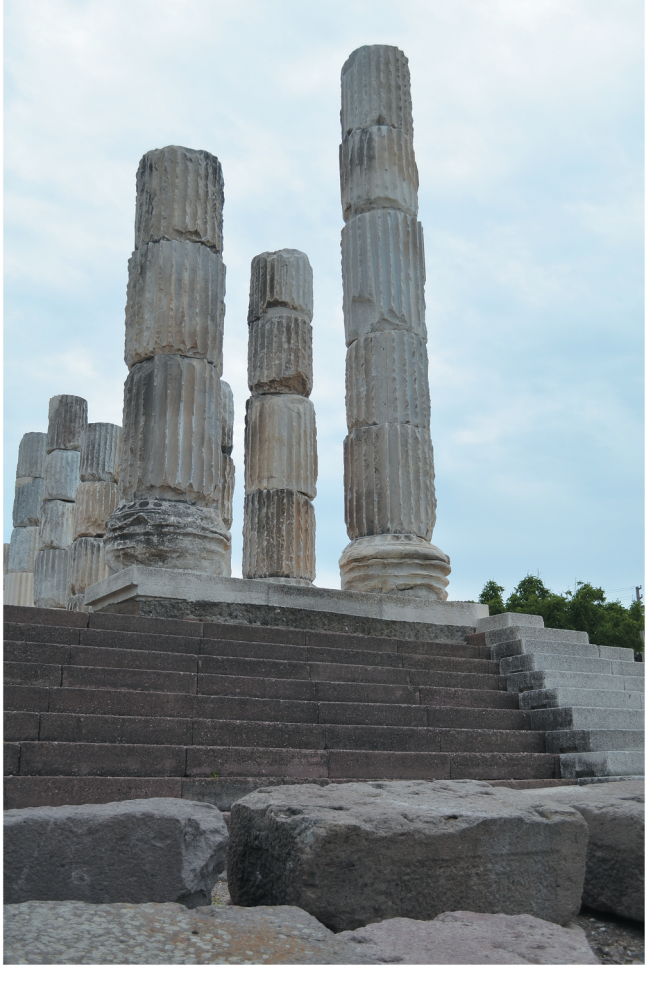

Figure 10. First erected three columns on re-built foundation and crepis on south-east side, Smintheion.

Figure 11. Re-erected original columns on new crepis on south-west side, Smintheion.

Figure 12. New and original foundation at Smintheion.

pieces originally from the stylobate level to the frieze level and to give the temple a three-dimensional appearance. Although this project was intended to be applied in the south-west corner, which had been re-erected in previous work, it could not be done due to lack of original parts and structural problems in existing parts. For this reason, it was decided to re-erect the already eroded south-east short side. The reinforced foundation was built on the original eroded foundation by preparing a solid foundation for re-erection. The 18 drums that matched through diameter were brought together, but it was determined from the dowels that they did not

match each other (Özgünel 2005) (Figure 10). At the end of the studies completed in 2014, the crepis of the south-western short side was rebuilt with reinforced concrete blocks in terms of harmony with the previous application. The columns on this side were re-erected to different heights and the broken column bases were completed with reinforced concrete. A display was made by putting two rows of columns on the south-eastern long side with their bases, one drum, *columna caelata*, capital each, one architrave and one frieze block over these columns (Özgünel et al. 2018) (Figures 11 and 12).

Temple of Apollo at Side (2nd Century CE, Side, Manavgat, Antalya)

The Temple of Apollo, which has a Corinthian order and *peripteros* style, located at the harbour in the original city plan. It was built along with the Temple of Athena, which was dedicated to the city's other protective goddess and was positioned on the shore in order to meet the ships coming to the port. There are 6 columns on the short sides and 11 columns on the long sides (Mansel 1958, 1963). Marble was used at the upper structure of the temple; columns were monolithic marble (Yorulmaz, Çılı, and Ahunbay 1989) (Figure 13).

The remains of the Temples of Apollo, Athena and the basilica in the sanctuary area were excavated beginning in 1947, the excavations continued until 1962 (Mansel 1958, 1964). The repair project was started in 1983 by İstanbul Technical University (İnan 1985), on the north-west corner and the second column of the north long side facing the sea, where the original remains are located. It was aimed to re-erect four columns of the west façade and two columns of the north side with the anastelosis study. In addition to the columns, capitals, architrave blocks, Medusa-headed friezes, geisons, 2/3 of the pediment, simas and eaves were also planned to be used in implementation to reach the original height assumed to be 16 metres

Figure 13. Current situation of the Temple of Apollo from north-west at the harbour, Side.

(İnan 1985). In order to re-erect columns safely, a reinforced concrete foundation was built by pouring lean concrete below the stylobate. A mixture of marble dust, marble chips, sand and white cement was poured in order to complete the missing parts of the columns, stylobate and base as continuing one piece. Reinforced concrete new pieces were integrated with original pieces with stainless steel bars (İnan 1985) (Figures 14 and 15).

Figure 14. New reinforced concrete parts of columns, Side.

Figure 15. Medusa-headed frieze of the Temple of Apollo, Side.

By 2001, the west façade of the temple was re-erected, including the pediment; there was no other anastelosis work done at the temple. It was decided that the artefacts, which had been excavated over 63 years, would be examined and evaluated before the new excavation, the necessary restoration and urgent conservation work was started (Alanyalı 2011).

Temple of Trajan at Pergamon (114–129 CE, Bergama Izmir)

Trajaneum (The Sanctuary of Trajan), with southern part towards the view, was built at the highest point of the acropolis, as a temple with the middle enclosed with galleries on three sides and can be seen from the lower city. The temple with *peripteros* plan was built in Corinthian order. On the short sides there are 6 columns and on the long sides there are 10 columns. The podium of the temple was made of andesite cut stone and overlaid with marble plates; the other architectural elements of the temple were also marble (Radt 2002) (Figure 16).

The restoration project of the Trajaneum was prepared and conducted between 1979–1994 by DAI. In the barrel vaults, that constitute the substructure of the sanctuary, the necessary protection interventions were done without considering re-erection of whole structure (Nohlen 1999). The columns of the Trajaneum's north, east and west galleries began to be placed in 1979 in order to harmonise with the temple (Radt 1981, 1982; Nohlen 1999).

The new material was artificially made of marble crushed-white cement and reinforced with steel mesh. The marble used for artificial stone production was brought from Marmara (Proconnesus) Island as it was in ancient times. To emphasise the age value of the construction, cracks were left untouched. The broken parts were combined with titanium reinforced stainless steel bars and epoxy. Cold marble aggregate and cold water from old water springs were used in the early morning cold weather in production. Concrete parts were buried for several weeks to prevent weathering and cracking by

Figure 16. The southern vista of the Temple of Trajan from north gallery, Pergamon.

keeping them at constant temperature and humidity. Fibreglass rods were used instead of steel to reduce the risk of lightning when joining elements with high position in the construction. The newly produced parts were left unornamented, only the contour of the ornamentations was processed; the only exception of this decision is new frieze blocks with Medusa heads (Radt 1987, 1988; Nohlen 1999) (Figures 17 and 18). A large part of the original pieces of the southern pediment were placed on the surviving stones of the podium on the south-eastern corner of the temple. It was suggested that this work was carried out in order that the size of the temple could be perceived, the parts of the pediment were protected by raising them from the ground (Radt 1993) (Figure 19).

Figure 17. Unornamented completions, Pergamon.

Figure 18. New concrete parts with original pieces, Pergamon.

Figure 19. Southern pediment joined without columns, Pergamon.

Damage was detected in a column in the western gallery of the Trajaneum in 2001. Cracks occurred from the use of poor-quality white cement with marble aggregate in the column. This time for repair of the column, new marble material was chosen, not artificial stone (Radt 2003).

Temple A at Laodikeia (2nd Century CE, Eskihisar, Denizli)

Temple A was built in the north of a courtyard accessed from Syria Street (Şimşek 2009). There are four columns on pronaos, their capitals are in Corinthian order. The main building material was travertine and was covered with marble plates. There is a vaulted room, which is believed to have been constructed as a religious archive under the cella (Şimşek 2006) (Figure 20).

Excavations were started in Temple A in 2004. Re-erection study was conducted by Pamukkale University (Şimşek 2006). It was determined that 10% of the original architectural elements belonging to the temple survived to present day (Şimşek 2007, 2009). Restoration and anastelosis studies were started in 2009. The missing steps and missing marble stylobate blocks in pronaos of the temple were reproduced with travertine blocks, which are a different material from the original material (Şimşek 2011). The original stereobate blocks were connected with sheet iron and lead clamps as in the original. Postament of east full twisted fluting column was completed with new material produced from marble-white cement mixture. The postaments of the half-twisted fluting columns at the edges of prostylos were reproduced from marble because they did not survive to present day. In order to exhibit damage caused by a sledgehammer on the front part of the middle drum of the same column, this section was not completed and three steel bars were placed between the upper and lower drums (Figure 21). The missing parts of the drums of the columns were completed with new material produced from marble and white cement mixture. From the 54 columns of the porticos that surround the courtyard of the temple on all four sides, very

Figure 20. Current situation of Temple A from its courtyard, Laodikeia.

Figure 21. Presentation of damaged left edge column caused by a sledgehammer, Laodikeia.

few columns survived; the surviving ones were re-erected. North and north-west walls of vaulted room under the cella, with an arch of a vault was rebuilt in 2005, were completed and vaulted room was covered with steel construction and unbreakable glass (Şimşek 2011, 2012). The cella door, made of marble blocks, was completed with new material produced from concrete and marble then re-erected. Chrome steel, araldite and lead were used in joining the pieces (Şimşek 2013b). The wall between pronaos and cella of Temple A was partly completed using new travertine blocks, the project was completed and fifteen of the columns belonging to the porticos were re-erected (Şimşek 2013a, 2013b) (Figures 22 and 23).

Figure 22. Glass floor of the cella of Temple A, Laodikeia.

Figure 23. Completions of the door with different materials as marble and reinforced concrete at Laodikeia.

Evaluation

In anastelosis practice, the impact of the structure to the archaeological site and in original context, structural and visual integrity, authenticity, reliability, distinguishability, visual and material compatibility, reversibility and re-treatability principles, which are undertaken in this study are to be followed as a holistic approach, ensures achieving the purpose of the implementation (Table 1).

Table 1. Evaluation of implementations through anastelosis principles.

Structure	View	Emphasis of the structure within the site scale	Integrity of the monument	Authenticity
Temple of Athena at Assos		Regained historical significance Partial re-erection is in harmony with the site	Medium structural integrity due to elements exhibited in museums or used in other buildings in the site and village. Visual integrity provided by the use of same new material with the original	Medium authenticity due to high amount of new stylobate blocks, new drums where necessary and the use of new material same as original
Temple of Athena at Priene		Regained historical significance Partial re-erection is in harmony with the site	Low structural integrity due to only five columns re-erected on one side with missing torus parts as well as superstructure	High authenticity through the partially sustained construction technique and the use of original material
Temple of Leto at Letoon		Regained historical significance Partially re-erected structure is in harmony with the site without being dominant	Structural integrity in the cella section without superstructure. Visual integrity provided by the use of low amount of the same new material with the original	High authenticity through partially sustained construction technique and the use of new material same as original
Temple of Apollo at Smintheion		Regained historical significance Reconstructed south side is striking in the ruin site	Reconstructed foundation built with reinforced concrete in different periods is disharmonious with the original foundation as well as the re-erected columns from material incompatibility and visual integrity both colour and use of new material point of views	Low authenticity due to reconstructed foundation, high amount of new concrete blocks on crepis
Temple of Apollo at Side		The greater and important Temple of Athena near temple is not recognisable. Temple has become the focal point in the site surpassing the greater and more significant Temple of Athena	Structural integrity together with partial superstructure. Low visual integrity due to new reinforced concrete parts in different colour and thickness from the original	Low authenticity due to high amount of reinforced concrete and new structural system built on the foundation
Temple of Trajan at Pergamon		Regained historical significance in the acropolis surpassing the main Temple of Athena. Might be considered reflecting the Roman Imperial Period approach. Partially re-erected structure is in harmony with the ruin monuments on terraced site	Structural integrity in the cella together with partial superstructure. South pediment of the temple joined without columns. Visual integrity in new reinforced concrete parts provided by colour tone	High authenticity through the use of original technique and material in the implementation on the northeast corner

(*Continued*)

Table 1. (Continued).

Structure	View	Emphasis of the structure within the site scale	Integrity of the monument	Authenticity
Temple A at Laodikeia		Regained its historical importance in the site as well as amongst the re-erected structures. Re-constructed structure is in harmony with re-constructed site. Striking glass terrace in the site	Low visual integrity due to different approaches in implementations such as completing with concrete, travertine and marble for missing elements, glass terrace on cella	Low authenticity due to the use of high amount of new material Partially sustained original construction technique

Structure	View	Reliability	Distinguishability and compatibility	Reversibility and re-treatability
Temple of Athena at Assos		Members placed referencing correct data obtained from a detailed study Incorrect information about stylobate size due to their decreased sizes	New andesite stones distinguished with uneroded details at present Visual and material compatibility was provided by the use of new material same as the original	Separable stylobates and drums but non-reversible lead plates without damaging original members
Temple of Athena at Priene		Randomly placed drums Incorrect information about the height of the columns Lack of torus parts of the column bases	No distinguishability and compatibility problem as there is no use of a new material	Detachable members as there is no use of new material
Temple of Leto at Letoon		High reliability as a result of a detailed study before the implementation Only places of a few cella blocks are questionable	New limestone distinguished with uneroded details at present. Visual and material compatibility provided by the use of same but new material as the original. Completed parts are the inner sides of the columns and cella; invisible from a distance	Separable cella blocks Cuttable but non-reversible steel bars without damaging the original members
Temple of Apollo at Smintheion		Correct image of the foundation system but with artificially coloured concrete blocks Concerns on the accuracy of the implementation due to non-matching column drums	New artificial blocks distinguished with uneroded details and without ornamentation. Material incompatibility of the new reinforced concrete part. Visual compatibility of new concrete parts	Non-reversible new foundation without damaging the original foundation Separable crepis blocks and drums, cuttable steel bars
Temple of Apollo at Side		The original height of the columns are not known exactly and placement of the survived members are doubtful. Misleading information about the colour of the temple	Unornamented architrave blocks. Unintentional distinguishability by colour and thickness. Material incompatibility of new reinforced concrete parts	Non-reversible foundation and reinforced concrete parts without damaging the original members Cuttable metal bars

(*Continued*)

Table 1. (Continued).

Structure	View	Reliability	Distinguishability and compatibility	Reversibility and re-treatability
Temple of Trajan at Pergamon		Detailed study before implementation. Avoided hypothetical completions Information about both structure and implementation shared on boards	Distinguishability with new unornamented parts. Material incompatibility of new reinforced concrete parts Visual compatibility by colour tone	Non-reversible steel bars and araldite without damaging original members Re-treatability sustained by changing the deteriorated column piece with new marble
Temple A at Laodikeia		Uncertainty about the detailed study before implementation Misleading information about the destructed column	Incoherence on distinguishability; some new members are different from the original for distinguishability, some are the same. Disharmony due to the use of different materials in place of the same original members	Separable stylobates and podium steps Non-reversible concrete completions without damaging the original members

Emphasis of the Structure within Site Scale

Before the anastelosis decision is taken, the effect that the implementation will create in the site as well as the contribution it provides to the integrity of the structure should be taken into account. Parallelism of the re-erected structure with significance in original context of the city, the relationship with other structures in the site and the survival situation of other structures should be discussed. The implementations of the Temple of Athena at Assos, the Temple of Athena at Priene and the Temple of Trajan at Pergamon made them a focal point in the site as they were originally visible from the lower levels. Since Priene was later afforested and other structures are still standing; and Pergamon was designed with terraces and re-erection was performed in a corner away from vista slope, the temples are not emphasised in the site and they are in the landscape unity with their close surroundings. However, the Temple of Athena at Pergamon, located on the lower terrace than the Temple of Trajan and dedicated to the protective goddess of the city, is unrecognisable compared to the Temple of Trajan. Like in the Temple of Trajan, in the anastelosis implementation of the Temple of Leto at Letoon, the far corner of the temple was re-erected away from the Temples of Artemis and Apollo, which lost the third dimension, and even though more architectural elements survived, these elements were not used in the anastelosis but still is emphasised more than the temples nearby as it was built greater and worshipped as main temple in the sanctuary. In contrast, the reconstruction of the Temple of Apollo at Side, which is located at the harbour, provided the temple to be stunning as seen from the sea, as it was in the past, but it did not perceive the Temple of Athena, which was located next to it as main goddess of the city and only column bases are visible. The reconstruction work on the crepis of the Temple of Apollo at Smintheion even though this emphasised the temple further, which was the most important structure in original situation, created

disharmony between the ruined and untreated structures in the site. It can be said that the reconstruction implementation of Temple A at Laodikeia does not draw attention considering the reconstructions performed on many buildings in the city, but the glass terrace attracts attention in the site. It can be argued that the place of Temple A in original context is maintained.

Integrity of the Monument

The fact that anastelosis is done with a small amount of architectural elements causes to break structural integrity; while fragmented approaches followed in practice or new materials are preferred cause the structures to not be perceived as a whole visually. As in the Temple of Athena at Assos, absence of architraves of the structure and the presence of other elements of the superstructure in different museums led to the inability to convey information about the superstructure. The temple mass is unperceivable since five columns belonging to only one side of the temple were re-erected in the Temple of Athena at Priene and the lack of environmental organisation. In the Temple of Apollo at Smintheion, a fragmented approach was followed, while the crepis were being rebuilt with new material, the columns were done by anastelosis on one corner and re-erected to different heights on one side, and on the other side two columns including one drum, base, capital and architrave and frieze over these two columns to convey information about the superstructure. Different application approaches resulted in visual and textual incompatibility in Temple A at Laodikeia. Although a holistic approach in applications was not followed, the application gives a general idea of the temple mass. In the Temple of Trajan at Pergamon and the Temple of Leto at Letoon, partial anastelosis was performed on the parts where the original material was abundant. This approach provided information about different parts of the temple and prevented the temple's dominance alongside other buildings on the site. However, in the Temple of Leto at Letoon, where only the cella and some columns were re-erected, in order to not become dominant in the site, the information of the superstructure is missing. The possibility of giving a misleading impression of the structure at first glance in the Temple of Trajan at Pergamon where the southern pediment was joined on the podium can be argued. In the Temple of Apollo at Side, partial re-erection similar to the Temple of Trajan at Pergamon gives a general idea of the whole of the structure. The situations in which the new material preferred in practice is in a different colour and texture from the original material may adversely affect the visual integrity of the structure. The colour difference in the crepis of the Temple of Apollo at Smintheion is striking since the applications were performed in different periods. In Temple A at Laodikeia, reproducing completely missing elements from marble or travertine with ornamentation; completing part-based losses from concrete without ornamentation resulted in visual and textual incompatibility. In the Temple of Apollo at Side, visual integrity could not be achieved because of the excessive amount of new material used in the reconstruction, reinforced concrete parts changed colour due to weathering and workmanship problems such as the thickness of new material is greater than the original. Visual integrity was ensured in the Temple of Athena at Assos and the Temple of Leto at Letoon through the use of new material which is the same as the original material. Since the new pieces used in the Temple of Leto at Letoon are located on the inner side of the columns and the cella, they do not draw attention at first in the

site. There is no situation in the Temple of Athena at Priene that would distort the visual integrity as new material was not used. The visual integrity was provided by producing new reinforced concrete parts with close colour tone to the original material in the Temple of Trajan at Pergamon.

Authenticity

It was seen that authenticity, which is the basic principle of the anastelosis, is not taken as a basis in all the applications of the study examples. Temple A at Laodikeia was re-erected even though the original material survived in small amounts and the implementation turned into a reconstruction application. The foundations of the Temple of Apollo at Smintheion and the Temple of Apollo at Side were reconstructed, and this reduced the authenticity rate. In the superstructure of the Temple of Apollo at Side, the authenticity rate is low because excessive new material was used, and the existing but damaged pieces were reproduced. It is possible to say that the authenticity rate is considerably high in the implementations of the Temple of Trajan at Pergamon and the Temple of Leto at Letoon. In both examples, the practice was planned in parts where the original architectural elements of the temple were in excess amount, even where it was possible to raise the temples more. Pediment elements are displayed in place in the cella in the Temple of Athena at Assos. However, the authenticity rate decreased in this implementation because the drum and stylobate blocks were reproduced. In the re-erection implementation of the Temple of Athena at Priene, there is no precise information but the result of the field survey is that no new material was used. For this reason, although the authenticity of the application is high, this practice gives false information about column heights.

The maintenance of the authenticity of the construction system as well as the material authenticity is one of the bases of anastelosis. New structural systems have to be developed in anastelosis applications due to the incomplete access of elements of the structure and the possibility of earthquakes. The original foundation system was harmed and it was reconstructed with reinforced concrete in the Temple of Apollo at Smintheion and the Temple of Apollo at Side in order to ensure the stability of the re-erection of columns. Although the missing elements were produced with reinforced concrete in the Temple of Trajan at Pergamon, a reinforced concrete system was not produced and the elements were connected to each other by steel bars. It can be argued that the original construction technique was maintained since the newly produced marble pieces in the Temple of Leto at Letoon and Temple A at Laodikeia were connected by iron clamps. However, there are broken architectural elements that are inevitably joined with steel rods, as it was in the Temple of Apollo at Smintheion, in order to provide stability in the structural system. In the Temple of Athena at Assos, dowels or bars were not used, lead plates were placed between the andesite elements for joining. It can be argued that the construction technique was maintained by considering lead plates as dowel functions. In the Temple of Athena at Priene, new material was not used to combine elements as far as is known. However, considering the possibility of an earthquake, the columns

were re-erected at a lower elevation than originally, and the torus part of the column bases were not used in implementation.

Reliability

Anastelosis should provide accurate information about the original state of the structure. The applications should be done at the end of a detailed research and documentation process and should avoid interference in unsure situations. No information was available on the research stage of the re-erection application that was carried out quickly at Temple A at Laodikeia. Since there are no columns that survived as a single piece at the Temple of Apollo at Side, the height of a column was calculated by analogy of the column of the Temple of Athena and the sizes of the temples. In the Temple of Apollo at Smintheion, in order to provide strength, solid drums with diameters matching but dowel spaces that do not match, were chosen, so the lining of drums is different than original. In the Temple of Athena at Priene columns that were re-erected lower than the original elevation to avoid collapse in a possible earthquake with missing drums, give false information about the height of the structure. Also, the fact that the torus parts belonging to base were not used in re-erection lead to misinformation about the columns. In the Temple of Athena at Assos, the stylobate blocks were produced in a smaller size than the original with concern of distinguishability, so the application conveys incorrect information about the stylobate. In the applications of the Temple of Leto at Letoon and the Temple of Trajan at Pergamon, the structures were researched before the work, the locations of the original elements were definitely determined, and the ones that could not be determined were mentioned through the publications. As in the junction of east and north galleries of Trajaneum, it was avoided from the hypothetical intervention since the precise information about the original state could not be obtained.

Distinguishability and Compatibility

Different approaches were followed to ensure that new materials used in anastelosis are compatible with the original materials but can be distinguished. Missing parts of the Temple of Trajan at Pergamon, the Temple of Apollo at Side and the Temple of Apollo at Smintheion were produced as reinforced concrete in a colour close to the original material. However, deteriorations in the new parts of the Temple of Apollo at Side caused discolouration. This deterioration in the new material also threatened the original elements. In the newly produced columns, a difference in thickness occurred due to poor workmanship, which facilitated the unintentional distinction. Although reinforced concrete is a preferred material because it provides durability and easy workability, it is not a material that is compatible with stone material. For this reason, it cannot be said that the reinforced concrete material in the foundation and upper structures of the Temple of Apollo at Side and the Temple of Apollo at Smintheion are compatible with the original material. However it is impossible to suggest that the reinforced concrete material is compatible with the original material, in the implementation of the Temple of Trajan at Pergamon, most of the problems originating from reinforced concrete materials were tried to be reduced. In order to be able to distinguish

new parts, these elements were produced without ornamentation. Different approaches were followed in Temple A at Laodikeia for the use of new materials on the same element, are visually incompatible. It is impossible to say that the concrete parts are compatible with the original material. In the Temple of Athena at Assos and the Temple of Leto at Letoon, it was aimed to distinguish the new parts, which were produced from the same material as the original, by their uneroded details. However, there is a possibility that when new parts wear out over time they become indistinguishable. Also, the newly produced stylobates of the Temple of Athena at Assos were produced in different dimensions from the original with the aim of distinguishability. In both applications, compatibility issues are not expected to arise because the new elements are the same as the original ones. The implementation of the Temple of Athena at Priene does not have a situation where compatibility and distinguishability problems can arise because no new material was used in the re-erection. New pieces produced in the Temple of Apollo at Smintheion and the Temple of Trajan at Pergamon without ornamentation are easily distinguished.

Reversibility and Re-treatability

The principle of reversibility is far from being realistic because every application leaves a mark on the original material. It is clear that metal components used in joining of pieces, lead plates and adhesives; the concrete poured into the foundation of the Temple of Apollo at Smintheion and the Temple of Apollo at Side cannot be reversed. Instead, selected examples were discussed in the direction of re-treatability, a more realistic principle. After the first restoration of the Temple of Athena at Assos, reinforced concrete elements, which were found to be damaging the original elements, were dismantled and the new application was realised with new andesite elements that are exactly the same as the original ones. Similarly, the worn-out reinforced concrete column in the west gallery of the Temple of Trajan at Pergamon was replaced with a new marble material a few years later. Similarly, it is thought that metal bars used in the Temple of Apollo at Smintheion, the Temple of Apollo at Side, the Temple of Leto at Letoon and Temple A at Laodikeia could be cut to allow for new applications. In addition, these practices are re-treatable, as the steps in crepis of the Temple of Apollo at Smintheion are removable, clamps were used in joining in the Temple of Leto at Letoon and Temple A at Laodikeia. The fact that new materials were not used to join the elements at the Temple of Athena at Priene is positive in terms of re-treatability when considering that there were missing elements in application.

Within the scope of the study, it was understood that not all of the implementations could be described as anastelosis, by evaluating them in terms of the determined principles. Accordingly, the implementation should be considered as anastelosis in the Temple of Leto at Letoon and the Temple of Trajan at Pergamon; considered as restoration in the Temple of Athena at Assos; considered as re-erection in the Temple of Athena at Priene; considered as reconstruction in crepis of the Temple of Apollo at Smintheion; anastelosis in three columns in its corner and re-erection of its other columns; considered as reconstruction in the Temple of Apollo at Side and Temple A at Laodikeia.

Conclusion

Anastelosis implementations were carried out in order to protect the original elements of a structure by raising them from where they lay on the ground, or were considered that it indirectly contributes to the development of conservation consciousness by allowing visitors to perceive the buildings as three-dimensional. In addition to these, there are also re-erection applications in order to make the archaeological site well-known and to meet the expectations of tourism industry.

- In site scale, anastelosis brings the structure into the forefront. The meaning attributed to the structure via application should be parallel with its situation in original context; otherwise more important structures especially in vicinity may be overshadowed.
- The lack of original elements or not included in the application or inadequately done re-erection and unorganised site, adversely affected the structural integrity of the structures. Visual integrity could not be achieved in applications done with fragmented approaches or when labour problems occurred.
- The implementations, in which the original elements were used in large quantities, provide both integrity as well as the conservation of original elements. If the original material was available in small quantities, and the application was insisted to carry out, the visual integrity and authenticity cannot be achieved. Original construction system can be partly maintained by combining original and new pieces with metal bars and joining blocks with clamps and dowels. In order not to harm original pieces, rustproof metal such as titanium, fibreglass, or stainless steel should be chosen. Considering a rigid system is not desired, titanium and fibreglass materials ensure preservation of original pieces by breaking titanium and fibreglass itself during an earthquake. Reconstructing foundation as reinforced concrete or designing reinforced concrete structural system by regarding earthquake risk, spoil original structural system.
- Identification of the locations of the original elements through detailed studies before the applications should be carried out and accurate information about the structure should be provided to ensure the reliability of implementations. It is also beneficial to share this data with the public in order to increase reliability of the study and attract public attention to conservation studies.
- Distinguishability in applications can be achieved by producing damaged or missing elements without any ornamentation or using new elements that are uneroded at present. Visual compatibility is ensured by using completely original elements, new material being the same as the original. Visual compatibility is also provided by producing new material in close colour tone to original material, however, new materials selected in some applications can create a visual or material incompatibility with the original.
- Re-treatability in applications is ensured by the use of clamps and metal bars being cuttable thus applications can be reproduced completely or partially. However, as these bars are fixed by adhering, they cannot be reversed without damaging the original material.

Implementations aimed at the promotion of the site can make the site vulnerable to the consequences of intensive tourist flow. Therefore, conservation work should be done as a result of serious planning. Anastelosis should not be undertaken when there is not enough information about the original state of the structure or the original material is only in a small amount.

Notes

1. Developed from the MS thesis 'Conservation and Presentation of Greco-Roman Temple Remains in Western Anatolia: A Critical Assessment on Selected Examples through the Concept of Anastelosis' prepared by Özge Deniz Toköz under the supervision of Prof. Dr. Başak İpekoğlu (Toköz 2018).

Disclosure Statement

No potential conflict of interest was reported by the authors.

Notes on Contributors

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