

SHELTERS FOR ARCHAEOLOGICAL SITES IN SERBIA: A RESEARCH AIMING TO DEVELOP GUIDELINES FOR FUTURE DESIGN AND CONSTRUCTION

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Abstract. *Between the years 2003. and 2013. the Republic of Serbia allocated in its own budgets around one billion dinars for designing and construction of shelters on archaeological sites. This paper researches the main factors for decision making on different levels, resulting in certain designs and construction solutions, but in numerous problems also. Based on all so far performed works and their results, the general guidelines applicable to the range of professionals involved were given.*

Key words: *shelter, archaeological site, design, construction.*

1. INTRODUCTION

Following the worldwide trends, in the past decade, our heritage professionals started developing projects for sheltering of archaeological sites. During this period of time seven shelters were built on five archaeological sites in Serbia, and the research on the performed designs and constructions seemed like a next logical step, before making any further decisions.

The research was done throughout the questionnaire which was distributed to all relevant institutions and individuals, but it was also followed by the field work. The results from this research could help heritage professionals and others through the process of sheltering archaeological sites based on our own experiences concerning also the applicable knowledge from abroad.

This topic as well as the question—how to construct shelters in order to protect archaeological remains in a best possible manner is always interesting for the various specialists all over the world. This has been a critical and not well understood issue, for decades now.

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Considering all that has been said, the aim is to develop and disseminate practical guidelines and design criteria that can be broadly adopted and utilized, resulting in better informed decisions and better performing shelters (Getty conservation institute).

Serbian heritage found consists of numerous monuments and sites, and archaeological sites are very important part of it with the total number of 186 protected by the law (Grupa autora, 2007). Some of them are enlisted with the UNESCO's world heritage list (UNESCO, Serbia).

On the list of archaeological sites with shelters in Serbia, there are two that are dated to prehistoric period: Lepenski Vir and Drenovac, and three from the period of the Roman antiquity: Viminacium, Mediana and Sirmium, also four of them are categorized as cultural heritage of exceptional importance for our country (see Table 1.).

Table 1 Archaeological sites with shelters in Serbia

Archaeological site (dating period)	Category	Position	Managment	Total number of shelters
Drenovac (prehistory)	none	Paraćin	Institute for Archeology Belgrade	1
Lepenski Vir (prehistory)	exceptional significance	Majdanpek	National museum Belgrade	1
Viminacium (antiquity)	exceptional significance	Požarevac	Institute for Archeology Belgrade	3
Sirmium (antiquity)	exceptional significance	Sremska Mitrovica	Institute for Cultural Heritage Preservation Sremska Mitrovica	1
Mediana (antiquity)	exceptional significance	Niš	Institute for Cultural Heritage Preservation Niš, National Museum Niš	2

2. SERBIAN SITES CASE-STUDIES

Starting from the earliest cases we can first analyze Viminacium shelters. Viminacium is an archaeological site of exceptional importance located near Kostolac and Pozarevac.

It consists of a Roman military camp and town, with a number of complementary structures such as necropolis, aqueducts, etc., dating from I century AD until the beginning of the VII century AD. The first archaeological excavations began in the late nineteenth century and have still been going on (E.V.Petrović, A.M.Petronijević, 2015). This archaeological site has three shelters erected over three different parts of the site: *termae*, fortification gate and *mausoleum*, all constructed as glued laminated wood structures and covered with the PVC membrane (see Fig. 1).

Sirmium is an example of the ancient town, captured within the framework of modern city of Sremska Mitrovica. The first archaeological excavations are dating back to the end of the XIX century, and it has 85 localities registered. It is categorized as a cultural heritage of exceptional importance, and the Imperial Palace, above which the shelter was built (E.V.Petrović, A.M.Petronijević, 2015) represents its central point. It is a combination of glued laminated wood structure at the top, covered with "lexan panels" and concrete-masonry walls in the lower parts (see Fig. 2)

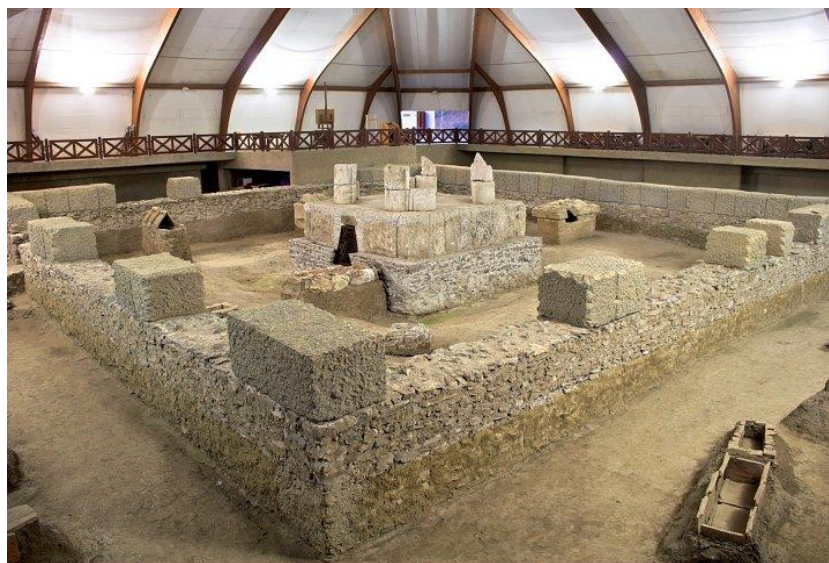


Fig. 1 Viminacium, the “Roman Mausoleum” shelter,
URL: <http://haemus.org.mk/wp-content/uploads/2013/05/VIMINACIUM.jpg>
(May 23th, 2015)



Fig. 2 Sirmium, the “Imperial Palace” shelter interior,
URL: <http://static.mondo.rs/Picture/78859/jpeg/> (May 18th, 2015)

Lepenski Vir, an archaeological site of exceptional importance from the municipality of Donji Milanovac, was relocated from its original position. During the archaeological

excavations in the period between 1965 and 1970 exactly 136 unique houses were revealed (E.V.Petrović, A.M.Petronijević, 2015). The shelter was erected over the complex of the houses mentioned before, after removing the old protective structure. This shelter is made of metal structure and covered with “lexan panels” (see Fig. 3).

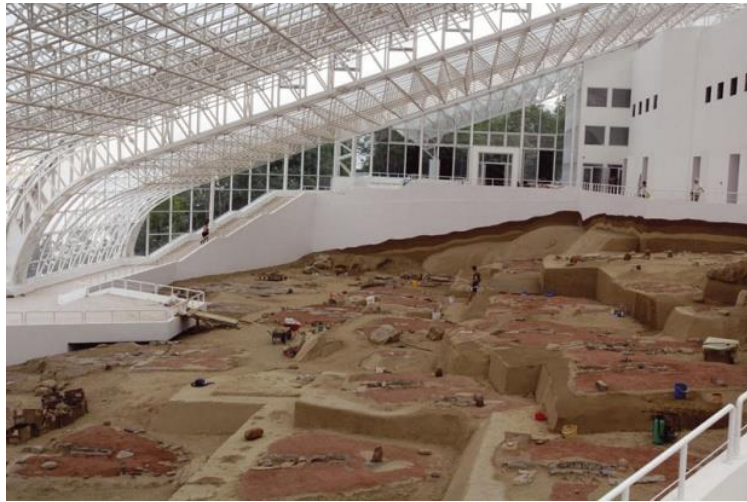


Fig. 3 Lepenski Vir, shelter and visitors center interior, URL:
http://www.novosti.rs/upload/thumbs/images/2011/06/2306/lepenski%20vir/Lepenski-vir-4_620x0.jpg (May 18th, 2015)

Not far from the village of Drenovac near Paraćin, there is the Neolithic archaeological site (Slatina-Turkey fountain). The construction of the highway Belgrade-Niš has divided it into two parts. On the eastern side the protective structure is raised over a trench in which the remains of prehistoric houses were researched (see Fig. 4). The protective structure comprises arched girders made of glued laminated wood, covered by PVC membrane (E.V.Petrović, A.M.Petronijević, 2015).



Fig. 4 Drenovac-Slatina, shelter and research center



Fig. 5 Mediana, shelter in construction phase

Mediana, an archaeological site of exceptional importance, is situated right beside the city of Niš. It is dated to the period from III to V century AD and built as a suburban residence consisting of Villas and numerous buildings of various use and function. Some of the residential buildings were the objective of research in the past and several excavated buildings had mosaic floors. The most important one is the so called Villa with the Peristyle, positioned in the central part of the site. The first protective structure at *Mediana* site, was built in 1936. over one part of the Villa (Small *triclinium* “A”), but most of the Villa’s stayed unprotected, so the new sheltering project begun in the year of 2013 (E. V. Petrović, 2015) (see Fig. 5).

3. OUTCOMES OF THE RESEARCH

Archaeological remains left *in situ* are exposed to numerous influences and risk factors and many of them are very fragile so their preservation must be done thoughtfully. Very often research and excavations are not followed by conservation. Even when conservation is done in appropriate way it does not imply necessary the presentation aspects. When it is included the presentation of architectural remains must be done in a way that extends the positive effects of conservation (E. V. Petrović, 2015). Designing and building shelters must be done in the same mode.

Research was done in few steps, the first one was a rapid assessment and survey of existing shelters in Serbia designed and built from the year 2003. until present days. A methodology for the rapid assessment was modeled on foreign examples (S. Tringham, J. Stewart, 2008). Based on this rapid assessment *in situ*, phase two was a preliminary assessment of the shelters from another point of view. The institutions in charge for management gave us information by filling in the questionnaire prepared by the researchers. The results are presented below.

In general shelters can be designed as enclosed or open (partially enclosed) structures. They are always covering very large spaces impossible for air conditioning. This is why we came to a conclusion that totally enclosed structures are not very suitable for our region, especially considering very high temperatures during the summer period. From our research we found that six of seven shelters are designed as enclosed, which makes temperature control inside the shelter impossible. In favor of this fact there is also the choice of light weight materials for roofing, in our cases those are “lexan” or “PVC membrane” (C.C.Briones, 2013).

Initially all the sheltering projects came from governmental institutions of culture and science, four designs were made by private companies and three were done in governmental Institutes for cultural heritage preservation.

None of the designs is selected by the public architectural competition. Five of them were preceded by feasibility studies and several by management plans also, like Viminacium shelters.

All shelters were financed by the Serbian government, the majority throughout allocation of finances by the Ministry of culture. The total amount of money exceeded the number of one billion RSD, or approximately ten million EUR invested in shelters on archaeological sites in Serbia, for the period of ten years (see Table 2).

Table 2 Shelters in Serbia - comparative review

Shelter (year)	Project design	Budget	Type	Area (m ²)	Span (m)
Viminacium Roman Mausoleum (2004)	Private company	< 100 million RSD	enclosed	1.000	40
Viminacium Fortification Gate (2003)	Private company	< 100 million RSD	enclosed	635	<50
Viminacium Termae (2004)	Private company	< 100 million RSD	enclosed	1.545	<50
Sirmium Imperial Palace (2009)	Institute for Cultural Heritage Preservation Sremska Mitrovica	>100 million RSD, <200 Million RSD	enclosed	2.680	26
Lepenski Vir (2011)	Republican Institute for cultural heritage preservation Belgrade	>200 million RSD	enclosed	3.500	50
Drenovac Slatina (2013)	Private company	>100 million RSD, <200 Million RSD	enclosed	1.200	<50
Mediana Villa with peristyle (2013)	Institute for Cultural Heritage Preservation Niš	>100 million RSD, <200 Million RSD	open	10.000	72.5

General evaluation of the conditions after the building of the shelter, given by the management authorities, has more positive than negative effects.

The choice of light-weight materials has good results in terms of possible large spanning and small foundations size, but it is extremely unfavorable for the air-conditioning. The combination of this materials with the concrete and masonry structures causes problems, especially if done without insulation solutions, like in Viminacium Roman Mausoleum and Sirmium Imperial Palace shelters.

Comparing the sheltered areas, constructive systems and spans, we can see that there is not much difference between the performed designs, but laminated wood is used in six out of seven shelters. The availability of this material and existence of companies with references which can design and construct this type of shelters in a very short period of time is obviously preferred in the process of decision-making.

There are many examples where water-management was not taken into consideration during the designing process which led to massive failures during the exploitation period. This was certainly the case with the Mediana shelter in the original designs, but in the process of project development it was eliminated, before the construction phase. The openings of the Mediana shelter were originally sized in a way that makes the existence of the shelter nonsensical (E. V. Petrović, A.M. Petronijević, 2015).

Regarding the preservation, management, marketing, and promotion of cultural heritage, both objects and sites and increasing cooperation among the various institutional partners and with the local stakeholders it gives good results in almost all cases.

4. GUIDELINES

Most of the shelters are intended to have multiple functions. Basically their primary role is to protect the archaeological sites or more often only one of its parts, but at the same time they serve the presentation aspect. Sometimes shelter is combined with the visitors facilities under the same roof, like in Sirmium and Lepenski Vir. If the shelter is serving only its primal functions the best solution could be open structure which allows natural ventilation during the whole period of year. In this way the microclimate beneath the shelter will follow the external patterns with less extreme temperature fluctuations and without negative effects of direct atmospheric influences (C.C.Briones, 2013). This brings us to a conclusion that shelter should have only ventilation openings, put in the adequate positions and properly sized, rather than large open areas. The survey of the shelters inside shows clearly that each of them has some of the listed problems, including condensation and extremely high temperatures.

Water-management is one of the crucial issues. Direct influence of rain and snow should be avoided regardless to the type of archaeological structure belonging to the sheltered building or complex.

Even if one decides to build a shelter which eliminates all negative impacts mentioned before, it is necessary to understand that the challenge of good presentation and preservation does not end there. Structures displayed under some kind of sheltering structure are put out of the original context even though they are still *in situ*. The lack of architectural forms that gives the observer clear picture and contribute to the overall experience of the place is sometimes mayor problem with this kind of presentation projects (A. Mirić, E.V.Petrovic, 2012).

Additional basic guidelines regardless the type of the site:

- when we think about design, we should be aware of the fact, that the main and only purpose of the structure is to preserve and protect, it is not supposed to be an architectural masterpiece and must not be competitive to anything that is around,
- when it comes to archaeology it has to be clear, whatever it was discovered has to be on the same plane, by this we can decide how and what is going to be sheltered,
- even if we have every record of archaeology remains, when it comes to conservation there must be some possibilities left for future changes, no matter what kind of analysis are done before, only monitoring period can give us the precise information on the influence of our work to the site and all of its parts,
- before making a decision even if we have a budget for the structure allocated, do not go further if there are no clear numbers of the budget for the maintenance, especially with large structures of several thousand square meters (E. V. Petrović, 2015).

Sustainability is critical to the success of any proposed programs and can only be through the tapping of the sites and their local communities for their full potential in terms of socioeconomic development. For this reason the approach that aims to involve local and professionals at all levels is the best.

5. CONCLUSION

Idea of delivering general guidelines for our specialists dealing with the sheltering projects is based on our own experiences together with the global issues.

In opinion of world famous experts guidelines should be: applicable to a range of heritage professionals including architects, engineers, archaeologists, scientists, conservators, curators, and other decision makers and administrators; encompass the entire sheltering process, including the decision of whether or not to shelter, design, construction, and evaluation and maintenance of shelters; provide easily accessible guidelines and illustrative case studies and are applicable to diverse situations and contexts (Getty conservation institute).

Considering the fact that each and every site is a case of its own, but also that geographical area largely determines the methodology and needs for sheltering we found it very useful to contribute to this serious topic by defining some of the guidelines for our region.

REFERENCES

1. Getty conservation institute LA, Shelters for archaeological sites Project, URL: https://www.getty.edu/conservation/our_projects/education/shelters/guidelines.html (May 23, 2015)
2. Grupa autora, Spomeničko nasleđe Srbije - nepokretna kulturna dobra od izuzetnog i velikog značaja, RZZSK Beograd, 2007.
3. UNESCO, Serbia, URL: <http://whc.unesco.org/en/statesparties/rs> (May 18, 2015)
4. E.V.Petrović and A.M.Petronijević, Zaštitne konstrukcije na arheološkim nalazištima-Potreba ili trend? Zbornik radova IX naučnog stručnog međunarodnog savetovanja Ocena stanja, održavanje i sanacija građevinskih objekata i naselja (643-650). Zlatibor 25-29. maj 2015.
5. E.V.Petrović, SHELTERS OF MEDIANA: The great challenges of the moment, "Conservation and Presentation of Mosaics: At What Cost? Proceedings of the 12 International Committee for the Conservation of Mosaics" to be published by the Getty Conservation Institute in Spring 2015.

6. S. Tringham and J. Stewart, Protective Shelters over Archaeological Sites: A Review of Assessment Initiatives. In *Lessons Learned: Reflecting on the Theory and Practice of Mosaic Conservation: Proceedings of the IXth Conference of the International Committee for the Conservation of Mosaics*, Hammamet, Tunisia, 2005, ed. A. Ben Abed, M. Demas, and T. Roby. Los Angeles: Getty Conservation Institute 2008.
7. C.C. Briones, A methodological approach to evaluate shelter effectiveness for the conservation of archaeological sites, *Science and Technology for the Conservation of Cultural Heritage* edited by Miguel Angel Rogerio-Candelera, Massimo Lazzari, Emilio Can, URL: <https://www.crcpress.com/engineering-civil,https://books.google.rs/books?id=q3YZBwAAQBAJ&pg=PA44&lpg=PA44&dq=Rapid+Assessment+of+Shelters+over+Mosaics:&source=bl&ots=bUCCSKJ4J&sig=fzZvAr4p0NteL4kwfN5B2UmmhUU&hl=en&sa=X&ei=zZNgVZOUGoelsgHr4YD4CA&ved=0CDUQ6AEwBQ#v=onepage&q=Rapid%20Assessment%20of%20Shelters%20over%20Mosaics%3A&f=false> (May 23, 2015)
8. A. Mirić and E.V. Petrović, Presentation Opportunities of Residential and Public Buildings Floor Mosaics from Late Antique Naissus and its Environment. In *PhIDAC: Proceedings of the IVth International Symposium for Students of Doctoral Studies in the Fields of Civil Engineering, Architecture and Environmental Protection, Niš, Serbia, 2012.*, ed. 186-192. Niš: Faculty of Civil Engineering and Architecture, University of Niš 2012.

ZAŠTITNE KONSTRUKCIJE ARHEOLOŠKIH NALAZIŠTA U SRBIJI – ISTRAŽIVANJE U CILJU DEFINISANJA SMERNICA ZA PROJEKTOVANJE I IZGRADNJU

U periodu između 2003. i 2013. godine Republika Srbija je za projektovanje i izgradnju zaštitnih konstrukcija na arheološkim nalazištima izdvojila ukupno oko milijardu dinara u svojim budžetima. Ovaj rad istražuje koji su faktori bili presudni u procesima odlučivanja na različitim nivoima, a što je rezultiralo određenim projektantskim i izvođačkim rešenjima, ali i brojnim problemima. Na osnovu svih dosada realizovanih projekata i rezultata dobijenih istraživanjem ponuđene su određene smernice, koje bi mogle biti od koristi za sve zainteresovane strane.

Ključne reči: zaštitne konstrukcije, arheološka nalazišta, projektovanje, izgradnja