

The Installation of Protective Constructions for Covering Archeological Excavation Sites and Medieval Buildings

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ABSTRACT: Protective constructions represent a special kind of auxiliary constructions. Their main role is reflected in a possibility of their installation over already existing construction or a larger open space, with an ability to overcome a large span and without a possibility to damage (constructively and physically) already existing construction or a building which is they should protect.

The installation of this type of protective constructions has an aim to protect an archeological site or a medieval building covering it – by building suitable eaves. With this kind of protection the object of protection (archeological excavation site or a medieval building) is protected from a direct effect of atmospheric conditions (rain, snow) and in that way is prevented an unwanted effect of atmospheric conditions on a cultural property. The necessity of an adequate protection is reflected directly in preservation of a cultural property and prevention of its possible destruction.

1 CLASSIFICATION OF PROTECTIVE CONSTRUCTIONS BY THE TYPE OF PROTECTION

The type of a protective construction is determined depending on a subject of protection, i.e. type of a building which is to be roofed. We can classify protective covering constructions into: permanent and temporary.

1.1 Permanent protective constructions

Permanent protective constructions are built over archeological excavation sites with a function to cover and protect them from a direct effect of atmospheric conditions, as well as to form a constant exhibit space. In that way is possible, if necessary, to perform further exploration and excavation within the site itself. This kind of protection, and the selection of a type and a sort of construction is built for a longer period of time (permanent solution), therefore it has a character of a permanent protective construction.

Example of this type of permanent protective construction is over the archeological excavation site of the remains of the Roman military camp Viminacium in surroundings of the town Požarevac (Serbia and Monte Negro). Viminacium was the capital city of the province Upper Mezia. The oldest traces of this site date from the 1st century AD. Three different types of protective constructions have been installed at this site, two permanent and one temporary. The constructions installed will be analyzed by their character and by the type of constructive solutions.

The first permanent protective construction covers the remains of an ancient bath from Roman period. This construction geometrically has a cylindrical shape and it is built of glued-laminated bearers. Each glued-laminated bearer represents a three-hinged arch. The bearers are

placed on the R.C. pedestals.



Figure 1: Protective construction over Roman bath, Viminacium



Figure 2 : Connection of the bearer with the footing, protective construction over Roman bath, Viminacium

The next example of the temporary protective construction at the Viminacium site is the construction built over the space where several graves from the Roman period had been discovered. This construction has also been built of glued-laminated timber and it has a pyramidal shape. Each primary bearer represents a three-hinged arch. The bearers of glued-laminated timber are placed on R.C. ring which at the same time represents a platform where the visitors of the site walk. The author of all protective constructions within the Viminacium block is academician, Professor Vojislav Kujundžić Ph.D., Engineer of architecture.



Figure 3 : Pyramidal protective construction over the graves, Viminacium

In both cited cases canvas has been used as a temporary roof covering, due to a shortage of financial resources. It is necessary to activate the snow melting device when it snows. The laminated wooden construction has been dimensioned to hold a snow load as well as a permanent roof covering. This space will be illuminated with lanterns.

As example of the permanent protective construction we will also mention the construction over mud brick arch gate in the ancient city of Dan (18th century B.C.). Complete construction has been built in the combination of tri-belted arch and straight steel bearers and the polycarbonate base product has been used as a roof covering. Ayelet Mor, an architect, is the author of this protective construction.

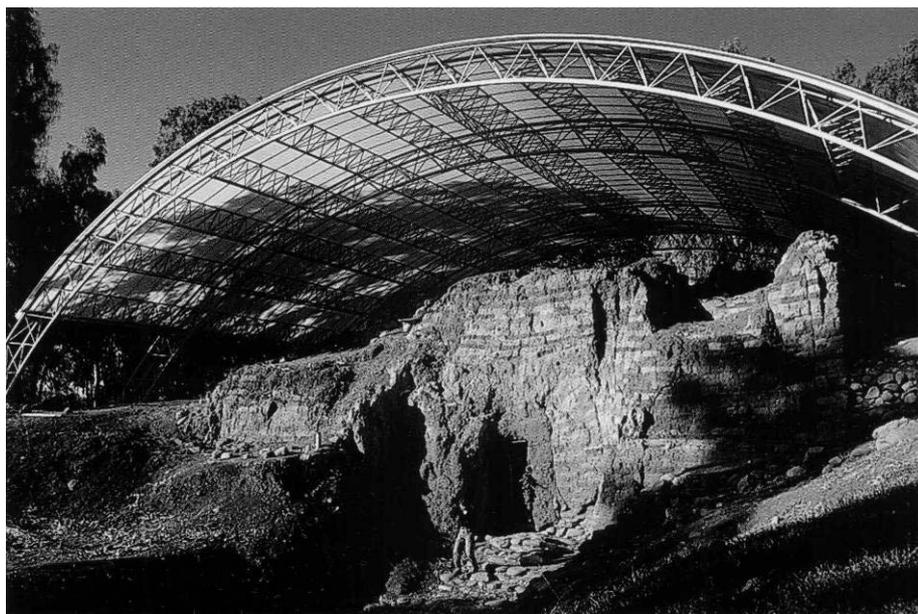


Figure 4 : Protective construction over arch brick gate, Dan

1.2 Temporary protective constructions

Temporary protective constructions are built over archeological excavation sites during explorations and excavations, as well as over medieval buildings during their rebuilding and reconstruction, and that only for a limited period of time – for as long as the work on them lasts.

Example of a temporary construction is on the archeological site Viminacium. Temporary construction has been built over the excavation and exploration site. The construction is built with metal plate connected wood trusses. Canvas is used as a roof covering over this protective construction.



Figure 5 : Temporary construction, Viminacium

Temporary protective construction has been built over one of the sites in Efes, Turkey. This important site dates from 1st century B.C. The type of this protective construction is a primary steel tri-belted truss construction in combination with dead shores under canvas as a roof covering.



Figure 6 : Temporary construction, Efes

There are also examples of temporary constructions built over medieval buildings in the oldest monastic state on Holy Mount, Athos in Greece. This type of covering has been built on following buildings on Holy Mount: over Paraclis of Holy Archangels, within Hilandar monastery and over Paraclis of St. Nicolas Church on Hilandar. Hilandar monastery, founded long ago in 1199, had been for a long time spiritual and cultural centre of Serbian medieval state.



Figure 7 : Protective construction over Paraclis of Holy Archangels,
within Hilandar monastery

Temporary protective construction built over Paraclis (the church) of Holy Archangels and over Paraclis of St. Nicolas Church on Hilandar is made of tube - shaped steel scaffolding.

M.Sc. Nenad Šekularac, Engineer of architecture, the author and contractor of these constructions is one of the authors of this work. Tube - shaped steel scaffolding is used for stiffening the construction. The protective construction over these buildings is covered by OSB plates. A protective foil was put over the plates. The installation of the construction has been realized without heavy machinery.



Figure 8 : Protective construction over Paraclis of St. Nicolas Church,
within Hilandar monastery

The purpose of building of a temporary protective construction over Paraclis (the church) of Holy Archangels is to protect the building during roof re-covering and replacement of the existing stone roof covering with a new one.

Temporary protective construction over St. Nicolas Church (from 17th century) has been built in order to protect the hole building (damaged during the fire in 2004) and to create the conditions for its rebuilding and reconstruction.

A construction made of tube-shaped steel scaffolding is planned in the solution suggested as a temporary protective construction over the remaining walls of White Palace (built in 1598), damaged in the fire 2004, and a trapezium tin is planned as a roof covering. M.Sc. Nenad Šekularac, Engineer of architecture, the author and contractor of these constructions is one of the authors of this work.

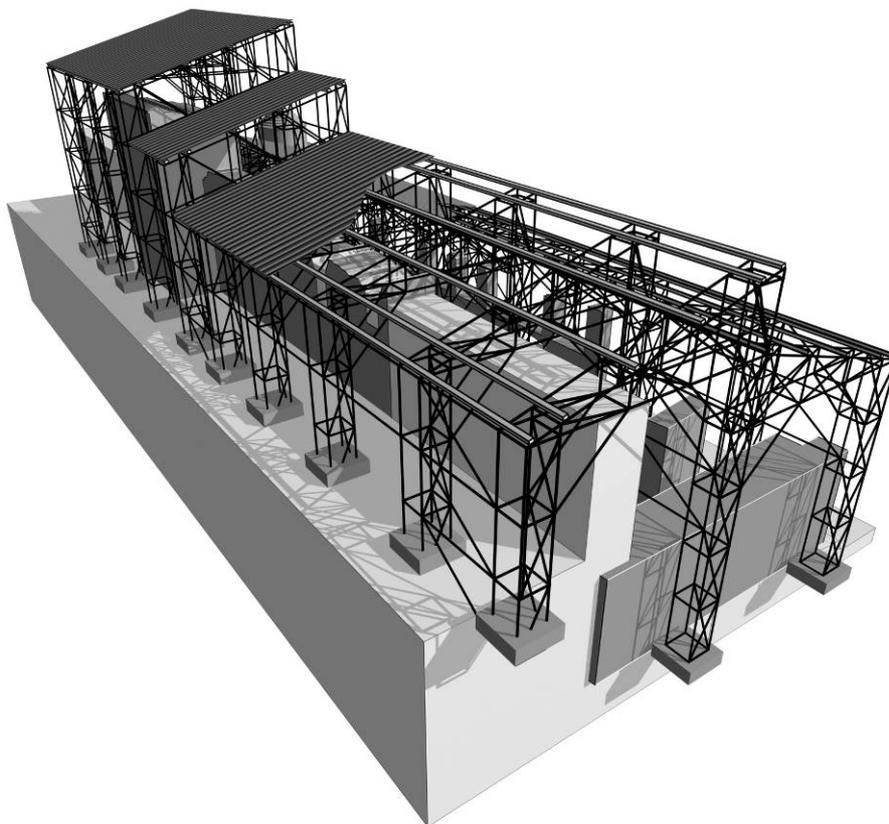


Figure 9 : Animation of the solution suggested as a protective construction over the remaining walls of White Palace

Temporary protective construction has also been built over The Protat Church in Carea, on Holy Mount. The construction has been built to protect the building during its reconstruction and replacement of a roof covering. This arch construction has been made of welded steel bearers. Steel bearers are placed on concrete pedestals (dimension 3,0 X 3,0 X 2,5m.) Tin, as a roof covering has been installed over steel binding rafters, placed on a primary steel construction. Certain parts of a roof are transparent and covered by polycarbonate base products. It is necessary to use machinery to install and take apart this type of a heavy protective construction, which represent its mayor disadvantage. In this case there is also a problem of removing large concrete pedestals (oversite concrete). Significant financial resources have been invested in this type of a steel construction and it is not certain that it would be possible to use it again in some other situation or on some other building.



Figure 10 : Protective construction in The Protat Church, Carea

2 RECOMMENDATIONS FOR A BUILDING PLAN OF A PROTECTIVE CONSTRUCTION

All the above mentioned types of protective constructions are built in a combination of various materials, depending on a kind - type of protection (permanent or temporary) and specific characteristic of each building. Examples cited in this work include constructions made of glue – laminated timber, hot rolled steel profiles, tube - shaped steel scaffolding, as well as construction made of light wood trusses.

Building an adequate protective construction which has to protect physically – to cover and shelter a space (building, site) is of a mayor importance. Good selection of a type of protective construction affects significantly the course of operations on the site or building – no matter what type of work that might be – investigation, conservation, rebuilding or a final presentation of the exhibit and the archeological site.

Wrong or bad selection of a protective construction may harm the object of protection (site, building). If used inadequate heavy construction the ground may settle and, as a consequence, the site or the construction itself may become statically unstable and endangered.

Inadequate selection of a heavy protective construction will later jeopardize its safe removal from the site or building that it is supposed to protect.

Temporary protective constructions have to meet the requirements of safety during its exploitation as well as easy installation and taking apart once the work have been carried out. Therefore, the conclusion is that every temporary construction needs to have characteristics of a light construction, to be easily installed and taken apart in a brief period of time and not to require significant financial resources.

Since it is a matter of various buildings and sites it is unlikely that a certain protective construction will be used in more than one situation; so, as a solution for building a protective construction, it is recommended to use a construction built of single elements (tube - shaped steel scaffolding), which has a possibility of a large number of combinations, according to a specific task, adequate stiffening elements (the reception of horizontal forces: the effect of wind and seismic forces) as well as an adequate roof covering.

As a possible solution for a temporary protective construction it is recommended to build a construction of wood trusses which represent both: a primary construction and, at the same time, stiffening in the terms of statics. The advantage of this type of a temporary protective construction is its ability to overcome a large span, relatively small weight of a construction itself,

quick installation and taking apart without the use of machinery and it requires a reasonable investment.

Protective constructions of a permanent character apart from their basic function have to meet high requirements of esthetics, considering the fact that they are situated in protected sites and in protected surroundings. What else needs to be emphasized from the point of view of architecture is that this type of protection does not have to dominate the space where situated, but to fit its architectural and formal solution into the environment in the best possible way and to highlight the object of protection (the building, archeological site etc.)

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