



European Union
Funded Project



Project Implemented
by Golubac Municipality

REVITALIZATION OF GOLUBAC FORTRESS - PROJECT DESIGN



ALBO-inženjering Beograd d.o.o. preduzece
za projektovanje i inženjering - Beograd

Project Design and Feasibility Study
for Revitalization of Golubac Fortress



European Union
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by Golubac Municipality

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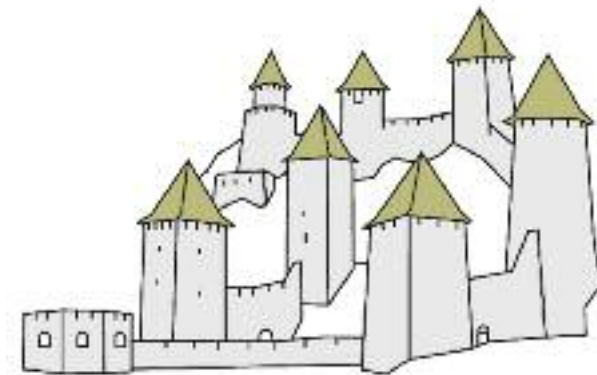
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Revitalization of Golubac Fortress

Project Design

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Golubac Fortress

10.1 km

lat: 44.704185 lon: 21.675588

Image © 2008 DigitalGlobe

Sep 10, 2008

Google

Eye alt: 35.00 km

Revitalization of Golubac Fortress

INTRODUCTION

Legal basis and jurisdictions

The designing and realization of the works on the Golubac fortress revitalization and its immediate surrounding area is defined according to the Spatial Plan of the Republic of Serbia, the Law on Cultural Assets, the Law on Planning and Construction, the Law on Environment Protection, the Law on National Parks, the Spatial Plan of the National Park Djerdap, the Program of the Protection and Development of the National Park Djerdap region (1996-2000), as well as according to the special regulations related to this area. These legal documents, as well as the Act on Protection, defined the boundaries and criteria of organizing and designing the Golubac fortress area.

According to these legislations mentioned above, the participation of all authorized government organizations is determined: Ministry of Environment and Spatial Design, Institute for Protection of Cultural Monuments, Institute for Nature Protection of Serbia and Public Enterprise of National Park Djerdap.

Acts on Protection

According to the Act on Protection and Scientific Research of Cultural Monuments NRS num. 276/48 on March 1st, 1948, Golubac- a fortress on the Danube was "placed under the protection of the state together with its immediate surrounding".

According to the decision of the Municipal Assembly of Golubac by the Act num. 633-3/1-71 on November 15th, 1971, the part of natural surrounding where the Fortress is situated was placed under the protection as a specific nature reservation named "Golubac fortress".

The Fortress was categorized as a cultural monument of extreme importance according to the decision of the Assembly of the Socialist Republic of Serbia (Official Gazette num. 14 on March 7th, 1979).

The measures and terms of preservation, protection and improvement of the Area of the National Park were determined on August 19th, 1979 (Official Gazette SRS num. 34, p. 12/79).

According to the Act of the Institute for Protection of Cultural Monuments num. 112/7 on April, 29th 1992, it was planned to remove the building of the old quarry managed by "Ivan Milutinovic" company.

According to the Act of the Institute for Protection of Cultural Monuments, Measures of Technical Protection for making of the Project of Restoration and Revitalization of the Golubac fortress and spatial management were defined.

The Institute for Nature Protection in January of 1986 created a Preposition for protection of natural surrounding of the immobile cultural asset of a medieval town Golubac and determined two zones of protection, which include the Fortress, suburb and a wide natural area on the south and south-east side of the Fortress.

Macro location and geographical position of the Golubac fortress

The cultural asset of the Golubac fortress is situated on the bank of the Danube, in the municipality of Golubac, at the entrance of the area of the National Park Djerdap. The Fortress is situated on a steep limestone section and a forward reef where the Danube suddenly narrows into the biggest European gorge; thrust through the massif of the Transylvanian Alps.

The Golubac fortress is situated along the Danube transport corridor and on the highway M-25.1. This significant transport and geographical position determined its significance in the past as well as in the present.

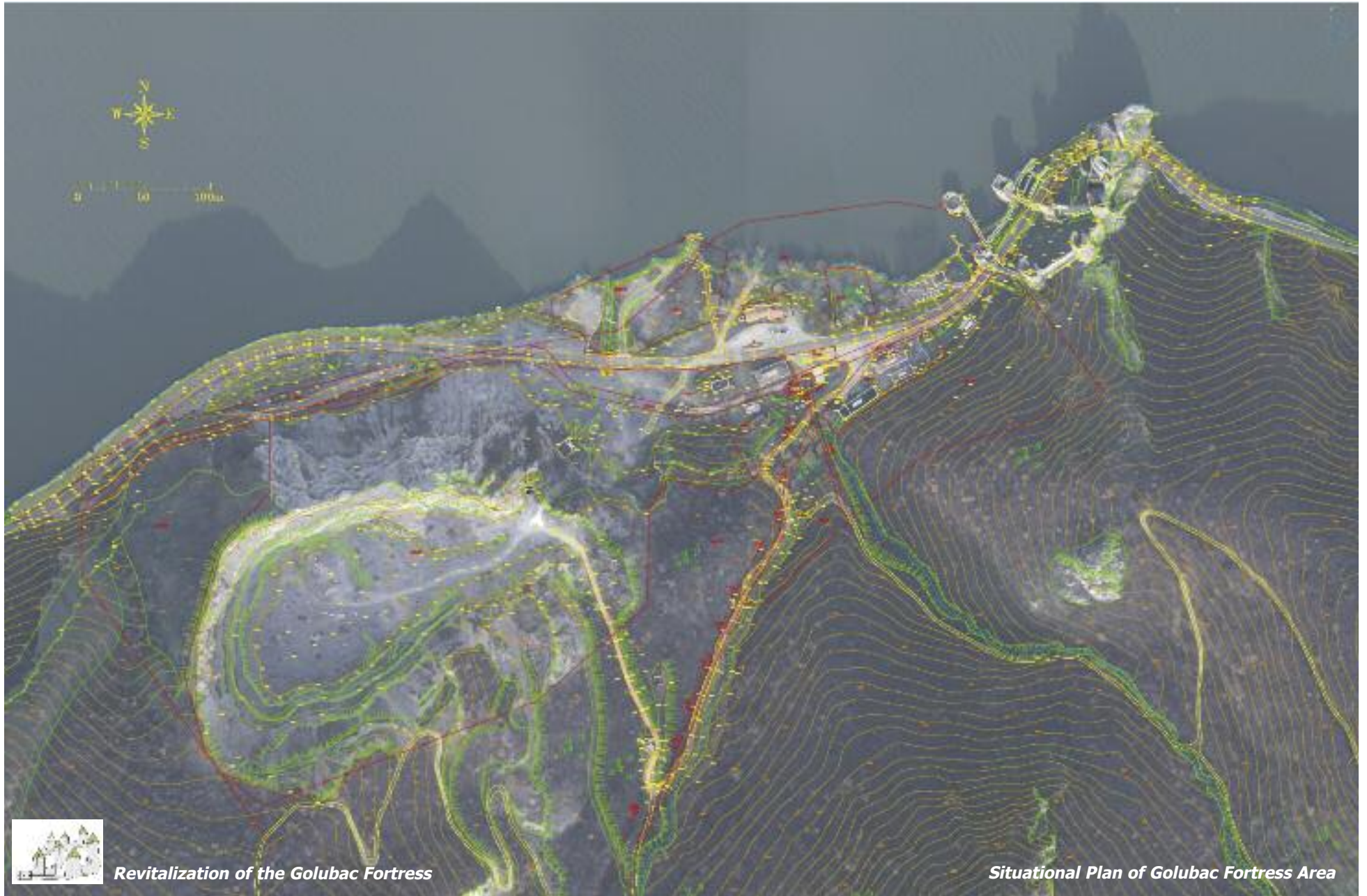
Among the most important European rivers (Volga, Danube, Rhine and Elba), the Danube is the most important navigable river road. Corridor VII (the North Sea - the Rhine - the Maine - the Danube - the Black Sea) is 2415 km long with great potential of enlarging its traffic intensity. And on this navigable road, the Djerdap gorge represents the most attractive sector.

The Djerdap gorge is through Pozarevac connected to a part of European corridor X, which passes through Serbia. However, the main high road of the region is the Djerdap main road-M25.1 (Pozarevac - Veliko Gradiste - Golubac - Donji Milanovac - Kladovo).

Physical characteristics of the Golubac fortress

The Danube runs as a wide valley river as far as Golubac, so it is a few kilometres wide in front of the Golubac fortress and then it suddenly narrows to a few hundred meters next to the Fortress. The Djerdap gorge, 95 kilometres long, begins from to the Fortress. The left bank of the gorge is steep and high, consisting of limestone rocks so the road was cut into the rock at several locations.

Forests are degraded, therefore beech forests are on the higher ground and on the lower ground there are mostly lilac and hornbeam shrubs.



Revitalization of the Golubac Fortress

Situational Plan of Golubac Fortress Area

The nature around the Golubac town itself is seriously degraded, but also at two locations downstream, next to the opening of the quarry. The quarry, which is next to the Fortress, at the very entrance of the National Park, is now closed, as well as Popovac, which is situated downstream of the Fortress, while Jelendo, ten kilometres downstream of the Fortress, is fully operating.

The second degrading factor is the main road, which passes through the protected natural area, but very cruelly through the cultural monument, the Golubac fortress, violating its ramparts and rocky ground on which it lies.

The suburb of the Fortress – a coastal terraced wider area- is completely devastated by activities of the quarry, and after the stone exploitation had stopped, the area was completely neglected.

Cultural and tourist characteristics of the Golubac fortress

The tumultuous history of the Golubac fortress is characterized by a frequent change of rulers, because it was a fortification on the border with Hungary. The town was first mentioned in a Hungarian charter in 1335, and it was held and maybe built by the Hungarians, then it was conquered by the Turks; it was reigned by Stefan Lazarevic, then again by the Turks and the for a period of time it was under the reign of Djuradj Brankovic until the Turkish conquering, but it was overtaken by Austria and then again by the Turks and the Serbs in turns, until it was surrendered to Duke Mihailo after which it was abandoned.

The Golubac fortress is one of the most striking and best preserved medieval fortresses on the territory of Serbia. There, one can perceive methods of fighting and defence with cold weapons and first cannons. Also one can perceive internal communication, organization of accommodation in particular high towers, as well as the more luxuriously decorated palace.

Representing the entrance to the National Park of Djerdap and also the entrance to the gorge, rich with natural and cultural characteristics, the Fortress represents important tourist attraction. Anyone who goes along the main road by a car, bus or a bicycle stops to look around and take photos of the Fortress.

However, today there are not even basic conditions for visitor reception, no car park or sanitary facilities or any other accompanying tourist offer. Sightseeing itself represents a potential danger- visitors stop along the narrow main road where cars, lorries and trucks pass.

It is dangerous for a group of visitors to stand on the road, as well as to make any step off the road – due to unsafe walls, bushes with snakes, and the only restored and preserved stairs which lead to the rampart without a fence, the Fortress represents a great danger (falls from these have already occurred during student excursions).

Golubac can be visited by water too. Big and small tourist boats usually stop so that tourist can take photos of the Fortress and then they go on, because there is no place for boats to dock.

Motive and purpose of the creation of the revitalization project of the Golubac fortress

The motive for making of this project is the fact that for the one of the most important and best-preserved fortification monuments in this part of Europe nothing has been done, apart from old archaeological researches and preservation and restoration attempts of two towers, a part of the palace and a part of one rampart.

Not only that this state of the Fortress does not make any profit and has no significance for the local and wider community, but it also represents an additional problem for traffic safety along the main road and safety of visitors.

Presented in a real way, the Fortress can put in use as a part of tourist offer. "Strategy of tourism development of Republic Serbia", made in 2006, recognized the Lower Danube Basin as one of the most significant tourist areas, and " Master Plan of the Lower Danube Basin " included the Golubac fortress as a key investment projects, with a conclusion that in the first period, it should concentrate on building of a theme, cultural and historic park.

Making of the Project Design of the Golubac fortress revitalization, together with its immediate surrounding, represents an operationalization of the conclusions of the Master Plan of the Lower Danube Basin.

Task for the project making

The task for making of the Project Design of the Golubac fortress revitalization originates from the evaluation of the location of the Golubac fortress conducted in the Master Plan of the Lower Danube Basin. The advantages of the location are general availability by all means of transport, all tourist facilities at the location itself, and availability of other tourist attractions in the nearby area: the area of the National Park "Djerdap", cultural monuments and bigger settlements. The location is graded with 73% and it is included in good locations according to the criteria of overall attractiveness and advantages.

In the theme, cultural and historic centre "Golubac fortress" the following activities are planned: navigation, swimming, fishing, entertainment...

There are also plans for 80 beds, a traditional restaurant, a terraced snack bar, a shop and a souvenir shop, a pier, panorama roads, hiking treks, cycling treks, an amphitheatre, the Visitors Centre of the National Park and a tourist information office.



Revitalization of the Golubac Fortress

Existing State of Immediate Fortress Surroundings

According to preservation regulations of the Service for protection of cultural monuments and according to the analysis of the current state and the degree of preservation, it is planned to recommend a restoration of the Golubac fortress to a degree which is possible. The purpose of the restoration is to bring the entire fortress and all the parts of the fortification into a state of construction suitability and to enable it for safe sightseeing and moving of visitors.

The project needs to recommend different methods of technical protection for the specific parts of the fortification, from conservation to complete restoration. The towers and ramparts, which are preserved to the height where hiking treks are, should be partially or completely restored.

When completely restoring the towers, it is important to pay attention to the restoration of the interior architectonic structure, so that the towers could be revitalized and could get a new purpose. In this regard, a restoration of the entrance should be planned, wooden floor constructions on the original levels as well as a reconstruction of the staircase and suggestion of roof construction.

The ramparts should be restored in all regards according to the saved data, including built staircases, walkways and merlons. On the interior side, modern, functional fences should be put because of the safety of all visitors.

For the needs of the restoration and presentation of the Golubac fortress, it is necessary to plan the moving of the main road. The new route for the road can extend along the brim of the plateau in front of the Fortress, i. e. along the brim of the former suburb then into the tunnel through the rocky slope so that it could again be joined to the route of the main road downstream the Fortress.

The moving of the road provides availability of the plateau in front of the Fortress for archaeological research, levelling and presentation of findings. Within this area, one should plan the building of the Visitors Centre for visitor reception, a smaller lecture room, information office, exhibition area and a souvenir shop. Within the transport project, there should be planned a car park for buses and cars. It is desirable to plan a building of small pier for boats, so tourists can do sightseeing of the Fortress by water.

State of research works on the area and documentation

The covering of a route of the road and making of openings necessary for vehicle passing into the Fortress, done between two World Wars, destroyed the entrance gate and also the exit between the coastal parts of the construction.

The remains of the object became covered with an even thicker layer of earth when the rearrangement of the terrain was done and the main road was constructed. On the location of former suburb, now there are objects built for the needs of the quarry,

mostly in a bad condition and designed in such a way that their plan and peak elevations, used for their construction, are completely unsuitable for use within the framework of newly planned facilities related to the design plan for the Golubac fortress area.

A quarry was opened in the middle of the last century in the immediate vicinity of the Fortress, and during the works for the arrangement of the PIM work site, a Turkish bath was found by accident. A concrete ceiling was cast over the arches in larger rooms and it was used for explosive storage for the quarry. There is a story that the remains of a nearby mosque were removed during that period.

In the Golubac fortress, archaeological research began within the research project Djerdap I and this occurred in the sectors which were most endangered by the water from the reservoir. After the first research, conducted in 1969 by the National Museum, and then by the Yugoslav Institute for Protection and Scientific Research of cultural monuments, and then by the Institute for Protection of Cultural Monuments, preservation and protection works were done until 1987.

1969 - The beginning of the research on the route of the Ramparts 5-8 in front of the Fortress;

1970-1971 - archaeological research in the suburb of the Fortress, which was endangered most by the rise of water level in the reservoir;

1972-Preservation works on Tower 8 and in the ditch;

1973-1974 - the research of the Palace; works on the protection of the rampart 5-8 and Tower 9;

1975-1977 - the research of the Palace; preservation of the building in the suburb;

1978-1979 - research next to Tower 8 and inside the Palace, works on Tower 9;

1980-1981 - cutting of greenery and the creation of the geodesic and technical documentation;

1982-1983 - clearing of Tower 1, technical recording, preservation of the ditch wall;

1984-1985 - reconstruction of Tower 5 and reconstruction and preservation of the Palace;

1986 - Preservation works on the Palace;

1987 - Preservation works on Tower 5.

After 1987, there have been no more research or preservation works on the Golubac fortress. The documentation of the conservation and preservation works as well as the



Revitalization of the Golubac Fortress

Existing State of Golubac Fortress

technical and architectonic documentation has been kept in the Institute for Cultural Monument Protection.

It can be said that the Fortress has been only partially researched, and this has been done only in the lower zones, and only outside the dimensions of the main road. The suburb was researched only in the zones next to the gate, so the area of the suburb cannot be considered as researched.

Previous projects for the Golubac fortress protection and area design

The projects of protection and preservation of particular towers and ramparts were made in the Institute for Protection of Cultural Monuments in the period of 1976-1988 (10 years). The executives of these preservation works were architect Dobroslav Pavlovic and architect Gordana Simic, and M.Arsovski, B. Jankovic, Nadezda Katanic, C. Jordovic, Z. Simic, M. Tomic and M. Djordjevic participated in the making of the documentation. The projects are exclusively related to research and preservation works on the Fortress, and the surrounding area was not included.

The project which dealt with the object in its surrounding area and which involved the design of the Fortress and the surrounding area, the consequence rehabilitation of the activities of the quarry was made by Professor Alexander Klekovic and architect Dragan Drndarevic in 1992. The project plans construction of a hotel, marina, tunnel-bypass and placing of the Golubac fortress within an attractive cultural and tourist offer.

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REVITALIZATION AND DESIGNING THE GOLUBAC FORTRESS AREA

Existing state of the immediate surroundings of the Fortress

Golubac used to be such an important fortification that once a sultan came to help to the besieged garrison; that its siege was a matter dealt with by a king with his whole escort of famous knights....

After the Turkish rule, the Fortress and its surrounding area became deserted. The new settlement of Golubac was founded on a more favourable location, on the location of a Roman castrum.

Between two World Wars, a road to Kladovo was marked and the ramparts were dug and tunnels were built through the Fortress itself. Builders of the main road of Djerdap corrected the route in the suburb and widened the tunnels through the Fortress.

In 1950s, Ivan Milutinovic Enterprise (PIM) opened a large quarry on the hill opposite the Fortress. The quarry included the top of the hill, but also a part of the slope visible from the main road. Crushing of stones, internal transport and loading into trucks and tugboats, garages and workshops, store houses and administrative buildings, canteens, reservoirs and a petrol station were located in the suburb area, on both sides of the main road.

A Turkish bath was discovered by accident by the PIM and it was used as a storage for explosives.

In the nineties of the last century exploitation of the quarry was stopped, but all the objects were left on this location, and the quarry itself was not overhauled, although it was a duty of the quarry owner.

Now, at the location of the former suburb and current protected surrounding of the immobile cultural asset of extreme importance, there are: two administrative ground-floor buildings of the PIM, a large built storehouse, a workshop for repair of machines and vehicles, eaves and a garage, a petrol station, a big reservoir, an electricity transformer, a few built toilets, an illegal catering facility, concrete dry docks for stone loading, a big multi-floor crusher, a tunnel for a conveyor belt which goes under the main road, concrete blocks on rings for lashing of tugboats, a wooden cottage of the Institute for Protection of Cultural Monuments....

A cut road leads to the quarry, and a country road branches off from this road what can be seen in the Spatial Plan of the National Park Djerdap marked as a scenic road and it represents the primary entrance into the National Park.

There is a spring next to the gate. There is no sewage system.



Conservation and restoration of two towers, part of wall and palace carried out by Institute for the Protection of Cultural Monuments, 1976–1987.

Project Design for Revitalization of Golubac Fortress by prof. A. Kekovic and arch. D. Drndarevic, 1992.

Designing the area and new facilities

Along the course of the Danube there are fortifications different in: age, plans, positions in the areas and beauty, but what they have in common and what is their major difference from other fortresses in Serbia is great effort put into their both restoration and maintenance. A benefit from all this is taken into consideration because they are a destination for numerous tourists.

In Serbia, fortifications are outside of modern trends, left to a more increasing decay. However, fortifications and folk construction works are cultural heritage which, protected, planned and organized, can attract participants and visitors with its programs and it can contribute a lot to its environment.

Moving of the main road is a prerequisite for any work on the area design and without this, one cannot even think about the Fortress revitalization whatsoever.

Protection of the cultural heritage and natural environment

The Project Design of the Golubac fortress revitalization includes, apart from the Fortress itself, another three very significant entireties without which there cannot be any improvement of the current state and inclusion of this monument in any programs.

The Project Design involves the protection of the entire monument of the Fortress, the protection of known and unknown archaeological objects in the suburb area, the reconstruction of the natural environment. New facilities planned for tourists' reception are situated on the locations which are the least devastated, while the zones where archaeological findings are expected are planned for the archaeological park.

The Golubac fortress

The reconstruction of the towers and objects is the most rational solution and it offers the greatest possibilities for planning and realization of various programs in the Fortress created for different visitor categories. It is planned that the towers in the lower zones of the Fortress offer contents which can be accessed by all visitors, and that on the higher levels, there are observation decks and specific contents interesting for younger category and sports active visitors. The Fortress museum is planned in the Palace with workshop rooms for curators and researchers, as well as a depot, an art gallery and occasional exhibitions, which will be held in Tower 5; the restored chapel, dedicated to St. George, is planned in Tower 4. The object area below Tower 1-Canteen- will be designed as a place for deserved rest of those visitors who climb the "Hat tower".

The watchtower next to the gate will be an area for guides and a souvenir shop, and the smaller watchtower next to the rampart 5-8 is planned as a wardrobe of performers, because it is situated near the stage. The auditorium will be, without changes in

the shape of a slope, put together of metal girders and it will have a capacity of 300 visitors. A guide service will be situated in the closed part of Tower 8.

An access is provided for all the towers, and they are open for observation decks. This means the reconstruction of roofs and all the wooden ceilings between floors and stairs.

All the platforms on the open towers, walkways on the ramparts and wall stairs must be secured by fences, and the original walkways to the towers and wall stairs will be cleaned and reconstructed, and on the steep parts they will be secured by metal handrails.

The tunnels existing in the fortification will be turned into a club restaurant, after the moving of the main road; they will be equipped with an especially designed mobillier (furniture) with carefully planned contents.

The supporting walls in the north part of the Fortress will be terraced observation decks for resting and refreshment, while the area below the supporting wall ceiling will be used as a snack bar.

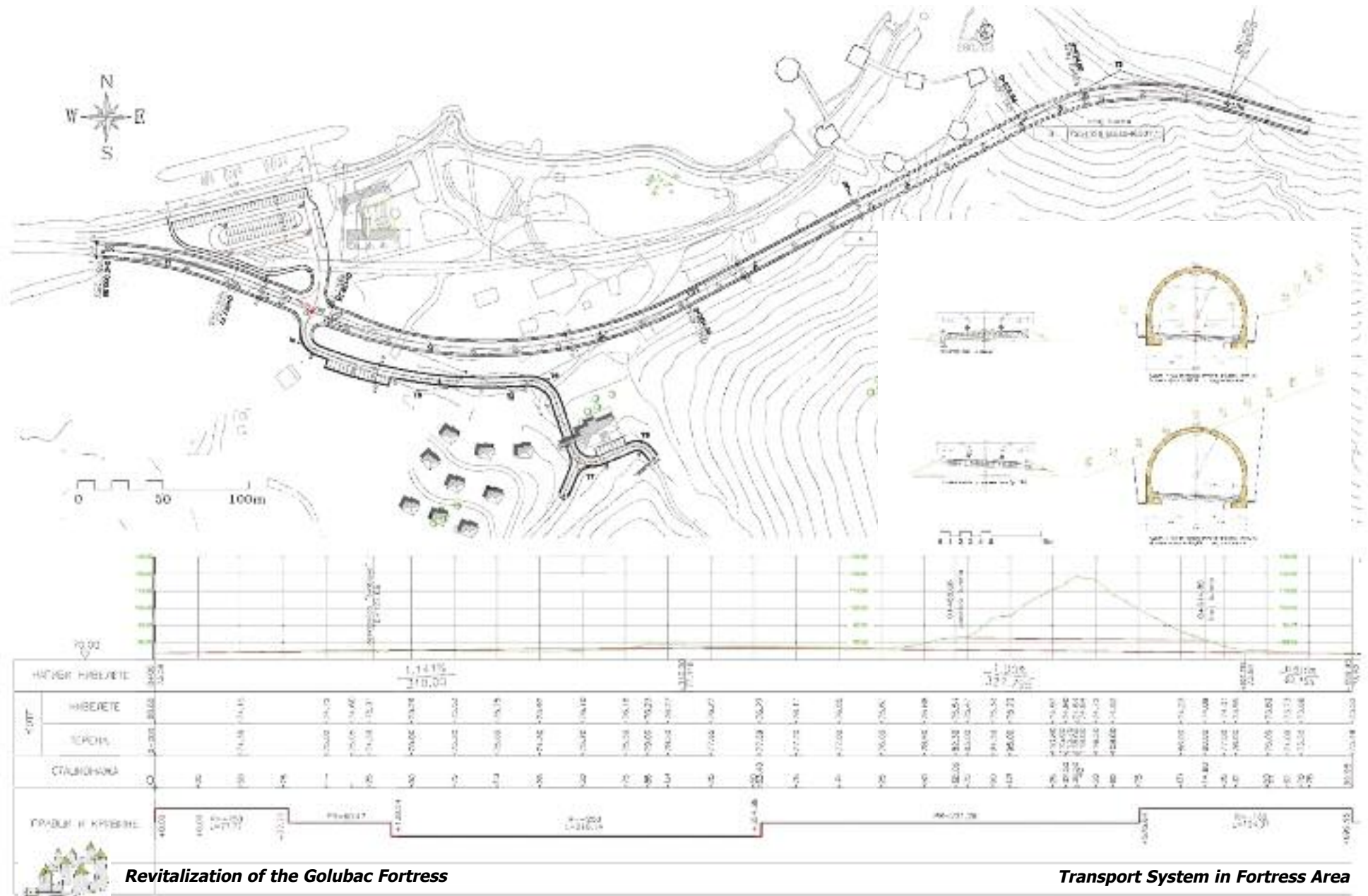
Archaeological Park

There are records about the suburb from written sources of the visitors who had the opportunity of seeing the object remains. Ancient travellers wrote about a caravansary, a church, mosques, and it is known that cannon balls were made near an army, that bullets were cast on locations where there were wood and lead, stone was prepared for fighting and building, arrows and weapons were minted near a town under military watch. Along with the obligation of supplying food, which was produced in the hinterland, there is a whole range of crafts which developed for military needs, and usually people who did this lived and worked in the suburbs of fortifications.

During the planned researches and after the bypass construction, the suburb will probably give some data about the manner and place of work of ordinary people engaged for the garrisons' needs. The Turkish bath, discovered by accident, provides evidence that public buildings were built soundly and well, so it is likely that archaeological diggings will result with the same findings; and preserved remains within a cultivated and planned area will be the Archaeological park of Golubac.

Visitors centre

The area, which is outside the archaeological park and which is devastated by the construction of underground tunnels for stone transport, is planned for the building of the Visitors Centre. The object consists of two ground-floor rooms- one is planned for an information desk, with a hall for exhibitions, lectures and presentations and sanitary facilities for visitors, and the other is planned for a restaurant with a big terrace overlooking the Danube.



Revitalization of the Golubac Fortress

Transport System in Fortress Area

In the area between the two parts of the object, there is an amphitheatre, covered with canvas ceiling. 13 two-bedded rooms with bathrooms are planned in the loft of the object.

Next to the Visitors centre, a car park is situated and where the old pier bindings for tugboats used to be, there will be a pier for tourist boats and mooring for small vessels.

Recreational zone

The bank of the lake is designed as a walkway on the quay with a cycling trek, leading along the bank all the way to the Fortress. The area between the Visitors Centre and the Fortress is planned for recreation- a swimming pool with filtrated Danube water; along the river bank an area for water sports is planned, a big field for minor sports and tournaments.

Suites

There is a junction south of the main road's new route and it is the beginning of scenic roads through the National Park Djerdap. The central object of the suite settlement and the gate mark the entrance into the area of scenic roads through the National Park Djerdap. There is a reception, an office, a snack bar on the ground floor of the object, and on the first floor there are six two-bedded rooms.

On the slope overgrown with trees, overlooking the Danube, there are nine wooden suites for accommodation of visitors or participants of tournaments and art colonies. The suites are four-bedded, designed in the manner of ancient traditional architecture. There is a dirt road leading to the suites.

Quarry - amphitheatre

The big quarry, today an inhospitable and dangerous place because of rockslides, is planned for reconstruction, reinforcement of its sides and levelling of the slope of a big entrance ramp. It will be turned into a huge stage with an auditorium, with greenery planted on its terraces. There is an access road and it leads to the primary entrance into the National Park, and it can be controlled. Plays, concerts for large audience, choir competitions and archery tournaments can be organized in the quarry cavity. It is planned to cut in a semicircular terraced auditorium on the east side, while the large area of the west - the lower part of the quarry - is planned for performers.

Transport structure

In the Fortress area today there is Djerdap main road, which is the main road M-25.1 on the section of the Veliko Gradiste- Golubac-donji Milanovac- Kladovo road, as well as an old macadam access road to an old and currently deserted quarry on the hill,

south of the main road. Just in front of the Fortress, along the high way there is a disorganized access road to old shipbuilding objects of the PIM, as well as a petrol station of "Yugopetrol". In terms of function, the main road is, even in the Fortress area, a non-urban road, going literally through the Fortress walls, with all negative side effects for the Fortress objects. In physical sense, Djerdap main road does not have clear elements of the route geometry and cross section. It goes through the Fortress walls, shorter towers and galleries, whereas, even minimal dimensions of transport and free profiles are not secured, so freight vehicles must use the middle of the road in order not to come into physical contact with the wall construction or rocks of the tunnels and galleries. It is not a rare case that they must stop and let some air out of their tyres in order to go through these unusually narrow openings, horizontally and vertically, therefore turning the main road into a one-line road for both directions.

Elements of transport structure in the Fortress area

In the area included in the Project Design of the Golubac fortress reconstruction and revitalization, there are following elements:

- Road bypass around the Golubac fortress 699,95m long, which is used to move Djerdap main road (main road M-25.1) outside the Fortress area where there is a tunnel 146,74 m long.
- Access road to the suite settlement with the main accommodation object on the hill along the old access road to the deserted quarry, 258,87 m long.
- Access for vehicles to the Visitors Centre on the bank of the Danube with a car park for passenger cars (70) and buses (8).

The bypass route in general sense goes round the Fortress from the south side, having in mind the fact that there is no alternative general solution because of the spatial relation between the Fortress and the Danube. This means that the bypass route runs along the foot of the slopes south to the Djerdap main road on the peak elevations 75-77 mnm.

The beginning of the bypass (0+000) is about 450 m before the first towers and walls of the Fortress from Golubac. On this spot the route branches off the main road by a right horizontal bend within a 250 m radius, and then after a short distance goes on to the left horizontal bend within a 250 m radius, so that it would, just before the first fortress towers, enter the tunnel. The entrance portal is situated in the area right to the first two towers of the Fortress (survey mark 0+468,06). At the entrance portal and the bigger part of the tunnel, the route is straight, where from the route goes on bending horizontally to the right of 160 m radius to the exit portal (survey mark 0+699,95) where the bypass ends.

Therefore the overall geometry of the bypass route is planned with two directions and three alternating curves within a 250; 250 and 160 m radius, as it is defined by the situational plan. The total length of the route in the tunnel is 146,7 m, of which 107,8 m are straight, and 163 m and 39,19 m is curved.



Revitalization of the Golubac Fortress

Look of Reconstructed Fortress and Renovated Area

Opposite to the nearest towers, the route is in the tunnel and it is at the distance of 7,20 m, i. e. 7,70 m from the towers, which was estimated as a good enough distance, taking into consideration that the half of the tunnel's width, together with the construction, is less than 4,95m. There is an assumption that the opening of the tunnel will not be done with explosives but with a milling machine and this will be established in details in the stage of creating the master and construction project of the tunnel and in accordance to the specific geo-technical features of rock.

The spatial determining of the bypass route and other elements of transport structure is defined equally- by axis coordinates and elements of the horizontal curve.

The transversal profile of the bypass, according to the adopted calculating speed of 80 km/h and its functional position in the network of outside town roads, in the basis, includes two traffic lanes of 3,25m, the edges 0,30 m and shoulders on both sides of 1,20 m.

In the tunnel part, the bypass retains the upper traffic elements of the profile, while it is planned to use official lanes on both sides instead of shoulders because of their maintenance.

The access road to the suites on the hill, in the transversal profile, includes two traffic lanes of 2,50m and shoulders on both sides of 0,60 m.

A crossroad is planned with four lanes on the bypass, at the survey mark 0+127,66 with a peak elevation in the centre of the crossroad 75,04. This crossroad provides the access to the Fortress, i. e. the Visitors Centre as an accompanying facility together with tourist, accommodation and parking capacities on the bank of the Danube, as well as the suite settlement on the hill on the right side of the main road along the access road 258,87 m long. The bypass is planned with the lanes for left turnings, so that a continuity of traffic lanes is secured along the bypass.

The levelling solution of the bypass is defined by a longitudinal profile 1:100/1000, which was given in a non-exaggerated proportion 1:1000/1000, for the needs of one-occasion understanding of the relation between horizontal and vertical projection of the bypass and also because of the tunnel problem. Because the tunnels were opened through the zone of higher peak elevations of the terrain south to the Fortress, longitudinal inclines of the bypass are small (0,50%-1,14%).

The levelling solution of other traffic areas is determined by peak elevations on specific spots.

The tunnel problems

On the basis of studying the program of the Design Project of the Golubac fortress revitalization and reconstruction, according to which the spatial position of the tunnel is defined, an estimate was made of the natural conditions, especially of the engi-

neering and geological features of rocks and the tunnel position in regard to the objects.

The conditions for the choice of the most up-to-date technical and technological solutions for construction and method of the tunnel construction are defined. The technical solutions applied for the solution of the tunnel problems are rational, and the choice and method for the digging of the tunnel and the construction technology are optimal, taking into consideration the position of the tunnel and geological and geo-technical conditions.

In making of the project documentation on all levels, the tunnel is designed according to the road category on which it is situated and according to the terms relevant for the open section of the bypass.

According to such design of the route, the tunnel would be dug mostly in the sediment complex of the lower chalk (K12) which, according to the available documentation, consists of marl, marl limestone and limestone with quartz. This is a complex of stratified sediments, heterogeneous in regard to its physical and mechanical properties. The stretching of the layers is almost in the same vertical to the future base of the tunnel with a slope to the west. In similar complexes, together with gaps between the layers, there are, as a rule, two more categories of fissures- vertical to the stratification and mutually vertical. The carstification of the massive is not expected. The level of underground waters is deeper than the level of the future road; it is approximate to the peak elevation of the water in the Djerdap reservoir. Therefore, during the digging of the tunnel and later exploitation, a small amounts of water can appear and this only occasionally- during or after precipitation.

In order to dig tunnels in such rocky ground, usually mining is applied, but in this case, having in mind the existence of the old town and in order to avoid possible damage due to vibration, the digging will be done by machines- milling machines. If problems occur due to the presence of limestone layers with quartz, a carefully controlled mining of these rocks will be applied.

In regard to the stability of the tunnel digging, the conditions will be favourable taking into consideration the favourable position of the stratification.

The permanent stability can be provided by applying suitable armature of bracing and sprayed concrete with armature mesh. The secondary armature would be needed only if a hydro insulation is put. The entrance and exit of the tunnel with front cuts will be done with uniting and loose materials: granulates, clayed granulates and clay. If it is proved, by a careful research, that the thickness of these materials is relatively small, the tunnel sections of the construction can be done in an open excavation and later it can be filled.

Before the beginning of the works on the project solutions, the state of the locality and location of the future tunnel construction is taken into account, with a particular atten-



Revitalization of the Golubac Fortress

Night Look of Reconstructed Fortress and Renovated Area

tion paid to the impact of vibration produced during the tunnel digging together with use of explosives onto the Fortress objects.

Description of the constructive solutions depending on the method of construction

Building the tunnel in the open. In order to avoid great heights in the front cuts, it is accepted to draw out the tunnel as much as it is allowed by the geo-technical conditions. The inclines of the front cuts are asymmetrical. Special attention should be paid to the side where the inclines are higher. If the inclines are to stay permanently, their protection should be made of reinforced concrete constructions or brace wire constructions with sprayed concrete and with armature mesh.

The construction of the tunnel in the underground conditions. The tunnel armature, in broader sense, includes both the primary and secondary armature. The most important element of the primary armature is rocks around the tunnel, and the technical solution of the armature depends on their geo-technical properties.

Reinforcement – the reinforcement of the tunnel profile involves technical measures of the elements:

- brace wires (\varnothing 22, L= 3-5 m) arranged according to the type,
- Sprayed concrete (d= 5-30 cm) according to the type,
- Armature mesh (one to two layers) according to the type,
- Tunnel construction strips (when needed I 100 -125).

The second or the secondary armature is an inner reinforced concrete construction (MB30 d= 30 cm).

For the stage of making the Project Design and the main project, it is necessary to do a certain research activities. Additional research should define the exact position of geological and geo-technical environment along the tunnel route. On the basis of geo-technical criteria and the height of the upper layer, a statistic control is performed according to the types of supporting walls.

Bases for making of the project for activities undertaking for the tunnel digging

For the anticipated geological and geo-technical conditions it is possible to apply:

- Traditional method of digging by use of explosives
- digging of the tunnel by a milling machine.

The restricting factors in the applying of the mining method are:

- Vibrations from mining should not be transferred to the surface, because it would cause danger to the fortress objects,
- The method requires skilled working personnel- experts for controlled mining and blasters,

- Mining system provides the biggest non-profile excavations.

The restricting factors in the applying of the milling machine method are:

- It is not suitable for digging limestone with quartz,
- The degree of economy in the conditions of a small range of works is not favourable,
- The conditions are very bad during the works because of the creation of dust.

For the needs of the Project Design and the main project, a project about conditions of applying milling machine method together with the use of explosives and this only in case of appearance of limestone with quartz should be done.

Electrical system

For the needs of the Golubac fortress revitalization and the realization of the planned facilities on the protected complex, the following works on the electro-technical infrastructure and secondary electro-technical systems are planned:

- Supplying the complex with electric power,
- Provision of stabile, wire and communication installations for the complex,
- Functional lights of road and pedestrian areas,
- Functional lights of planned cultural facilities and areas,
- Decorative- architectonic lights of the Fortress and archaeological objects,
- Installations of low voltage and communicational and signal installations in all planned object in the complex (Visitors Centre and the restaurant, the pier, the suite settlement, painting studios),
- Protection of the object from atmospheric discharges.

Supplying electric power

A reliable and quality supplying of electric power in the complex can be achieved with a new transformer 10/0, 4 kV, with the capacity of 400 kVA, connected to the long-distance power line, which the existing transformer station is connected to.

The connecting line 10 kV should be a cable, standardized according to the demands of Technical conditions of the competent enterprise for distribution of electric power. For the construction of transformer station and the connecting line, it is necessary to obtain Technical conditions for designing, taking into consideration electro-energetic needs and the number of independent consumers in the complex or uniform consumption measuring within 10kV should be chosen. At the same time, one should have on mind the fact that electro-energetic needs are mostly affected by the choice of energy sources for heating of objects.

The suitable location for the transformer station is on the right side of the existing road, which stretches from the direction of Golubac, in the zone of the former quarry crusher.



Revitalization of the Golubac Fortress

Look of Reconstructed and Conserved Golubac Fortress

Distribution of electric energy

From the transformer station with the voltage level of 0,4 kV, the distribution would be by cables, by lines put along the new main road and the roads in the complex to the particular objects inside the complex and the Fortress. In general, the distribution covers the following parts:

- The Fortress and the archaeological sites (general and decorative lights and general consumption),
- Objects in the complex (Visitors Centre with a restaurant, a pier),
- Painting studios (adapted crusher),
- Suite settlement with its central object,
- Street lights in the complex (the main road in the complex zone, road and pedestrian areas, the area in front of the suite settlement).

Communication system

All the needs for the fixed communication installations would be solved by connecting the complex to the existing TT (telephone cables) on the main road, which are situated in the zone of the complex, having in mind the need for their moving completely from this zone and their installing along the new main road and the tunnel, through the installed sewerage system and TT vaults.

For those needs which cannot be solved according to the mentioned method, a modern wireless system would be used (satellite receivers for radio and television programs, wireless Internet etc.).

Installations in the objects

All planned objects in the complex would be, depending on purpose and the level of works, equipped with necessary modern installations of low voltage, communication installations and installations for safety and protection.

Depending on the organization of the physical protection, the systems for the technical protection would be located in one of the objects in the complex.

Functional public lights

It is planned to install lights for:

- The new section of the main road in the zone of the complex(posts up to 8m high, placed on one side on the right side towards Golubac- modern sources of light with a good colour reproduction will be used),
- The tunnel, along 150m, with lampposts for tunnel lighting placed on the tunnel ceiling, with light markers on the curbs and the walls along the bend route of the tunnel),

- The car park for passenger cars (chandelier posts up to 4m high, with light bulbs with good colour reproduction)
- Hiking and cycling treks along the Danube bank, with lampposts placed as a protective wall, up to 6m high,
- The walkway from the Visitors Centre towards the Fortress and archaeological sites, with lampposts up to 1m high, placed along walkways
- The pier with places for tourist vessels, according to the design of the pier, the access to the pier from the land as well as according to the demands for the lighting of such navigation objects,
- Road to the suite settlement and the objects in the settlement.

When choosing streetlamps for outdoor functional lights in the zone closer to the Fortress, one should take care of light pollution which would affect decorative lights; it is suitable to use streetlamps whose optical tools provide the category ZONE 1 in regard to light pollution.

Decorative - architectonic lights

These lights are planned for:

- The Fortress outside and the parts inside the Fortress— inside for two directions of looking, from the water and from the land, in the direction to and from Golubac,
- Stone and green areas next to the Fortress,
- The inner, restored and revitalized parts of the Fortress which can be seen by passing through the Fortress,
- The walkways on the tops of the ramparts between the towers, and walkways inside the Fortress,
- The revitalized objects inside the Fortress and
- Parts of the old Roman road carved into the rock.

The lighting of some of the mentioned objects would be simultaneous and functional lights of these objects.

With such lighting of the Fortress, the dimensions, the vertical walls of the towers and ramparts which connect them would be emphasized, as well as the merlons on the top of all the towers (by lighting from the inside), parts of the environment where the Fortress is situated, parts of the old Roman road in the outer wall of the Fortress (possibly with a light of some other colour), the existing tunnels below the Fortress(also with a light of some other colour), and other elements which point out specific parts of the Fortress.

The octagonal tower on the water, with holes in the walls, is suitable for combined lighting; lighting from the inside and direct lighting from the outside, from the level next to the water.



Revitalization of the Golubac Fortress

Night Look of Reconstructed and Conserved Golubac Fortress

When lighting the towers and ramparts which are in the water, it is possible to place lighting equipment in the lower zones, next to the water because the water level in Djerdap Lake is controlled.

The lighting equipment is placed, in general, in the lower zones of the objects, at the corner of the tower walls, in the foot of the rampart, in the lower parts of rocks between the towers, according to the possibilities on the ground, or on the lower girders as possible as it is.

The lighting would be conducted in a combined way, by applying the most modern light sources, LED diodes and modern light bulbs with discharges, warm white colour as a basic colour, with a possibility of applying other colours or a change of the light colour for some objects or parts of objects, by setting predefined light scenes with automatic changes of scenes and operating regimes of installations. The operating control would be automatic, central, with a possibility of manual interventions in case of a need.

Having in mind the low accessibility of the terrain inside the Fortress in order to place cable lines as well as demands for evasion of transfer cases placement on or in the objects, one should include the need for placement of more independent transfer cases and the need to coordinate their locations with the space design inside the Fortress. It is recommended to use modern polyester transfer cases of great durability in the broader zone of the Fortress.

Protection from atmospheric discharges

The revitalized fortress, but also all the objects in the complex, as well as the suite settlement, should be protected from atmospheric discharges by applying some of modern systems of protection of objects and larger areas.

The most rational would be the application of stick tongs with reinforced effect - a device for early start which, due to its dimensions and shape, does not stand out a lot on objects.

At first, the Fortress could be protected with two systems, and one would be enough for every zone: the Visitors Centre, the restaurant and the pier, and the suite settlement. Depending on the construction of the object, it is possible to apply traditional lightning rod installations, and this type of installation is recommended for the former crusher.

Thermo-technical installations

Within the complex of the Golubac fortress, thermo-technical installations are planned for the Museum inside the Palace, for the restaurant "Lagum" inside the former tunnel road and in the Watchtower 1- a room for guides and surveillance. These areas are

within the special regime of protection of the National Park of Djerdap.

Outside the National Park, there are the following objects which will be treated: the Visitors Centre and the Suite Settlement with its central object.

Inside the National Park the only allowed source of energy is electric power, and outside the borders of the protected environment, the allowed source of energy are electric power and a boiler room which uses light heating oil (D2).

The Palace

A museum exhibit is planned for the Palace, which will be reconstructed. It is planned to exhibit metal objects, ceramics and copies. Therefore, according to the "Standards on conditions for preserving and maintaining museum artefacts", it is necessary to keep the positive temperature ($>5^{\circ}\text{C}$), and the relative humidity ($\varphi < 50\%$).

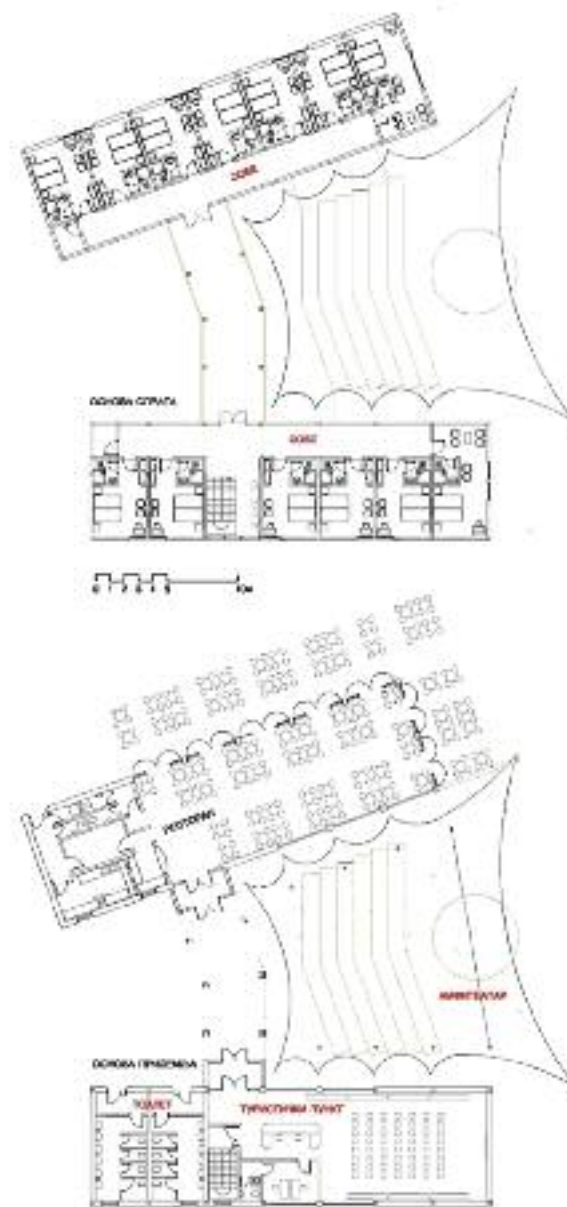
The installation of floor heating, with the capacity of max. 24 kW is planned for 200 m² large room. The temperature will be regulated by a thermostat in the room, and one local measuring of t/rh and relative humidity. As the heat source, it is planned to install a case package electro boiler room, and the transport fluid is antifreeze for thermo-technical installations. Cooling and air conditioning of the object are not planned. The ventilation of the room is natural by opening of windows.

The restaurant in the former road tunnel

The existing tunnel consists of two parts of the total area of 350m². In order to completely use the area for a restaurant, it is planned to install floor heating, of the total capacity 36kW maximum, with a thermostat regulation in the room. As the heat source, it is planned to install a case package electro boiler room, and the transport fluid is antifreeze for thermo-technical installations. Cooling and air conditioning of the object are not planned. The ventilation is achieved/conducted through sucking of air from equipment, sanitary and working facilities (the bar and the kitchen, and fresh air will be provided by flowing of air through the facade openings.

The Watchtower 1 – the room for guides and surveillance

The room is about 50 m² large. The room is should be heated by radiators, with aluminium-plastic pipes installed in the floor along the edges. As a heat source, it is planned to use a case package electro boiler room with the capacity of 9 to 12 kW, and the transport fluid is antifreeze for thermo-technical installations. The regulation is done by thermostat valves on the radiators. The ventilation of the room is natural. Within this area, cooling of a working room is planned by a mobile air conditioner, and it is also planned to construct a facade opening, 400 cm² big, for the needs of this mobile air conditioner. During transitional periods, the mobile air conditioner will heat the room in order to reduce energy consumption.



Revitalization of the Golubac Fortress

Visitors Center

The Visitors Centre

The Visitors Centre, of the total area of about 800m², includes public areas- a restaurant, a hall, a sanitary facility, a tourist desk, and hotel rooms on the upper floor. The heating of the object is done by radiators; the transport fluid is antifreeze for thermo-technical installations. For every functional area and a hotel room it is planned to install a separate branch, in order to secure 24-hour heating (+5 °C) when this area or the hotel room is not used in order to save energy. The pipeline distribution is done through aluminium-plastic pipes installed in the floor along the edges.

Inside the complex, it is planned to build a 10-12m² big boiler room with the capacity of 120kW, using extra light heating oil (D2). The chimney for the inner installation of Ø 250 mm diameter, and about 6 to 7 m high is inside the object. Outside the object, there is a dug-in reservoir of extra light heating oil, with double walls and the volume of 8m³. The ventilation of the boiler room is natural with additional exhausting facade ventilators.

The ventilation of the tourist desk, the hall and the hotel rooms is natural. The ventilation of the central sanitary facility is natural with additional forced local exhausting. The ventilation of the restaurant is natural with additional forced local exhausting through the kitchen. Cooling system is not planned.

The central object of the suite settlement

Inside the object there are offices, a reception of the suite settlement and a snack bar, with the total area of 200m².

Objects are heated by radiators; the transport fluid is antifreeze for thermo-technical installations. The inner distribution in the object is done through aluminium-plastic pipes installed in the floor along the edges.

Inside the complex, it is planned also to build a boiler room, with the capacity of 120kW using extra light heating oil (D2) of the area of 12m². The chimney for the inner installation of Ø 250 mm diameter, and about 6 to 7m high, is inside the object. Outside the object, there is a dug-in reservoir of extra light heating oil, with double walls and the volume of 8m³. The ventilation of the boiler room is natural with additional exhausting facade ventilator.

The ventilation of all the rooms is natural with forced ventilation of blocked sanitary rooms, and eventually of the bar, through exhausting hoods. It is planned to cool offices and public areas- the reception, bar and similar by split system air conditioner.

Suites

It is planned to build 9 wooden houses, each 64m² big, with the total area of 576m². The heating is done by radiators, through aluminium-plastic pipes installed in the floor

along the edges. As a heat source, it is planned to use a case package electro boiler room with the capacity of 9 to 12 kW, with antifreeze as transport fluid for thermo-technical installations. The regulation is done by thermostat valves on the radiators. The ventilation of all the rooms is natural.

The ventilation of all the rooms is natural with forced ventilation of blocked sanitary rooms, and kitchenettes of the suites through exhausting hoods.

Water supply, sewerage and filtrations of waste water

Water supply

Three groups of objects are planned to be connected: the Fortress, the Visitors Centre and the suite settlement. The objects are going to be connected to the existing system. All the objects that use sanitary water and produce waste water will be equipped with horizontal, polyethylene pipes which are installed through the ground. At the vertical branching off, it is planned to install a valve for water releasing from the system. A sufficient number of drainage valves should be planned at the branch offs for every sanitary unit as well as drainage valves for every sanitary device.

In the Visitors Centre, the central object of the suite settlement as well as in the suites, boilers will be installed in bathrooms, kitchens and sanitary facilities, according to the needs and the purpose of the room where they are installed.

Sewerage

Sewerage installations are planned for three groups of objects: the Fortress, the Visitors Centre and the suite settlement. It is planned that installations inside the objects and also in the outside system consist of three-layer polypropylene sewerage pipes. It is planned to install faeces vertical pipes which receive waste water from sanitary facilities. The sewerage system is planned to go along the shortest possible route from the object. Valves for filtration will be placed at the top and the bottom of the sewerage verticals and at the lower distribution system. Waste water will be removed to the devices for filtration outside the fortification and only filtered water can be released into the lake. Waste water from the Fortress, the Visitors Centre, the adapted crusher and the objects of the suite settlement will be treated in the same manner.

In the Fortress, sewerage and water supply installations will be placed only for three objects, and waste water will be distributed along the route of the removed road through the former road tunnel, where also these systems will be installed to the devices for filtration of waste water from the east side of the Fortress.

Installations in the object, Canteen - additionally built next to the Hat tower, are also planned. A dish washer will be installed in the snack bar. The sanitary facility built below the Canteen will be used.



БОКОВИ ПОГЛЕД

ПОГЛЕД ПРЕМА ДУВАЊУ



ОСНОВА СГРБАТА



Revitalization of the
Golubac Fortress

Central Object of Apartment Settlement



< ПАНОРАМСКИ ПУТ

КАМЕНОЛОН >

Кухи - РЕСТОРАН

КОИТОРА

0 1 2 3 4 5 10m

ОСНОВА ПРИЗЕМЛА

The areas in the supporting walls. A sewerage system should be installed from the Canteen to the reconstructed supporting walls, just below the ceiling in the area of the supporting wall 1 and below the ceiling of the supporting wall 4, hence it will run through the reconstructed part of the rock in front of the entrance into the small tunnel and it will be connected to the sewerage system from the Palace to the filtration system outside the Fortress.

Installations in the Palace. In the loft of the Palace, there are rooms planned where water will be used: an area for material processing, a kitchenette with installed elements and a sanitary facility for the personnel. In this part above the hall there will be a concrete ceiling at a place where the installations are grouped. Pipes will be grouped in the south-east corner of the object.

Filtration of waste waters

Devices for filtration of waste waters must be chosen in such a manner that water can be released into the lake without any danger or it can be used for lawn watering.

Waste water filters will be dug into the ground and their dimensions will be determined by the number of everyday users. Filtration technology should be based on biological and mechanical processes, anaerobic, with efficient and reliable exit criteria according to the EU standards. Devices for waste water filtration should be prefabricated technological entireties, consisting of compact reservoirs-containers, separated inside into individual zones of filtration; hydraulic systems for recirculation and aerating systems with installed compressors.

The reservoir and technological divides should be made of resistant, constructive, polypropylene plates, of practically limitless durability. Compressors should be ecological, with low energy consumption (from 0, 75 kWh per day to 3 kWh per day). Such filters should achieve high level of filtration. The technology must be in accordance to the Standard Framework on Waters of European Union, so that exit water can be used to 95-98%, either for watering or for releasing into the recipient.

A device for waste water filtration should be used for the Fortress with the capacity for 100 users, i. e. equivalent of users; for the suite settlement also 100 users, while for the Visitors Centre a device is used with the capacity for 200 users.

Garbage

Rubbish produced by visitors will be removed daily and at the end of a day it will be classified and driven away from the Fortress area, the archaeological Park and recreational area. The basic assumption of care is the constant care for cleanliness.

Safety at work

Together with the strict obeying of the regulations regarding safety at work, and especially article 9, act 2 of the Law on safety at work (Official Gazette of RS num. 42/91),

the Regulations on safety at work (Official Gazette of RS num. 29/67), the Regulations on technical measures for building building walls ((Official Gazette of SFRY num. 17/70) where protection measures are precisely listed .

The main architectonic construction project must anticipate measures in case of damage and dangers related to safety t work and the project must be undertaken completely according to the technical regulations and standards for this type of object.

The contractor is under the obligation to provide especially high boots for workers against snake bites and to provide, at the working site, serums against snake, scorpion, bee and wasp bites, in regard to the distance of the Fortress from the town. Serums must be kept under defined regulations and expiration date should be taken into consideration.

When engaging cranes and lifters, the contractor is obliged to provide quality machines and skilled employees, a manager for mechanics operations who needs to be constantly present at the working site so that unprofessional work or use of machines would not cause damage of accidents on the working site.

REVITALIZATION OF THE GOLUBAC FORTRESS

Applied methodology

In order to start the restoration design and object reconstruction in the complex of the Golubac fortress, and thus the making of a program for the object use, analysis of their state were conducted for all the objects in the Fortress. The towers, walls and the remains of the objects were individually considered in order to establish and present the scope of recommended work on them.

During the works on the objects, having in mind that the lower areas are covered with torn down materials and that they are founded on ultimately unsuitable basis, one should include the need to complete the data about these zones. It is also needed to expect even a possible increase of amount of the specific type of works, depending on the amount of damage in the zones of the object and the level of their decay due to influence of cold and moisture, which is possible only after the beginning of works on the object restoration. Therefore, the main project must, without fail, plan additional research for every object.

The project offers possibilities of undertaking specific type of work, their scope and the results obtained by adopting the specific type of works in terms of conservation, partial reconstruction or reconstruction

Attractiveness, durability and possibility of using the object is most certainly optimal in the case of reconstruction of the object, which has been proved by experience, so far



Revitalization of the Golubac Fortress

Wooden suites



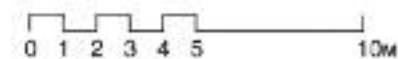
БОЧНИ
ИЗГЛЕД



ИЗГЛЕД
ПРЕМА
ДУНАВУ



ОСНОВА
ПРИЗЕМЉА



with preservation works on such objects. Preservation is the most modest in terms of invested resources, but it is the least modest and durable in terms of the effect it provides.

Conservation

The conservation includes a consolidation and protection of the current state of the towers or sections of the ramparts, so that their existence would be prolonged. The wooden elements, such as ceilings and fences, have not been restored so the visitors' approach to the restored towers could not be allowed. Conservation procedures involve building of scaffolds in and around the object, construction of platforms for work and rebuilding of stones which started to move, careful removal of overgrown bushes and removal of soil on which it grows, removal of remains of decayed beams, decayed mortar and dust. Before dismantling of all unsound wall sections, it is necessary to take photos of the surface of the walls and to mark stones on the parts which are decaying. After dismantling of stones, removing of old mortar and removing and washing of stones should be done. For the rebuilding according to the original design, it is necessary to prepare connective material as similar to the old mortar in terms of quality and composition as possible, but with the adding of natural additive for achieving a better quality mortar.

Levelling of mortar fillings of the surface which is being reconstructed should be done with the same mortar used for reconstruction and at the same time as the reconstruction. After a period necessary for care, the working site is cleaned and the immediate surrounding is returned into the original state.

Partial reconstruction

The partial reconstruction includes the above mentioned works, but also it would mean, according to the existing data, the reconstruction of merlons on the towers and ramparts, setting up beams and floors on the places where they originally existed, the reconstruction of the staircase and the rampart walkway, with modern safe fences. The roofs will not be reconstructed because the camber of the roof surface is not incontrovertibly known. In this case the access to the towers and ramparts would be allowed, with the constant inspection of the wooden elements. The towers, reconstructed in such manner, could not obtain any special content, apart from visitors' tours and as observation decks. As the experience with Tower 5, which was partially reconstructed in the 80s in the last century, showed, the durability of wooden elements would be short because there is no protection which is present when there is a roof.

Reconstruction

This type of preservation intervention means all the above works for partial reconstruction, but with roofs built above the towers; floors and staircases with fences would be built inside the walls, as well as fences on the stone staircases which lead to

the towers and ramparts. Thus secured, the towers would be available for visitors, and for the closed towers could be given a content, for example an exhibiting area. The open towers would be observation decks. In this case, the user would be obliged to maintain and inspect safety of the object regularly. The benefit of putting towers in use is most significant).

Within the range which is possible and necessary for making of the Project Design of the Fortress revitalization, state analyses of the particular objects were performed, and the choice and suggestion of works for every individual object originated from the estimate and program offered in case of applying one of the considered methods of protection.

Objects in the Fortress - State analysis and planned works

The north part of the fortification is a sector where the most important objects are situated and which is in a good state, due to its position, terrain configuration and circumstances that it was protected by the south part of the Fortress.

Although, it was not damaged by war activities as much as the south part was, the greatest damage to the north part was caused by weather conditions, i. e. the existing damage originate from the exposure of unprotected stone walls to moisture and low temperatures.

The parts which had been attacked the most, the south part of the Fortress, the towers and the ramparts, were ruined on several occasions and that happened at least once before fire arms appeared. For now, it is possible to confirm that all the towers and all the visible objects in the Fortress had lost their roofs before the arrival of first travel writers to a free Serbia. Having in mind the fact that town garrisons were constantly present, no matter which army defended it, it is logical that the towers had roofs.

It is planned to reconstruct all the towers and most of the ramparts, but, before making detailed projects, it is certainly necessary to perform detailed archaeological and architectonic researches which have not been done so far. This is especially important for the inaccessible zones in the higher parts of the Fortress, which have not been researched at all.

At the level of the Project Design different possibilities are considered. There are three possibilities for work realization on Towers 6, 7, 8 and 9 and only after the analysis of their impact, onto the general design of the Fortress; a decision can be made regarding the application of one of the solutions.

Tower 1, Hat tower- current state and planned works

Tower 1 is the most complex according to its construction and due to its unique shape it is called the Hat tower. The Tower was built at the highest peak elevation of the



Revitalization of the Golubac Fortress

Painters Studios in Adapted Stone-Crusher

steep slope of the mountain Ridan, which comes down to the Danube. Having polygonal foundations and a shape of irregular hexagon, it was built as a plateau on which a round tower was built. There is a closed staircase inside the round part, covered with a ceiling as an exit to the top of the Tower with merlons and a roof. Due to its polygonal foundations, the walkway is wide almost the same, but the merlons on these parts of the Tower are little thinner than usual. In the centre of the polygonal tower, obviously adapted to the shape of the rock on which it lies, there is a small room 2x2 m large, and two higher levels inside the round part are also of the same dimensions at their foundations. From the outer side of these rooms, stairs are built, vaulted with a segmented arch, which leaned onto a thin wall towards the rooms of the tower. Nothing is preserved from this wall, apart from stone fulcrums at the lowest landings, but it can be reasonably assumed that it was made from bricks, just as the arch.

The dimensions and the number of rooms do not allow an assumption that this tower was a donjon tower, because such objects were not, by definition, intended for a small number of defenders and they were equipped for a stay of large number of people and also with storages for food, water and weapons of last defenders of the fortification.

The round tower had merlons and it was covered by a wooden ceiling. Around the circular base, the polygonal plateau was also bordered with merlons. Apart from the damaged merlons, all the parts of wooden construction disappeared from the tower, as well as the outer stairs which were used to approach the polygonal base and wooden parts of the stairs at the entrance into the round part of the tower.

The tower is possible to be completely restored according to the preserved parts of the merlons and other elements which still exist. The merlons on the round part of the tower, which disappeared, will be restored, and the tower will be protected by a roof. The roof can be restored according to the analogies which are numerous and done according to the reliable data. The roof panelling will be made of shingle, with an additional protection from leakage and decaying of wooden elements.

The wooden constructions between floors and the inner stairs will be restored, as well as the front of the built stairs inside the tower. The wall which supports the arch will be reconstructed with bricks.

The frontal area of Tower 1 will be rebuilt again after the preparation of the base which was damaged. It will be built in the manner as similar to the manner of building of the existing preserved front areas as possible, in lines, by trimming of visible areas of stone and by panelling of connectors during the construction. The Hat tower- reconstructed and with secured accesses- will have a purpose of an observation deck to which the access can be allowed only in the company of trained guides.

Ramparts 1-2- current state and planned works

The walls which used to connect Tower 1 to Tower 2 and 3 are seriously damaged. The route of the rampart on the top of the ridge leading to Tower 2 could be defined with

certainly only after a safe moving along the steep rocks is secured and thus done only by reading the mortar prints- the foundation where the wall was built.

There was a rampart (R1-2), situated on the polygonal base on which Tower 1 extended to Tower 2, but the only part left is a part near Tower 1 and a part of the wall near Tower 2, while the possible remains are now covered with bushes at the almost inaccessible terrain and the correct direction is only assumed.

It is possible to reconstruct a section of the rampart with merlons next to Tower 1 according to the present remains. The problem of work range may be solved only reliable determination of its route, but it is certainly necessary to restore it, at least to the height of the parapets, in order to achieve safe moving of visitors.

Ramparts 1-3- current state and planned works

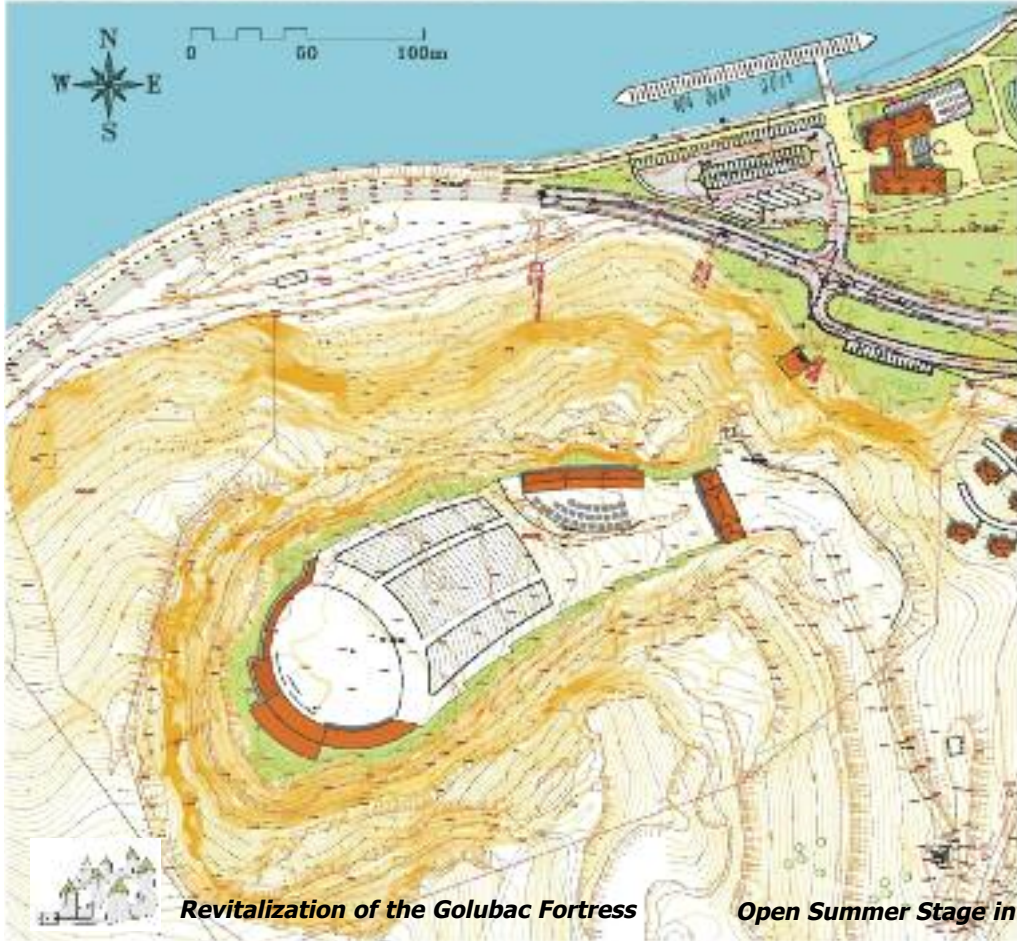
There is a rampart wall R1-3 stretching From Tower 1 on the west to Tower 3. On the preserved part of the hill, which is greatly damaged, there is a thick wall built along the very steep top of the rock. According to the mortar marks/leftovers on the Tower, it is possible to establish its original height. It had merlons, because it was used for defence of the entrance on the south-east side, i.e. from the higher peak elevations at whose end the Fortress is situated.

The restoration of the ramparts is planned because their route may be reconstructed reliably, as well as the height of the walls next to Towers 1 and 3. Additional researches are needed as well as recording of this section of the rampart. Additional researches are needed as well as recording of this section of the rampart.

Object next to Tower 1, "Canteen"- current state and planned works

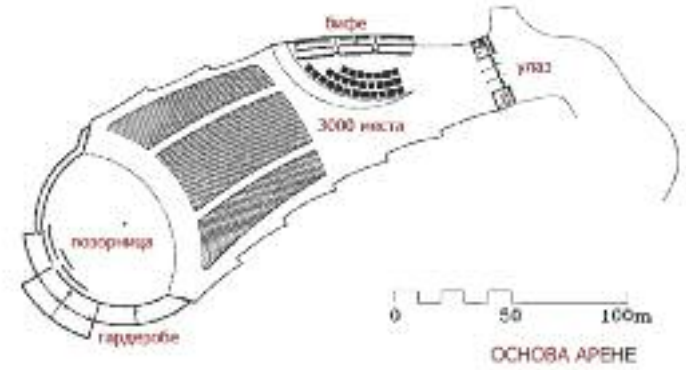
An object, 13x6, 5 m large, was built next to the polygonal foundations of Tower 1, on the steep rock. According to the position of the preserved windows, in order to organize the area, a part of the slope was covered, so that a floor could be built. With the north-east section of the facade wall, this object leaned against the round building, with the inner diameter of 4m. In order to reach the Hat tower by steep stairs, one needed to go through this object from the south-east to the north-east. It probably served for accommodation and sojourn of soldiers in the citadel, which stretched over the highest peak elevations of the Fortress.

Because there are remains of the wall and the support wall on the polygonal foundation of the Tower 1, as well as because some important elements of the building are preserved- the entrance, windows, the peak elevation of the top of the wall- it is possible to restore the object after archaeological researches and defining of the nivelletes (heights) of the floor. The planned works are: reconstruction of the walls of the same thickness, reconstruction of the ruined front facade and reconstruction of the window and door openings, reconstruction of the brick floor, construction of the one-side roof, reconstruction of the covering made of shingles, construction of carpentry.

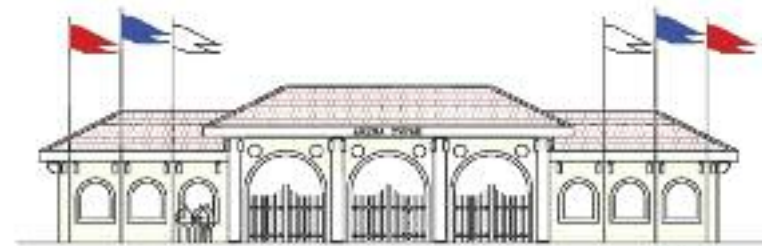


Revitalization of the Golubac Fortress

Open Summer Stage in Old Quarry

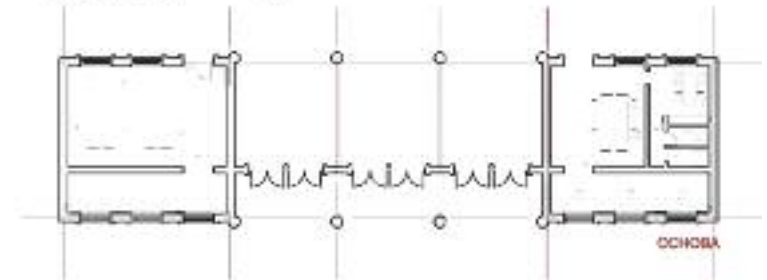


УЛАЗНИ ОБЈЕКАТ У АРЕНУ



0 1 2 3 4 5 10m

МОГЛЕД



ОСНОВА

This room is planned to be a resting area for visitors where herb teas from the mountain Ridan and soft drinks can be served. As it probably had the same purpose originally- gathering of the garrison, it can be fitted with furniture of massive, rough wood.

The round building, with the inner diameter of 4m and wall thickness of about 90cm, is greatly damaged. According to its location and general appearance, it is similar to Tower 2. The rampart 1-2 borders it on its route towards Tower 2. No openings have been noticed so far on this round building. It is possible that this building was accessed through the object "Canteen". The original use will be probably determined after additional researches. It is planned to clean this round object from shrubs, to consolidate the walls, to additionally build walls up to the height of the fence, as a security measurement and to preserve them.

Wall 1 - current state and planned works

From the west corner of the object "Canteen" to the north corner lower than the two pantry objects, a wall was built which forms the area of the citadel. The entrance into the citadel was situated next to the pantry. The wall is not in a good condition, it crumbled more than one metre down, and the original narrow passage towards the yard misses a doorjamb, probably made of wooden beams, so the wall below has started to crumble down.

It is necessary to carefully research a connection between the object and this wall and to determine its original height on the west wall of the object "Canteen". The wall is 1, 0m thick and it did not have any merlons. After the removal of the crumbled wall parts, it is necessary to build these parts and rebuild the whole wall to the reliably determined height. Smaller damaged places should be filled with suitable stone after processing of the bearing. The entrance should be restored by installing wooden carrying beams and building of the damaged parts above the new beams. The door should be made of wooden boards trimmed manually on both sides.

A steep walkway leads from the door towards the Wall 1 and it will be paved with stone tiles from the entrance to the "Canteen", i. e. towards the Hat tower.

Pantry - current state and planned works

On the steep slope, below Tower 3, two small objects were built. They have only one door on the north side and there are no window openings. Although, they were built one next the other, due to the very steep terrain, there is a height difference between the floors of almost 4 metres. The inside dimensions are 2,50 x 4,50 with the walls 70-80 cm thick. They are carefully built, vaulted with semi-round brick arches, plastered inside and they had brick floors over good insulation (below the floor there were layers of thrown stones of different size in order to stop capillary water raise)

After former archaeological research inside the pantries, neither the floor subtractions nor the floors themselves were restored, so the reconstruction can be done according

to the documentation of researchers who did the works.

The arches are destroyed, but their restoration is possible. They were covered with one-side roofs. The east walls are destroyed so the location of the entrance opening in the higher object can be only guessed, while the entrance into the lower object is better preserved and it is visible that it had doorjambs, probably wooden.

These two objects were probably food pantries. The objects can be restored and they should be restored completely. Their purpose would remain unchanged; they would be used as pantries for needs of the "Canteen", which will be used as a resting area for visitors.

The restoration includes reconstruction of the walls and the arches in whole, construction of the new base of the floors and the brick floors, construction of new doorjambs and the door of trimmed wooden elements with the appropriate hand-wrought frame and roof covering. At the same time, it is necessary to make oak stairs, with strong girders and steps, which would, in several segments, lead from the low entrance to the citadel, (The wall 1), past the pantries to the passage through the rampart on the south side (Rampart 3-4).

Supporting walls 1-4 - current state and planned works

Four supporting walls are built between the Wall 1 and the Ramparts 2-4, on the steep slope below the citadel. Between these supporting walls, there was an access walkway from the gate in the Rampart 2-4 to the citadel.

The supporting wall 1 was built 8m away from the Wall 1, so that a flat area was formed by embanking of the area behind the supporting wall. The supporting wall is about 2m thick and it was probably used to enable the use of the area which was, due to the great slope, otherwise unusable. The area 8m wide enables erecting of, for example, a wooden object and a passage through it. The supporting wall is preserved to the height of 3 metres, and it is 20m long. The consolidation and restoration of the supporting wall, construction of a plateau instead of an embankment and paving of its surface provides an area for visitors of the Fortress, which can be used as an observation deck or a terrace with catering purpose. The area behind the supporting wall, and below the plateau will be used a catering facility.

The supporting wall 2 was built 5m away from the supporting wall 1 and towards the Danube; it is 2 metres thick and with current preserved height of 2, 5 m. The length of the preserved section of the supporting wall is 17m. Supporting walls extended to walls which are vertical so the reinforcements 1 and 2 extended vertically to the Ramparts 1-2. The supporting wall was certainly higher and by an analysis of their relation, its original height can be determined, therefore a consolidation of the preserved wall and additional building to the necessary height is planned. The new plateau will be used as an observation deck with tables and benches for resting and



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Open Summer Stage in Old Quarry

refreshment of visitors. The area behind the supporting wall will not be filled with construction waste, but it will be turned into an insulated plateau and will serve as a place for the inventory storage and a beverage storage place.

The supporting walls 3 and 4 were built at the same peak elevations as the supporting walls 1 and 2, but they are shorter and they are much more damaged. They certainly had the same usage, to flat and create a useful area, while there was a steep walkway between them leading to the citadel. After a detailed peak elevation recording where the supporting walls 3 and 4 were founded, it is necessary to determine their original height and after the consolidation of their remains, it is also needed to reconstruct missing parts and to build the supporting walls to their original height. It is also planned to build terraces above these supporting walls instead of filling with construction waste. The upper surface will be paved with stone tiles and thus formed terraces will be used as observation decks, with a café for visitors' refreshment. Below the supporting wall 4 a sanitary facility for visitors is planned.

Tower 2 - current state and planned works

The round tower was built on a rock above the river; it is small in dimensions when compared to the other towers, and it was probably used as a lookout tower of the immediate coastal area and as a defence for the Palace. It has a polygonal foundation, but the surfaces are rounded and it is also rounded at the top. Apart from visible marks made by heavy missiles, it was also seriously damaged during the digging of the tunnel through the rock on which it was built. Larger sections of the wall plaster are missing and the filling is slowly crumbling down, and the repairs with blocks of light stone, done in some better times, are weakened and there is a danger of their crumbling down. So far the tower has been inaccessible, but the direction of the Ramparts 1-2 and 3-4 will be determined according to the remains of ramparts next to Tower 2.

Before undertaking the restoration works on the tower, it is planned to close the tunnel below the tower by building of concrete membrane, outside reinforced on the sides with chunks of rocks and with a wall as filling between them and planted creepers which should cover in time these reinforced sections. The passage through the tunnel will be partially closed by this reinforcement, and in the section of the supporting wall below the route of the Rampart 2-4, stairs will be built leading to the gate in the wall towards the citadel.

The left passage into the tunnel must be wide enough for a smaller electric-power vehicle to pass through, which will be used as a delivery vehicle and an emergency vehicle and also as a passenger vehicle for visitors with special needs. The opposite entrance into the tunnel below the tower will be used in the same manner.

Tower 2 can be reconstructed in whole, after additional researches. It is also planned to close gaps made by cannon missiles, to rebuild walls in the supporting structures, to reconstruct missing facade of the wall fronts merlons with a walkway. The wooden

constructions inside the tower, floors, stairs as well as the roof on the tower are planned for reconstruction. The reconstructed tower may be used as an observation deck.

Ramparts 2-4 - current state and planned works

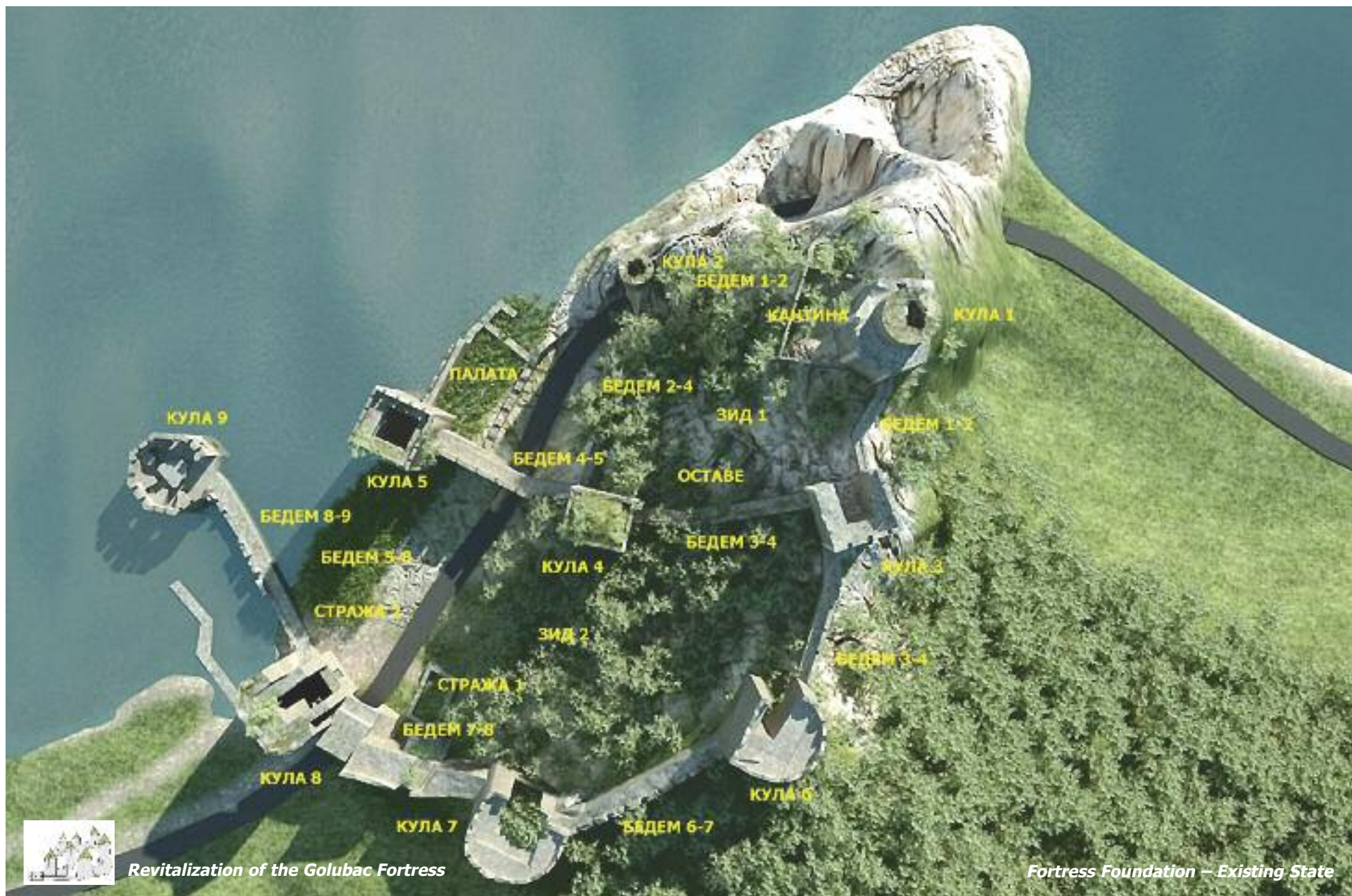
The ramparts between Tower 2 and 4 was probably demolished partially during the building of a section of the road between two World Wars, because parts of the rock sloping towards the river were removed to the surface of the wall, and this deterioration was assisted by weather, rain and low temperatures. This wall had a passage - a gate leading to the coastal area, i. e. from the Palace to the Citadel, but it was covered with earth, so that its position will be determined only after additional research.

After the route of the steep walkway leading from the Palace to the Ramparts 2-4 is determined, it is planned to secure the wall so that it does not represent danger for visitors. It is necessary to consolidate upper zones of the crumbled wall. Reinforce sections of the wall in the foundation, to reconstruct a part of the rock together with the closure of the entrance into the tunnel and to provide an access to the stairs to the entrance opening in the wall towards the citadel. The height of this wall can be determined by the rampart remains next to Towers 2 and 4, but this probably will not provide sufficient data for the reconstruction of the possibly existing merlons. The wall can be rebuilt to the safe height and preserved.

Tower 3 - current state and planned works

Tower 3 was built relatively close to the Hat tower to which it is connected by the Ramparts 1-3, and the Ramparts 3-4 connects it to Tower 4. The position it takes enables a great view of slopes on the east, south and west. On the east and west wall, there are machcoulis (loopholes), and the wall tops were finished by merlons. All the wooden elements have disappeared, but there are reliable data for the reconstruction because the rear parts are preserved. The walkway and the merlons are damaged to a larger degree, but it is possible to reconstruct the Tower completely according to the preserved elements. The Tower has a square foundation, unequal sides and it was open towards the area of the citadel along its complete height, and this should be confirmed by additional research on the object before making of the main project of the tower reconstruction.

In order to conduct the reconstruction it is necessary to dismantle crumbled parts of the walls both the complete wall canvases and walkways and merlons, too. A reconstruction of machcoulis (loopholes), in wood is planned as well as the construction of ceilings between floors, stairs and the roof. The reconstruction of the walkway from the passage in the Rampart 3-4 to the ground floor of Tower 3 will enable an access to visitors and exit to the top of the Tower, which will be used as an attractive observation deck.



Rampart 3-4 - current state and planned works

The Rampart 3-4 slopes down a steep cliff from Tower 3 to Tower 4, and on it there is a passage placed very high between the east and the west part of the Fortress. This rampart has a relatively well-preserved wall canvases towards the south part of the Fortress, while the north facade is almost completely ruined and the walkway with merlons is narrowed and damaged and therefore inaccessible. The upper level of the tower could be reached by the walkway of this wall, and winding stairs partially cut into the rock, and partially built were used to reach the Rampart, beside the passage through the Rampart, below Tower 3.

In the middle of the Rampart, on the south side, there was a machicoulis (loopholes) on stone cantilevers and with an arch above the line of merlons. The walls of machicoulis (loopholes) were probably made of wood, and it defended the access to the passage in the Rampart 4, as well as the machicoulis on Tower 3. There were stone stairs leading to Tower 4 along the Rampart.

Together with thorough cleaning of the fillings on the north side, on the places where plastering fell off, and along the walkway, weakened sections of the walls and merlons will be dismantled. The restoration of wall surfaces will be performed from the wall supporters towards the walkway and this will be done according to the existing damage in the zone of contact the Rampart and the rock. The base of the wall will be consolidated and the front will be reconstructed up to the level of the walkway. There are all the necessary data for the complete reconstruction of this rampart, as well as for the entrance-gate, machicoulis (loopholes) and two stairs. The doors can be made of trimmed wood, with strong girders and steps. The steps lean on the reconstructed stone cantilevers.

Tower 4, White tower - current state and planned works

This tower is of heterogeneous content in vertical. The level of the ground floor has a direct entrance from the outside, with a main beam as a doorjamb. There is an opening for archers towards the north in the ground floor. The room did not have any connection to the next level, which was separated by a ceiling made of thickly placed beams of big profile. The beams are 25x25 cm, and the distance between them is 27 cm- it is almost equal to the thickness of the beams. The second level also has an entrance from the outside, right above the entrance into the ground (first) level. Above the main beam opening, there is a shallow arched niche bordered with thin bricks, which have a layer of fresco mortar. The remains of red colour, of which other researchers wrote, have disappeared in the meantime. The same mortar is preserved on the wall on the north side to the entrance, in a recess of the entrance and partly on the south wall of the room. The room is vaulted by a semi-circular arch made of sika (construction material). This material was also used to build three niches in the east wall. There is a window on the east wall. The purpose of the room is clear- it was a chapel. Even if the theory of the Fortress construction in stages is true, the builder

of the oldest complex was Orthodox. The chapel, in terms of beam dimensions and its mutual gaps, could have a floor made of bricks. For now, pieces of bricks dipped in a mortar base can be seen on two places, but even more reliable data on the chapel floor should be looked for during the research below the embankment in the ground floor room. Above the arch of the chapel, which was probably covered with construction material, stone and rotten wood of the crumbled constructions between floors, there is a big tree whose treetop is higher than the merlons of Tower and it completely disables the access to the higher levels. There is an entrance on the walkway of the Rampart 3-4 to the level 5 of Tower which was also used to come down to the levels 4 and 3 by an inner wooden stairs and also by wooden stairs, one could reach the level with merlons, i. e. an area covered with roof. The merlons on this tower are damaged, but their reconstruction is possible because the width and thickness of the merlons is known.

Tower 4 should be reconstructed completely. It is necessary to build doorjambs for entrances, to build doors, to process the window hole in the chapel. All the wooden ceilings can be made according to the dimensions of the openings in the walls. Floors, stairs, roof construction and wooden cover should be made. All wooden building material should be hand-trimmed and protected properly from fire, insects and humidity. The floor in the chapel will be made in the following manner: thick wooden boards, with edges that can be fitted one into another, will be placed over the roof beams and over the beams, a limestone mortar foundation. Bricks, with filled joints, are dipped in this foundation. After levelling and rough plastering with liquid mortar, the chapel will be painted in white, at the same time keeping sections of the old mortar in the same state. The doors of the room on the ground floor, the chapel and the entrance to the rampart will be made from hand-trimmed wide thick wooden boards (two or three boards) connected with rough metal wrought bars with strong wrought built simple hinges in the doorjambs and strong wrought hinges.

Next to the north-east wall, a section of the wall is preserved, which connected this tower with Tower 2 (Ramparts 2-4). The restored chapel should be put into use, i. e. in the sanctified chapel, liturgy would be held once a year, as a mass to defenders of the Fortress. This liturgy can be related to battles in which Christian knights, Serbs, Hungarians and Poles, participated, and in their honour a tournament of knights from European countries can be organized every year.

Tower 5 - current state and planned works

Research and works on certain objects in Golubac were undertaken in the period of 1969-1987. The works on Tower 5, for which a decision was made to be restored, began in 1984 and they lasted until 1987 when further funding of research and restoration stopped. All the preservation works were done, apart from the roof reconstruction instead of which a temporary protection was made. The state in which this tower was soon after the restoration is the best example that restoration works on such objects, in designing as well as in undertaking, must be completed. Temporary



Revitalization of the Golubac Fortress

Fortress Foundation – Reconstruction

protection is a reflection of inability to answer a question what the point of restoration is; what the final purpose of a restored object is and what the real priorities are.

The period of ten years was enough for the whole wooden construction of the tower to become rotten and crumble down due to the decay of the temporary protection and negligence, including outer wooden fence of the narrow stone stairs. Colonizing vegetation sprouted from the soil, where sections of the walls and merlons were built and that was not cleaned well enough, and today bushes and young trees mark the newly built upper zones of the tower.

Works that should be done on Tower 5 are: removal of greenery on the restored sections in the upper zone and merlons and also reconstruction of the complete wooden construction, which must be made from a quality manually processed oak material as well as in all other planned restorations of the objects, including a permanent reconstruction of the roof which is necessary for any defining of the purpose of the object. The doorjambs on the north side openings on the level of the upper floor of the Palace should be restored and also a wooden door should be made. The fence on the stairs must also be safe in order to stop new accidents from occurring.

Having in mind the position of the Tower and its good accessibility, it should be used an object of the widest interest of visitors, which can have an educational character at the same time. This purpose is an exhibiting area in the broadest sense and it involves changes of contents so that they also represent a good reason for repeated visits to Golubac. It should be primarily used for exhibiting achievements of participants of painting colony, as a selling exhibition of paintings depicting the Danube and Golubac, theme exhibitions of photographs, etc.

Ramparts 4-5 - current state and planned works

During the works in the 80s, the Rampart between Towers 4 and 5 was reconstructed, but as the road from the Fortress area was not removed, the problem of delevelling of the terrain on both sides of the rampart could not be solved, including the area in front of the Palace and Tower 5. Walkways, merlons and stairs leading to the walkways were reconstructed. The Rampart is in a good state, but the wooden fence on the stairs became rotten and disappeared, which was dangerous. The walkway has never been equipped with a protective fence so any moving along the stairs or walkway is dangerous.

It is planned to lower the terrain to the original peak elevations after the main road is removed from the Fortress, so that the original passage will be reconstructed- a gate through the rampart; and also stairs leading from the original peak elevations will be built. The walkway on the rampart should be secured by a metal fence. The access built stairs should also be equipped with a fence, but a wooden one with metal base so that visiting would be completely safe.

The Palace – current state and planned works

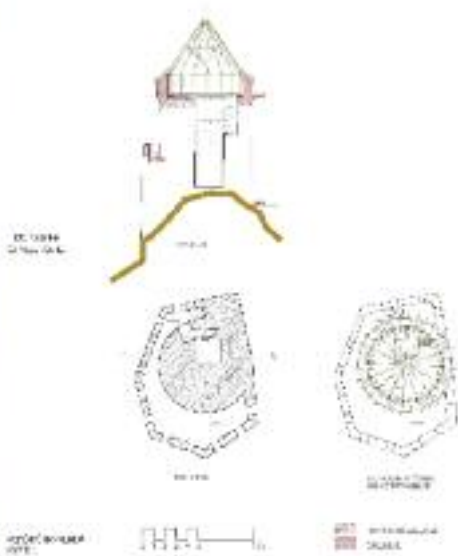
The building on the bank, between Towers 2 and 5, was luxuriously built when compared to other profane objects in the Fortress and was given the name Palace with a reason. The rampart wall to the river had windows with seats inside the wall and high windows, used for defence of the Palace. The windows with seats were constructed in a similar way as the windows in the palace in Small Town in Smederevo. The palace had a direct connection in the lowest level with Tower 5, and on the floor level a connection to the entrance from Tower 5 towards the river.

A part of the Palace was partially restored during the works on Tower 5, with the same results: partially reconstructed walls resist time, while wooden elements became rotten and disappeared, and those three beams which remained represent a danger for braver younger visitors who walk along it at risk.

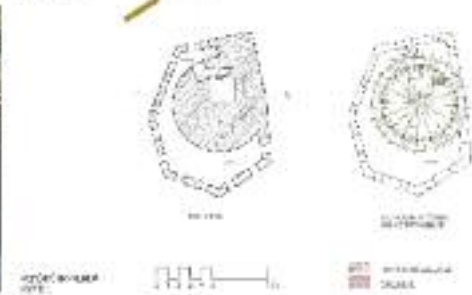
The Palace was defended by two towers at the ends, Towers 2 and 5. The wall towards the river had high openings in the wall instead of merlons, and it supported one-side roof, covering the Palace. The position of the roof girders can be clearly seen on the walls of Tower 5 and this represents a base for making a reconstruction plan for the Palace. The base of the Palace is almost symmetrical to the entrance in the middle of the object at the basement level, to which wide stairs were leading, cut into the rock. Today, because of the water level in the reservoir, the basement is not functional, as well as the level of Tower 5, connected to it. The wall of the Palace towards the inside of the Fortress is partially reconstructed, but a major disadvantage for any attempt of a presentation is the main road, because the Palace, covered with dust, can depict little about its structure, purpose and appearance.

A part of the object of the Fortress will be available only to visitors, who are in a good physical condition and only in the presence of well-trained guides. However, according to the idea to determine new purpose and content to particular objects, the Palace has the most important role, because it will be easily accessible for the largest number of visitors belonging to different age and interest groups. In this regard, the purpose of the restored Palace is to be the museum of the Golubac fortress, with a modern concept; to be suitable for exhibiting the material related to the Fortress, and also to be an area with special educational theme workshops.

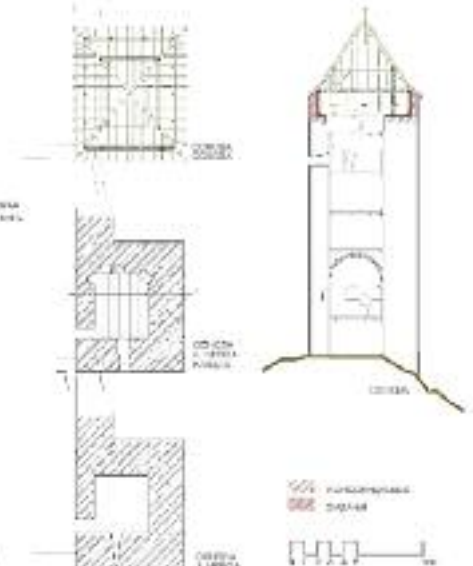
The complete base of the Palace will be restored, whereas the north part will be restored according to the analogy with the south part, for which all the necessary data exist. The entrance into the rooms on the upper floor is from the terrain level, while stairs lead from the basement to the attic. The basic condition for all other works is to get rid of capillary humidity from the object walls, in order to create special conditions for exhibiting museum artefacts. Another issue of similar importance is making the attic of the Palace secured from the impact of rain, wind and snow. All the openings on the Palace will be reconstructed and closed with polycarbonate boards in thin frames from the interior of the high windows in the attic and windows on the upper



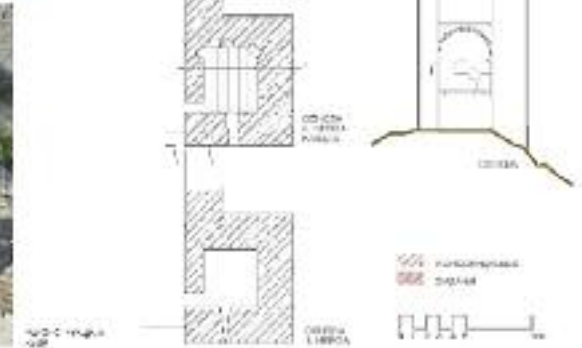
Tower 1, Hat tower - current state and reconstruction



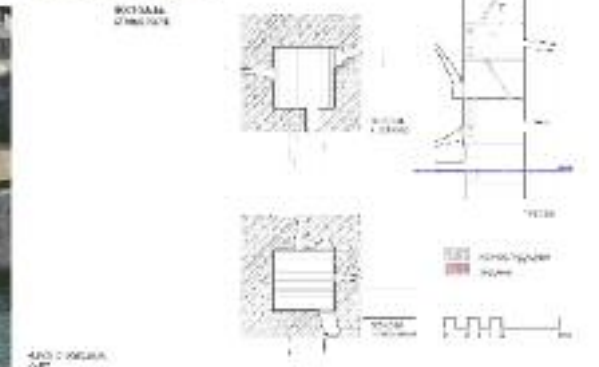
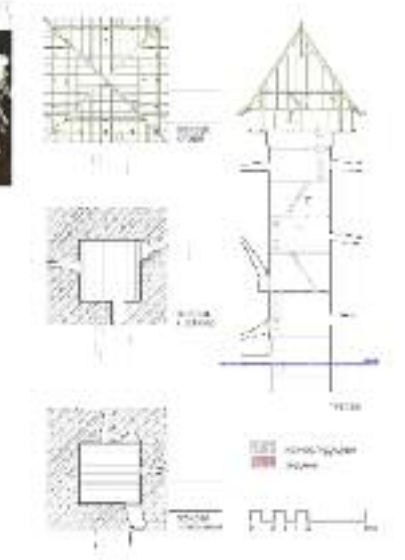
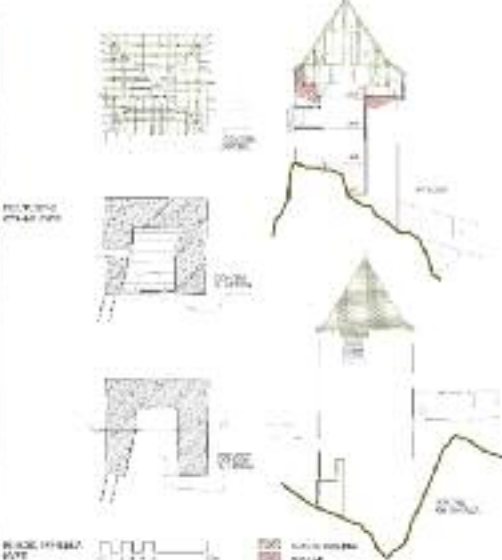
Tower 3 - current state and reconstruction



Tower 4, White tower - current state and reconstruction



Tower 5 - current state and reconstruction



floor, so that sun and water reflection will be avoided, and the area under the roof will also be protected. Special attention should be paid to the interior design of the Palace-museum. The floor of the Palace will be made of thick oak boards placed over an insulated reinforced concrete surface, which will replace wooden beam construction, in order to avoid humidity from the basement zones where water will still remain, covered by mine aggregate rock. The ceiling construction will be made of visible oak hand-trimmed roof beams, over which hand-polished thick boards, with shaped edges will be set. The roof will be covered with shingles, thermo and hydro-insulated, so that a part of the attic could have a useful purpose as an area for curators and researchers, and another part for storing of the artefacts which are part of the current exhibit.

Tower 6 – current state and planned works

This tower was greatly damaged even during cold weapon battles and it was restored in the same form, so the walls were later made longer and thus the surface of the base was made larger in all the levels. There was a way leading from the ground floor of Tower 6 onto the rampart wall towards Tower 3, but these stairs were built during the great restoration of the rampart, undertaken during the later waling in. A section of the wall with an entrance opening belongs to the oldest stage and for now, without necessary research of the object (which is needed to be done before the start of making the main project) it can be said that Tower was restored three times and that the last restoration, when the Tower was supposed to resist cannon balls, was the largest in scope and it was done immediately after the restoration of greatly damaged Ramparts 3-6 and 6-7.

Removing of greenery and crumbled material from the Tower is a prerequisite for all further works on the object. Only after the embankment is made, it is possible to build scaffolds inside the Tower and to determine why the Tower was so much damaged in first place, as well as the order of the restorations and their influence onto the changes in the lifestyle and purpose of the Tower. The reconstruction is possible, and by a presentation it is necessary to classify and show all the stages of the previous building, the restoration of wooden elements of the construction, the stairs, and also of the roof construction. In the Tower restored in such a way, it is necessary to anticipate and provide additional safety for visitors.

Rampart 3-6 – current state and planned works

This rampart was defended by the crew from Tower 6 and they did it because it was possible, using the built stairs from its ground level either to reach the walkway with merlons, supply ammunition and other means of defence or from the top of the tower to reach to the top of the wall. Prior to the restoration of the group of the south towers, there was a large range of works on the ramparts, and this rampart was at that time thoroughly restored. For now it is unclear why, the height of the additional wall on the meeting point of the Rampart and Tower. Detailed research in this sector should obtain an answer about the reasons and the origin of the bearings for beams of great

sections and also about the origin of the arc vaulted niche in the rampart. From the refraction towards Tower 6, there is a line of merlons, almost completely preserved, so this section of merlons, walkway and stairs built in stone can be chosen for reconstruction. There is a larger damage in the rampart next to Tower 6, caused by fire arms and which is planned for restoration.

Rampart 6-7- current state and planned works

This rampart also was restored just before the restoration of Tower 6 and that was done because the old rampart was demolished to such a degree that it could not impose any serious threat for attackers. The line of merlons follows the gradient of the wall and the terrain, as well as the walkway along them, and the rampart was reached by built stairs to the third level of Tower 7, and from this plateau in front of the entrance of Tower 7, across an uncomfortable part of the stairs, to the walkway along merlons. During the construction of last surrounding walls, which protected the Tower from the cannon fire, the last, already restored, merlon of the Rampart was included in the front of the wall as much as it is wide so we know about it only by an archer opening and visible silhouette.

This rampart is well preserved when compared to some others and all its parts can be completely reconstructed: stairs, walkways, merlons. It is necessary to completely secure visitors, i. e. to plan metal fences everywhere on the walkways, and for the stairs a wooden fence with metal base.

Tower 7 – current state and planned works

Taking into consideration the position it has in the outer, south part of the Fortress, Tower 7, during its lasting, was certainly exposed to intensive attacks and it was probably even more devastated than Tower 6, so they were both restored at the same time as the rampart which connects them. Originally, Tower 7 was walled in as all the towers in line on the south rampart, but a wall around it had already been built; and it was adequate to threatening dangers, according to the size of stones used. Originally it was rectangular; it had six levels and merlons under the roof. The tower was entered along steep stairs inside the rampart onto the third level; hence, one came down the wooden stairs to the lower levels or climbed up to the top of the Tower. Today, an extraordinary tree grows from the ground floor inside the tower, which is probably covered with rocks and remains of wooden parts; and the tower cannot be entered because the access stairs are completely useless.

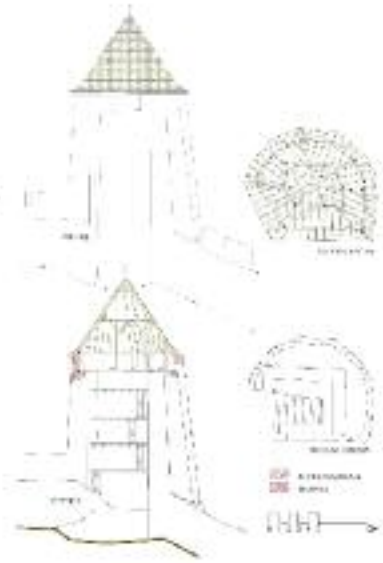
The first measures to be undertaken are cleaning the tower thoroughly and removing of vegetation in order to set up scaffolds and to enable detailed defining of the scope, type and time of the restoration prior to the last big works on the Tower- building walls around. All these stages should be preserved and made readable, and the Tower should be reconstructed completely, a new roof and all structures between floors should be built. There is a significantly wider area on the top of the Tower when com-



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РЕКОНСТРУЦИЯ



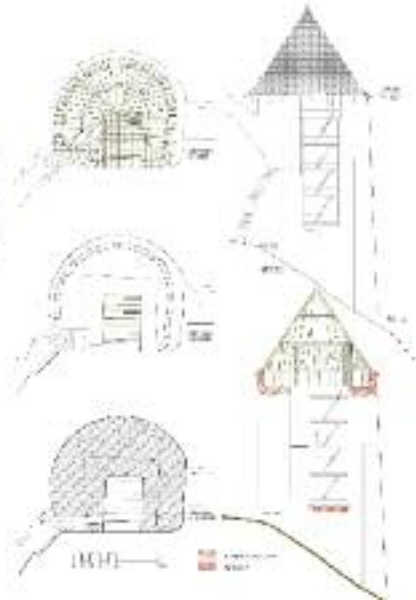
Tower 6 - current state and reconstruction
Tower 7 - current state and reconstruction



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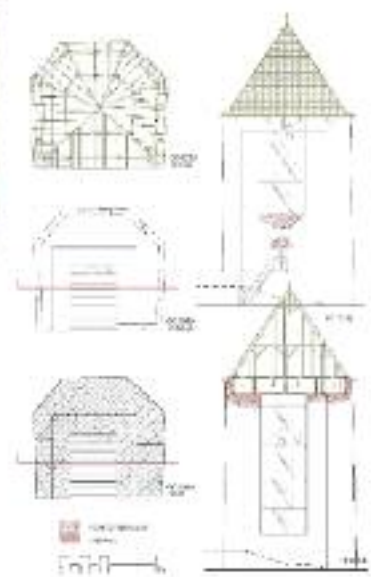
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ТЕКУЩЕ СЪСТОЯНИЕ



РЕКОНСТРУЦИЯ



Tower 8 - current state and reconstruction
Object next to Tower 1, "Canteen" - current state and reconstruction



ТЕКУЩЕ СЪСТОЯНИЕ



РЕКОНСТРУЦИЯ



pared to the original tower with merlons and walkways, and the rounded off wall of the last restoration is framed with merlons as well as the original object. The stairs and the ceilings will be equipped with a wooden fence, with a metal reinforcement in the base.

Rampart 7-8 – current state and planned works

There is a massive wall stretching from Tower 7 to Tower 8, with such a complicated structure and complex interventions that one of researchers classified it a tower, as a pendant to Tower 8 at the entrance into the Fortress. This assumption is not without grounds, because this case is usual and completely justifiable on most fortifications, so it is possible that the original entrance into the Fortress was conceived in such a way. Looking from the outside, this rampart has one big opening, maybe a trace of former built machicoulis (loopholes) or a bigger forced entry. Next to Towers 7 and 8, there are barely visible signs of its earlier height and remains of merlons. The outer surface of the rampart was made during the restoration of Tower 8, according to the manner of building and the type of the used stone.

At this stage of the project, it is possible to predict detailed removal of sprouts from all the wall surfaces and preventive conservation. Large scope of archaeological and architectonic research should precede making of the main project and only afterwards, a decision can be reached regarding a possible reconstruction or further treatment of this complex structure. The entrance group must have been the target of the fiercest attacks, but also of later radical and emergent restorations; but there is a possibility that the data will be obtained by the road removing and delevelling of the terrain around the entrance gate.

According to the possible dynamics of the works on the Fortress revitalization, and having in mind their complexity, this sector may be delevelled only after all the works on the north part of the Fortress are finished: cranes and other big machines pass, scaffolds and materials are taken out through the existing entrance. The removing of the road will enable for the entrance to be returned to the old dimensions, position and level, as well as the definite presentation of the currently existing walls along the interior facade of the Ramparts 7-8.

Tower 8 – current state and planned works

During the restoration of the greatly damaged original Tower 8, the surrounding wall around it, according to the manner of shaping supports, points to the fact that the restoration was run by men who knew the manner of building towers on the west. Builders were familiar with the system of supports called "goat's leg" which was applied in Europe on slopes, instable soils and flood areas.

Originally, the Tower was partly closed and on all the walls, it had loopholes and openings necessary for the defence of the access road to the gate of the Fortress. A new

surrounding wall, polygonal at the base above the foundation zone, was not built over the lines of the rampart walls. Now, these front plates partially are demolished, although it is definite that they ended vertically beside the rampart wall above the gate. From the top of the Tower, behind both, the merlons of the old and the new merlons of the new surrounding wall, a wider area was defended. The Tower had six levels and an entrance on the northeast wall above the lowest level. According to the currently assumed original peak elevation of the terrain in the entrance area, the Tower is covered with sand at least 2,5 m high. The entrance opening had doorjambs, a threshold and transom made of sandstone, and according to the position of these elements, it is possible to reconstruct the original form and the appearance of the entrance. A rampart was walled in from Tower 8 towards the bank, as well as to Tower 5, but the found sections of the wall towards this tower did not provide any reliable data about its thickness, although it also had merlons according to the drawing of Kanitz.

The reconstruction of the Tower can be done. Along with a careful cleaning of the interior of the tower and making of scaffolds, it is necessary to remove overgrown greenery from the upper parts of the tower and all the cleaned part should be consolidated by rebuilding. The damaged portion of the wall surface should be repaired, and concrete reinforcements should be put into the bearings of former beams - santrac. It is possible to reconstruct the walkway and merlons completely. The northwest and southeast wall of the new supporting wall should be consolidated and, if it is not determined that they were walled in along the whole width of the original wall, they should not be persevered as wide as they are today, but equally. The tower was partly closed, so it is necessary to wall in the northeast wall to its full height, after the entrance reconstruction. All the wooden elements – ceilings, stairs, door, and roof and shingles cover - can be reconstructed. As the closed part of the Tower should be used as an area for guide service, works on thermo protection of the closed part of the Tower should be done.

Ramparts 8-9 – current state and planned works

The Rampart 8-9 connects the Tower 8, in its present form, and the youngest Tower 9, but there are serious reasons for an assumption that it was much higher and that it protected the pier even before the building of the cannon Tower 9. There are remains of a wall higher than merlons on this rampart from the first stage of Tower 8.

It is possible to reconstruct the Rampart 8-9 from its last stage, because the dimensions of merlons and walkway can be established. Before the restoration of these ramparts, it is necessary to research whether, at some point, they were widened in the zones of contact to Tower 9 and what their relation is with the wall and the widening along Tower 8 as well as to the rampart leading towards Tower 5.

Tower 9– current state and planned works

Tower which was built for protection of the pier differs significantly from all the other



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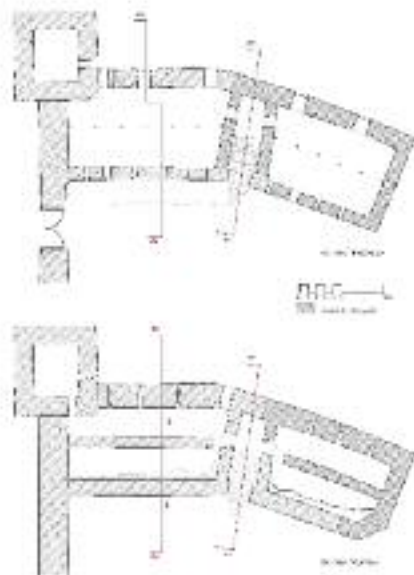
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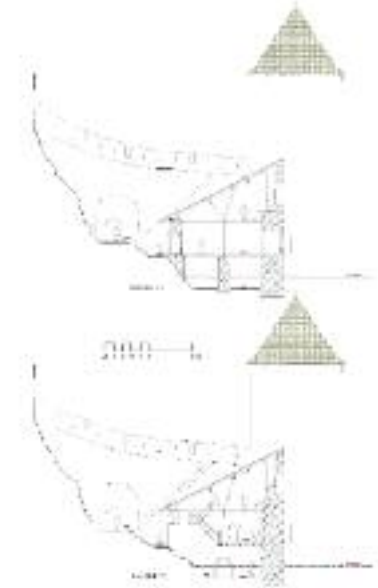
The pantries - current state and reconstruction
The Palace – current state and reconstruction



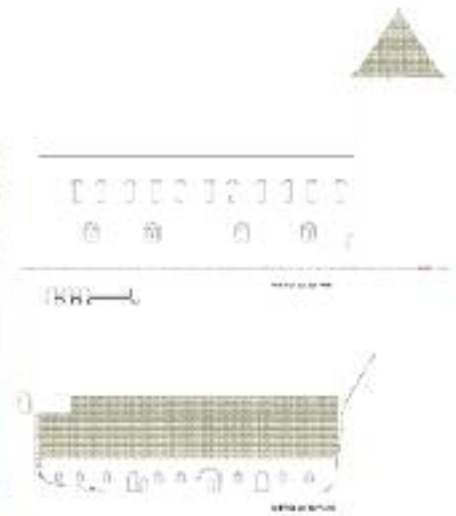
ПALACE
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ПALACE
УТОБРАЖЕ
ОСТАТЦИ



The Palace – current state and reconstruction
Palace – the reconstruction



towers in the Fortress. It was used for cannon defence, and due to its position, it overlooked wide area. It protected immediately the access to the pier and the gate of the Fortress. It was connected with the rear part by a rampart with high merlons and it was directly connected with Tower 8, which was also used for the defence of the access area and the gate. It was built at the end of the 15th century and according to the manner of its construction, it is similar to the Smederevo fortress. Tower was reconstructed and restored during the works in the 80s of the last century and there is no larger damage, apart from a small damage on the facades, caused by a reaction of the salt from mortar onto the blocks of sandstone and brick.

It is planned to construct and replace damaged blocks of stone or brick on the facades. Tower 9 can be used as an observation deck on the level of the walkway because it is easily accessible to visitors. A wooden platform can be built for the observation deck on the same level as the walkway with merlons, and this platform would be reached by wooden stairs.

Rampart 5–8 – current state and planned works

The Rampart 5-8 was discovered at the beginning of the archaeological research done within the project of Hydro Power Plant Djerdap 1. In the drawing of Felix Kanitz it was represented as a rampart with merlons, but it was discovered in 1968, in a very bad state, beneath construction waste material left after the tunnel digging and alluviums of the Danube. It was discovered along its complete line between Towers 5 and 8; its width was determined 1, 90- 2, 00m, as well as the manner of building, and also that it was demolished to its greater part since Kanitz's visit and that its upper surfaces are crumbled. The rampart defended the pier and as an important part of the fortification it was especially taken care of. This is proved by an object added to the inner front of the rampart, probably an area where guards stayed during the protection of this rampart, i. e. the pier.

By a careful inspection, it is necessary to find the smallest traces on the wall of the Tower which will help to determine the height of the rampart which was added next to it. This rampart should be definitely built higher when the road is removed and when the terrain level is lowered in front of the wall. If additional research establishes reliably the original height of the wall, the reconstruction of the walkway and merlons should be included.

Wall 2

The wall, which separated the south part of the fortification in two parts, stretched from Tower 4 to Tower 7. The wall is mostly demolished, and only two sections of the wall remained. There was a walkway going through the wall to the opening in the Rampart 3-4. Without any additional research, the purpose of this wall is not clear.

The wall needs to be researched along its complete length and its remains should be preserved.

Guardhouse 1 – current state and planned works

The object is additionally added next to the Rampart 5-8 and according to the report of researchers, who dug it during the archaeological researches in the 70s of the last century, there are two stages in its construction. During the works in the 80s, it was partially rebuilt and preserved, together with the route of the Rampart 5-8.

It is necessary, together with prior preparation (removal of the upper line of panelling stone filled with cement mortar) to wall it in above the existing part of the wall up to the height of the ground floor with a one-side roof so that an area built like this could be used as a wardrobe for performs of the events which will be held in this part of the Fortress.

Guardhouse 2 – current state and planned works

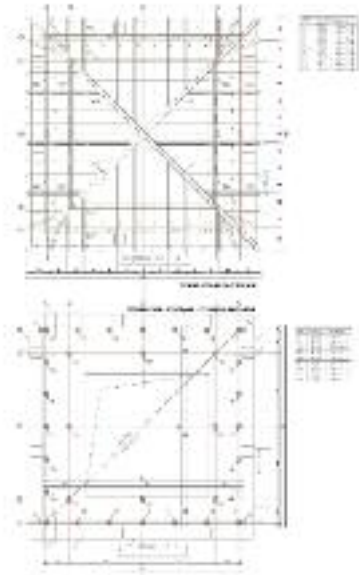
The object, placed on the east of the entrance gate in the Fortress, was built for staying of the gate guard. With massive walls made of limestone on the outside, it was built of light stone. Plastered silica is a good thermo insulator, and it does not transfer capillary humidity, so this object was, together with the Palace, the most suitable for living. The entrance into the object was on the east side. The object was preserved in the 1980s.

It is planned to level the terrain and dig out the object after the moving of the main road, so that all the data, necessary for the reconstruction of this object and of the entrance gate, will be obtained. After the research of the object, it should be reconstructed completely and it should be used for accommodation of guide service.

Entrance Gate – current state and planned works

Instead of the gate which regulates the access and communication in the Fortress, vehicles run through two insufficiently profiled tunnels. After the removal of the road from the Fortress and digging on both sides of the gate, we will have clear information on the original location of the entrance. According to drawings and old manuscripts, there was a ditch in front of the gate with a drawbridge. There is the ditch nowadays, but it is covered by the road, as well as a passage through the Fortress on the level higher than the original.

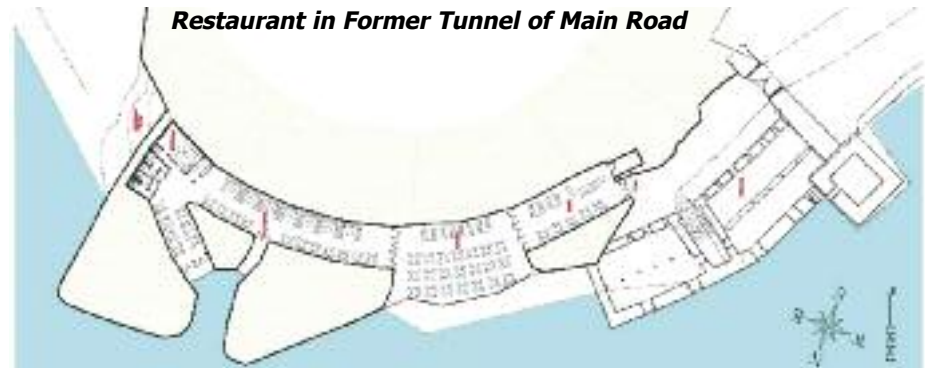
It can be expected that by digging the original peak elevations of the entrance the width of the gate will also be determined, so that the gate can be reconstructed according to these data and existing photographs. The wooden bridge across the ditch should be also reconstructed. The removal of the concrete portal at the widened opening for vehicle passing represents a serious construction problem, because the south-east angle of Tower 8 has cracked along its height and before the portal removal, it must be restored and connected to the centre of the Tower. The front of the wall above the portal, which was built with silica during some previous restoration of the rampart,



Constructive and static solutions



Restaurant in Former Tunnel of Main Road



is now crumbled and destabilized. Only after the works on the structural stabilizing of the present passage, works on the reconstruction of the original entrance into the Fortress can be undertaken. The gate will be made of massive wood, panelled with horizontally placed iron bands and wrought iron with big hand-made heads. Suitable mechanisms will be put into the gate girders in order to move the gate easily. These will be the final works on the revitalization of the Golubac fortress, because the road will be used during the reconstruction of the object and the working site organization.

Constructive and static solutions

For making of the wooden construction in the Golubac fortress, types of wood will be used depending on the needs of the project, the needs of the static calculation and also depending on the purpose and exposition of wood elements.

The types of wood used for construction of monolith wood and boards, laminated constructions are according to the SRPS.U.DO.001: a) Conifers (fir, spruce, white pine tree, black pine tree), b) Hard deciduous tree (oak, ash, black locust, hornbeam, beech and elm).

For monolith wood, the criteria significant for its use are: botanical species, type of processing, growth characteristics, irregularities and damage, humidity, volume mass, shrinking and swelling, cutting area, mechanical properties, dimensions and possible use of protective materials.

The wood for supporting construction is classified into three quality types:

I type – wooden material of high supporting capacity (used for constructions where the need for high support is essential for complex static conditions);

II type – material of standard supporting capacity (used for all types of wooden constructions in usual conditions);

III type – material of small supporting capacity (used for parts of the construction without any significant load).

The criteria for wood classification are defined by the standards of SRPS.U.DO.001/1983. Article 4.12 and SRPS U.DO.001/1 (1987).

In case of the Golubac fortress, when the objects were built or restored, the prerequisite for works was the experience of builders, the skill in wood processing and the possibility of wood acquisition depending on the abundance of forests, immediate surroundings, the height above sea level where a forest is situated, i. e. whether the object is in the area of deciduous forests or conifer forests.

Golubac was founded on the slopes of the mountain of Ridan and the highest peak elevation, where from tree trunks could be lowered or towed down, does not exceed 200m. Abundant forests were the source of quality hard wood Such as oak, ash, elm, beech and these types could be only used for making of wooden constructions on the

objects of the Fortress.

The dimensions of the supporting elements between floors remained written down in the prints of missing wooden elements and recesses for beam bearings, so that it is possible to establish dimensions of the larger part of the constructive elements on the basis of these data.

For all parts of the constructions, apart from the roof construction, oak tree will be used. There is a version of using pine tree material, reinforced with metal supporters fitted into beams because of the safety of visitors. The roof construction according to the static calculation in the Main Project will be designed and dimensioned according to the properties of conifer material.

Wood processing

Monolith wood for supporting constructions can be processed as: round, semi-round, trimmed and carved material.

In case of former use of wood material for the objects in Golubac, tree trunks were sawn up to necessary measures, and then they were hand trimmed to the wanted dimensions and shapes. Therefore, in the final processing of all the elements, apart from floor boards and elements of the roof construction, trimming will be used. Shingles for roof covering will be of split oak.

The protective coats for wood protection must be according to: SRPS.D.T4.037 and SRPS.D.T4.039.

Wood protection in the constructions

SRPS.D.T4.037(1962) - Wood protection – impregnation of wood posts for lines by fluorides according to the process of osmosis.

SRPS.D.T4.039(1982) – Method of testing of the protective coats for wood to fire impact.

Wood protection against insects and fungi must be according to: SRPS.D.T4.027, SRPS.D.T4.028, SRPS.D.T4.036, SRPS.D.T4.035.

The bolts used for connecting of wooden construction must be zinc.

Supporting connections must have at least two bolts, and for connecting of secondary elements, it is allowed to connect with one bolt (SRPS.U.C9.400/1984).

It is planned to use nails with flat heads according to SRPS.M.B4.021.

It is allowed to use other types of nails, if their supporting capacity is established according to the standards in SRPS.U.C9.200. Article 4.2.

Investment estimation for works on the Golubac fortress - Recapitulation

- Reconstruction and conservation of Tower	32.563,21
- Reconstruction and conservation of Merlon 1-2	1.686,32
- Reconstruction and conservation of Merlon 1-3	2.886,32
- Reconstruction and conservation of "Canteen"	19.406,32
- Reconstruction and conservation of Wall 1	1.242,11
- Reconstruction and conservation of Storage facility	9.691,58
- Reconstruction and conservation of wall 1-4	65.815,79
- Reconstruction and conservation of Tower 2	9.072,63
- Reconstruction and conservation of of Tower 3	33.626,37
- Reconstruction and conservation of Merlon 3-4	27.581,47
- Reconstruction and conservation of Tower 4	48.265,58
- Reconstruction and conservation of Tower 5	49.369,47
- Reconstruction and conservation of Merlon 4-5	11.931,58
- Reconstruction and conservation of Palace	262.065,26
- Reconstruction and conservation of Tower 6	41.968,95
- Reconstruction and conservation of Merlon 3-6	3.552,63
- Reconstruction and conservation of Merlon 6-7	8.464,84
- Reconstruction and conservation of Tower 7	55.328,21
- Reconstruction and conservation of Merlon 7-8	29.805,26
- Reconstruction and conservation of Tower 8	66.865,79
- Reconstruction and conservation of Merlon 5-8	24.294,74
- Reconstruction and conservation of Merlon 8-9	4.042,11
- Reconstruction and conservation of Tower 9	10.580,00
- Reconstruction and conservation of Guardhouse 1	25.100,00
- Reconstruction and conservation of Guardhouse 2	17.610,53
- Removal of asphalt road inside the Fortress	32.736,84
- Works on adaptation of the tunnel	29.052,63
- Constructions of stage, amphitheatre (auditorium) and walkways	40.578,95
- Installment of lifts, cranes, scaffolds and platforms	76.842,11
- Acquirement of white pigeons	783,16

OVERALL

1.042.810,74

Investment estimation for works on the surrounding area of Golubac fortress

- Construction of bypass - road and tunnel	1.653.684,21
- Removal of asphalt road inside the Fortress	50.842,11
- Archeological digs of control works	37.894,74
- Deleveling of terrain	173.684,21
- Supervision of works and creation of documentation	22.105,26
- Visitors center	521.052,63
- Wooden suites	378.947,37
- Central object in the suits settlement	254.736,84
- Adaptation of the stone-crushing facility	210.526,32
- Water pool	315.789,47
- Docking bay	842.105,26
- Waste water filtration facilities	71.578,95
- Greenery, park and recreation zone construction	52.000,00
- Stone-paved walking paths and benches	125.000,00
- Pavement of area surrounding the Visitors center	205.263,16
- Estimated cost of electrical installations	282.631,58

OVERALL

5.197.842,11

Investment estimation for works on the Golubac fortress and surrounding area

6.240.652,84 EUR