THE RECOVERED BEAUTY.
RESTAURATION AND RECONVERSION
OF THE ROMAN – CATHOLIC CHURCH
OF BOBDA, ROMANIA

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ABSTRACT
Bobda is a small community in the western plain of Romania; the village was the property of the hungarian family Csavossy. In 1865, after the accesion to the high nobility, the baron Csavossy has build a neo-classical manor house and an neo-palladian mausoleum-church, all imbedded into an landscaped park. Only the damaged church survived together with a fragment of the park. The attraction of the building resides in two characteristics: the neo-palladian appearance, rare in the local culture and the formal and structural consistency, because no further alteration have been produced. The masonry box is covered by an elegant light metal structure, sustaining the inner vaults and cupola, realised in mesh-reinforced plaster. The slender superstructure was damaged by earthquakes and storms. A cultural foundation adressed the T.U. Timisoara in order to develop a proposal for the reconversion of the church into an equiped auditorium. The conclusion of the study presented theoretical issues concerning the adaptation of such a coherent structure to the modern use. The final decision was to conserve the architectural and structural integrity, taking the following steps: the „camouflaging” of the auxilliary and technical spaces into a „landform” – a controlled ondulation of the terrain, the repair of the metallic structure using modern lightweight techniques in order to control the seismic behaviour and the concealment of the main lighting and mechanical systems into the residual space between the structure and the plaster vaults. The final aim was to ensure an elegant appearance as an attractor for the Foundation’s activities.

Keywords: Theory, Integrity, Structural analysis and repair, Seismic behavior, Landscape

1. INTRODUCTION
1.1. The general context
Bobda is a small, sleepy agricultural town situated in the western plain of Romania. The only distinctive feature of the city is the magnificient silhouette of its neo-clasical church (Fig. 1). The existence of the town is well documented starting with the XIIIth century, but the present layout dates from the early XVIIIth century, when Bobda was rebuilt after the complete destruction during the war against the turks in 1695. The rebuilding was performed using the usual orthogonal grid common for the colonist settlements established by the Austrian empire in the newly conquered territories. The most proeminent local family in the XIXth century – the Csavossy were raised to the ranks of the higher nobility after the 1848 revolution (Fig. 2).
In 1860 the baron Csavossy bought two opposite plots of land in the center of the city and decided to build a manor house with a big landscaped park and a surprising neo-palladion church inspired by the Esztergom cathedral as a family church and mausoleum. By the death of the baron (1911) both buildings were fully completed (Fig. 3).

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Fig. 1 Bobda location map. Bobda Church – external view

Fig. 2 Baron Gyula Csavossy. Central Bobda Csavossy property

Fig. 3 Esztergom Cathedral
The family’s fortune vanished in the 1930’s during the great depression when only the church survived. Csovossy heirs emigrated to Canada and a school was built on the site of the vanished manor. Today the surviving church, which was several times desecrated (in the early 1950’s and after the 1989 revolution) is now the property of the romano catholic bishopric of Timisoara. The church is outstanding in more than one way: it is the only neo-classical palladian structure in an area filled with baroque, neo-baroque and neo-gothic churches; it was built without any alterations of the original plan, it has never been modified and finally it was finished with great accuracy of detail (Fig. 4).

The decorative vaults were realised using the Stauss-Platte, a ceramic mesh, patented in 1880 and still in production today.

In 2008 a cultural foundation addressed the „Politehnica” University of Timisoara in order to develop a proposal for reconversion of the abandoned church into an auditorium. Interesting theoretical issues were developed concerning the adaptation of a church situated in such a context for that modern use.

The very structure of the church was favorable, because it consisted from a regular masonry box elevated atop a vaulted crypt and covered with a double shell lightweight cupola (Fig. 5).

The lightweight cupola was damaged during the 2004 earthquake and a couple of heavy storms. The rest of the structure, including the architectural surfaces suffered only fully recoverable damages. The use of plaster vaults makes planning modern mechanical and electric installations very comfortable without interfering with the interior outlook. Two main problems have to be addressed: the structural recovery and the way to position the necessary support and auxiliary spaces of a contemporary auditorium of over 200 seats without damaging the fundamental relation of the structure to the ground, Betski [14].

1.2. Description of the resistance structure
The Banat seismic area from Romania is characterized by shallow earthquakes, with major effects on buildings with high rigidity. In this case the authors together with teachers and graduate students from
the Faculty of Architecture from Timisoara have conducted researches studying the risk and vulnerability of masonry monuments and churches: orthodox and catholic churches and synagogues. The vulnerability studies of the bearing structures were coordinated by prof. V. Gioncu [1-7] and were based on the researches published by: Crisan [8], Mazzolani [9], D’Ayala [10-11], Langomarsino [12], Binda [13] and were started in the international research contract “PROHITECH” coordinated by prof. Mazzolani.

The historic bearing structure of the Catholic Church from Bobda is a good example of efficient combination between classical structural subsystems: masonry brick walls, arches, vaults and slabs. It is remarked a great in plan compliance to the seismic action as well as on vertical direction, fact confirmed by the reduced damages of the building in its almost 200 year existence. The longitudinal seismic forces are taken by the perimeter brick walls, and on the transversal direction these are taken and transmitted to the foundations by the columns and the brick arches. By assigning correct cross sections for the elements, the bearing capacity of the structure was insured and the spatial collaboration was provided by an efficient connection of the longitudinal bearing elements with transversal arches. The uniqueness of the bearing structure compared to other churches present in this part of Romania, consists in the fact that in the central tower there are two staggered spherical domes made from steel profiles. The superior dome closes the tower, while the inferior dome plays a decorative role, anchoring beautiful architectural elements.

Hence, it is observed that the main bearing structure of the church is made from two old materials: burnt brick in the foundations, walls, arches and columns and wood used for the roof framing. Steel, being recently added to the list of historic materials, was used for the two spherical domes from the nave and pendants.

Walls of 90-100 cm thick are disposed at the basement and the ground floor, having a maximum height of +2.65 m at the basement and +9.7 m at the ground floor. The brick arches have a thickness of 90 cm and a span of 5.60 m; they start from +5.25 and have a maximum height of 7.90 m from the floor level. The bell towers are made of brick masonry, having 90 cm thickness and +7.55 m height. The tower from the nave area has a thickness of 90 cm, interior diameter of 9.60 m and a height of 8.10 m between +9.73 and +17.80. Inside the church there were two circular brick masonry columns with the diameter of 50 cm which overtook the vertical loads from the balcony and 4 exterior columns with 75 cm diameter.

In the narthex, apse area, the roof framing is made of wooden arches having steel sheet covering. The slabs over the basement and from the balcony are composite, made from brick supported by steel beams and having a total thickness of 90 cm.

The resistance structure of the roof covering from the nave area is made from a double dome with the diameter of 9.60 m and made from curved steel beams. The first dome starts from +12.00 m and ends at +16.20 m and the second steel dome starts from +17.85 m and ends at +23.85 m.

1.3. Description of the structural resistance damages

The damages recorded in the resistance structure are due to poor maintenance in time, uneven settlements of the foundations and seismic actions.

i) As a result of poor maintenance, there are recorded:
   - zones in which the steel sheet covering was torn off by the wind and wasn’t replaced due to lack of funds (Fig. 6);

![Fig. 6 Area of the dome in which the covering was torn by the wind](image-url)
– mould areas in the walls which led to a reduction of the mortar and brick capacity;
– rusting of the steel profiles from the domes and slabs, significantly reducing their bearing capacity (Fig. 7);

![Fig. 7 Rusty steel profiles from the dome and apse](image)

– due to clogging and missing gutters, the rainwater infiltrated through the covering inside the building, leading to the rotting and breaking of the wood from the roof framing. Such failures can be observed in the nave area, specially in the support area (Fig. 8);

![Fig. 8 Degradations and roof framing and wooden pendants failures in the nave area](image)

– cracks in the brick masonry floors with steel profiles from the basement as a result of rainwater infiltration and overloading of these areas with loads exceeding the maximum admissible loads for serviceability limit state (Fig. 9);

![Fig. 9 Cracks and degradations in the slab over the basement](image)

ii) Uneven settlements are highlighted by the cracks in the masonry walls from the basement under the connection area between the apse and the nave, as a result of the big differences of vertical loads transmitted to the foundation ground in these two areas. Settlements are recorded in the zones of water drainage from the roof, as a result of their infiltration in the foundation ground beneath the rigid continuous masonry foundations;
Because these types of buildings are very vulnerable to seismic actions, the literature identifies as primary failure mechanism, the in-plane and out of plane failure of masonry and torsion at the level of the central tower. As a result of good conformation of the resistance structure and the spatial collaboration between all bearing elements, none of these mechanisms were formed at the Bobda church. The seismic forces produced damages in the following zones of the historic bearing structures:
- transversal and longitudinal cracks in the arch keys from the central axis of the church at level +7.90 m as shown in figure 10a and b. After the cracking the church can be divided in failure blocks delimited by cracks;
- inclined cracks in the corners of the openings from the perimeter masonry in the connection area of the bell towers with the nave masonry (Fig. 10);

![Fig. 10 Cracks a) in nave arches b) in narthex](image)

![Fig. 11 Inclined cracks in the connection area of the bell tower with the narthex](image)

1.4. Consolidation solutions of the resistance structure
The consolidation solutions of the historic brick masonry bearing structure were proposed following the analysis of the failure mechanisms developed in the church by seismic actions and vertical loads. Because the maximum efforts in the structure were made by seismic actions, the site location having a peak ground acceleration of 0.20 g, the consolidation solutions pursued the use of all bearing capacity reserves present in the structure providing that all the spatial elements will work together. The increase of bearing capacity will be provided by the use of steel elements which will not increase the rigidity of the building and which will respect the reversibility principle imposed by the Chart of Venice. The minimal consolidation interventions proposed are presented in figure 11 and consist of:
- laying out steel ties at the brick arches at the level +7.90 m;
- mounting of steel beams which act as a horizontal rigid diaphragm and which connects the brick perimeter walls in the narthex and apse area;
- provision of post-tensioned steel contour beams made of flat bars at the central tower at levels +11.00 and +17.80 m;
- due to the fact that the apse of the altar are the most vulnerable to out of plane failure, there are provided exterior steel contour beams at the level +6.60 m;
- cleaning the degraded mortar from the damped zones from the masonry joints and replacing it with higher resistance mortar;
– the cracks from the brick arches will be consolidated by injecting some epoxy-resin mortars between the bricks, which will be able to restore the bearing capacity of the brick arch;
– replacing the wooden lintels with steel ones, which could be able to insure a good transmission of efforts from one masonry post to another;
– steel meshing of the exterior walls between the bell towers and the central tower;
– unfolding the entire steel roof from the level +17.80 m from the central tower. By lifting and translating the structure with the help of a crane, the steel structure will be remade at ground level and then assembled in the same position at the same level on a concrete contour beam; the steel structure at level +11.00 m will be cleared of rust and will be consolidated with steel parts. The pendants will be remade in the same manner, from steel profiles.

Fig. 12 Proposed consolidation solutions for the church

1.5. The relationship of the Church with the ground and the preservation of its unique silhouette
This was a difficult task for the design team, because the isolated auditorium needed visible additions to the main building in order to function: spaces for artists, technical and ancillary spaces, toilets, a small cafeteria, a foyer, etc.
The structural analysis proved the church to be fit for the function but the formal integrity made interior or exterior additions unwanted.
The concept of “landform” as defined by Charles Jenks – and materialized at the “Dean Building (Scottish National Gallery of Modern Art)” in Edinburgh proved to be very useful (Fig. 13).

Fig. 13 Charles Jenks – Landform Edinburgh

A controlled undulation of the terrain manage to preserve and enhance the monument’s relationship to the ground “camouflaging” in the same time the service structures, Jencks [15] (Fig. 14).
2. CONCLUSIONS

The good behaviour in time of the building, subject to seismic actions, and the limited damages made possible to propose only minimal consolidation solutions, that don’t increase significantly the rigidity of the overall structure but reduce its vulnerability by hindering the development of dangerous failure mechanisms.

The rather limited and „curable” surface damage and the opportunity presented by the plaster vaults to harbour the modern equipment added to the interest of the conversion.

Finally – by using – a „landform” in order to camouflage the auxilliary spaces, the use of expensive and/or sophisticated finishings was avoided and beside the landscaping effects a considerable cost reduction was obtained.

A financial evaluation done by experts presented very interesting conclusions – the cost of the structural recovery of the church together with basic surface restauration was around 160 000 €. The cost of the equipments, the landform and the auxilliary spaces added another 120 000 €. For less than 300 000 €, you achieve the conversion into a functional auditorium of over 200 seats and the priceless conservation of an astounding beauty, a magnificent presence on the vast skiline of Roumania’s western plains.

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