

PUDDLED IRON EMERGES INTO ROMANIAN TERRITORY

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Abstract: *For a long period of time, as it was mentioned when we tried to recon the transport infrastructure works relating to medieval period, we found that these works were entirely missing. The historical documents record in the attestation certificate of the town of Slatina, of January 20, 1368, that crossing the river Olt in the area was done either trough its channel, when the water level would allow this, or by floating bridges, which the local people would call "moving bridges". Crossing the River at Slatina was the most appropriate location that ensured the connection between the historic Romanian provinces Oitenia and Muntenia (Valachia). It was were the economic and commercial interests would meet, both internal and external. The catholic bishop who made a trip to Slatina on August 26, 1641, recorded "... Slatina is located on the bank of Olt River which is crossed by skiff boat."*

The construction of this bridge is considered, for that period, the most impressive project of the Romanian country. The archive documents tell us that the specialists of the time, on the basis of the studies performed, would locate the first permanent bridge over river Olt, a timber bridge, in line with village Prooroci, a village which was later integrated into the today's Milcov commune, of Olt county.

The pilasters made of wrought natural stone, jointed at their upper ends by a cast iron beam, would mark the bridge entrance.

Key words: *bridge, river Olt, moving bridges, impressive project.*

1. Introduction

The construction of this bridge is considered, for that period, the most impressive project of the Romanian Country. The archive documents tell us that the specialists of the time, on the basis of the studies performed, would located the first permanent bridge over river Olt, a timber bridge, in line with village Prooroci, a village wich was later integrated into the today's Milcov commune, of Olt County. As university professor Nicolar LEONACHESCU tell us, while presenting the site preparation and the construction of this timber bridge in his work "Historical premises of the modern Romanian techniques", on February 14, 1845: Slatina personalities have asked the sovereign that the bridge be built at Slatina, which request was approved and finalized

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on January 27. 1846, on wich date C.N. Ramniceanu finalized the topographic survey for the new location[3].



Fig. 1. *An image during the execution of the timber bridge. Collection of History Museum of Olt County*

The inauguration of the wooden bridge over the River Olt (Figure 1) took place on September 8. 1847, after oane year and two months of construction time, as the historic documents tell us.

The documents recorded again the presence of sovereign Gheorghe Bibescu, ruler of the Romanian Country. In front of numerous local inhabitants the first permanent timber bridge over the River Olt was inaugurated, according to historic sources. Otherwise, the event was captured by painter Barbu Iscovescu in a drawing; concomitantly, the image of this bridge appears on the face of a silver coin.

Fifteen years later, in February 1862, the bridge is blown to pieces by the strong pressure of ice and heavy floods. Our history abounds with accounts of such sad events relating to the performance of forein specialists. I do not know details of this bridge. Certainly, the knowledge and science of building such structures was at their beginning in this country, but, for the contractors of the time there was the plentiful profit, made from what they did not actually build, but reported only on paper (Figure 2).

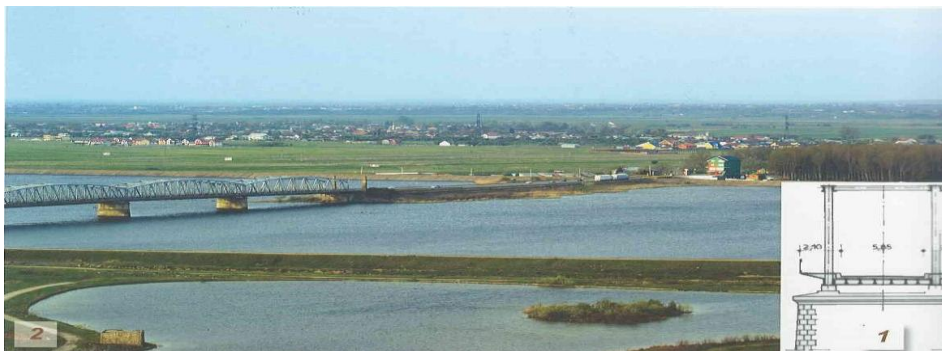


Fig. 2. *Cross section of the bridge inaugurated in 1891. Bridge elevation as seen for upstream*

It is also true that the Olt River valley at Slatina, chosen to locate the bridge, is several kilometers wide, and includes, on its right side, the confluence with river Beica; in this area Olt River waters would have a very meandrous flow, with major change of its meanders from year to year.

The event made the crossing of the river to go back to skiff boats.

The solution adopted and applied into practice was: five simple supported spans of 80.00 m each, with a total superstructure length of 405.00 m; semi-parabolic truss with carriageway at the bottom and multiple diagonals, made of puddled steel, all supported by infrastructures with elevations covered with wrought stone blocks, and very deeply founded, i.e. 12.00 m under the mean river water level, on air compressed caissons. Construction started in 1888 and completed in 1891. The height of main girders is 6.50 m at their axes on, end supports, and 10.00 m in the middle of the span, with the upper girder flange staked out by equation of a parabola crossing three fixed points. This grants the bridge a pleasing aesthetic.[2]

In his book “The Reinforced Concrete in Romania”, the Romanian engineer and great entrepreneur Emil Prager, mentioned that the entrance and exit portals of the bridge over then Olt River at Slatina, was designed by engineer Elie Radu. He also mentioned the contribution of engineers in structures, which were usually attributed to architects. Two pilasters made of wrought natural stone, jointed at their upper ends by a cast iron beam, would mark the bridge entrance.

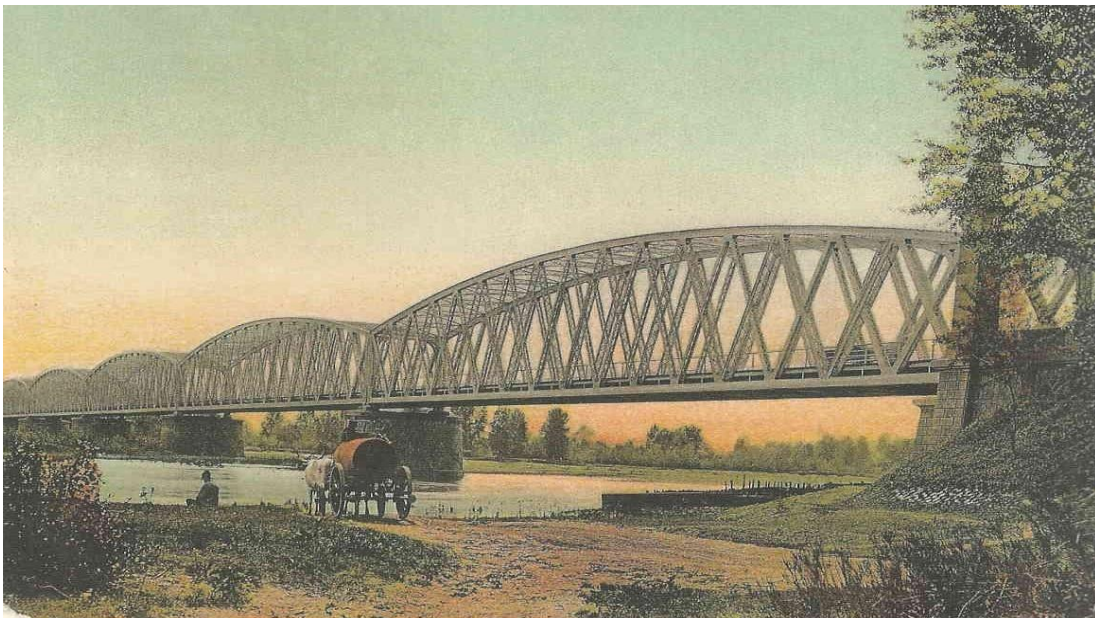


Fig. 3. *Elevation of the bridge inaugurated in 1891*

The cast iron girder of variable height, decorated with circles and floral motifs, gives the bridge the aspect of a basket handgrip (Figure 3). The pilasters, or posts of the

bridge entrance and exist portals, have concrete decorations applied on them, on which the year of commencement of works is carved on the left side post of the exiting portal, on the right side of Olt River, and the inauguration year, on the right side post of the same portal.

The decorations on the bridge entrance portal, the one on the left bank, bears no inscriptions. The cast iron cross beam which would link the two pilasters of the portal (the ornamental posts) was removed from both sides of the Olt River, during the communist time (Figure 4), on reasons that they were bearing symbols of the Romanian royal family.



Fig. 4. *The bridge entrance portal, modified during communist time. The basket handgrip shaped crossbeam dissappeared*

The answer was given by a solution based on the idea of best using the existing structural potential, of keeping the initial form but applying the required upgradings.

The design task has been entrusted to the project manager, engineer Rodica Stoica, whose principle started from idea that the architecture of a bridge should be expressed by a whole and not by a part of it. She had the express desire of ensuring the connection between the concept and the location peculiarities, in order to reach the context in which the chosen structural form is achieved, but it shakes hands with the elegance and the beauty.

Thus, it was decided the replacement of end decks built in 1889, and made of puddled steel (96 years of service) by new decks, but maintaining the same shape and length of spans as for those of the central spans, namely by truss beams with

carriageway at the bottom and a semiparabolic upper chord. A triangular system with vertical tie beams, with a carriageway of 7.80 m and two cantilever safety sidewalks of 0.50 m each, outside the main girders.

The central decks were widened, by keeping the same dimensions in the cross sections, and using an original solution patented by engineer Rudi Buzuloiu: method for the consolidation and widening of bridges, Romanian Patent No 96215. The schematic drawings speak for themselves about the principle of this method without having recourse to further explanations.

The lifting was progressively achieved, in stages, by setting up concrete blocks embedded into the reinforced concrete of the elevations; for the lifting, high capacity hydraulic hoist systems were used. For the consolidation of existing structures, performed inside air compressed caissons, cement slurry, or gunite, was injected under high pressure by means of a shotcrete gun.

The effect of this strengthening was checked by drilled cores extracted from the structure before and after shotcreting. During the execution the traffic was detoured through a by passing route located on the top of the dam built downstream.

The old stone masonry pilasters were dismantled with care and relocated so that they could partially remake the old visual aspect without disturbing the traffic. One hundred years of existence, plus the upgrading, possibly for another hundred years, is actually a performance !

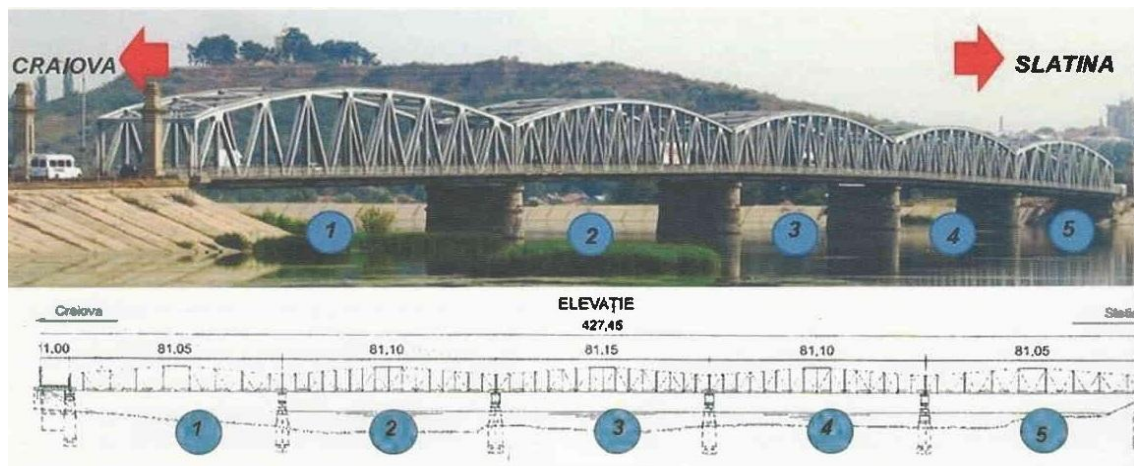


Fig. 5. Conventional notation scheme

In order to make a uniform description of the project's provisions and the construction works, the following notation system was adopted (Figure 5):

- The spans were numbered in an ascending order in the mileage direction;
- The infrastructures were marked as follows:

C00: Craiova abutment (right bank)

P01, P02, P03 and P04: piers were marked in ascending order, similiary to span marking

C05: Slatina abutment (left bank) [1].



Fig. 6. *Elevation of the consolidated bridge in 1985 as seen from upstream, from Gradiste Hill, left side of Olt River*

The promotion of detail technologies constituted the best answers which those who left their print on the project could obtain. They did that to meet, in the end, with the technically concrete solution, but shaking hands with the design calculation hypotheses (the mathematical abstractness), in order to emphasize the beauty in the middle of a mirific landscape (Figure 6).

The images gathered during construction prove the devotion with which workers like Bebe Buzatu, crane operator, Alexandru Chiper, welder, Ilie Chelmeag, installer, who, we can say, had to perform mountaineering (Figure 7,8).

Dismantling the old decks had recourse to the following main operations:

- demolishing the reinforced concrete slab;
- raising the bridge decks and their placement on skidding-launching devices;
- launching the decks (their taking out of the span area) and their relocation on stands in specially prepared locations, for dismantling the structural elements;
- cutting the structural elements by oxygen-acetylene welding machine, their sorting out and storage.

In parallel with dismantling the existing decks, all the existing infrastructures were raised to a higher elevation, both piers and abutments.

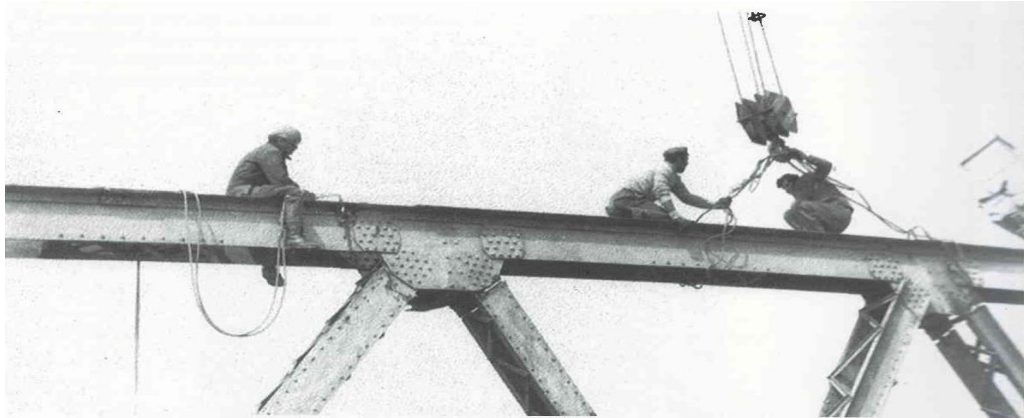


Fig. 7. *Balancing action at high elevation*

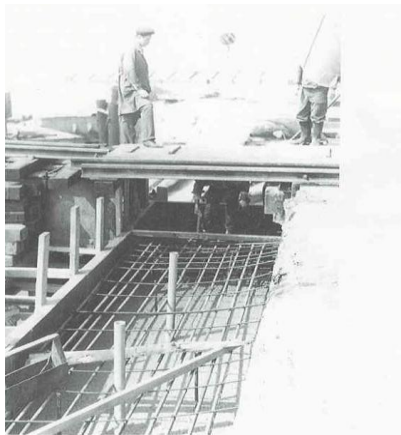


Fig. 8. *Reinforcement of the superelevation area of abutment C05, at Slatina*
Master builder Ion Stan supervises the concreting operation

The works of consolidation and the upgrading of the geometry of the bridge over the Olt River to meet the modern traffic requirements, which were high complexity works, made this team of personalities to meet, to group themselves with competence and consciousness in a perfect simbyosis of experience and ambition.

It is worth pointing out the authority with wich the team has managed the project, selected and mobilized the best construction site, the most capable and experienced personnel, who organized the site operations at a high performance level.

In this project an exceptional co-operation was achieved: design, construction, consultancy, the employer, the government construction inspectorate. As evidence of this assertion is the photograph taken in one of the ordinary days on the site (Figure 9).

The project, which has been in operation since 1891, consolidated and rehabilitated in 1985-1986, after more than 121 years, continues to exhibit its functionality, stability and grandeur above the water mirror of Slatina reservoir on Olt River.



Fig. 9. Evidence over the years

Conclusions

The emotional charge, the history of the area highlighted by the presence of these real engineering works of art, remind us of our predecessors: engineer Alexandru Davidescu, the first project manager. Engineer Elie Radu, who originally supervised the design and construction, has also closely dealt with the architectural aspects relating to bridge entrance and exit portals, in which they invested love and passion that can be found in personalities and in the mass of the many who worked and continue to work in the bridge profession.

I quote from Alexandru Vlahuta (5 September 1858, Plesesti, today Alexandru Vlahuta, 19 November 1919, Bucharest):

„...in the moonlight, in the tranquility of the night, under the starry sky, the beauty and the grandeur of this strong embodiment of the Romanian genius, give us the impression that we are in a world of magic...The supporting feet walled in stone, are so far from one another, and so tall, that the whole giant steel web, on which the overwhelming, trains are running, seem as though floating in the air, light like a lace”[2]

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