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## A COVERED WOODEN BRIDGE OVER THE OSAM RIVER IN THE BULGARIAN TOWN OF LOVECH – ITS HISTORY AND THE PRESENT DAY

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### ZADASZONY DREWNIANY MOST PRZEZ RZEKĘ OSAM W BUŁGARSKIM ŁOWECZU – JEGO HISTORIA I DZIEŃ DZISIEJSZY

#### Abstract

The history and structure of the historical covered wooden bridge built over the Osam River in the Bulgarian town of Lovech is described and discussed in detail. This bridge was completed in 1874 by Kolyu Ficheto and had a total length of approximately 86 m. The original bridge burned down in 1925. Its present structure is partially made from reinforced concrete and was opened to the traffic in 1931.

*Keywords: wooden bridge, covered bridge, cultural heritage, renovation*

#### Streszczenie

W artykule przedstawiono historię i opisano rozwiązania konstrukcyjne zadaszonego drewnianego mostu przez rzekę Osam wybudowanego w bułgarskim Łoweczu. Oryginalna konstrukcja mostu zaprojektowana przez Kolyu Ficheto i oddana do użytku w 1874 roku miała całkowitą długość około 86 m. Została ona jednak całkowicie spalona w 1925 roku. Odbudowany most otwarty dla ruchu w 1931 roku został wykonany częściowo z żelbetu.

*Słowa kluczowe: most drewniany, most zadaszony, dziedzictwo kulturowe, renowacja*

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## 1. Introduction

The Osam River runs through the middle of Lovech and divides it into two major districts. Their connection as well as the movement from Lovech to the surrounding towns and villages is via a wooden covered bridge built over the river almost in the middle of a shopping street. The building of this bridge started in 1872, during the rule of the city mayor Ismail – it was finished two years later. To supervise the construction process, a six-member committee was elected consisting of three Bulgarians and three Turks who took care of both the procurement of materials and the work of volunteers. The wood came from the Trojan district whereas the stone was sourced from the Lovech district. Nikola Fichev, better known as Kolyu Ficheto (Fig. 1a), was the bridge designer and was personally responsible for the selection and the preparation of the materials. To achieve this, he visited quarries and walked through the woodlands to select which stone material should be used and which trees should be cut down. His payment was 10 lev per day. Kolyu Ficheto was a self-taught man. Indeed, anyone who inspects this unique wooden structure notices that Kolyu Ficheto has demonstrated not only foresight and ingenuity but also the skills and many other qualities that define a good technician. Let us note that Nikola Fichev designed and built many other structures, notably a bridge over the Yantra River near the town of Byala (Fig. 1b) in Ruse Province. The same Kolyu Ficheto designed and built many churches, including those completed in Veliko Tarnovo – such as the churches of St Mary, St Spas, St Atanas, Saints Constantine & Helena and St Marina; St Dimitar church in Lyaskovec; St Nicholas church in Gorna Oriahovitsa; Saints Cyril & Methodius church in Svishtov. He also built the Transfiguration Monastery in Veliko Tarnovo. It is no wonder that Kolyu Ficheto is nowadays named as the main architect of the Bulgarian National Revival. His biography, as well as the biographies of the other Bulgarian former building masters, are collated by G. Kozarov in [1].

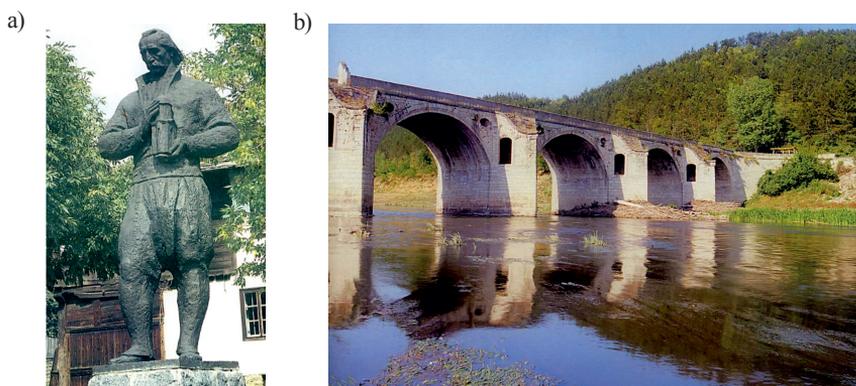


Fig. 1. a) The Kolyu Ficheto monument in the Bulgarian town of Dryanovo, his town of birth (source: <https://upload.wikimedia.org/wikipedia/en/thumb/8/81/KolyoFicheto-monDryanovo150.jpg/800px-KolyoFicheto-monDryanovo150.jpg>, access: April, 2016), b) The stone bridge over the Yantra River near Byala in Ruse Province built by Kolyu Ficheto in 1867 (source: <https://upload.wikimedia.org/wikipedia/en/3/39/ByalaBridge-KF150.jpg>, access: April, 2016)

## 2. Description of the bridge stone pillars structure

The Lovech bridge has 6 spans. The supporting pillars are made of stone and are spaced at intervals of 11 m. The stone blocks are tapered on the front side. The thickness of the pillars is 3.50 m and their height is 4.50 m. Their foundations are made of specially constructed wooden cages formed from poles and beams connected together by hydraulic mortar. This medieval method of constructing bridge foundations is performed after diverting the flow of the river for the purposes of digging out the dry riverbed to the size required for the foundations to a depth of 2 to 3 meters. After the construction of the foundations, the stone pillars were built on top of them. Finally, the river was redirected back to its original path. The underwater sections of the stone pillars are made from large stone blocks joined with grout. The upper parts of these pillars, usually located above the water level, are built of hewn stone joined with mortar. Furthermore, the lower segments of the pillars (to a height of 2 m above the level of the riverbed) are the structures with entire walls while their upper segments (from 2.0 m up to 4.5 m above the level of the riverbed) are built as the openwork walls with the windows of 1.50 m width (Fig. 2). These windows are designed to ensure the free flow of water in case of flooding. Currently, the concrete bridge deck rests on these stone pillars as well as the historical wooden bridge structure with numerous shops.

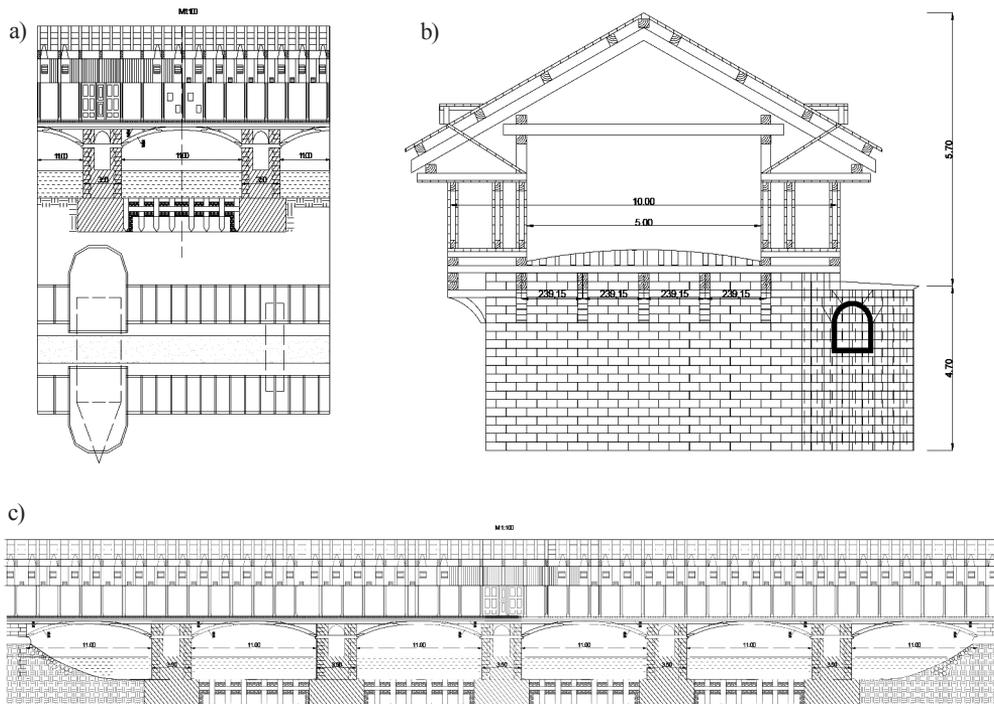


Fig. 2. The technical drawings of the bridge over the Osam River in Lovech: a) the part of the view from the river side together with the corresponding horizontal section, b) the bridge cross section, c) the view of the entire bridge (according to [2–3])

### 3. Description of a wooden part of the bridge structure

The timber structure of the bridge is about 86 m long and it is covered in its entirety with boards. The total width of the bridge is 10 m; however, only 5 m in the middle of the bridge deck constitutes the road and is nowadays accessible only for pedestrians and for bicycles. The remaining 2.5 m on both sides of the pedestrian/cycle lane is occupied by numerous shops. Their floors are constructed to be about 60 cm higher than the road level. The bridge is lit and ventilated by skylight window openings located in the roof structure as well as by other windows visible in the exterior walls of the shops (Figs. 5–6).

The wooden part of the bridge is made of both oak and beech. Its main bearing structure is formed as the so called rainbow chain stiffened by the beam (Figs. 2 and 3). The considered chain is made of three separate wooden beams connected to each other by hinges. In this way these beams constitute the pseudo-arch. Each end of such the arc rests on a console made of wooden beams with dimensions of 25 cm by 25 cm which are embedded into stone pillars. The distance between the neighbouring consoles is 11 m. Other wooden beams, also with dimensions of 25 cm by 25 cm, rest on these arch structures and are connected to them in the middle sections. In each span of the bridge the system of five rainbow chains, lying side by side and transversally connected to each other, is constructed, consisting of five horizontal beams resting on five corresponding wooden pseudo-arch structures. The spacing between the particular bearing chains, measured across the width of the bridge, is 1.35 m. The subsequent beams are laid transversally to the basic load-bearing structure constituting the road surface. All of the components are connected using wooden wedges and pins. Steel or iron nails are not to be found anywhere within the structure [4–6].

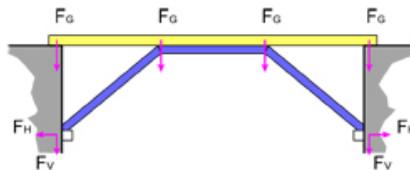


Fig. 3. The scheme of the timber bridge rainbow chart stiffened by the beam  
(source: [https://www.tu-cottbus.de/projekte/uploads/pics/4\\_04\\_Grub.jpg](https://www.tu-cottbus.de/projekte/uploads/pics/4_04_Grub.jpg), access: April, 2016)



Fig. 4. The old bridge in Lovech in 1877 during hostilities of the Russian-Turkish War  
(according to [2–3])

The stores on the bridge are 2.50 m deep, 2.50 m wide and 2.50 m high. They are separated from one another with wooden partitions and have double exterior wooden walls. The center of the bridge is marked by larger and more circular shops extending outwards beyond the other shops and located on both side of the bridge (Fig. 2a). At present, we have a hairdressing salon prospering here and a coffee shop on the other side. When the bridge was new, it was decorated with four sculpture figures: a lion, representing Bulgaria; a two-headed eagle, representing Russia; a female bust with flowers, representing fertility and a stick with a mace, probably representing power. In the present day, only the figure of the lion remains. Additionally, the year 1874 is carved on one of the pillars as well as a hand holding a rod.



Fig. 5. Views of the old bridge over the Osam River in Lovech (according to [4] – courtesy of N. Tuleskov)

Owing to its robust construction, the bridge has survived many severe floods. In 1897, during the largest of these, the waters of the Osam River devastated six shops and all of the sculptures. Furthermore, arson which occurred overnight on the 2<sup>nd</sup> and 3<sup>rd</sup> of August 1925 turned out to be catastrophic – the entire bridge burned down including all sixty-four shops on its deck. Nothing could be saved [7]. The authorities immediately came to the rescue by providing 5 million leva for the reconstruction of the bridge and the shops. In the late autumn of 1925, a temporary bridge was built which was accessible for pedestrians only, it was located 30 m north of the old burnt bridge.

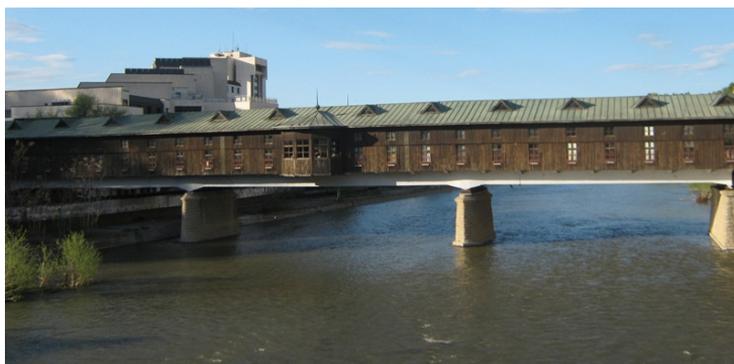


Fig. 6. The present view of the reconstructed bridge in Lovech (photo by M. Mašlak, 2013)

#### 4. The reconstruction of the bridge

To develop a rational plan for the effective reconstruction of the bridge, a contest was organised amongst Bulgarian civil engineers and architects. This was required in order to provide the elaboration of the executable design work, prepared in 3 copies, which could later be purchased by the authorities. The conditions set out in these requirements, approved by the appropriate minister, included everything that was necessary for executing the entire reconstruction process of the bridge. The works submitted to the contest were evaluated by a jury appointed by Order No. 1936 from June 7, 1926 issued by the Minister of Public Buildings. The jury was formed with the following members: eng. N. Pachev (Chief of Roads and Bridges); eng. B. Stefanov (Head of the Technical Bureau); arch. Lozarov and eng. P. Abadzjev (the representatives of the Engineering – Architecture Company); eng. G. Vasiliev (the representative of the free-practicing engineers). The jury met on 9<sup>th</sup> May 1926 at a meeting in the Ministry of Public Buildings. Only three contest entries were assessed. According to the jury protocol these were as follows:

- the project identified by the signature "**8**" which contained fifteen sheets of technical drawings, an explanatory note and an analysis of the projected costs with a payroll (all in triplicate);
- the project identified by the signature "**Old Mountain**" which contained thirty-one sheets of technical drawings and two sheets of perspective drawings (all in triplicate),

- the certificates, an analysis of the projected costs with a payroll as well as a copy of the analytical calculations relating to the project;
- the project identified by the signature "**River 8**" which contained nine sheets of technical drawings (all in triplicate), the certificates, an analysis of the projected costs with a payroll and an explanatory note with a copy of the analytical calculations relating to the project.

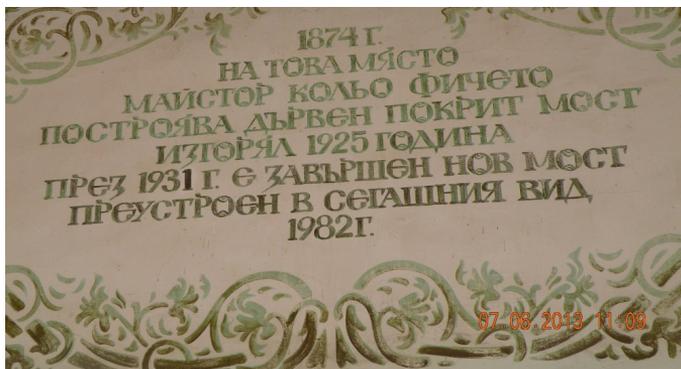


Fig. 7. Inscription informing about the old and reconstructed bridges in Lovech (photo by M. Mašlak, 2013)

As a consequence of many meetings held consecutively on 10<sup>th</sup>, 13<sup>th</sup>, 14<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup>, 17<sup>th</sup>, 19<sup>th</sup>, 20<sup>th</sup>, and 21<sup>st</sup> July 1926, the jury found the following:

- the project with the signature "**8**" gave the following reasoning – with respect to the bearing construction of the road and the stores, nine 86.8 m continuous concrete beams along the entire length of the bridge (without the expansion joints) were to be used. All of the walls in the stores were to be made of reinforced concrete. The reinforced concrete roof structure above the shops was to be supported on the walls. The reinforced concrete roof over the road was to be constructed on the curved beams resting on the vertical columns. The lighting of the road was to be only through the windows in the side walls.

In the opinion of the jury, the recommended roof structure had no technical justification because the curved roof beams as well as the reinforced concrete roof slab with a hole the size of 0.90 m were modelled in analytical calculations in a too simplistic way – using the fully straight horizontal beams. Consequently, the horizontal force resulting from the arc-shaped curved beams was not taken into account when the vertical columns were designed. In general, the analytical calculations attached to the project were incomplete and besides this, they were invalid in some places. There were no drawings relating to the scaffolding. Some of the attached drawings seemed to be unfinished because they were made partly with a pencil. The project was not sufficiently developed with respect to bridge architecture. To sum up, the entire project was evaluated to be an incomplete and insufficiently studied work. Moreover, it violated not only the requirements of the contest but also the law on public works.



Fig. 8. The entrance to the reconstructed bridge in Lovech (photo by D. Partov, 2013)



Fig. 9. The ceiling beams in the reconstructed bridge in Lovech (photo by D. Partov, 2013)

- The project with the signature "**Old Mountain**" recommended the execution of the arch bridge spans with reinforced concrete. All of these arches were designed to be three-hinged. Three options for the bridge load-bearing structure were discussed in detail. In the first variant, the existing stone pillars were to be left in their places while arches were to be constructed between them. In the second solution, only one arch bridge span was proposed to be used along the entire length of the bridge. In the third option, the building of five completely new pillars was recommended as well as the building of new bridge abutments. The bridge superstructure was designed as an arcade frame structure without any hinges. The subsequent frames were also to be made of reinforced concrete. The roof construction was to be lit both from above and from the side. The concept to apply in a new bridge the arch-shaped spans was associated with the resignation of the holes previously existing in the upper segments of bridge pillars. This would have increased the risk of water damming during a flood which could have resulted in the partial flooding of the vaults.

The jury evaluated this project as having been well developed especially in terms of the architectural elaboration. However, the recommended arch-shaped bridge slabs were judged as unacceptable due to historical and conservation considerations.

- The project with the signature "**River 8**" gave the following recommendation – the bridge deck was to be made from seven horizontal concrete beams. On the deck, two-hinged main frames, which were also to be made from reinforced concrete, were to be constructed as well as the half-frames disposed on both sides of each main frame. These half-frames were the structural segments including shops. The upper beam of each transverse frame was to be shaped as the beam broken in the axis of the bridge. As a result of this, the bridge was to be lit both from the side and from above.

According to the assessment of the jury, this project was well developed and met all the requirements of the contest; however, some deficiencies and errors in engineering calculations were recognised.

The decision of the jury was to accept and to recommend using only the project with the signature "**River 8**" with the technical solutions shown in detail in Figs. 10 and 11.

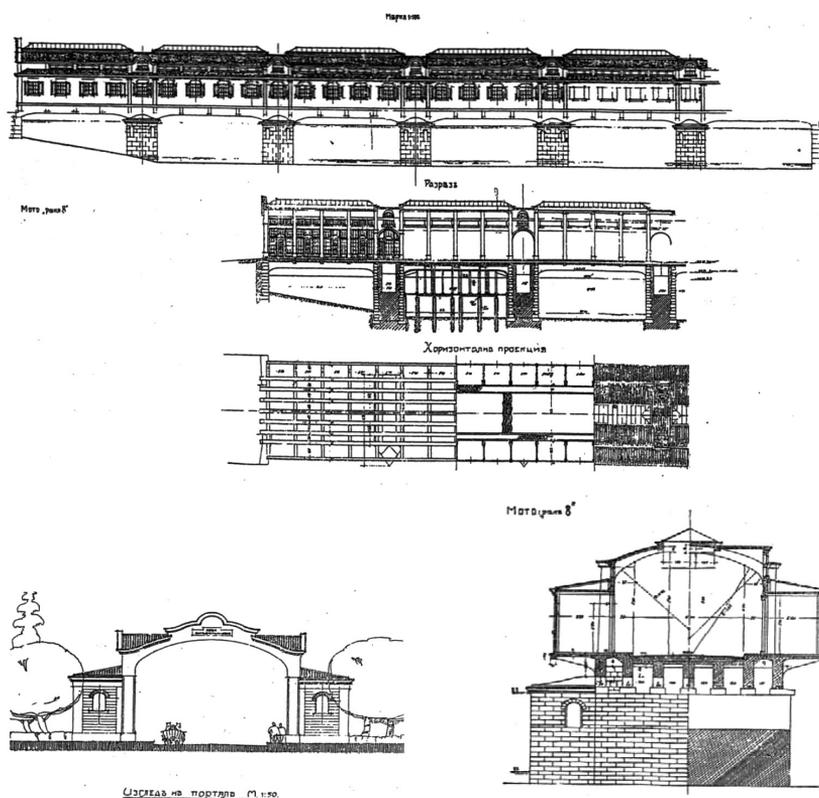


Fig. 10. The technical drawings relating to the reconstruction of the bridge in Lovech, taken from the winning design with the signature "**River 8**" – general view and recommended cross sections (according to [2–3])

According to the contest regulations relating to the possible awards, the following premiums could be granted: first prize – 40 000 leva; second prize – 25 000 leva; third prize – 15 000 leva. Furthermore, the sum of 12 000 leva was also intended to be paid to the authors of the other projects, especially those not approved for implementation. As a result of a vote conducted by the jury by a majority of 4 votes, the jury decided to award the second prize to the authors of the winning elaboration, with an appropriate financial premium. Only one vote was to award the third prize to this project. As far as the rejected projects are concerned, the project with the signature "**Old Mountain**" received payment to the amount of 9000 leva whereas the project with the signature "**8**" only 3000 leva.

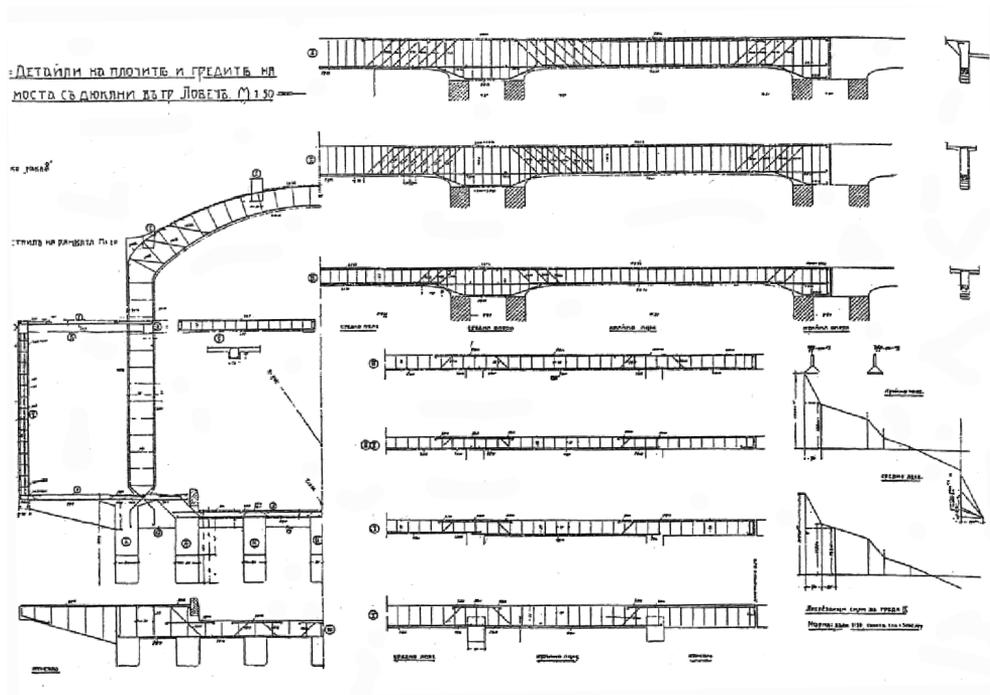


Fig. 11. Technical drawings relating to the reconstruction of the bridge in Lovech, taken from the winning design with the signature "**River 8**" – plan of the reinforcement of the bridge structural elements (according to [2 and 3])

After making the above decisions, the jury opened the envelope with the signature "**River 8**" and it turned out that its authors were two drafters engineers Hristo Tenekiev and Vladimir Dimitrov as well as the architect Zlatev Koev. The auction was scheduled on 12<sup>th</sup> November 1926 and the total value of this undertaking was estimated at 5 million leva. The new concrete bridge was opened to traffic in 1931.

## 5. Concluding remarks

The history and manner of reconstruction of the heritage covered timber bridge built in the Bulgarian town of Lovech over the Osam River is a good example of how tasks of this type were performed at the beginning of the twentieth century. Although the bridge was restored to use and its current structure made in a large part of reinforced concrete is undoubtedly more durable and stable than the previous construction, its original character has been changed and due to this, its historical heritage value has been reduced. However, it seems that it was able to keep the unique atmosphere of the original bridge as well as its general appearance blending in with the city landscape. When a lover of the old tradition comes to Lovech to see the famous wooden bridge, she/he will not immediately perceive the reinforced concrete bridge deck in its structure, but if that happens she/he will not necessarily associate this fact with the lack of originality of this bridge.

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