ALTERNATIVES FOR ROAD BRIDGES. CORRUGATED STEEL BRIDGES

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ABSTRACT
Together with the modification of climate and rain conditions and the massive deforestation of woodlands, changes in river situation are shown in their torrential character which also leads more than often to the damage of the existing bridge infrastructures. In such a situation, solutions are required to design and build bridge infrastructures and superstructures made from easily accessible local materials that do not consume time and energy and do not require special equipment and technologies.

Keywords: design, build, structure

INTRODUCTION
The bridge we will refer to from now on is situated in the village of Calata, on the county road DJ 108C, linking Calata to Manastireni. At kilometre 40 + 850, the road crosses Calata valley. In the year 2010, the bridge was damaged during a torrential rain when the left hand bank abutment was eroded and the bridge collapsed.

MATERIALS AND METHODS
1. Initial situation. Designed solution
The carriageway is 2.65 m wide, it is framed between the upstream damaged side by a ledge type metal parapet, mounted on metal piles, recovered from the upstream parapet which had fallen down when the abutment damaged. The superstructure that still can be used now is formed of four prestressed reinforced concrete beams, with a height of 72 cm, width of 102 cm and length of 7.70 m. The abutments were built in two steps, with the downstream abutment of 4.5 m long, and a 6.80 m long upstream abutment. The total length of the wall is 11.30 m (fig. 1 and fig. 2).

The expert’s report conclusions were that the existing bridge should be demolished and a new one should be built.
1.1. Designed suprastructure and infrastructure

The bridge is designed, in the plan view, to be placed normally (straightforward), its total length will be 13.00 m, and the width of 11.30 m. Longitudinally, the bridge superstructure will present only one span calculated at 7.13 m (fig. 3).
The superstructure will be built with an open structure of corrugated steel structure type SC-27SA, placed on continuous foundations, and filled with successive compacted ballast layers strengthened by reinforcements with geotextiles arranged each 50 cm along the height to reinforce the filling material (fig. 4).

The steel structure will be limited with ballast walls of C25/30 reinforced concrete, joined together by two C35/45 reinforced concrete tension rods;

The bridge infrastructure is designed as “continuous foundation” made of reinforced concrete and of two abutments.

At the upper part of the foundation, behind the vault, an ø110 corrugated PVC tube which will collect and drain the infiltration water.
1.2. Riverbed and banks

The river bed will be provided with gabions, and it will be packed with gabions of 50 cm thickness. The river bed will be arranged upstream, downstream and under the bridge covering a length of 60 m totally.

Downstream, the operation will end with a bed threshold formed of gabions and a calming down area and rock fill to dissipate water energy. The bridge will be connected to the valley banks with the support walls that will limit the valley of the river bed (fig. 5).

1.3. The bridge access ramps

The bridge access ramps have a total length of 100 m, 50 m before the bridge and 50 m following the bridge.

The route of the ramps follows the present line of the road, and in the bridge area a curve to the straight line of 250 m radius was drawn.

In this section, design speed of 40 km/h, was adopted due to the field situation and the curves present overwides and conversions according to STAS 863/85.

The carriageway on the ramps is 6 m wide for two lanes and is limited by shoulder of 75 cm.
The carriageway width was selected according to STAS 2900-89, and the situation on the ground, too, not to interfere with the property ownership limits.

The road system proposed for the bridge access ramps is the same as for the bridge itself (fig.5).

1.4. Car access during execution

During the works, the road traffic is fully stopped in the area of the bridge it is interrupted and for the pedestrians a temporary wooden pass will be provided.

CONCLUSIONS

As the space is limited in the internal area of the villages, no options to build local by-passes for the bridge in constructions are possible, so that a rapid solution that does not consume much time and material and technologic resources is necessary.

For these solutions to be economically competitive, it is necessary to have a service life and a maintenance cost similar to conventional solutions and to be built quickly and safely.

Corrugated sheet metal bridges represent a viable alternative to classical solutions when the ground and geometry of the place require such solutions.
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