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TEMPORARY RIVER REINFORCED CONCRETE CROSSING STRUCTURE ACROSS THE NEW MUŠNICA RIVERBED

Miloš Živanović[1a], Jelena Stefanović[1b], Jelena Đorđević[1c], Sandra Guševac[1d], Ivan Jelić[1e] Nikola Jovanović[1f], Tanja Stanković[1g]

[1]Mining and Metallurgy Institute Bor, Alberta Ajnštajna 1, 19210 Bor, Serbia

[1a] milos.zivanovic@irmbor.co.rs, https://orcid.org/0009-0006-3331-4294;
[1b] jelena.stankovic@irmbor.co.rs, https://orcid.org/0000-0001-6418-1814;
[1c] jelena.djordjevic@irmbor.co.rs, https://orcid.org/0000-0001-5406-0074;
[1d] sandra.filipovic@irmbor.co.rs, https://orcid.org/0000-0002-6776-9899;
[1e] ivan.jelic@irmbor.co.rs, https://orcid.org/0000-0003-4534-0706;
[1f] nikola.jovanovic@irmbor.co.rs, https://orcid.org/0009-0008-0982-2576;
[1g] tanja.stankovic@irmbor.co.rs, https://orcid.org/0000-0002-2714-7016

Abstract

The continuous transport of overburden and waste from the open pit mine across the newly built Mušnica riverbed is possible only in the case of construction a new bridge with a load capacity of over 300 t. Given the fact that the process of geological research, design, construction and commissioning requires a long period of time, the solution of building a new temporary reinforced concrete crossing of the assembly-disassembly type was chosen. The crossing will be used in the dry period of the year and will be built on the site of a temporary mine road until the permanent solution of the new bridge structure.

Keywords: *Gacko surface coal mine, external transport of waste and overburden, Mušnica river, temporary crossing structure*

1. INTRODUCTION

With the opening of a new exploitation field on the surface coal mine Gacko and completion the works on relocation of the Mušnica riverbed, as well as the selection of the Gelja Ljut landfill, the need for formation a temporary road and crossing over the new river bed appeared. Waste and overburden will be transported by the BELAZ 75135 mine trucks with a gross capacity of over 250 tons. Due to the occurrence of torrential flows of the river Mušnica in early spring and autumn, the new crossing structure will be of the assembly-disassembly type and used only during the dry period of the year. After the crossing is dismantled, no parts of the structure must remain in the riverbed that would affect the flow of water in the riverbed. Due to this reason, the foundation plate of the new crossing structure will have its upper surface level aligned with the riverbed, and the side walls will be formed along the slopes of the riverbed so that they do not negatively affect the water flow in the river. The choice of location for crossing will enable the planned and proper development of the Gelja Ljut landfill and longer duration of the temporary crossing. Figure 1 shows a temporary crossing structure foundation plate.

2. REINFORCED CONCRETE CROSSING STRUCTURE DESIGN

The crossing structure consists of the foundation slab, coastal side walls, transition slabs and assembly-disassembly reinforced concrete slabs. The crossing is 9 m wide and 15 m long, which is the width of the free profile of the riverbed. An intermediate space of 1 m is provided between the individual assembly-disassembly plates for easier assembly and manipulation the individual plates. A 30 cm thick foundation slab over a 1.0 m soil replacement layer was founded in the river bed. Coastal side walls with a width of 80 cm and a height of 100 cm have niches for supporting the transition plates on one side and assembly-dismantling plates on the other. The transition plates, 4 in total, have dimensions of w/l/d=400/200/30cm, made on site over a 60 cm soil replacement layer. The assembly-disassembly plates are in the shape of the letter "П" with a plate thickness of 30 cm and walls in the shape of the letter "V" with a width of 35cm at the bottom and 40 cm at the joint with the plate, a total of 10 pieces. The installation of transition plates is provided in the niches lined with a steel sheet 8cm deep in the base plate. These niches will make the panels immovable in both directions because they are filled with a cement-based mass after installation. The walls of transition plates form the trapezoidal culverts through which water flows unhindered. They are 70 cm high and dimensioned for a 2-year rainfall return period. Connecting elements in the direction of the river flow are foreseen, consisting of the steel rods, placed longitudinally in the openings in the individual transition plates and "UPN" steel profiles 1m long, with the nuts used to finalize the plates in the designed position and ensure the rigidity of the entire structure.

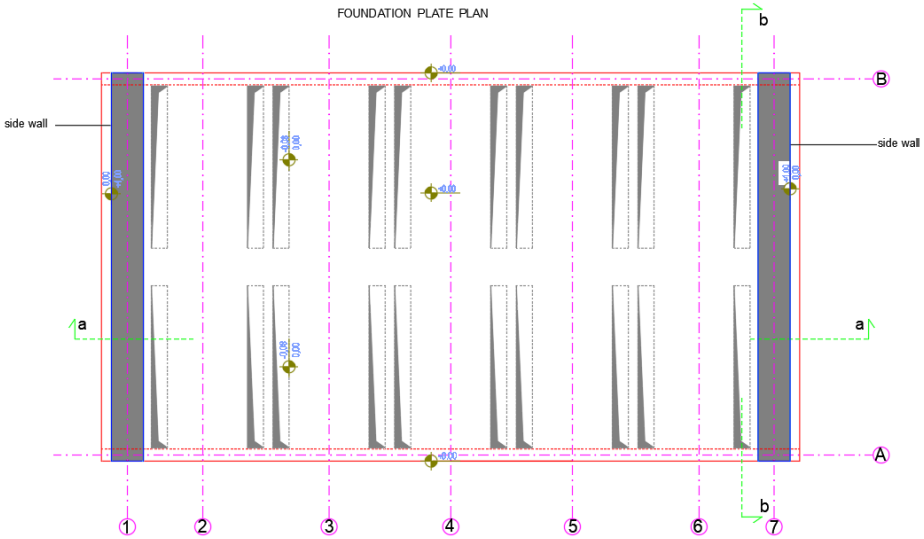

Figure 1. *Foundation slab plan [1]*

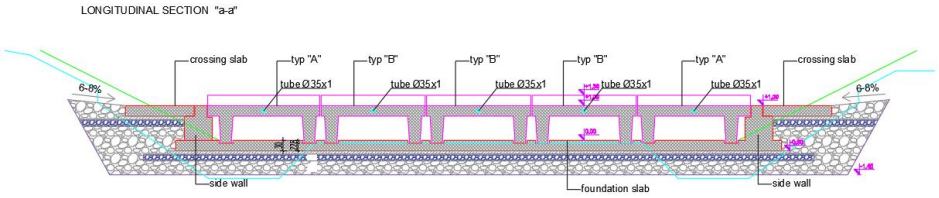

Figure 2. *Temporary crossing structure longitudinal section [1]*

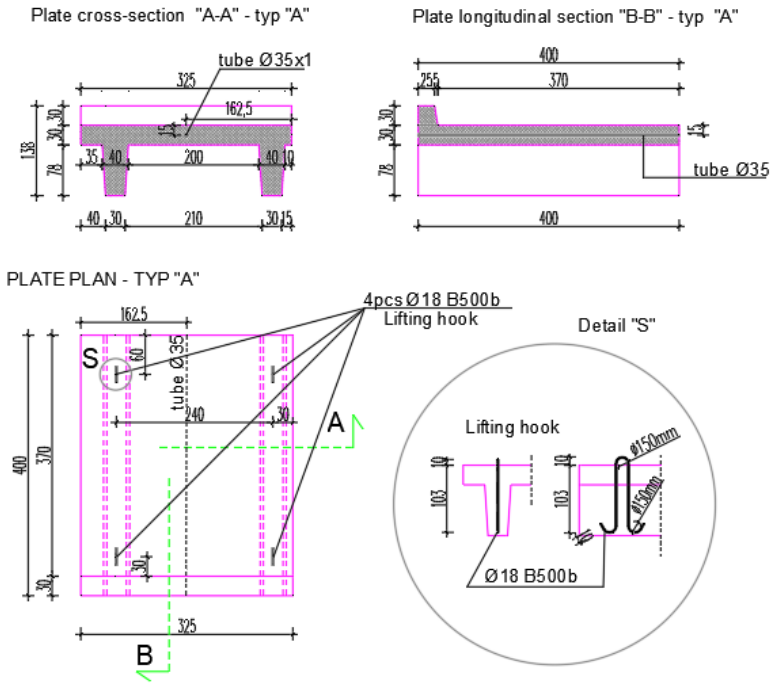

Figure 3. *Assembly-disassembly element longitudinal and cross-section – type "A" [2]*

Assembly of the reinforced concrete elements will be done with a mobile crane. The individual elements weight is around 16 t, the edges are reinforced with steel sheets to increase durability and prevent a manipulative damage. Between the elements, there are 4 cm wide joints, which are sealed after assembly and prevent movement and appearance of instability. The tracks on which the wheels of the mining truck will move are reinforced also with the steel sheets 1.0 m wide and 8 mm thick. On the edge parts of the concrete elements, there are a 30 cm high curb. Figure 3 illustrates the crossing element sections and plate plan.

Dismantling is done with the mining excavators that can access the individual sides of the crossing structure and remove one element at a time, considering the fact that it is necessary to "loosen" the cement mortar joint from the niche in which the individual element of the crossing is placed, what is impossible to do with a crane. Figure 4 illustrates the crossing section final position.

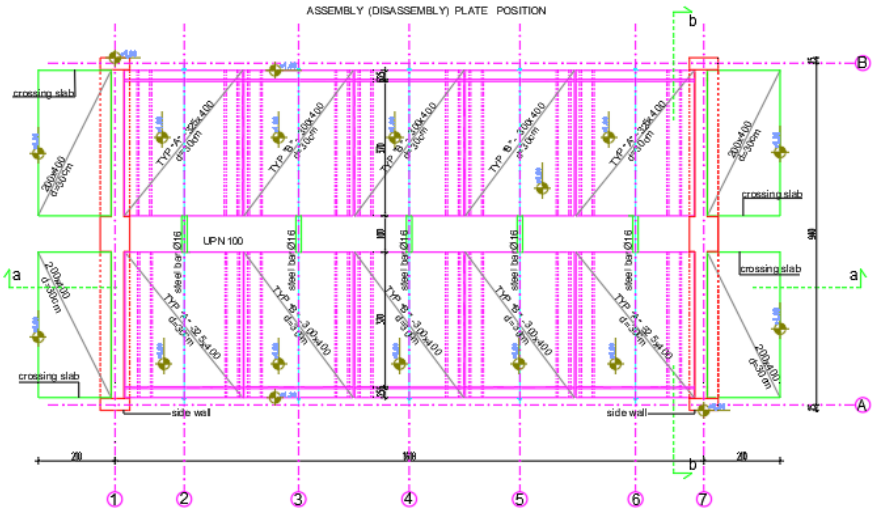

Figure 4. *Assembly-disassembly plate position [1]*

3. CONCLUSION

During the dry period of the year, the continuous transport of overburden and waste to the new Gelja Ljut landfill is enabled via the temporary crossing structure, which enables the fulfillment of the planned dynamics and smooth operation of the Gacko surface mine. Fast manipulation, moving, assembly and disassembly of the crossing elements reduces the costs of its exploitation, and measures to strengthen the sensitive parts of the AB construction enabling its long life. If it is necessary, by creation a new base plate, the coastal side walls and transition plates, at any place along the new Mušnica riverbed, the crossing can be moved and a new one formed. Therefore, the investment is certainly profitable many times over in the future of mine development.

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