

Study for the establishment of a consolidation solution for the county road DJ 178

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Abstract

This paper presents the main aspects of the solution adopted for the consolidation of the county road DJ 178, Comănești, Suceava county. After describing various consolidation solutions currently used in road practice, the study is concentrated on the solution on the use of gabions as main elements for consolidation and side protections in the bridge area designed to protect the road from the destructive actions of the stream Soloneț. Finally, some recommendations for the construction and maintenance of these gabion structures used for consolidation are given.

KEYWORDS: side protection, bridge area, solutions for consolidation, gabion structures.

1. INTRODUCTION

The project is located in the NE of Romania, the central part of Suceava county, about 40 kilometers west of the city of Suceava, 30 kilometers northeast of the town of Gura Humorului and 10 kilometers south of town Cajvana.

The construction site is on the current location of the road DJ 178, the inner territory of the Comănești village, the public domain managed by the mayoralty of Comănești Local Council and Suceava County Council through County Roads and Bridges Suceava.

The road links the towns Humoreni, Bălăceana, Brașca and Ilișești, an alternative road about 200 km shorter than the route Humoreni - Cacica - Pălinoasa - Ilișești. Also this road is particularly important for inhabitants of Comănești as it ensures the access to agricultural land.

The bed of the Soloneț stream splits into approximately two equal parts Humoreni village, the road DJ 178 is the only link between the two sides. In case of the traffic disruption on this road, it would lead between two households located on each side of the riverbed to drive at least 42 km with average tonnage cars.



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Following heavy rains during the summer of 2008 the left side of the stream Soloneț was eroded, with penetration to the main riverbed up to 50 m from the initial position of bank also being eroded the embankment of the road DJ 178 between 27+446 km and 27+516 km, the penetration on the right was about 1.50m in the shoulder and the carriageway.

The bank erosion has occurred because over the years, the coastal inhabitants and the corresponding upstream of riverbed of the second opening of the bridge was clogged and the forest grew, existing tree diameter on the area being between 20 and 40 cm.

The bank erosion has created a twist, upstream of the bridge, which is parallel to the road embankment and the access ramp of the bridge.

Because of the road embankment erosion, the traffic safety is not ensured and the traffic is carried out on a road lane.

The completion of the protection of the road will strengthen at local and county level, those parts of infrastructure which represent the road traffic routes. It represents the cover of the traffic capacity and it states the following:

1. The making of the side protection will ensure the traffic safety and comfort on the road DJ 178.
2. Presented as a link road to several villages of different sizes, the effect will be the attraction of the economic and travel traffic in the area.
3. The strengthened and repaired road will ensure the access of the inhabitants of the both sides of the Soloneț stream.
4. Existence of functional communication channels will allow an exchange of goods with higher expansion of local markets;
5. The work necessary to achieve this construction will be carried out with interwoven materials according to official regulations and in accordance with Government Decision no. 76/1997 and Law no. 10/1995.
6. The presented constructions fall within the proposed priorities for the mayoralty of Comănești and County Roads and Bridges Suceava road network development and maintenance of county interest;

The investment opportunity is permanently given the importance of inter-network transport paths and the settlements in the area and seeks to increase the living standards of residents.

This construction is part of a group of works containing the rehabilitation of the bridge over the Soloneț stream, building an earthen dam to protected with wattle works for routing the water and works on the adjustment of the riverbed.



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2. CONSOLIDATION SOLUTIONS FOR EMBANKMENTS [2]

2.1. Support and consolidation with concrete support wall

These works include:

- concrete retaining walls, the embankment or excavation;
- deep concrete foundations for parapets.

Construction of concrete retaining walls involves the execution of the following elements:

- the work platform;
- the excavation and support of excavation banks;
- execution of the foundation;
- construction of the elevation;
- execution of the drain structure behind the wall.

2.2. Support and consolidation with reinforced concrete support wall

These works include:

- retaining walls of reinforced concrete for embankment or excavation;
- deep reinforced concrete foundation for parapets;
- reinforced gutters.

Achievement works includes the following stages:

- the work platform;
- the excavation and support of banks;
- the reinforcement work;
- the concrete filling;
- execution of the drain structure behind the paper.

2.3. Support and consolidation with gabion support wall

The gabions have the following characteristics:

- are elastic structures capable of withstanding in good condition to any kind of loading;



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- are structures which limited deflection is not a defect but a functional factor, which confirms the cooperation between all the construction elements without reducing its resistance;
- are draining structures.

The construction of gabion support walls involves the following stages:

- the work platform;
- the excavation and support of the excavation banks;
- construction of the foundation;
- execution of the elevation.

3. THE PROPOSED SOLUTION

The best solution in economic terms to resolve all issues directly or indirectly to ensure road safety and protection of households in the area is the achievement of gabion support wall to protect the embankment, an earthen dam protected with wattle works and an adjustment of the riverbed.

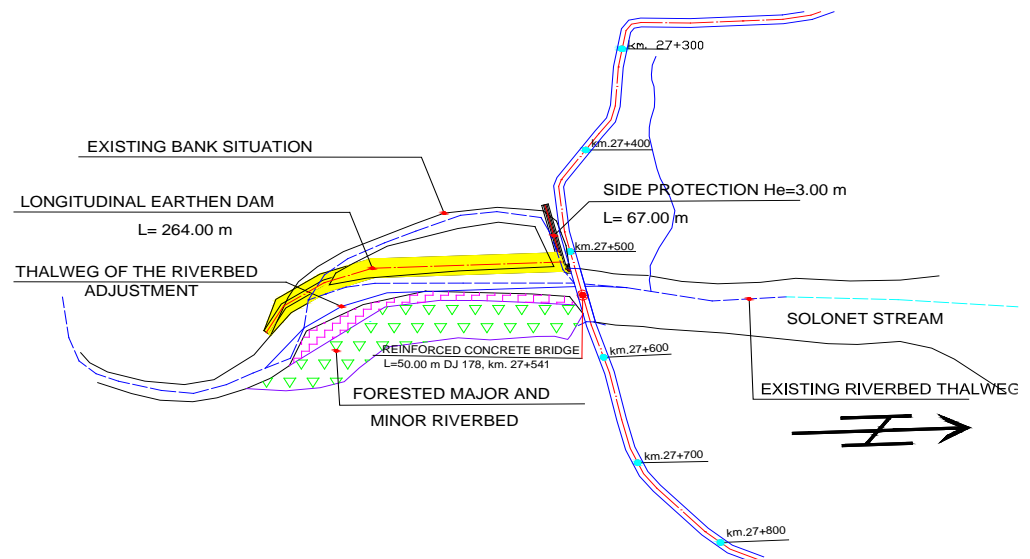


Figure 1. The proposed solution



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Table 1. Description of the constructions

Nr. crt.	Elements	Characteristics
1	Support gabion wall	- He = 3,00 m, - mattress 0,50 x 4,00 x 4,00 m - length 67,00 m
2	Longitudinal earthen dam	- filled section = 56,20 mp - wattle works at the base of the dam on a slope width of 5,00 m - width to canopy 5,00 m - height 2,50 – 4,70 m - dam length 264,00 m
3	Riverbed adjustment	- riverbed adjustment length 264,00 m - flow section ensured in the minor riverbed is 41,00 mp

3.1. Side protection with support gabion wall

The total length of the support wall with $he=3.00$ m is 67.00 m, the longitudinal earthen dam is 264.00 m and the riverbed adjustment will be made on a length of 264.00 m upstream left of the bridge. The support wall will be done in gabions arranged as:

- mattress gabion 0.50 x 4.00 x 4.00 m;
- gabion 1.00 x 2.00 x 4.00 m;
- 1.00 x 1.50 gabion x 4.00 m;
- gabion 1.00 x 1.00 x 4.00 m;
- to protect the wire mesh against floaters actions it will have to execute a 10 cm thick concrete screen.

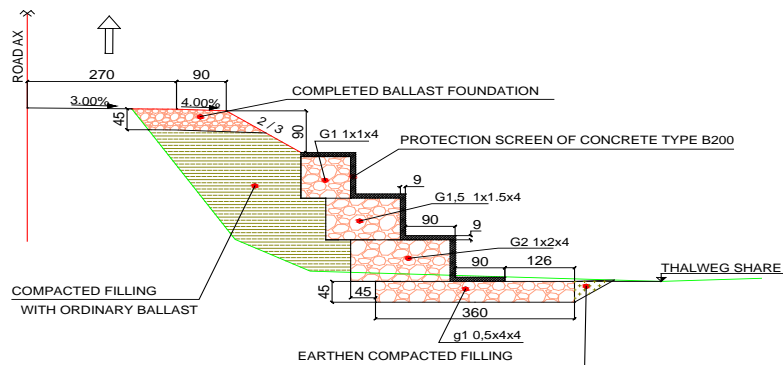


Figure 2. Transversal section of support wall and embankment protection $He=3,00$ m



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The execution of support and protection wall:

- road signs to ensure continuity of traffic;
- construction of earthworks consisting on excavation until the foundation depth of the mattresses are reached;
- the mattresses are placed in situ, the seams between the mattresses are executed and the river rocks stuffing is executed;
- the gabions 1.00 x 2.00 x 4.00 m are placed, clamping the seams running between gabions and between gabions and mattresses;
- implement the filling behind the gabions 1.00 x 2.00 x 4.00 m;
- the gabions 1.50 x 1.00 x 4.00 m are arranged and then bonded with seams between gabions fixtures;
- construct the filling behind the gabions 1.00 x 1.50 x 4.00 m;
- arrange the gabions 1.00 x 1.00 x 4.00 m and connect with seams the gabions fixtures;
- place the filling behind the gabions 1.00 x 1.00 x 4.00 m;
- execute formwork for achieving the concrete screen;
- the concrete for the screen is poured;
- execute the road embankment filling supplement;
- adding a filter, insulating and protective layer of sandy ballast 25 cm thick;
- is made the compaction of the filter, protective and insulator layer;
- execute the expanding foundation layer of ballast in 25.00 cm thick and the shoulder.

3.2. Earthen routing dam protected with wattle works

Longitudinal dam with trapezoidal section with the canopy width of 5.00 m, sides with slope 2 / 3 and height between 2.50 m and 4.70 m, maximum height of the gabion support wall. The protection of the dam will be with wattle works the slope on the side of the stream.



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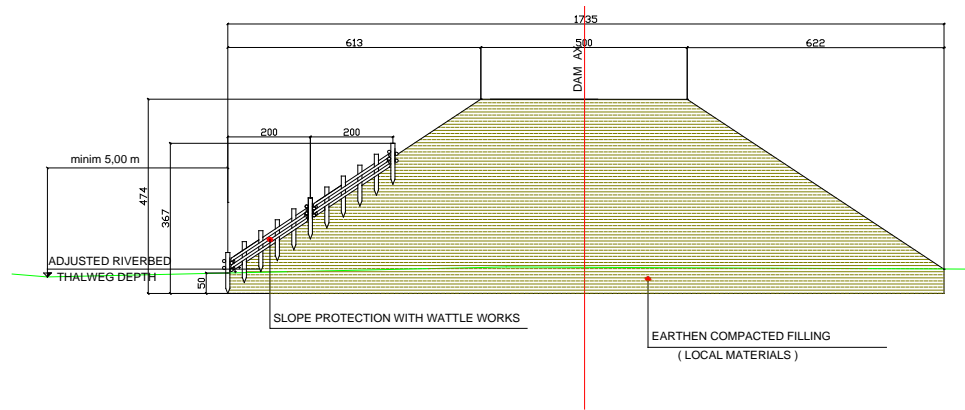


Figure 3. Transversal section of the routing dam

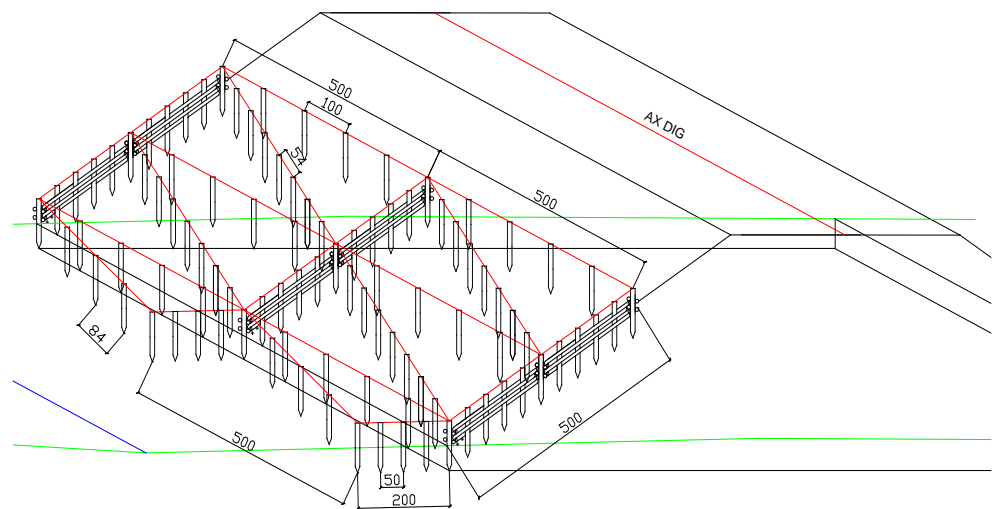


Figure 4. Wattle work arrangements



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Execution of earthen dam lengthwise involves:

- consisting earthwork excavation up to foundation level;
- leveling and compaction in successive layers of dam body;
- finish slopes and crown;
- place wattle works;
- placing wooden spikes made from deciduous trees on route fences;
- placing the mat of twigs in the coastal fences;
- place the filling inside compacted wattle works;
- sowing grass on the slope and the dams crown.

3.3. Riverbed adjustment

Soloneț stream bed will be adjusted, the average drainage section will be made on trapezoidal dimensions 25.00 / 29.50 / 1.50 m (41.00 sq m).

Running adjustment riverbed:

- cleaning mud materials, dirt;
- implementation of the excavation for unclogging the riverbed;
- transport and storage material in the dam area by pushing the bulldozer;
- finish the bank slope with bulldozer;
- finishing bottom of whites executed by bulldozer.

4. RECOMANDATIONS

1. Periodic verification and monitoring the performance in time of the construction:

- the support wall must be verified for the occurrence of fissures and cracks in concrete screen, ruptures, dislocations, displacements, erosions, piping
- to monitor the earth dams fissures, cracks, subsidence, piping, wattle works damages
- the riverbed adjustment should be monitored following phenomena of the emergence of meanders, changing course, the occurrence of natural plantings, deposits of material, plant debris, erosions of the shore



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2. It will follow especially exposed damaged parts (joints, structural, roadway, curbs).

3. Data from periodic checks shall be kept on file by the recipient and the file work will be interpreted for the proposed remedial measures in terms of occurrence of special events such as:

- traffic accidents;
- explosions;
- transport gauge;
- appearance the visible strains;
- floods, earthquakes;
- landslides;
- fires caused by fuel tanks located in or above the limit of safety.

References

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