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ROAD BYPASS AROUND THE CITY OF BRČKO - PRESENTATION OF THE SPECIFICS OF THE PROJECT AND CONSTRUCTION OF THE BYPASS

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Abstract

The creation of the Main Project for the Bypass around the city Brčko, based on the Conceptual Project for the construction of the part of the future highway Bjeljina- Šamac highway, is presented. It was requested to change the project assignment from a highway to a bypass road solution with level junctions. Due to an earlier initiation of the land expropriation process, it was not possible to change the ground plan elements according to the route from the Conceptual Project. In accordance with the project terms of reference, The Conceptual Project was refined for the purpose of its optimization in cooperation with the Client's team of experts. The paper will present the process and specifics of creating project documentation, under the minimum conditions of legal and technical local regulations and the actual construction of the road section.

Keywords: bypass, project, junction, structures, environment, drainage and waterprotection, construction

1 Introduction

Concentration of the most intensive streams of transit, origin-destination, and local traffic was within the central city zone (before the Bypass construction), with all its consequences in terms of available services, traffic safety, negative environmental impacts etc. The inner-city roads were markedly unadjusted to the intensity and structure of traffic streams, and attempts are being made to remedy that by widening the intersections in city and by increasing maintenance budget. The client, the Government of the Brčko District, made a decision to proceed with the creation of the main project documentation (hereinafter referred to as Project) for the construction of the Ring Road around the city of Brčko (hereinafter referred to as Bypass), from Gredice to Gorice, in the length of 18,68 km. The goal of the Project was to relocate the transit traffic from the existing major road M14.1 which passes through the center of Brčko.
The Bypass route partly overlaps with the route of the planned Bijeljina-Šamac motorway. Since it was not likely that the said motorway will be built in the near future, the Client decided that the Bypass would be built as a main road with intersections at level. In terms of traffic, the construction of the Bypass had an impact on the entire road network of the Brčko District, including the street network of the city of Brčko. At the same time other specific goals were achieved, such as increasing safety for all road users, a more favourable impact on the environmental, etc.

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2 Change of project task

The initial basis for the Project was the Conceptual Project for the Bypass around the city of Brčko (IPSA Institute Sarajevo, 2004). The Location permit has been obtained (3 June 2009) as well as the certificate that the issued Location permit conditions have not been altered (Request for Construction had not been submitted within a year so the permit was still valid as such). The Conceptual Project, in keeping with the terms of reference, has been amended in order to optimise it in collaboration with the Client's team of experts, through several important points:

- In order to be able to plan at-grade junctions and roundabouts, the design speed, proposed by the terms of reference, has been reduced.
- The types of intersections and their locations, and thus the longitudinal profile of the Bypass, have been additionally modified.
- Road intersections with major and regional roads have been designed as roundabouts (the grade-separated intersection from the Conceptual Project), while intersections with local roads have been designed as at-grade junctions.
- The structure spans are conditioned by the geotechnical conditions for the load-bearing capacity of foundation soil and the deficit of material for the construction of embankments. The max. embankment height of 8 m has been selected.
- The cross-section has been amended in keeping with the planned traffic requirements.
- Except via intersections, other local or rural roads to the Bypass. Roads, which have been cut off because of the Bypass, have been connected via parallel roads along the route.
- The Project proposes locations for the roadside service facilities plateaus. Two locations have been selected in keeping with the Location permit, and the third one has been added in keeping with an agreement with the Client.
- Interaction with the existing electrical installations has not been addressed in the Conceptual Project or in the tender documents. Those installations have been considered and addressed in detail in the Project, in keeping with the electrical power distribution requirements.

Since the Government of the Brčko District has started the land expropriation process in keeping with the route from the Conceptual Project, it was not possible to modify the plan view elements of the route even though it would have made sense in terms of route optimisation, i.e. the sequence of geometrical elements, and thereby the overall solution. Modifications of the route have been performed on the longitudinal profile mostly (by optimising the grade line).

2.1 Description of the bypass solution

The beginning of the bypass is at km 0+000, where the route diverges from the M14.1 major road just outside the village of Gredice, at the entrance into Brčko from the direction of Bijeljine. Passing by the villages the route emerges at the Greda plateau, in continuation crosses the bridge across the valley of the Gabela stream and continues south of Omerbegovača. It bypasses Brod, Kolonija and Grbavica in a large arc, only to join the M14.1 in the village of Gorice. The Bypass route around the city of Brčko passes to the south-east of city mostly through flat terrain composed of low terraces along the river Sava and its tributaries: Tinja, Brka and Zovički potok. The route crosses a numbers of the existing paths that fan out from the city to the south. Site investigations and laboratory testing were performed in the period between November 2012 and January 2013, while the preparation of data and the entire geotechnical design was completed by June 2013.

Figure 1 Route location of the Brčko Bypass [1]

In agreement with the Client, the amendment and revision of the Conceptual Project have been carried out through conducted analyses and presentations to teams according to their subject matter. Based on the precise topographic survey of the terrain and geotechnical investigation works in the route corridor, the route grade line has been optimised, as well as exterior drainage, intersections, junctions and other parameters. The necessary amendments of the Conceptual Project have been conducted.

2.2 Road intersections

The route intersects with a series of regional and local roads as well as with the Brčko – Banovići railway line. The Bypass crosses over the railway line via the Pruga Bridge, with provided clearance for the reconstruction of the existing single-track line as well as for the planned extension of the second track (in compliance with the conditions of railway administration). Other intersections with the regional and more important local roads have been proposed as roundabouts (intersections with regional roads), and as at -grade junctions (intersections with more significant local roads):

- Gredice roundabout : division from the Bypass towards city at the beginning of the route and connection of a local road (figure 2.)
- Čelić roundabout: intersection with the R425 regional road
- Gornji Zovik at-grade junction: intersection with a local road towards Gornji Zovik
- Cerik roundabout: intersection with the R460 regional road towards Cerik (figure 3.)
- Ulice at-grade junction: intersection with a local road for Ulice (figure 4)
- Gorice roundabout: division from the Bypass towards city at the end of the route and connection of a local road (figure 5).


Figure 2 View of the constructed Gredice roundabout [2]

Figure 3 View of the constructed Pruga bridge and Cerik roundabout [1]

Along with the above mentioned more significant intersections, the Bypass cuts across a series of local, uncategorised and agricultural roads of less importance. There is a series of larger and smaller structures on the route for letting the watercourses through and letting the paths across.

Figure 4 View of the constructed Ulice at-grade junction [1]

Figure 5 View of the constructed Gorice roundabout [1]

There are five (5) overcrossings (Kobilić, Brezik, Ražljevo, Barica and Grbavica), and two (2) undercrossings (Cincerovo polje and Pljoštare).

Figure 6 View of the constructed overcrossing Ražljevo [2

Figure 7 View of the constructed overcrossing Grbavica [1]

Interrupted roads are connected by service roads total length 23.627,11 m. The Project specifies traffic surfaces of the roadside service facilities on the right side of the bypass. Roadside service facilities type C have been proposed, with a car park, a petrol station and toilette facilities. Lay-bys – car parks at approx. 2 km intervals have been proposed on the bypass route on both sides of the road.

2.3 Watercourse regulation

In places the Bypass route collides with the existing watercourses; technical solutions have been provided for the regulation of those watercourses in compliance with the conditions of the Water Management Department in charge. The Bypass route collides with river Brka, Gabela stream, Zmajevac stream, Grabovica stream, Kriva bara stream and Lukovac stream. Approximately 560 m alter course regulations have been designed.

2.4 Drainage and water protection

Controlled drainage system was implemented at the Bypass which implies that no water may overflow from the pavement onto the surrounding terrain. All the water from the pavement is collected with devices in a controlled manner and conveyed to a treatment plant via a closed sewerage system and further on to the recipient. The proposed length of the watertight drainage system is approx. 22,700 m and consists of concrete sewerage pipes with slots min. DN 300 mm in diameter. At least some 24,400 m of open exterior drainage canals has been proposed. 19 facilities for primary treatment of polluted storm water from traffic surfaces have been proposed, which are basically the so-called oil and grease separators where separation of sedimented and floating substances will take place prior to being discharged into the existing natural watercourses.

2.5 Design of the road markings and traffic signs, road furniture

Solution for road markings, traffic signs and lights and road furniture at and around the bypass traffic surfaces, intersections, bridges, overcrossings and roadside service facilities has been elaborated in detail in the Projects for road furniture, road markings and road signs for the bypass, all in compliance with applicable regulations, standards and location permits. The design includes road markings, traffic signs and road furniture for the final condition of the bypass and essential temporary road markings, traffic signs and road furniture during the performance of works.

2.6 Cut stabilisation with gabion wall

Cut slopes which are over 6 m high were stabilised with a retaining structure. The design proposed slope stabilisation by constructing a gabion wall in 1 m wide rows using rock fill from the gabion wall.

2.7 Landscape design

The landscape (horticultural) design addresses the preparation of intersection surfaces and proposes the preparation of the roadside service facilities surfaces. This design specifies all required plant varieties and the planting plan. In keeping with the requirements of the environmental impact assessment, the landscape design includes possible rehabilitation of forest edges, slopes, noise protection barriers etc.

2.8 Noise protection report

The Project analysed the necessity for noise protection so the designer has included recommendations from the Environmental impact assessment of the Bypass and other findings related to environmental protection from the documentation development stage. There are 5 locations at which noise exceeds limit parameters. The two locations are situated in intersection zones. No noise protection has been proposed for the intersection zones due to the fact that lower speeds are expected there (speed limits) as well as because construction of noise barriers would disrupt visibility and safety at approach roads to intersections. Noise levels at the facilities situated at the other three locations are just above the allowable limit, it has been recommended that noise protection be implemented though passive measures, i.e. by putting up facades, putting in good-quality windows etc.

2.9 Structures

Nineteen (19) structures are planned on the bypass route, twelve bridges, 5 overpasses and 2 underpasses. By developing project documentation at the level of the Project, the level was additionally corrected in order to ensure a smooth connection of the existing local and agricultural roads, which further increased the required span of the structures. Five (5) types of structures are foreseen:

- TYPE I – concrete prestressed structure with spans of 32 and 25.6 m. Along with these spans, a 20 m span has been designed as well in certain combinations. In terms of statics, structures were designed as continuous and as static systems of simple-supported beam.
- TYPE II - reinforced concrete structures with spans of 12.8 and 16.0 m. In terms of statics, structures were designed as continuous and as static systems of simple-supported beam.
- TYPE III (underpass structure) - reinforced concrete frame superstructure , with span of 6,0 and 7,7 m. The structure does not have the usual substructure or superstructure.

- TYPE IV (overpasses across the route) - concrete prestressed structure with spans of 25.5 m long, as static systems of simple-supported beam.
- TYPE V (overpasses across the route) – reinforced concrete monolithic structures with spans of 12.8 and 16.0 m. In terms of statics, structures are designed as continuous.

With the development of the Project, the total length of the structures, which was approx. 380 m in the Conceptual Project, was increased to 1400 m. For the better insight into the complexity of the design, an overview of the structure is provided by figure 8. and 9.

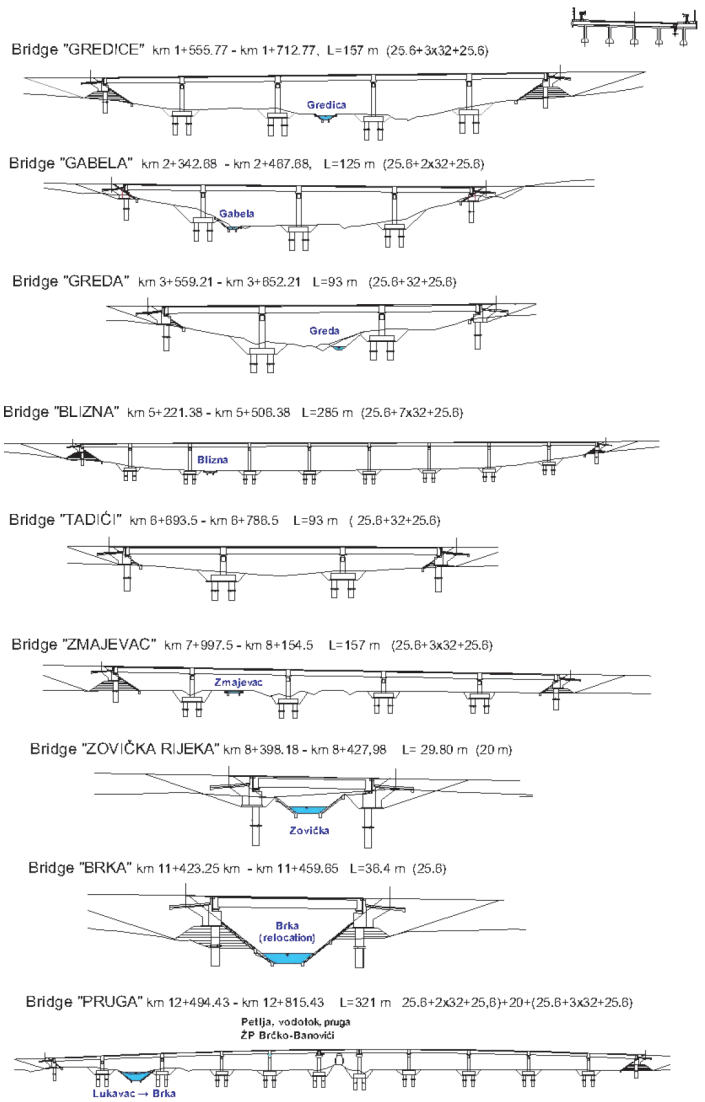

Figure 8 Structures – bridges [3]

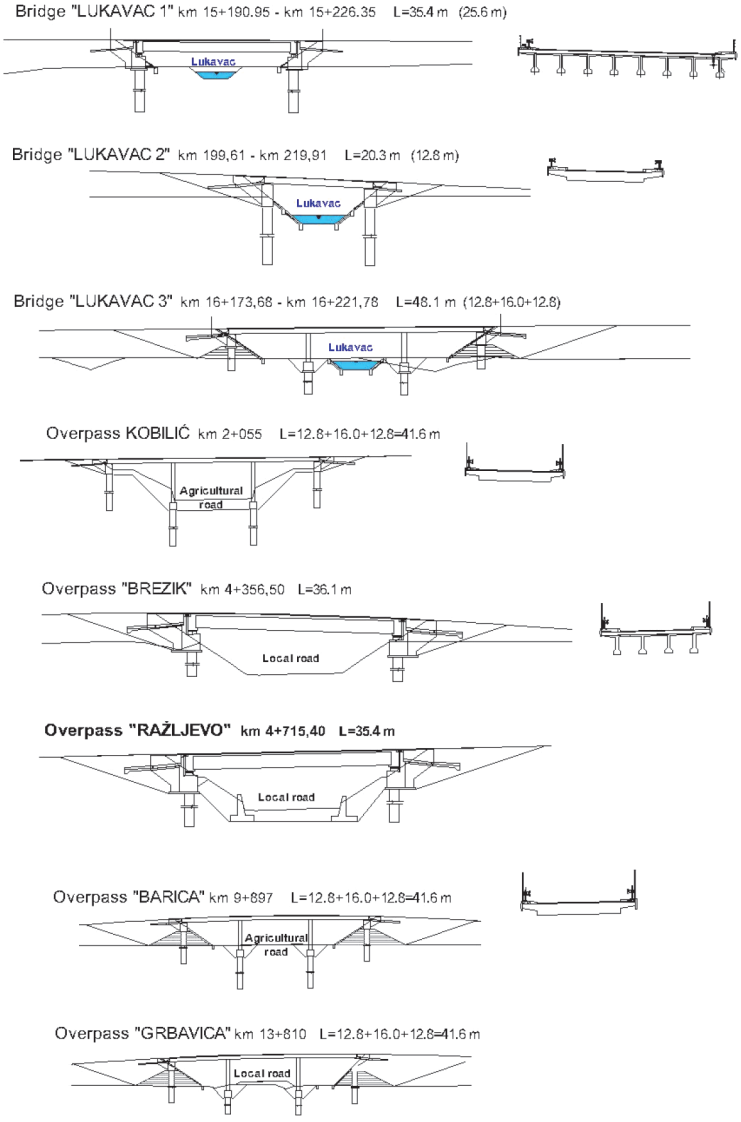

Figure 9 Structures – bridges and overpasses [3, 4]

2.10 Installation design

Based on construction drawings and documents for the Bypass and in cooperation with the Client and municipal companies (installation owners), collision points have been established between the Bypass and the existing installations, and a design solution developed for that collision (relocation or protection, in keeping with the conditions from the owners). Intersections between LV (low voltage) and HV (high voltage) lines (32 crossings or intersections) and the bypass have not been addressed in the Conceptual Project and special requirements were not obtained for the intersections from supply and distribution (Brčko Mu-

nicipal company). Special requirements for power distribution have been obtained through the Project and solutions have been proposed for the collisions.
Installations of the water supply system are protected or relocated in keeping with the distributor's requirements as presented in the Project. There were no sewerage or gas installations on the Bypass route. The existing telephone installations were protected according to special requirements from the operators. Projects for new installations (electrical, telecommunication, lighting and water supply installations etc) have been developed for the purposes of the Bypass facilities and equipment (intersections, roadside service facilities).

3 Conclusion

During the work on the Project, a number of problems appeared such as: the problem of mined terrain, difficulty in obtaining consent, slow response from the Client regarding some open issues (requests for deviations from the project assignment, requests for additional works, contacts with other parts of the project, etc.), requests and conditions of certain institutions arrived late, long waiting for peer review reports. Despite all the difficulties, changes along the way and additional requirements, the Project was successfully completed and implemented. Construction of the Bypass began in August 2015. It was put into traffic in July 2019 under a temporary special regime with a speed limit of 60km/h. The technical inspection was completed in April 2020, and the previous bans were lifted. About 6000 vehicles pass through the Bypass every day, of which approximately 1000 are trucks [2].
There are multiple benefits of building a Bypass from a traffic and environmental point of view Traffic through the city has been relieved of transit traffic, especially traffic of heavy goods vehicles, and the quality of life and air in the city itself has been raised. Th traffic relief in the city has enabled a simpler reconstruction of local roads in the city and suburban settlements.

References

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