

RECONSTRUCTION OF THE KRAJIŠKIH BRIGADA STREET AT BANJA LUKA FOLLOWING THE COMPLETE STREETS CONCEPT

REKONSTRUKCIJA ULICE KRAJIŠKIH BRIGADA U BANJOJ LUCI PREMA KONCEPTU KOMPLETNIH ULICA

Nikola Damnjanović¹
Igor Jokanović²
Milica Pavić.²
Mila Svilar²

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Summary: The complete street is a form of planning and space management, with the aim of providing safe access to all participants in traffic, and as such brings a certain change compared to the traditional approach to planning and designing urban roads. The paper presents an analysis of the existing conditions and restrictions in the area of Krajiških brigada Street in Banja Luka on the stretch from Ranka Šipke Street to Milana Radmana Street, and the adjustment of the cross section and alignment to the concept of complete streets.

Keywords: complete street, reconstruction, access, pedestrians, bicycling, parking

Rezime: Kompletna ulica predstavlja formu planiranja i upravljanja prostorom sa ciljem da se omogući bezbedan i ugodan pristup svim učesnicima u saobraćaju. Kao takav ovaj pristup predstavlja značajnu promenu u odnosu na tradicionalni pristup planiranju i projektovanju gradskih saobraćajnica. Ovaj rad prikazuje analizu postojećih uslova i ograničenja u zoni ulice Krajiških brigada u Banjoj Luci na potezu od ulice Ranka Šipke do ulice Milana Radmana, te prilagođavanje poprečnog profila i trase konceptu kompletnih ulica.

Ključne reči: kompletna ulica, rekonstrukcija, pristup, pešaci, biciklisti, parking

1. INTRODUCTION

The accelerated settlement and expansion of cities in the second half of the XX century and the beginning of the XXI century invoked the need to satisfy the growing demand for the transport of passengers and goods in large territories that such units cover. A decades-long approach to meeting that demand with an appropriate supply, especially through the construction of traffic infrastructure, has led to

1. UVOD

Ubrzano naseljavanje i širenje gradova u drugoj polovini XX i početkom XXI veka je uslovalo potrebu zadovoljavanja sve veće potražnje za prevozom putnika i roba na velikim teritorijama koje takve celine pokrivaju. Decenijski pristup zadovoljavanja te potražnje odgovarajućom ponudom, i to naročito putem izgradnje saobraćajne infrastrukture, je doveo do autcentrično orijentisanih urbanih

¹ Nikola Damnjanović, Master Civil Eng., Valjevo, Republic of Serbia, Serbia, e-mail: damnjanovic.nikola992@gmail.com

² University of Novi Sad, Faculty of Civil Engineering Subotica, 2a Kozaračka Str., Subotica, Republic of Serbia, e-mail: jokanovici@gf.uns.ac.rs; pavic953@gmail.com; mila.svilar@gmail.com

autocentric oriented urban areas. Practically, everything that satisfies the needs of passenger motor traffic was taken into account, while other traffic participants were (un)intentionally left aside and/or neglected. This way of planning and designing, and thus the construction and exploitation of traffic infrastructure, has led to big problems in many cities worldwide - looking from the aspect of normal, safe and functional life, and the movement of the population within urban units. Excessive jams (and congestions) caused by the increasing use of passenger vehicles, integration of all participants in motor traffic at the same traffic surface, and thus the slow movement of public transport vehicles - all these are key problems in terms of safety and comfort of participants in traffic.

Although this has been a problem for decades, it was necessary to find a solution that would effectively reduce congestions, while enabling equal and safe treatment of all their users.

Thus, the first, pragmatic example of changes within the transport infrastructure is appearance of a fast bus transport (Bus Rapid Transit - BRT). The aim of this concept is to provide separated areas within the urban road cross section for urban public transport. In addition to reducing congestion, the concept also assumed the full functionality of public transport vehicles, which in the case of good organization could serve as a replacement for the subway. The pioneer in application of this concept was Brazilian city of Curitiba (1963). After the great success, the concept was "copied" in some other cities of South America which then became a specific base of knowledge and experience for wide application in the world. The inspiration for modern BRT systems was (to date) the largest such system used in the world - "Transmilenio" in Bogota, the capital of Colombia [1, 2]. As a multi-million city

sredina. Praktično je vođeno računa o svemu što zadovoljava potrebe putničkog motornog saobraćaja, dok su ostali učesnici u saobraćaju (ne)namerno ostavljani po strani i/ili bivali zanemareni. Ovakav način planiranja i projektovanja, pa samim tim i izgradnje, odnosno eksploatacije saobraćajne infrastrukture je u mnogim svetskim gradovima doveo do velikih problema sa aspekta normalnog, bezbednog i funkcionalnog života, i kretanja stanovništva u okviru gradskih celina. Prevelike gužve (i zagušenja) izazvane sve većom upotrebom putničkih vozila, integracija svih učesnika motornog saobraćaja na istu saobraćajnu površinu, a samim tim i usporeno kretanje vozila javnog gradskog prevoza - sve to su ključni problemi u pogledu bezbednosti i udobnosti učesnika u saobraćaju.

Premda ovo predstavlja višedecenijski problem, bilo je potrebno pronaći rešenje koje će efikasno smanjiti zagušenja, a istovremeno omogućiti ravnopravan i bezbedan tretman svih njihovih korisnika.

Tako se kao prvi, pragmatičan primer promena u okviru saobraćajne infrastrukture javlja brzi autobuski prevoz (Bus Rapid Transit - BRT). Cilj ovog koncepta je da se obezbede zasebne površine u okviru profila saobraćajnice za javni gradski prevoz. Osim smanjenja gužvi, koncept je pretpostavio i punu funkcionalnost vozila javnog gradskog prevoza koja bi u slučaju dobre organizovanosti mogla poslužiti kao zamena za metro. Pionir u primeni ovog koncepta je bio brazilski grad Curitiba (1963). Nakon velikog uspeha, koncept je „kopiran“ u još nekim gradovima Južne Amerike koja tako postaje svojevrsna baza znanja i iskustva za široku primenu u svetu. Kao inspiracija za moderne BRT sisteme je poslužio (do danas) najveći ovakav sistem koji se primenjuje u svetu - „Transmilenio“ u Bogoti, glavnom gradu Kolumbije [1, 2]. Kao višemilionski grad sa lošom saobraćajnom infrastrukturom

with poor transport infrastructure and pronounced local and international influx of population due to migration, both for economic and political reasons, and due to the lack of capacity to establish subway transport, the BRT system was built and introduced in 2000. Today, "Transmilenio" system encompasses infrastructure of 12 lines in total, 112 km long with about 1,500 busses and average of approximately 1.5 million passengers which are using this type of transport on a daily basis.

Meanwhile, in the 1970s, the United States of America (USA) increasingly considered what needed to be done to improve the safety of pedestrians and bicyclists in traffic [3]. The idea named "routine accommodation" was initially considered in the Federal State of Oregon (1970), and later in Florida (1984). The idea had one goal - serious changes and development of new ideas related to the safety of pedestrians and bicyclists as equal participants in traffic. The "routine accommodation" approach gets new name during 2003, today well known as "complete streets concept". The 2010 Federal Law on Transport emphasizes the needs of pedestrians and bicyclists as equal, but also endangered participants in traffic, and recommends changes in the methods of designing, i.e. providing a certain (specific) area for their movement in order to increase safety, and thus in fact "paves the way" for the practical application of the complete streets concept.

The complete street, created through this initiative, is a new form of planning and space management with the aim of providing safe and comfortable access to all participants in traffic, from individual motor vehicles and urban public transport (including BRT), through motorcyclists and bicyclists, to pedestrians. Using the complete streets concept significantly changes the traditional approach to planning and design, and consequently the operation of urban roads [4]. The main

i izraženim lokalnim i međunarodnim migracionim prilivom stanovništva, kako iz ekonomskih tako i političkih razloga, a usled nedostatka kapaciteta za uspostavljanje metro prevoza, BRT sistem je izgrađen i počeo sa radom 2000. godine. Danas „Transmilenio“ sistem sadrži infrastrukturu od ukupno 12 linija dugačkih 112 km, sa oko 1.500 autobusa i prosekom od oko 1,5 milion putnika koji svakodnevno koriste ovaj vid transporta.

U međuvremenu, 70-ih godina prošlog veka u Sjedinjenim američkim državama (SAD) se sve više razmišlja o tome šta je potrebno uraditi po pitanju unapređenja bezbednosti pešaka i biciklista u saobraćaju [3]. Ideja nazvana „routine accommodation“ se za početak razmatra u saveznoj državi Oregon (1970), a kasnije i na Floridi (1984). Ideja je imala jedan cilj - ozbiljne promene i razvoj novih ideja u pogledu bezbednosti pešaka i biciklista kao ravnopravnih učesnika u saobraćaju. „Routine accommodation“ pristup u toku 2003. godine dobija novi naziv, danas poznatiji kao koncept kompletnih ulica. Federalni zakon o saobraćaju iz 2010. godine stavlja akcenat na potrebe pešaka i biciklista kao ravnopravnih, ali i ugroženih učesnika u saobraćaju, i preporučuje izmene u načinima projektovanja, odnosno obezbeđivanja određene (posebne) površine za njihovo kretanje u cilju povećanja bezbednosti, i time faktički „utire“ put praktičnoj primeni koncepta kompletnih ulica.

Kompletna ulica, nastala kroz ovu inicijativu, predstavlja novu formu planiranja i upravljanja prostorom sa ciljem da se omogući bezbedan i ugodan pristup svim učesnicima u saobraćaju, od pojedinačnih motornih vozila i javnog gradskog prevoza (uključujući i BRT), preko motociklista i biciklista, do pešaka. Korišćenjem koncepta kompletnih ulica sa značajno menja tradicionalni pristup planiranju i projektovanju, a posledično i eksploataciji saobraćajnica u gradovima

characteristic of the concept is that, unlike the traditional approach to the design of urban roads (functional classification, design speed, traffic volume), the reverse approach is applied - design decisions are based on data that describe the urban road itself, as well as hierarchical priority [5], in order to meet the needs of the entire community and infrastructure users, and to ensure an appropriate level of safety.

In the former Yugoslavia, there were certain indications of the design and implementation of urban roads in newer urban settlements (created in the 60s and 70s of the last century) that are similar to the complete streets concept, but lacking its full implementation, even in recent times when (at least declaratively) the concept of sustainable urban mobility is supported and forced, with transportation infrastructure as one of the main components. This paper presents possibility of application of the concept in the zone of Krajiških Brigada Street in Banja Luka, at the stretch from Ranka Šipke Street to Milana Radmana Street, using the analysis of the existing conditions and limitations and adjustment of cross section, alignment and intersections to the complete street concept.

2. EXISTING CONDITION

Initially, Krajiških brigada Street had a regulation width of about 18.0 m, which is not enough for a solution using the complete streets concept (optimal regulation width is 38.0 m). Within the stated regulation width, there were areas for road traffic (total width about 6.0 m) and two, mostly unarranged pedestrian walkways. Access to the main street was provided directly and uncontrolled from the surrounding facilities (residential and commercial buildings) leading to frequent interruptions of through traffic and traffic

[4]. Osnovna karakteristika koncepta je da se, za razliku od tradicionalnog pristupa projektovanju gradskih saobraćajnica (funkcionalna klasifikacija, računaska brzina, saobraćajno opterećenje), primenjuje obrnuti pristup - odluke oko projektovanja se zasnivaju na podacima koji bliže opisuju samu saobraćajnicu, kao i na hijerarhijskom prioritetu [5], sa ciljem da se zadovolje potrebe kompletne zajednice i korisnika infrastrukture i osigura odgovarajući nivo bezbednosti.

Na prostoru bivše Jugoslavije su postojale određene naznake projektovanja i realizacije gradskih saobraćajnica u novijim gradskim naseljima (nastalim 60-ih i 70-ih godina prošlog veka) koje su slične konceptu kompletnih ulica, ali je njegova potpuna realizacija izostala, čak i u novije vreme kada se (barem deklarativno) podržava i forsira koncept održive urbane mobilnosti čija je jedna od glavnih komponenti saobraćajna infrastruktura. U radu se prikazuje mogućnost primene koncepta u zoni ulice Krajiških brigada u Banjoj Luci na potezu od ulice Ranka Šipke do ulice Milana Radmana, i to kroz analizu postojećih uslova i ograničenja, te prilagođavanje poprečnog profila, trase i ukrštaja konceptu kompletnih ulica.

2. POSTOJEĆE STANJE

Inicijalno, ulica Krajiških brigada je imala regulacionu širinu od oko 18,0 m, što nije dovoljno za rešenje prema konceptu kompletnih ulica (optimalna regulaciona širina iznosi 38,0 m). U okviru navedene regulacione širine su se nalazile površine za kolski saobraćaj (ukupne širine oko 6,0 m) i dve, na većem delu neuređene pešačke staze. Pristup glavnoj drumskoj saobraćajnici je bio omogućen direktno i nekontrolisano sa okolnih sadržaja (stambeni i komercijalni objekti) tako da je često dolazilo do ometanja protočnog

accidents.

In the meantime, the reconstruction of this significant urban road took place and the profile of two traffic lanes in each direction separated by median reserve (predominantly 1.5 m wide) (Figure 1) was provided. Additionally, both-sided edge greenery (variable widths) and, only partially, parallel service roads (about 3.0 m) were provided to ensure the collection of traffic from residential and commercial buildings and the controlled introduction into the main flow. At the time of reconstruction, due to the requirement to minimize interference with private property and provide access to primarily commercial facilities, the complete arrangement of service roads and ensuring safe and comfortable pedestrian and especially bicycle traffic, which can be considered important in the area of Banja Luka, was missed. Additionally, parallel parking was enabled at one part of the urban road, directly from the through lane that serves express traffic. This parking method was applied due to access (buyers and suppliers) to commercial facilities and in response to the requests of owners of these facilities in relation to the impact on business. However, along certain segments of the urban road, short-term parking was turned into long-term by users.

saobraćaja i saobraćajnih udesa.

U međuvremenu je obavljena rekonstrukcija ove važne gradske saobraćajnice i obezbeđen profil od po dve saobraćajne trake u svakom smeru koje su odvojene srednjim razdelnim pojasom (pretežno 1,5 m širine) (Slika 1). Dodatno je obezbeđeno obostrano ivično zelenilo (promenljive širine) i, samo delimično, paralelne servisne saobraćajnice (oko 3,0 m) kako bi se osiguralo prikupljanje saobraćaja od stambenih i komercijalnih objekata i kontrolisano uvođenje u glavni tok. U momentu rekonstrukcije je, zbog zahteva što manjeg ometanja privatnih poseda i obezbeđenja pristupa prvenstveno komercijalnim objektima, propušteno kompletno uređenje servisnih saobraćajnica i osiguranje bezbednog i ugodnog pešačkog, a naročito biciklističkog saobraćaja koji se može smatrati značajnim na području Banjaluke. Dodatno je omogućeno i podužno parkiranje na jednom delu saobraćajnice, direktno sa protočnog kolovoza koji servisira brzi saobraćaj. Ovakav način parkiranja je primenjen zbog pristupa (kupci i dobavljači) komercijalnim objektima i kao odgovor na zahteve vlasnika tih objekata u odnosu na ugrožavanje poslovanja. Međutim, duž pojedinih segmenata saobraćajnice, kratkotrajno parkiranje su korisnici pretvorili u dugotrajno.



Slika 1 - Postojeće stanje ulice Krajiških brigada [Internet]

Figure 1 - Existing conditions at the Krajiških brigada Street [Internet]

3. GEOMETRIC CROSS SECTION AND LAYOUT

Due to the observed shortcomings, the analysis of the possibility of arranging this high-capacity urban road following the complete streets concept, i.e. the creation of a functional road that aims to provide safe and comfortable access to all traffic participants. The idea is to perform segregation of all participants in traffic, in order to increase safety to the highest possible level, simultaneously observing whether the planned arrangement was possible during the previous reconstruction.

Approximately 840 m long stretch between intersections with Ranka Šipke Street (south-west end) and Milana Radmana Street (north-east end) was analysed. The optimal regulation width for the concept realization of 38.0 m was used for this analysis.

Within the new regulation width of the street, it is planned that the express traffic will take place in the central part, while slow traffic is planned on one-way roads located on the sides. The combined edge zones, on the left and right side of the central part of the street, provide an area for pedestrian and bicycle traffic. It has also been planned to install a tree grove in the combined zone. Within the edge parts of the cross-section of the street towards the facilities, the movement of pedestrians on the sidewalk is planned, but parallel parking lots were also envisaged for short-term parking due to private visits or for business.

Elements of geometric cross-section of the street profile (Figure 2) are:

- sidewalks with parking bay within the service roads (2 x 3.5 m);
- service roads (2 x 2.75 m);
- combined zones for pedestrians and bicyclists with tree groves (2 x (2.0 + 2.0 + 1.0 m));
- central part for the express through traffic (2 x 6.5 m /two lanes 3.25 m each, on both sides/);
- median strip (1.0 m)

3. GEOMETRIJSKI POPREČNI PROFIL I SITUACIONI PLAN

Usled uočenih nedostataka, pristupilo se analizi mogućnosti uređenja ove visoko kapacitetne gradske saobraćajnice prema konceptu potpunih ulica, odnosno stvaranju funkcionalne saobraćajnice koja za cilj ima da se omogući bezbedan i ugodan pristup svim učesnicima u saobraćaju. Zamisao je izvršiti segregaciju svih učesnika u saobraćaju kako bi se bezbednost podigla na najveći mogući nivo, uz istovremeno sagledavanje da li je prilikom ranije rekonstrukcije bilo moguće ostvariti planirano uređenje.

Analiziran je potez dužine oko 840 m, između raskrsnica sa ulicama Ranka Šipke (jugo-zapadni kraj) i Milana Radmana (severo-istočni kraj). Optimalna regulaciona širina za ostvarivanje koncepta od 38,0 m je iskorišćena za ovu analizu.

U okviru nove regulacione širine saobraćajnice je predviđeno da se brzi saobraćaj odvija na centralnom delu, dok je spori saobraćaj predviđen na jednosmernim saobraćajnicama koje se nalaze sa bočnih strana. Kombinovane ivične zone, sa leve i desne strane centralnog dela saobraćajnice, obezbeđuju površinu za pešački i biciklistički saobraćaj. Takođe, u kombinovanoj zoni je predviđeno postavljanje drvoreda. U okviru ivičnih delova poprečnog profila saobraćajnice prema objektima je predviđeno kretanje pešaka po trotoaru, ali su takođe predviđena i podužna parkirališta za automobile koji se kratkotrajno zadržavaju radi privatnih poseta ili obavljanja posla.

Elementi geometrijskog poprečnog profila saobraćajnice (Slika 2) su:

- trotoari sa parkiralištem u okviru servisnih saobraćajnica (2 x 3,25 m);
- servisne saobraćajnice (2 x 2,75 m);
- kombinovane pešačko-biciklističke zone sa drvoredima (2 x (2,0 + 2,0 + 1,0 m));
- centralni deo za brzi protočni

Along the edges of the combined zone a width of 0.5 m on each side is envisaged, with 1.0 m high greenery as a safety zone of sides.

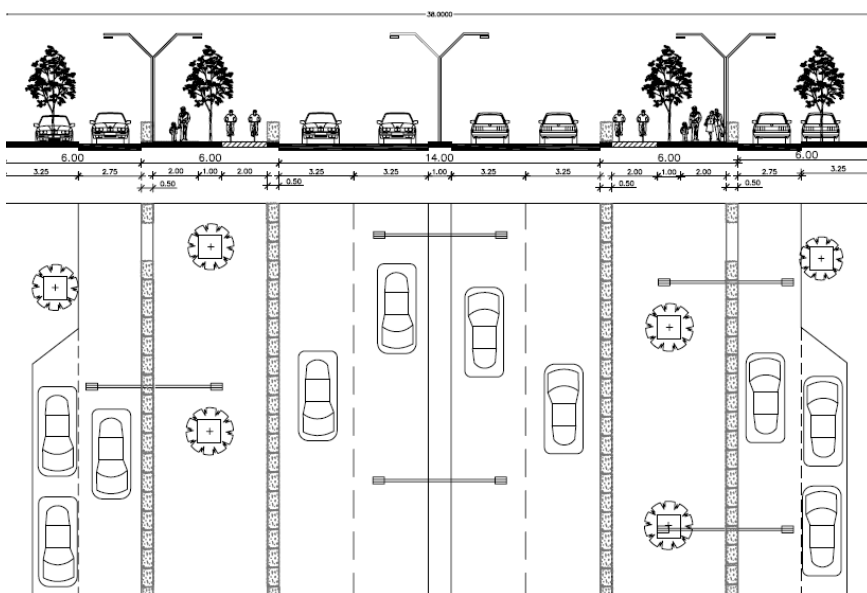
It is planned to perform the surface treatment of the pedestrian part of the combined zone from prefabricated concrete elements 10 x 10 x 8 cm, while in the zone between the sidewalk and bicycle path, a tree grove 1.0 m wide is planned. The area between the tree groves consists of large prefabricated concrete slabs of 40 x 40 x 8 cm.

saobraćaj (2 x 6,5 m /dve trake od po 3,25 m sa obe strane/);

- srednja razdelna traka (1,0 m).

Po ivicama kombinovane zone je predviđena širina od po 0,50 m, u kojoj se nalazi živa ograda, visine do 1,0 m, kao zaštitni deo sa bočnih strana.

Predviđeno je da se površinska obrada pešačkog dela kombinovane zone uradi od prefabrikovanih betonskih elemenata 10 x 10 x 8 cm, dok je u zoni između pešačke i biciklističke staze predviđen drvored na širini od 1,0 m. U međuprostoru između drvoreda se nalaze velike prefabrikovane betonske ploče dimenzija 40 x 40 x 8 cm.



Slika 2 - Planirani geometrijski poprečni profil ulice Krajiških brigada
Figure 2 - Planned geometric cross section for the Krajiških brigada Street

The layout (Figure 3) indicates the proposed solution, which envisages two both-sided stops for the needs of urban public transport.

The pedestrian crossing over the central part of the street is planned with two footbridges so that the traffic on that part of the street runs smoothly, and pedestrians cross safely from one side to the other.

Na situacionom planu (Slika 3) se može sagledati predloženo rešenje koje predviđa i po dva obostrana stajališta za potrebe javnog gradskog prevoza.

Prelaz za pešake preko centralne saobraćajnice je predviđen sa dve pasarele kako bi se saobraćaj na tom delu saobraćajnice odvijao neometano, a pešaci bezbedno prelazili sa jedne na drugu stranu.



Slika 3 - Situacioni plan rekonstruisane ulice Krajiških brigada
Figure 3 - Layout of the reconstructed Krajiških brigada Street

In the central part of the street, the confluence of precipitation water towards the outer edges is ensured with a cross fall of 2.5%. In the combined zone, a one-sided slope of 3.0% is envisaged, directed towards the outer edge of the pavement of the central part of the street. At the street median, the planned two-sided cross-fall is 1.0%. Cross-fall at the service roads is one-sided and amounts 2.5% towards the outer edges, while on the sidewalks along the service road it is 3.0%, and it is directed towards the edge of the pavement of the service road.

4. TRAFFIC ARRANGEMENT OF MAIN INTERSECTIONS

Intersections between Krajiških brigada Street and Milana Radmana and Ranka Šipke Streets appear as two key intersections of traffic flows.

Milana Radmana Street, access road by its functional rank, contains two traffic lanes of 3.25 m each and a sidewalk of 2.50 m on both sides. The connection with Krajiških brigada Street (Figure 4) is planned through a one-way service road to the central Krajiških brigada Street, according to the exit/entrance principle.

At the intersection of Ranka Šipke and Krajiških brigada streets (Figure 5), a roundabout of 35 m in diameter is planned, with the aim of calming traffic, but also enabling faster traffic flow without large time losses, since both streets represent important urban connections. Connections to the roundabout are planned using the 2:1:2:1 system - two inbounds and outbounds in the direction of Krajiških brigada Street, and one inbound and outbound in the direction of Ranka Šipke Street.

As on the main street, on the left (south-east) side of Ranka Šipke Street, a combined pedestrian-bicycle zone is provided on both sides. The

Na središnjem delu saobraćajnice je poprečnim nagibom od 2,5% obezbeđeno slivanje oborinskih voda ka spoljnim ivicama. U kombinovanoj zoni je predviđen jednostrani nagib od 3,0%, usmeren ka spoljnoj ivici kolovoza na centralnom delu saobraćajnice. Na srednjoj razdelnoj traci saobraćajnice, predviđeni dvostrani nagib iznosi 1,0%. Poprečni nagib na servisnim saobraćajnicama je jednostran i iznosi 2,5% ka spoljnim ivicama, dok je na trotoarima uz servisnu saobraćajnicu 3,0%, a usmeren je ka ivici kolovoza servisne saobraćajnice.

4. SAOBRAĆAJNO REŠENJE GLAVNIH RASKRSNICA

Kao dva ključna ukrštaja saobraćajnih struja se pojavljuju raskrsnice između ulice Krajiških brigada i ulica Milana Radmana i Ranka Šipke.

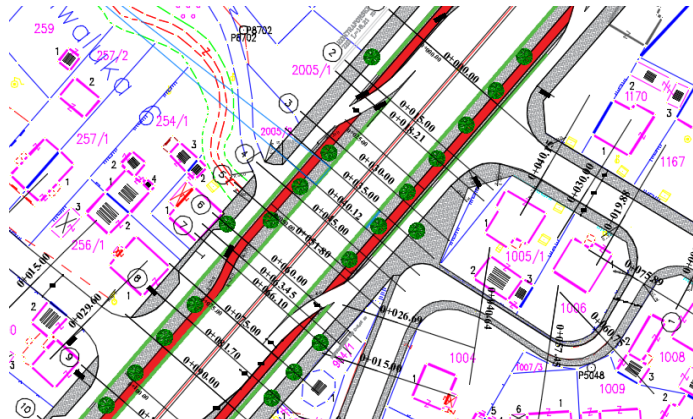
Ulica Milana Radmana, pristupna po funkcionalnom rangu, u profilu sadrži dve saobraćajne trake od po 3,25 m i obostrani trotoar u širini od 2,50 m. Povezivanje sa ulicom Krajiških brigada (Slika 4) je predviđeno preko jednosmerne servisne saobraćajnice na centralnu saobraćajnicu Krajiških brigada, i to po principu izlaz/ulaz.

Na raskrsnici ulica Ranka Šipke i Krajiških brigada (Slika 5) je predviđena kružna raskrsnica, prečnika 35 m, sa ciljem umirenja saobraćaja, ali i omogućavanja bržeg protoka saobraćaja bez velikih vremenskih gubitaka pošto obe ulice predstavljaju značajne gradske veze. Priključci na kružnu raskrsnicu su predviđeni po sistemu 2:1:2:1 - po dva uliva i izliva na pravcu ulice Krajiških brigada, te po jedan uliv i izliv na pravcu ulice Ranka Šipke.

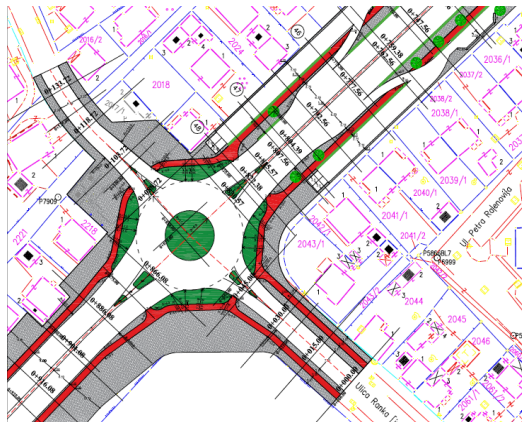
Kao i na glavnoj saobraćajnici, sa leve (jugo-istočne) strane ulice Ranka Šipke je obezbeđena obostrana kombinovana pešačko-biciklistička zona. Obezbeđen je potpuni kontinuitet biciklističkih staza

complete continuity of bicycle paths from the direction of Krajiških brigada and Ranka Šipka streets in relation to the roundabout has been ensured.

iz pravca ulica Krajiških brigada i Ranka Šipke u odnosu na kružni tok.



Slika 4 - Priključak ulice Milana Radmana na ulicu Krajiških brigada
Figure 4 - Connection of the Milana Radmana Street with the Krajiških brigada Street



Slika 5 - Kružna raskrsnica na ukrštaju ulica Krajiških brigada i Ranka Šipke
Figure 5 - Roundabout at the intersection of streets Krajiških brigada and Ranka Šipke

5. ACCESS TO SERVICE ROADS AND PARKING AREAS

The connection of both sided one-way service roads with the central road was done using oblique connections - entrances and exits, which enables relatively fast evacuation from, i.e. connection to the main flow

5. PRISTUP SERVISNIM SAOBRAĆAJNICAMA I PARKING PROSTOR

Povezivanje obostranih jednosmernih servisnih saobraćajnica sa centralnom saobraćajnicom je izvršeno korišćenjem kosih veza - uliva i izliva, čime se omogućava relativno brza evakuacija sa, odnosno priključak na glavni

carriageway with minimal obstruction of the main traffic flow and reduction of time losses.

Service road is closed for traffic before entering the roundabout. In that final part, two traffic lanes 2.75 m wide are exceptionally planned, in order to enable two-way traffic to the junction location to the central traffic road, in order to have unobstructed access to facilities in those zones.

Parking lots in the Krajištih brigada Street are secured within the service road for short-term visits to facilities and business along the traffic road. Parking is organized longitudinally in segments, so that two vehicles can be parked within an individual segment.

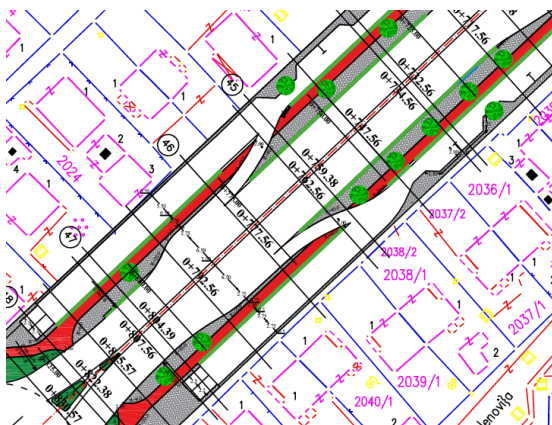
At the places where the service road is closed to traffic, two parallel parking spaces 5.00 m long and 2.50 m wide are planned.

protočni kolovoz uz minimalno ometanje glavnih saobraćajnih struja i skraćenje vremenskih gubitaka.

Servisna saobraćajnica je zatvorena za saobraćaj pre ulaza u kružni tok. Na tom završnom delu su izuzetno predviđene po dve saobraćajne trake širine 2,75 m, kako bi se omogućilo dvosmerno odvijanje saobraćaja do mesta priključka na centralnu saobraćajnicu, u cilju neometanog pristupa objektima u tim zonama.

Parking mesta u ulici Krajiških brigada su obezbeđena u okviru servisne saobraćajnice i to za kratkotrajne posete objektima i delatnostima uz samu saobraćajnicu. Parkiranje je organizovano podužno u segmentima, tako da se u okviru pojedinačnog segmenta mogu parkirati dva vozila.

Na mestima gde se servisna saobraćajnica zatvara za saobraćaj predviđena su po dva paralelna parking mesta dužine 5,00 m i širine 2,50 m.



Slika 6 - Uređenje servisnih saobraćajnica i parkinga duž ulice Krajiških brigada
Figure 6 - Arrangement of service roads and parkings along the Krajiških brigada Street

6. CONCLUSION

By developing and analysing the presented solution, it was determined that it is possible to arrange a high-capacity urban road using the complete streets concept in order to ensure the comfort and safety of all participants in

6. ZAKLJUČAK

Izradom i analizom prikazanog rešenja je utvrđeno da je moguće uređenje jedne visoko kapacitetne saobraćajnice prema konceptu kompletnih ulica sa ciljem osiguranja udobnosti i bezbednosti svih učesnika u

traffic. Separating pedestrians and bicyclists from the central part of the street where the express through traffic takes place enables their safe movement, while service roads additionally calm the traffic and serve the target locations.

Having in mind the optimal regulation width of 38.0 m for the realization of the complete street, it is necessary to provide land expropriation that falls under the boundaries of the new regulation width. Comparing with the previously performed reconstruction and the needs for expropriation at the time, it is clear that the proposed solution requires somewhat broader regulation, which increased the requirements for expropriation by about 15%.

Therefore, the conclusion can be drawn that despite the increased regulation width, it was possible to use the complete streets concept for the reconstruction of Krajiških brigada Street with somewhat increased costs. The justification for the increased costs lies in: (i) providing a high level of service for all participants in traffic that was not provided by the previous reconstruction, (ii) increased level of safety, (iii) safe access to commercial facilities along the urban road (without obstructing flows on the main road) and (iv) a greater amount of greenery (hedges and tree groves compared to a simple grass cover with the existing solution).

saobraćaju. Odvajanjem pešaka i biciklista od centralnog dela saobraćajnice u kojem se odvija protočni saobraćaj je omogućeno njihovo bezbedno kretanje, dok servisne saobraćajnice dodatno umiruju saobraćaj i opslužuju ciljane lokacije.

Imajući u vidu optimalnu regulacionu širinu za realizaciju kompletne ulice od 38,0 m, neophodno je eksproprijacijom obezbediti zemljište koje potpada pod granice nove regulacione širine. Upoređenjem sa ranije izvedenom rekonstrukcijom i tadašnjim potrebama za eksproprijacijom, jasno je da predloženo rešenje zahteva nešto širu regulaciju čime su zahtevi za eksproprijacijom uvećani za cca 15%. Dakle, može se zaključiti da je i pored uvećane regulacione širine bilo moguće iskoristiti koncept kompletnih ulica za rekonstrukciju ulice Krajiških brigada sa nešto uvećanim troškovima. Opravdanost uvećanih troškova se nalazi u: (i) obezbeđenju visokog nivoa usluge za sve učesnike u saobraćaju koji nije bio osiguran ranijom rekonstrukcijom, (ii) povećanom nivou bezbednosti, (iii) sigurnom pristupu komercijalnim objektima duž saobraćajnice (bez ometanja tokova na glavnoj saobraćajnici) i (iv) većom količinom zelenila (žive ograde i drvodredi u odnosu na jednostavni travnati pokrivač kod postojećeg rešenja).

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