COMPLETE STREETS - STREETS FOR ALL

KOMPLETNE ULICE - ULICE ZA SVE

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UDK: 625.712
DOI: 10.14415/zbornikGFS34.05

Summary: The complete street represents form of spatial planning and management, for the purpose to provide safe and comfortable access to all traffic participants. In this way, it represents significant change compared to traditional approach to planning, designing and building of traffic infrastructure in cities. The paper presents basic concepts of forming complete streets and application at one of the most significant streets in Belgrade.

Keywords: traffic areas, safety, complete street, space

Rezime: Kompletna ulica predstavlja formu planiranja i upravljanja prostorom, sa ciljem da se omogući bezbedan i ugodan pristup svim učesnicima u saobraćaju. Na taj način predstavlja značajnu promenu u odnosu na tradicionalan pristup planiranju, projektovanju i izgradnji saobraćajnica u gradovima. U radu su prikazani osnovni koncepti formiranja kompletnih ulica i primena na jednoj od značajnijih gradskih saobraćajnica u Beogradu.

Ključne reči: saobraćajne površine, bezbednost, kompletna ulica, prostor

1. INTRODUCTION

The spatial planning of the modern city is based on the planned arrangement of the most important city contents: housing, work activities, education, central functions, entertainment, etc., while the task of harmonizing these elements in a conceptually designed unit belongs to urbanism [1]. This implies a good organization of the movement of people and goods in the urban area as well as the provision of appropriate transport facilities, networks and systems.

The main goal today, when designing urban traffic infrastructure, is to create a complete, safe and sustainable traffic infrastructure satisfying to all participants in the traffic, as well as the needs

1. UVOD

Prostorno uređenje savremenog grada počiva na planskom razmeštaju najznačajnijih gradskih sadržaja: stanovanje, radne aktivnosti, školovanje, centralne funkcije, zabava, itd., pri čemu zadatak usklađivanja ovih elemenata u planski osmišljenu celinu leži na urbanizmu [1]. To podrazumeva dobru organizaciju kretanja ljudi i dobara u gradskom prostoru kao i obezbeđenje odgovarajućih saobraćajnih objekata, mreža i sistema.

Danas je glavni cilj prilikom projektovanja gradskih saobraćajnica stvaranje kompletne, sigurne i održive saobraćajnice koja odgovara svim učesnicima u saobraćaju, kao i potrebama modernog društva.

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of a modern society. Current knowledge and awareness of the interdependence of urban development and traffic indicate that it is necessary to strike a balance for the right solution.

2. BRIEF HISTORICAL OVERVIEW OF URBAN TRAFFIC INFRASTRUCTURE DEVELOPMENT

Each historical period leaves a visible trace in road engineering, as well as in the organization of road traffic.

The first form of the roads consisted of paths that were paved by the movement of people and/or animals, while the first roads in a classic form with a hard surface appeared in ancient times.

Namely, the first path was created in prehistoric times when a human pulled a fork shaped branch over the ground, in order to facilitate the movement of load, and in some way unconsciously made the first form of communication.

As shown in researches, in the oldest cities, more specifically in Ur (antique city in the southern part of Mesopotamia, present territory of Iraq), there is little information about flat and wide open streets. What researchers of Sumer called “boulevard” should not be mixed with the boulevards that occur much later. Sumerian boulevards represent wide road, wide enough for large number of people, which in principle serves as nowadays “parade” [2].

Later in the period of the Alexandrian city there is an expansion of the Greek street of about 4 m. In Alexandria itself (about 332 BC), the width of an ordinary street was 6 m, while the main road, the Canopus Street (Figure 1) was 33 m wide, which was an extraordinary width for that time [2].

During the period of Roman Empire, construction of first roads started in the period about 334 BC. Roman roads were recognizable for their strength, durability, excellent foundation, good drainage and application of mortar for

Postojeća saznanja i svest o međuzavisnosti razvoja grada i saobraćaja ukazuju da je za ispravno rešenje neophodno uspostaviti ravnotežu.

2. KRATAK ISTORIJSKI PRIKAZ RAZVOJA GRADSKIH SAOBRAĆAJNICA

Svaki istorijski period ostavlja vidljiv trag u putnom inženjerstvu, kao i u organizaciji putnog saobraćaja.

Prvu formu puteva su činile staze koje su utabane kretanjem ljudi i/ili životinja, dok se prvi putevi u klasičnoj formi sa tvrdom podlogom pojavljuju u antičkim vremenima.

Naime, prva staza nastaje u praistoriji kada čovek vuče račvastu granu po zemlji, kako bi sebi olakšao prenos tereta, i time na neki način nesvesno pravi prvi oblik komunikacije.

U najstarijim gradovima kako pokazuju istraživanja, konkretno u Ur-u (drevni grad u južnom delu Mesopotamije, na sadašnjoj teritoriji Iraka), postoji malo podataka o ravnim i široko otvorenim ulicama. Ono što istraživači Sumera nazivaju rečju „bulevar“, ne treba nikako pomešati sa bulevarom koji nastaje dosta kasnije. Sumerski bulevar predstavlja širok put, dovoljno širok za veliki broj ljudi, koji u principu ima svrhu kao današnji „korzo“ [2].

Kasnije u periodu aleksandrijskog grada dolazi do proširenja grčke ulice od oko 4 m. U samoj Aleksandriji (oko 332 godine p.n.e), širina obične ulice iznosi 6 m, dok je glavna saobraćajnica, ulica Kanope (Slika 1) široka 33 m, što je za to vreme izvanredna širina [2].

U periodu Rimskog carstva počinje se sa izgradnjom prvih puteva oko 334. godine p.n.e. Rimski putevi su prepoznatljivi po čvrstoći, trajnosti, odličnoj osnovi, dobrom odvodnjavanju i primeni maltera u svrhu izrade same konstrukcije (malter na bazi vulkanskog pepela pomešan sa krečom) [3]. Neke od formi standarda koje su korišćene za izgradnju puteva u Rimskom carstvu, se

the purpose of making the construction itself (mortar based on volcanic ash mixed with lime) [3]. Some of standards used for construction of roads in the Roman Empire are applied at the present time. After the division of the Roman Empire, and the final collapse a longer period of stagnation occurs in the road construction practice.

primenjuju i u današnje vreme. Posle podele Rimskog carstva, i konačne propasti, nastaje duži period zastoja u putogradnji.

Figure 1 - Canopus street, Alexandria [4]
Slika 1 - Ulica Kanope, Aleksandrija [4]

Figure 2 - Omnibus in Paris, end of 19th century [5]
Slika 2 - Omnibus u Parizu, kraj XIX veka [5]

Only in the 16th century, the cities began extensive use of carts. This is partly a result of technical improvement that was achieved by replacing old-fashioned full wheel with wheel filled with parts, such as frames and spokes, and also adding a fifth wheel for easier turning. The beginning of public transport coincides with appearance of chariots around 1600 in London. Invention of omnibus in 1798 (Figure 2) raises public city transportation to a higher level. Increased capacity for passengers, reliability, speed and accuracy give priority to the omnibus, in relation to other means of transport. It is important to mention the year 1863, when the first underground railway - the metro, was constructed in London, with total length of 6km. That was the first time that underground traffic was separated from the surface traffic. Appearance of motor vehicles was followed by the development of urban traffic

Tek u XVI veku, u gradovima počinje obimnija upotreba zaprežnih kola.
To je delimično rezultat tehničkog poboljšanja koji je postignut zamenom staromodnog punog točka sa točkom ispunjenim delovima kao što su okviri i paoci, ali i dodavanje petog točka radi lakšeg okretanja. Početak javnog prevoza se poklapa sa pojavom fijakera oko 1600. godine u Londonu. Konstrukcija omnibusa 1798. godine (Slika 2), podiže javni gradski prevoz na viši nivo.
Veći kapacitet za putnike, pouzdanost, brzina kretanja i tačnost daju prednost omnibusu, u odnosu na druga prevozna sredstva. Bitno je još navesti 1863. godinu, kada je u Londonu izgrađena prva podzemna gradska železnica - metro, dužine 6 km. Tada se po prvi put podzemni saobraćaj odvaja od površinskog. Pojavom prvih motornih vozila, dolazi do razvoja gradskih

infrastructure, which had to be adjusted to new type of traffic.
Regulatory width of the street becomes a major European theme in the second half of the XIX century because of extensive requirements of ampler traffic faced a huge problem of narrow streets of old cities. Therefore, more and more substantive forms of cross-sections of urban streets started developing, distinguishing specific forms depending of their function.

3. GENERAL FUNCTIONAL CLASSIFICATION OF URBAN TRAFFIC INFRASTRUCTURE

Urban road network can be divided in two basic functional groups:
- primary (urban) road network which provides traffic connection and enables movement of all types of vehicles that can appear in urban areas (surface types of public transport, passenger vehicles, cargo transport, bicycles, etc.):
- secondary (local) road network serving as access to locations in direct vicinity of street, exclusively intended for use by passenger vehicles, bicycles and passengers.

The division of the road network makes it possible to define the relationship according to different modes of transport and their spatial treatment, primarily in the cross-section.
Traffic infrastructure of the primary road network consists of:
- urban highways;
- main magistral streets;
- magistral streets;
- collector streets.

The principle of segregation dominates at the traffic infrastructure of the primary road network. Different types of traffic are spatially separated by segregation principle so that each of them can meet the requirements at an acceptable level of service.
Traffic infrastructure of the secondary road network comprises:

saobraćajnica, koje je trebalo prilagoditi novom vidu saobraćaja.
Regulaciona širina ulice postaje velika evropska tema u drugoj polovini XIX veka pošto zahtevi sve obimnijeg saobraćaja nailaze na ogroman problem uzanih ulica starih gradova.
Samim tim se počinju razvijati sve sadržajniji oblici poprečnih profila gradskih ulica, uz izdvajanje određenih formi prema funkciji koju obavljaju.

3. OPŠTA FUNKCIONALNA KLASIFIKACIJA GRADSKIH SAOBRAĆAJNICA

Gradska putna mreža se može podeliti na dve osnovne funkcionalne grupe, i to:

- primarna (gradska) putna mreža koja obezbeđuje saobraćajno poveziva-nje i omogućava kretanje svih tipova vozila koji se mogu pojaviti u urbanim sredinama (površinski vidovi javnog gradskog prevoza (JGP), putnički automobili, teretna vozila, biciklisti, itd):
- sekundarna (lokalna) putna mreža sa ulogom pristupa lokacijama nepo-sredno uz deonicu ulice, uz isključivo korišćenje od strane putničkih automobila, biciklista i pešaka.

Podela putne mreže omogućava da se definiše odnos prema različitim vido-vima saobraćaja i njihov prostorni tretman, pre svega u poprečnom profilu.

Saobraćajnice primarne putne mreže su:
- gradski autoputevi;
- glavne gradske magistrale;
- gradske magistrale;
- sabirne ulice.

Na saobraćajnicama primarne putne mreže dominira princip segregacije, u kojem se različiti vidovi saobraćaja prostorno razdvajaju, kako bi svaki od njih mogao da ispuni zahteve na prihvatljivom nivou usluge.

- access streets;
- parking places.

For the secondary road network the principle of integration is applied, with equalization of dynamic characteristics of various types of traffic, starting from the most sensitive participants (pedestrians).

Primary and secondary road networks are interconnected with collector streets, with the purpose to unify these two sub-systems of various character-ristics in a comprehensive hierarchical system. The collector streets as such belong to both primary and secondary road networks [1].

4. COMPLETE STREETS

The complete street represents form of spatial planning and management, for the purpose to provide safe access to all traffic participants. Complete streets provide certain change compared to traditional approach to planning and designing of urban infrastructure. Planning of complete street can be made in several alternatives, depending on number of factors. Typical parameters used in traditional design of urban traffic infrastructure, such as functional classification of infrastructure, design speed and traffic load, cannot always be applied in designing a complete street. In case of complete streets, the reverse approach is applied - decisions on designing are based on information that more closely describe the traffic infrastructure itself, as well as on the hierarchical priority [6]. In doing so, pedestrians and cyclists are in the first place.

The aim of this concept is to increase the safety of all participants in traffic, better organization and full utilization of space within the regulation width of traffic infrastructure, all in line with the needs of the entire community.

Functional elements of the complete street

Saobraćajnice sekundarne putne mreže su:
- pristupne ulice;
- parkirališta.

Za sekundarnu putnu mrežu se primenjuje princip integracije, sa ujednačavanjem dinamičkih karakte-ristika različitih vidova saobraćaja polazeći od najosetljivijih učesnika (pešaka).

Primarna i sekundarna putna mreža su povezane sabirnim ulicama, koje imaju za cilj da objedine dva podsistema različitih karakteristika u celovit hije-rarhijski sistem. Kao takve, sabirne ulice pripadaju istovremeno i primarnoj i sekundarnoj putnoj mreži [1].

4. KOMPLETNE ULICE

Kompletna ulica predstavlja formu planiranja i upravljanja prostorom, sa ciljem da se omogući bezbedan pristup svim učesnicima u saobraćaju.

Kompletne ulice pružaju određenu promenu u odnosu na tradicionalan pristup planiranju i projektovanju gradskih saobraćajnica.

Planiranje kompletne ulice se može vršiti u više varijanti u zavisnosti od niza faktora. Tipični parametri koji se koriste prilikom tradicionalnog projek-tovanja gradskih saobraćajnica, kao što su funkcionalna klasifikacija saobraćajnice, računska brzina i saobraćajno opterećenje, se ne mogu uvek primeniti prilikom projektovanja kompletne ulice.

Kod kompletnih ulica se primenjuje obrnuti pristup - odluke oko projekto-vanja se zasnivaju na podacima koji bliže opisuju samu saobraćajnicu, kao i na hijerarhijskom prioritetu [6]. Pri tome su na prvom mestu pešaci i biciklisti.

Cilj ovog koncepta je povećanje bezbednosti svih učesnika u saobra-ćaju, bolja organizacija i potpuna iskorišćenost prostora u okviru regu-lacione širine saobraćajnice, a sve to u skladu sa potrebama celokupne zaje-dnice.

Pedestrian walkway

Pedestrian walkways (Figure 3), as a rule, have a minimum width of 2.0 m, and the height difference between the level of the pavement and the pedestrian walkway must be at least 150 mm. At the same time, a smaller height must be enabled at pedestrian crossing, which provides easier access of pedestrians and there must be a ramp. The pedestrian walkway can be arranged with tree lines, with an expansion of 1.0 m. Generally speaking, a pedestrian walkway can be divided into three zones: a zone next to buildings, a mobility zone (a zone for pedestrian movement), and a zone that separates the walkway from the pavement [7]. In the separation zone, various pedestrian facilities can be fitted, such as seating benches etc.

Figure 3 - Pedestrian walkway [8]
Slika 3 - Pešačka staza [8]

Bicycle track

The bicycle track (in some cases the lane) (Figure 4) must provide continuous movement. It is physically separated from the lane intended for motor vehicles and thus provides comfort and safety to users, i.e. cyclists. Minimum width of the track is 2.0 m for one direction, i.e. 3.0 m if two directions are envisaged. The space that separates bicycle track from the pavement is at least 0,5 m [7]. Various content can be set up within this space, for example, street lamps, flower gardeners, etc. At

Funkcionalni elementi kompletne ulice

Pešačke staze

Pešačke staze (Slika 3), po pravilu, imaju minimalnu širinu od 2,0 m, a visinska razlika između nivoa kolovoza i pešačke staze mora iznositi najmanje 150 mm. U isto vreme kod pešačkog prelaza se mora ostvariti manja visina, koja obezbeđuje lakši pristup pešaka i obavezno mora postojati i rampa. U okviru pešačke staze se mogu uklopiti drvoredi, sa proširenjem od 1,0 m. Generalno gledano, pešačka staza se može podeliti na tri zone: zonu uz objekte, zonu mobilnosti (zona predviđena za kretanje pešaka) i zonu koja razdvaja stazu od kolovoza [7]. U zonu razdvajanja se mogu uklopiti razni sadržaji za pešake, kao što su klupe za sedenje i dr.

Figure 4 - Bicycle track [9]
Slika 4 - Biciklistička staza [9]

Biciklistička traka

Biciklistička traka (u pojedinim slučajevima i staza) (Slika 4), mora obezbediti kontinualno kretanje. Fizički se odvaja od trake za motorna vozila i na taj način omogućava udobnost i bezbednost korisnicima, tj. biciklistima. Minimalna širina trake iznosi 2,0 m za jedan smer, odnosno 3,0 m ukoliko su predviđena dva smera. Prostor kojim se odvaja biciklistička staza od kolovoza iznosi najmanje 0,5 m [7]. U okviru tog prostora se mogu postaviti razni sadržaji, kao što su npr. ulične svetiljke, žardinjere sa cvećem, itd. Na mestima

places where a pedestrian crossing is envisaged, there must be a ramp.

Fast lanes for public city transport
Fast lanes for public transport provide high capacity and quality traffic, close to the level of metro service Fast bus lanes are placed in the middle of the street, except in case of streets with smaller regulation without enough space. The width of the lane is at least 3.3 m, with the addition of space intended for separation from the lane in which the combined traffic takes place [7].

Effects of the complete streets concept

The application of the complete street concept, as already mentioned, aims to provide safe access to all traffic participants, but in addition, it aims to ensure continuity of movement and reduction of public transportation delays. Since the beginning of the implementation of this concept in some parts of New York, according to the research [10], the total number of injured participants in traffic has decreased by 35% and the number of injured pedestrians by as much as 67%. At the same time, the speed of vehicles on paved surfaces where integrated traffic is envisaged is reduced by 14%.

5. PRESENTATION OF THE ARRANGEMENT FOR JUŽNI BULEVAR AT BELGRADE

Using the example of the street Južni bulevar in Belgrade, simultaneous arrangement was made according to the general functional classification of urban traffic infrastructure, as well as according to the concept of complete streets. In the existing condition, the regulation width within the traffic infrastructure is about 30 m, which gives enough space to develop all types of urban infrastructure of the primary road

gde je predviđen pešački prelaz, mora postojati rampa.

Brze trake za javni gradski prevoz
Brze trake za JGP obezbeđuju visoko kapacitetan i kvalitetan saobraćaj, približno nivou usluge metroa. Brze autobuske trake se smeštaju u sredinu ulice, izuzev kod ulica sa manjom regulacionom širinom koje nemaju dovoljno prostora. Širina trake iznosi najmanje 3,3 m, uz dodatak prostora koji je predviđen za razdvajanje od trake u kojoj se odvija kombinovani saobraćaj [7].

Efekat koncepta kompletnih ulica

Primena koncepta kompletne ulice, kao što je već rečeno, ima za cilj da omogući bezbedan pristup svim učesnicima u saobraćaju, ali pored toga ima za cilj da obezbedi kontinuitet kretanja i smanjenje kašnjenja JGP-a.
Od početka primene ovog koncepta u pojedinim delovima Njujorka je, prema istraživanjima [10], smanjen ukupan broj povređenih učesnika u saobraćaju za 35%, a broj povređenih pešaka za čak 67%. Istovremeno, brzina kretanja vozila na kolovoznim površinama gde je predviđen integrisani saobraćaj je smanjena za 14%.

5. PRIKAZ UREĐENJA ULICE JUŽNI BULEVAR U BEOGRADU

Na primeru ulice Južni bulevar u Beogradu je izvršeno istovremeno uređenje prema opštoj funkcionalnoj klasifikaciji gradskih saobraćajnica, kao i prema konceptu kompletnih ulica.
U postojećem stanju, regulaciona širina u okviru saobraćajnice iznosi oko 30 m, što daje sasvim dovoljno prostora da se razviju svi tipovi gradskih saobraćajnica primarne putne mreže, kao i primer uređenja kompletne ulice.

Sabirna ulica

network, as well as an example of arrangement through complete street.

Connector street

The following elements of the geometric cross-section are envisaged as part of the arrangement of the connector street (Figure 5):
- both-sided pedestrian walkways (2 x 4.0 m);
- two bicycle tracks (2 x 2.0 m);
- inclined parking within the edge separation lane (2 x 4.0);
- two through lanes (2 x 3.0 m);
- two exit lanes (2 x 2.0 m).

U okviru uređenja sabirne ulice (Slika 5) su predviđeni sledeći elementi geometrijskog poprečnog profila:
- obostrane pešačke staze (2 x 4,0 m);
- dve biciklističke staze (2 x 2,0 m);
- koso parkiranje u okviru ivičnih razdelnih traka (2 x 4,0 m);
- dve trake za protočni saobraćaj (2 x 3,0 m);
- dve trake za isključenje (2 x 2,0 m).

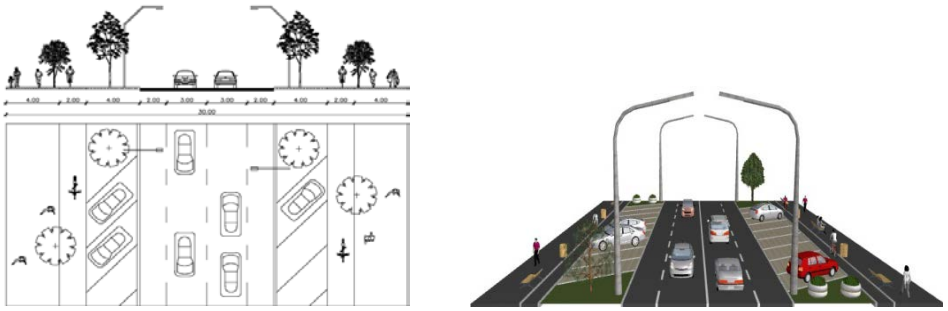

Figure 5 - Connector street (geometric cross-section and axonometry)
Slika 5 - Sabirna ulica (geometrijski poprečni profil i aksonometrija)

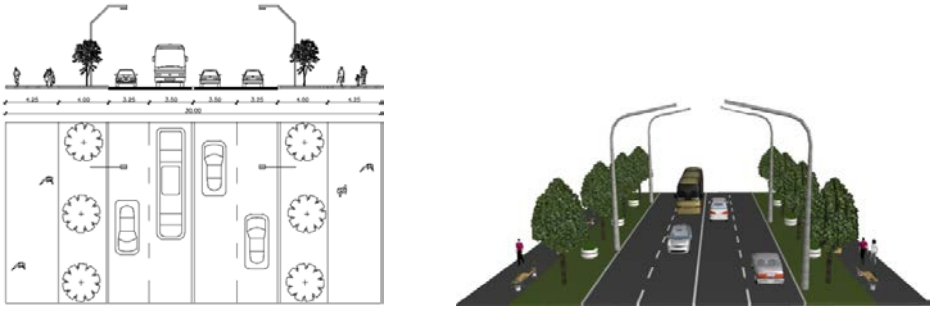

Figure 6 - Magistral street (geometric cross-section and axonometry)
Slika 6 - Gradska magistrala (geometrijski poprečni profil i aksonometrija)

Figure 7 - Main magistral street (geometric cross-section and axonometry)
Slika 7 - Glavna gradska magistrala (geometrijski poprečni profil i aksonometrija)

Magistral street

The following elements are anticipated for the magistral street (Figure 6):
- both-sided pedestrian walkways (2 x 4.25 m);
- two edge separation lanes (2 x 4.0 m), with planted trees;
- two through lanes in each direction (4 x 3.5 m).

Main magistral street

The contents within the geometric cross-section of the main magistral street (Figure 7) are as follows:
- both-sided pedestrian walkways (2 x 2.5 m);
- two edge separation lanes (2 x 3.0 m), with planted trees;
- four through lanes, two lanes in each direction (4 x 3.5 m);
- median separation lane 5.0 m wide, but in some areas the width is reduced to 3.0 m in the event that changing lane is anticipated.

Complete street

As for the concept of complete streets, given the regulation width of the traffic road of 30 m, it is relatively difficult to align all the necessary facilities within the geometrical cross section in the best possible way. Arrangement of the traffic infrastructure according to the complete street concept (Figure 8) contains the following elements:

Gradska magistrala

Kod gradske magistrale (Slika 6) su predviđeni sledeći elementi:
- obostrane pešačke staze (2 x 4,25 m);
- dve ivične razdelne trake (2 x 4,0 m), sa zasadima drveća;
- po dve trake za protočni saobraćaj u svakom smeru (4 x 3,5 m).

Glavna gradska magistrala

Sadržaji u okviru geometrijskog poprečnog profila glavne gradske magistrale (Slika 7) su sledeći:
- obostrane pešačke staze (2 x 2,5 m);
- dve ivične razdelne trake (2 x 3,0 m), sa zasadima drveća;
- četiri trake za protočni saobraćaj, po dve u svakom smeru (4 x 3,5 m);
- srednja razdelna traka širine 5,0 m, s tim da je na pojedinim mestima širina redukovana za 3,0 m u slučaju da je predviđena traka za prestrojavanje.

Kompletna ulica

Što se tiče koncepta kompletne ulice, s obzirom na regulacionu širinu saobraćajnice od 30 m, relativno teško je uskladiti sve potrebne sadržaje u okviru geometrijskog poprečnog profila na najbolji mogući način. Uređenje saobraćajnice prema konceptu kompletne ulice (Slika 8) sadrži sledeće elemente:

- two lanes for servicing the locations with anticipated slow traffic (2 x 2.4 m);
- a combined zone with parallel parking and greenery with planted trees (2 x 2.2 m)
- both-sided pedestrian walkways (2 x 3.5 m);
- two express through lanes (2 x 3.8 m);
- two bicycle tracks (2 x 2.0 m);

Table 1 summarizes good and bad sides of proposed solutions. This is to point out that solutions have not been proposed with the aim of changing the current functional level of the street Južni bulevar, but as an addition to the possible way of shaping urban streets and defined regulation.

- dve trake za opsluživanje lokacije u kojima je predviđen spor saobraćaj (2 x 2,4 m);
- kombinovana zona u kojoj je smešten podužni parking i zelenilo sa zasadima drveća (2 x 2,2 m);
- obostrane pešačke staze (2 x 3,5 m);
- dve trake za brži protočni saobraćaj (2 x 3,8 m);
- dve biciklističke staze (2 x 2,0 m).

U Tabeli 1 su rezimirane dobre i loše strana predloženih rešenja. Naglašava se da rešenja nisu predložena sa ciljem promene trenutnog funkcionalnog nivoa ulice Južni bulevar, već kao prilog mogućem načinu oblikovanja gradskih ulica i definisanoj regulaciji.

Figure 8 - Complete street (geometric cross-section and axonometry)
Slika 8 - Kompletna ulica (geometrijski poprečni profil i aksonometrija)

Tabela 1 - Upoređenje rešenja
Table 1 - Comparison of solutions

street type	collector street	magistral street	main magistral street	complete street
tip ulice	sabirna ulica	gradska magistrala	glavna gradska magistrala	kompletna ulica
good sides	- large regulation width of traffic infrastructure which enables placing of all required contents for this rank of infrastructure - sufficient space and comfort for all traffic participants	- wide pedestrian walkway secured with wide edge separation lane which provides high level of pedestrian safety	- express through lanes - secured continuous movement of vehicles, easier and faster connection of distant urban parts	- through lanes are separated from other content - safety of all participants in traffic at high level - a large amount of greenery and trees within the

street type	collector street	magistral street	main magistral street	complete street
tip ulice	sabirna ulica	gradska magistrala	glavna gradska magistrala	kompletna ulica
				profile of traffic infrastructure
dobre strane	- velika regulaciona širina saobraćajnice koja omogućava smeštanje svih potrebnih sadržaja za ovaj rang saobraćajnice - dovoljno prostora i udobnosti za sve učesnike u saobraćaju	- široka pešačka staza, obezbeđena širokom ivičnom razdelnom trakom čime se postiže visok nivo bezbednosti pešaka	- brze trake za protočni saobraćaj - obezbeđeno kontinualno kretanje vozila lakše i brže povezivanje udaljenijih delova grada	- kolovozne trake za protočni saobraćaj odvojene od ostalih sadržaja - bezbednost svih učesnika u saobraćaju na visokom nivou - velika količina zelenila i drveća u okviru profila saobraćajnice
bad sides	- none	- all aspects of motor traffic integrated on the same surface - parking not foreseen within the edge separation lane	- all participants in traffic are integrated at the same surface - special lane for public transport not foreseen - bicycle track/lane does not exist	- possible jam in slow traffic lanes - special lane for public transport in central part of infrastructure not foreseen - wide regulation for placing all the elements is necessary
loše strane	- nema	- svi vidovi motornog saobraćaja integrisani na istoj površini - nije predviđeno parkiranje u sklopu ivične razdelne trake	- svi učesnici u saobraćaju integrisani na istoj površini - nije predviđena posebna traka za JGP - ne postoji biciklistička traka/staza	- moguće zagušenje u trakama za spor saobraćaj - nije predviđena posebna traka za JGP u centralnom delu saobraćajnice - neophodna široka regulacija za smeštaj svih elemenata

6. CONCLUSION

Based on a number of factors presented in this paper, designing a complete street positively affects primarily the improvement of the safety of all participants in traffic, and in the first place the pedestrians and cyclists. Also, a significant contribution is made in terms of comfort, which is guaranteed by better space utilization, as well as by reducing the negative impacts on the environment, specifically reducing air pollution due to less use of passenger vehicles. Traffic

6. ZAKLJUČAK

Na osnovu niza faktora koji su izneti u ovom radu, projektovanje kompletne ulice pozitivno utiče pre svega na poboljšanje bezbednosti svih učesnika u saobraćaju, a na prvom mestu pešaka i biciklista. Takođe značajan doprinos se ostvaruje po pitanju udobnosti koja je zagarantovana boljim iskorišćenjem prostora, kao i smanjenjem negativnih uticaja na životnu sredinu, konkretno sma-

jam, heavy use of passenger vehicles, slow motion of public transportation vehicles in the streets in which no special pavement surface for this type of transport is envisaged, individually or in combination, lead to congestions and delays. Poor space utilization also leads to more frequent accidents - the vulnerability of pedestrians is at a high level, and the integration of cyclists in the same area with other road users is a form of danger. Only few the problems that arise in the traffic infrastructure that are designed by traditional methods were listed. The application of the complete street concept to the primary urban traffic infrastructure represents the future in their design, with the possibility of further progress and improvement, and probably even more widely utilization around the world. The limitation, of course, is the available regulation width within the cross section.

njenje zagađenosti vazduha zbog manje upotrebe putničkih vozila.

Zagušenje saobraćaja, velika upotreba putničkih vozila, usporeno kretanje vozila JGP-a ulicama u kojima nije predviđena posebna kolovozna površina za ovaj vid prevoza, pojedinačno ili u kombinaciji dovode do zastoja i kašnjenja. Loša iskorišćenost prostora takođe dovodi do učestalijih nezgoda - ugroženost pešaka je na visokom nivou, a integracija biciklista u istu površinu sa ostalim učesnicima u saobraćaju predstavlja jedan vid opasnosti. Navedeni su samo neki od problema koji nastaju na saobraćajnicama koje su projektovane tradicionalnim metodama.

Primena koncepta kompletne ulice na primarne gradske saobraćajnice predstavlja budućnost u projektovanju istih, sa mogućnošću još većeg napretka i usavršavanja, a verovatno i još zastupljenijom primenom širom sveta. Ograničenje, naravno, predstavlja raspoloživa širina regulacije unutar poprečnog profila.

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