

ANALYSIS OF THE PROJECT OF UNUSUALLY ARRANGED MULTILEVEL ROAD INTERCHANGE IN ASTANA

Bizhanov Daniyar

d.bizhanov93@mail.ru

L.N. Gumilyov Eurasian National University, Nur-Sultan, Kazakhstan

1. Introduction – Road Interchange. Road interchange is a complex of road structures (bridges, tunnels, roads), designed to minimize the intersection traffic flow and, as a consequence, to increase road capacity. Mainly as road interchange is understood traffic intersection in different levels, but the term is also used for special occasions transport crossings at the single level. In Kazakhstan, the best known transport interchanges are located in the cities of Almaty and Astana (the intersection of Dostyk Avenue and Al-Farabi Avenue, Furmanov Street and Al-Farabi Avenue, Sarayshyq Street and Mangilik El Street, ... etc.), as well as railway interchanges. Multilevel road interchange allows transport to move in the course of its motion with constant velocity and without crossing traffic streams, eliminates congestion, leading to higher throughput and ensures safety.

2. Proposal of Multilevel Road Interchange of BauyrzhanMomyshuly Avenue and TauelsizdikAvenue. This proposal relates to the construction of bridges and can be used in the construction of new multilevel road interchange (see Fig. 1). Technical task is to raise safety and increase bandwidth of traffic. Multilevel road interchange at the location of current one level intersection of BauyrzhanMomyshuly Avenue and Tauelsizdik Avenue is equivalent to crossroads formed by interchanges type as “cloverleaf” and “duplex clover funded”.

Since this intersection is located in a densely populated and busy part of the city, traffic almost does not stop. Design and construction of road interchanges will solve the problem of traffic jams in the so-called peak time.

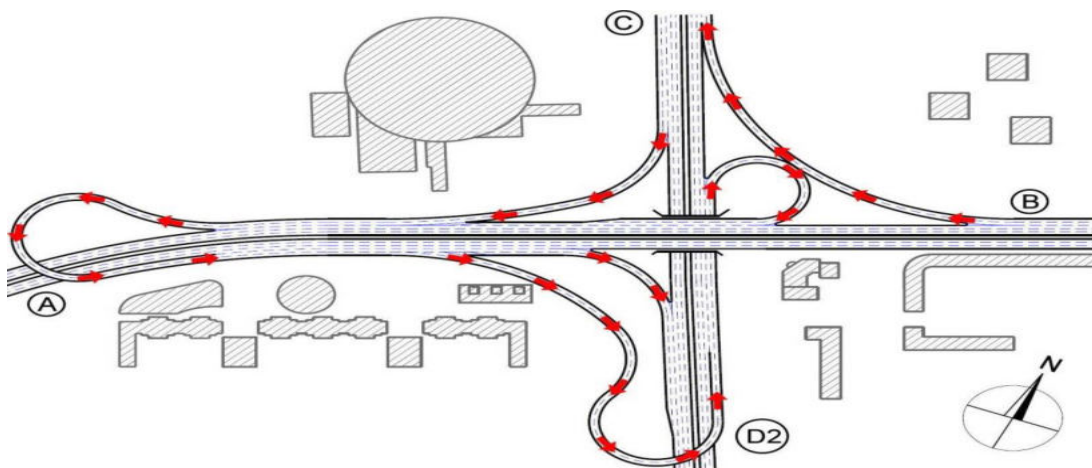


Figure 1 - Overview scheme of proposed multilevel road interchange of Bauyrzhan Momyshuly Avenue and Tauelsizdik Avenue (Astana, Republic of Kazakhstan) – simplified cheaper variant

The proposed multilevel road interchange at the location of current one level intersection of BauyrzhanMomyshuly Avenue and Tauelsizdik Avenue takes into account presence of current buildings and facilities (business center, high-rise apartment buildings, palace of scholars ... etc.) using the specified modification of interchange (Fig. 1 for the simplified cheaper modification). At this interchange there are provided all right-turns and left-turns (totally 12 various directions of traffic flows including the straight directions), as well as unhindered U-turn at the western part of

BauyrzhanMomyshuly Avenue (see Fig. 2 and location in the frames of proposed interchange at Fig. 1) to enable drivers drive to the desired street and make the maneuver without disturbing other drivers.

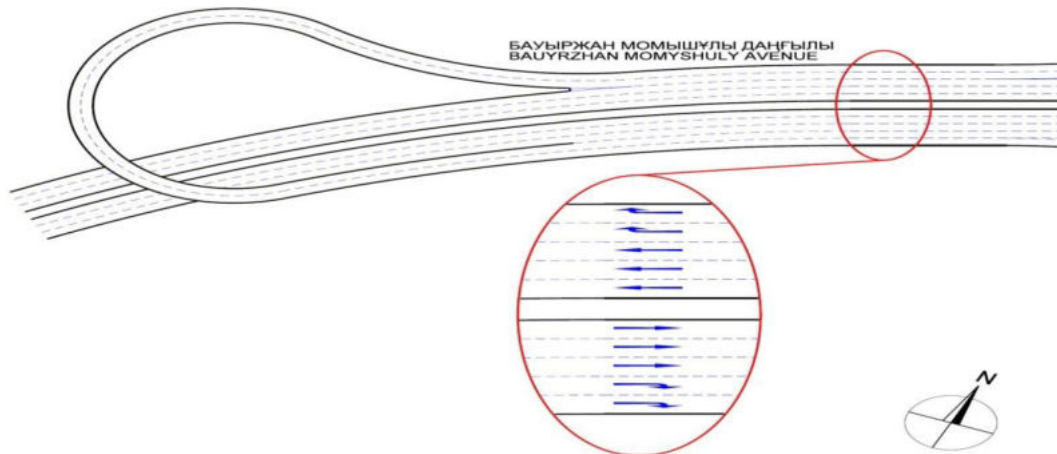


Figure 2 - Example of proposed U-turn ramp (including the road marking in the section between the main area of interchange and U-turn ramp) at the western part of Bauyrzhan Momyshuly Avenue

3. Using of U-ramp to Enable All Directions of Traffic Flows. The proposed U-turn ramp mentioned above provides 2 various directions of traffic flows (when the basic modification of interchange is used – the scheme of these traffic flow motions used at the traffic sign see at the Fig. 3), resp. 3 various directions of traffic flows (when the simplified cheaper modification of interchange is used – the scheme of these traffic flow motions used at the traffic sign see at the Fig. 3) – because the main goal is to increase the capacity of the majority of traffic flows, the multilevel road interchange will provide non-stop vehicular traffic at the intersection.

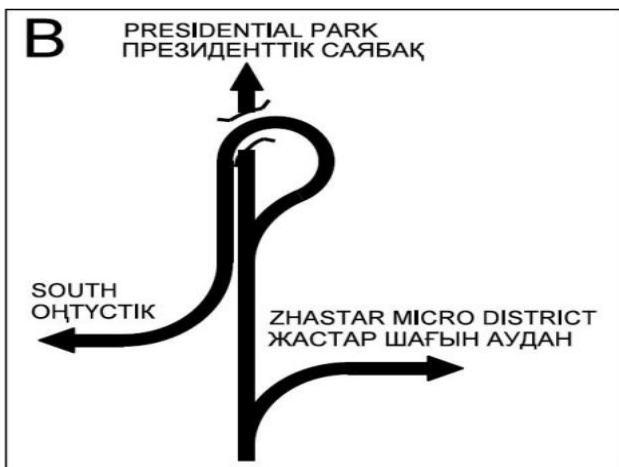


Figure 3 - Example of proposed traffic signs showing to driver how to catch correctly the required exit – entry from the eastern part of Bauyrzhan Momyshuly Avenue

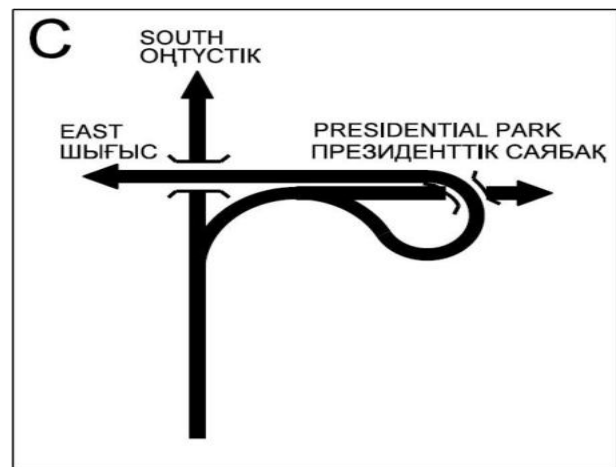


Figure 4-Example of proposed traffic signs showing to driver how to catch correctly the required exit – entry in the direction from the Zhastar Micro District (the northern part of Tauelsizdik Avenue)

Vehicles entering the interchange from the Presidential Park (the western part of Bauyrzhan Momyshuly Avenue) and following the Zhastar Micro District (the northbound of Tauelsizdik Avenue) will use the right traffic lane shorter than usually and then they will quickly turn right as first and use the left-turn semi-loop ramp (see Fig. 4, scheme of the traffic flow motion used at the traffic sign see at the Fig. 5). Vehicles turning right from the Presidential Park (the western part of Bauyrzhan Momyshuly Avenue) will use normal short right-turn ramp to catch the southbound of Tauelsizdik Avenue (see Fig. 4, scheme of the traffic flow motion used at the traffic sign see at

the Fig. 3). Therefore the new design of multilevel road interchange eliminates conflict points and more ensures the road safety.

4. Two Modifications of Right-turn from Tauelsizdik Avenue. For the right-turning vehicles from the southern part of Tauelsizdik Avenue there are two modifications to solve this problem. There is not possible to use usual normal solution with the short direct right-turn ramp because of the buildings of the business center and park in front of these buildings using the space suitable for this ramp mentioned above.

First modification, what can be considered basic variant (see Fig. 1) although more expensive, is using of unusual and longer “S-shaped” right-turn ramp with three curves (see Fig. 9) to avoid and bypass the space of existing buildings of business center and park in front of them.

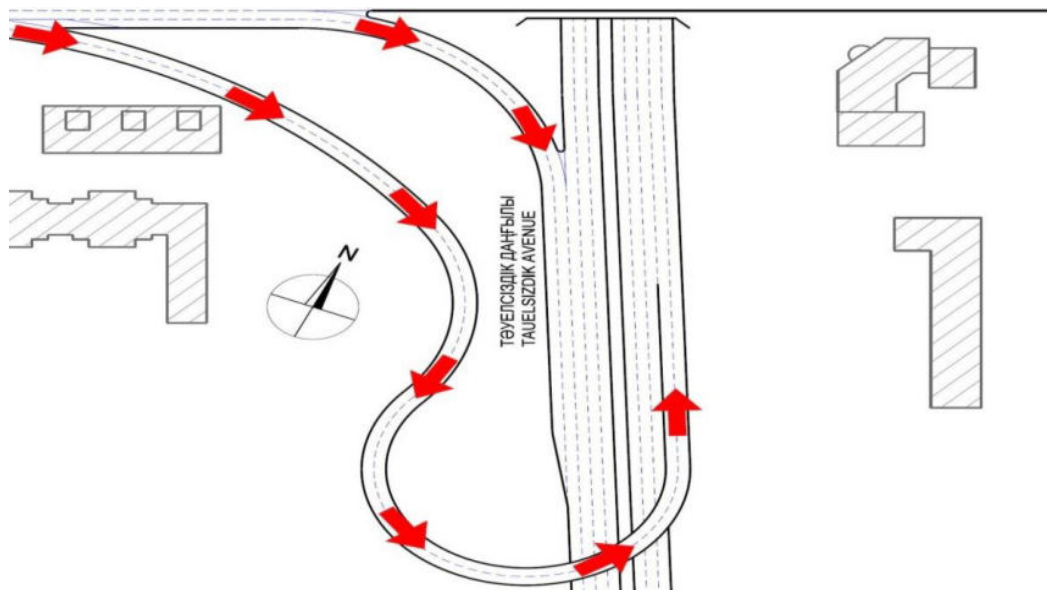


Figure 5 - Left-hand turn and right-hand turn in the direction from the Presidential Park (the western part of Bauyrzhan Momyshuly Avenue) at the simplified cheaper variant of proposed multilevel road interchange of Bauyrzhan Momyshuly Avenue and Tauelsizdik Avenue

The second, simplified and cheaper variant of solution is based on missing right-turn ramp and directing of drivers to the very difficult, but safe, route (using at first one loop ramp for right turning and then follow to the U-ramp at the western part of Bauyrzhan Momyshuly Avenue) how to catch the desired destination at the eastern part of Bauyrzhan Momyshuly Avenue. The principle of this more difficult route (but cheaper from the point of view of costs of this interchange) is shown at the scheme of the road signs for drivers at Fig. 7.

5. Benefits and Disadvantages of New Proposal. Benefits & advantages of new proposal of multilevel road interchange of Bauyrzhan Momyshuly Avenue and Tauelsizdik Avenue:

- high capacity of intersection in all entries;
- saving the travel time of vehicles passing through the interchange in comparison with the current state of the intersection;
- exit from interchange is sometimes realized before entering new vehicles to the same traffic flow;

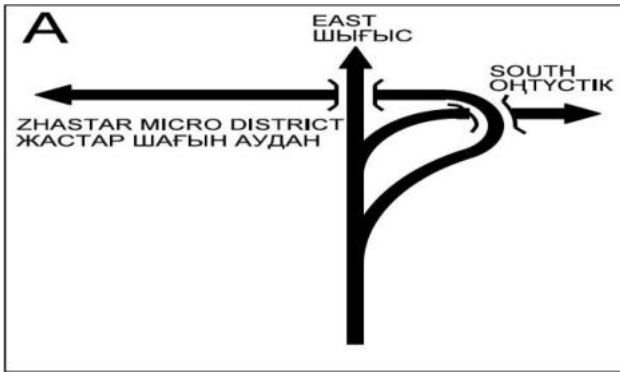


Figure 6-Example of proposed traffic signs showing to driver how to catch correctly the required exit – entry in the direction from the Presidential Park (western part of Bauyrzhan Momyshuly Avenue)

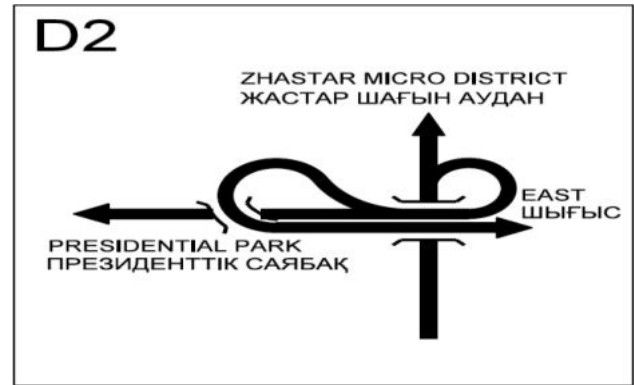


Figure 7-Example of proposed traffic signs showing to driver how to catch correctly the required exit – entry from the southern part of Tauelsizdik Avenue (the simplified cheaper variant)

- using not so much space for the structure of the multilevel road interchange than could be usually supposed;
- there is reduced the necessity and the amount of mutual changing the traffic flows and traffic lanes before the turning right and left inside the interchange;
- there are reduced the conflict traffic flows in the area of interchange – the drivers prepare to use their traffic lane in advance before entering the area of original intersection;
- in some occasions there is possible to turn back although it is sometimes difficult;
- construction with minimal problems – first step is construction of ramps for right turn, in the second step the direct traffic lanes will be closed to enable the construction of bridges and after it the interchange will be completed.

Disadvantages of new proposal of multilevel road interchange of Bauyrzhan Momyshuly Avenue and Tauelsizdik Avenue:

- sophisticated design (see Fig. 9)
- high cost of construction structures
- except the crossing of direct traffic flows crossing there is necessary to build next 3 (sometimes unusual) bridge constructions for curved flyovers of left turn (in total 3, resp. 4 bridges are necessary)
- the need to build special constructions to enable traffic of pedestrians (under the interchange or above the interchange)

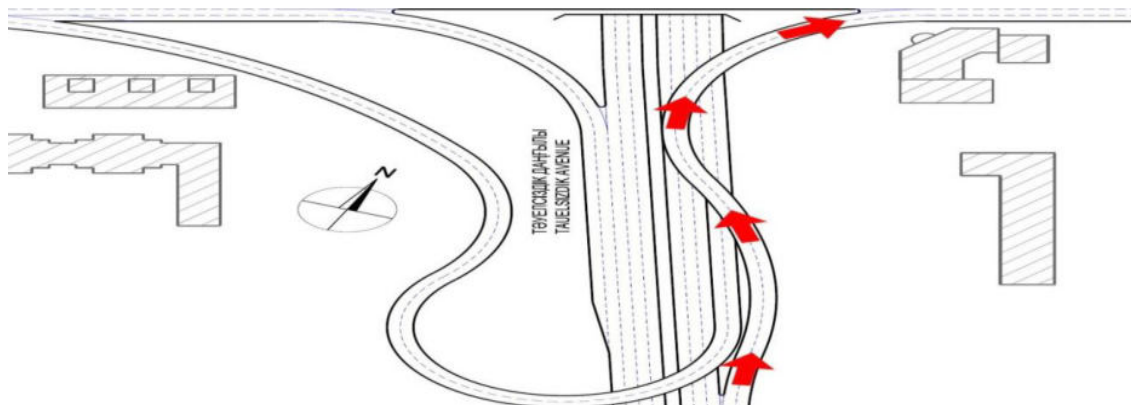


Figure 8 - Proposal of unusual right-turn ramp from the southern part of Tauelsizdik Avenue at the basic variant of proposed multilevel road interchange of Bauyrzhan Momyshuly Avenue and Tauelsizdik Avenue

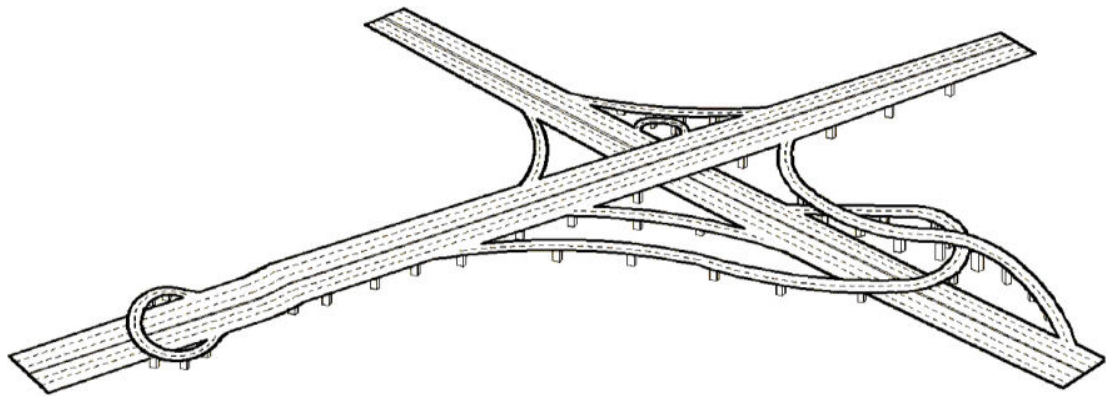


Figure 9 - 3D scheme of proposed multilevel road interchange of Bauyrzhan Momyshtuly Avenue and Tauelsizdik Avenue

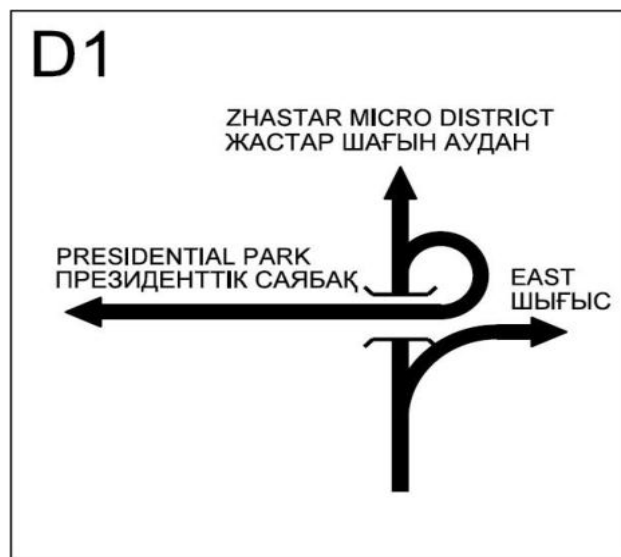


Figure 10 - Example of proposed traffic signs showing to driver correctly catching the required exit – entry from the southern part of Tauelsizdik Avenue (the basic variant)

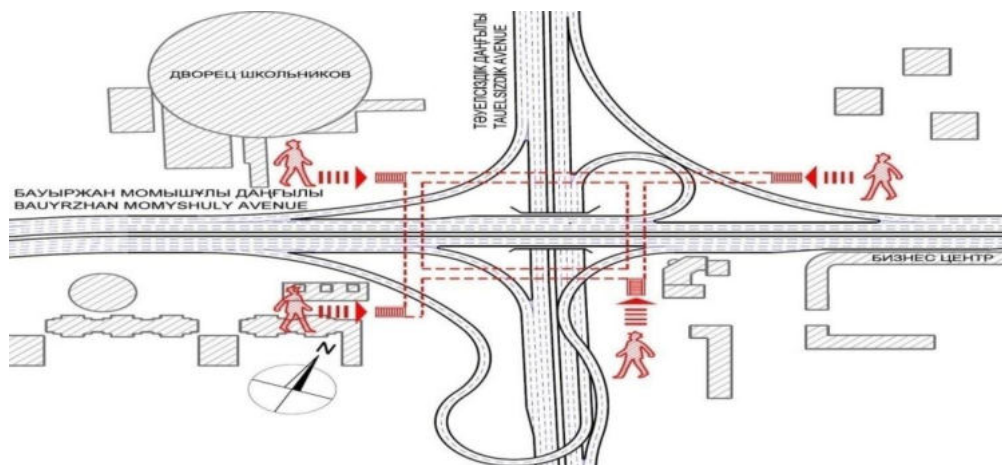


Figure 11 - Scheme of pedestrian underpasses planned at proposed multilevel road interchange of Bauyrzhan Momyshtuly Avenue and Tauelsizdik Avenue

- new proposal of interchange will have limit for the lorries and heavy freight road vehicles (the will have to pass around this interchange – currently it is usual to not allow the entry

of lorries and heavy freight road vehicles into the centers of large cities in the world, therefore this is not considered to be a future problem)

6. Traffic Signs and Road Marking. There will be necessary to use very well designed and prepared traffic signs in connection with the road marking (see Fig. 3) at the proposed multilevel road interchange of BauyrzhanMomyshuly Avenue and Tauelsizdik Avenue. The traffic signs (examples see at Fig. 4, 5, 7, 8 and 11) must show to the drivers how pass through interchange to catch correctly the required exit.

7. Solution of Pedestrian Traffic. As a result the proposed scheme of multilevel road interchange of BauyrzhanMomyshuly Avenue and Tauelsizdik Avenue will reduce road car accidents, increase the road safety and it will increase the capacity of the intersection as well. To enable the safe and not disturbed pedestrian traffic in the area of reconstructed interchange there are proposed pedestrian underpasses, excluding all conflicts between of pedestrians and motor vehicles (see Fig. 11).

References

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