The Reorganization of the Traffic in the city of Opole during the Renovation of Niemodliński Bridge

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In the near future the city of Opole, as well as the whole Opole Voivodship are going to suffer from a serious problem connected with the traffic system which provides for closing of the core bridge crossing from one part of the city to another one – the Ulga canal. The condition of the bridge crossing at Niemodlińska Street is constantly deteriorating. After the first expertise had been conducted by a construction supervision, the decision to close the bridge on 1st June 2015 was made. The decision is justified by the safety reasons and disastrous technical state of the bridge crossing. In order to delay the moment of the closing and lighten the bridge, the inside lanes were changed into bus lanes and thereby the centre of gravity has been moved closer to the bridge crossing axis. Cars are going to use outside lanes. In front of the bridge vehicles height limiters were set in order to eliminate trucks from the traffic. For this kind of vehicles a special detour was created (Wrocławska Street, Road No 45). After this procedure the next expertise of construction supervision was conducted whereby the exclusion of the bridge from the traffic was delayed for one year. For the time being, it is known that the third expertise is being prepared. During the bridge renovation the car drivers and public transport passengers who travel to work every day are going to come across the serious communication problem.

Keywords: traffic reorganization, traffic engineering, traffic design in the city.

1. INTRODUCTION

In the near future the city of Opole, as well as the whole Opole Voivodship are going to suffer from a serious problem connected with the traffic system which provides for closing of the core bridge crossing from one part of the city to another one – the Ulga canal. The condition of the bridge crossing at Niemodlińska Street is constantly deteriorating (fig. 1.). After the first expertise had been conducted by a construction supervision, the decision to close the bridge on 1st June 2015 was made. The decision is justified by the safety reasons and disastrous technical state of the bridge crossing. In order to delay the moment of the closing and lighten the bridge, inside lanes were changed into bus lanes and thereby the centre of gravity has been moved closer to the bridge crossing axis. Cars are going to use outside lanes. In front of the bridge vehicles height limiters were set in order to eliminate trucks from the traffic. For this kind of vehicles a special detour was created (Wrocławska Street, Road No 45). After this procedure the next expertise of construction supervision was conducted whereby the exclusion of the bridge from the traffic was delayed for one year. For the time being, it is known that the third expertise is being prepared. During the bridge renovation the car drivers and public transport passengers who travel to work every day are going to come across a serious communication problem.

Fig. 1. Niemodliński Bridge, crossed by 20,000 cars per day (photo taken by the authors).

2. THE AIM OF THE PAPER

As a result of closing the bridge existing on Niemodlińska Street, the concept of a traffic reorganization in this part of Opole is going to be presented. Due to heavy traffic in this region the option of a temporary bridge above the Ulga canal was created in order to replace the bridge that is closed on Niemodlińska Street. The traffic reorganization concerns:

- Spychalskiego Street;
- Wrocławska Street;
- Krapkowicka Street;
- Niemodlińska Street;

On these streets vehicles, cars, public transport buses and emergency vehicles no heavier than 3.5 tonnes are allowed to move.

Some visible improvements of given streets will be proposed in order to improve the conditions of getting around the city.

3. THE REORGANIZATION OF INDIVIDUAL CROSSROADS AND PARTS OF ROADS

3.1. THE CROSSROAD OF NIEMODLIŃSKA STREET AND STANISŁAW SPYCHALSKI STREET

This is one of the most threatened crossroads and significant problems are expected here. Especially if it is taken into consideration that after the bridge on Niemodlińska Street is closed, the whole traffic will be directed to Spychalskiego Street which is crossed by Niemodlińska Street. The current condition (fig. 2.) of this crossroads is good but it is possible to create some facilities connected with removing of the green belt which is visible on the map. Owing to this, the large lane will be created which will facilitate car traffic.

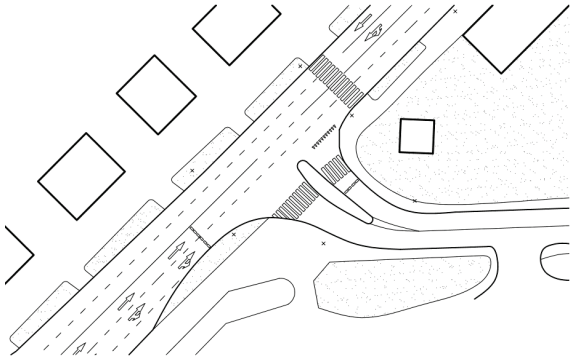

Fig. 2. The crossroad of Niemodlińska Street and Stanisław Spychalski Street - Current condition (elaboration by authors).

In contrast, the left lane of the rode will be changed into a bus lane [1]. The bus stop will be moved in order to enable passengers to get on and out of a vehicle safely. They will also be able to get to the zebra crossing which is situated on the other side of the traffic island. This movement will result in the improvement of traffic for all its users because the cars will not interfere with public transport.

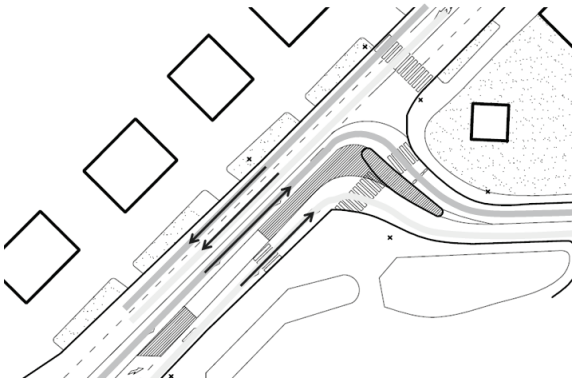

Fig. 3. The crossroad of Niemodlińska Street and Stanisław Spychalski Street - the condition after modernization (elaboration by authors).

This is a very important aspect, and it is worth pointing out that the costs of this project will not be high but it will improve the traffic on the crossroads.

The traffic lights will not be needed what is connected with other savings [2]. Owing to this, the crossroad will be separated, and that will improve the safety of traffic. In the place where the bus stop is situated, it is also possible to deal with the situation in an economical way- the cheapest way to do it is to paint the zebra crossing next to the bus stop, and set some barriers which will make the bus stop safe.

At present, the road on Niemodlińska street is passable both ways, but the presented idea assumes that during the bridge renovation it will be impossible to get through the crossroads by Niemodlińska street to the bridge.

It will be possible to get from domestic premises towards the renovated bridge to the place where Niemodlińska street is connected with Krapkowicka street, and it will be also possible for buses which will get a bus lane there.

Fig. 4. The road in this place will be closed, and cars will pass as in the picture (photo taken by authors).

crossroads at the expense of exploitation of some parts of pavement and shoulders [3]. The object is situated in the place that is strongly limited in terms of the expansion of the area occupied by roads. The only way to temporarily widen the shoulders is to raise a structure of buttress, but for a short period of time the effect is not adequate to needs. Therefore, a total rebuilding has been taken into consideration.

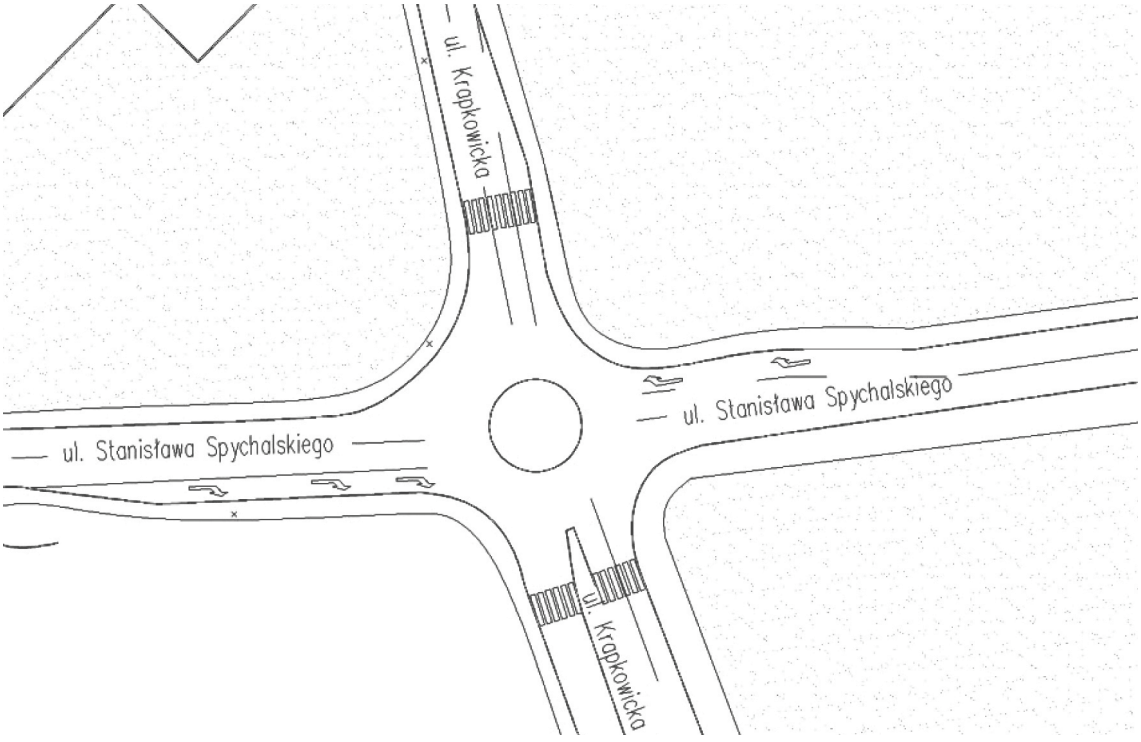

Fig. 5a. The crossroads of Stanisław Spychalski Street and Krapkowicka Street – current conditions.

3.2. THE CROSSROADS OF STANISŁAW SPYCHALSKI STREET AND KRAPKOWICKA STREET

Current condition:

The project of the traffic reorganization concerns rebuilding of Spychalskiego and Krapkowicka streets crossroads. Currently, there is a vehicular traffic but after some changes are applied, this solution will stop being effective. First of all, its throughput and functioning will be reduced. Apart from that, it strongly reduces the space which may be destined for additional traffic lanes.

In order to keep current condition, it is necessary to temporarily widen the roads near the

Fig. 5b. The crossroads of Stanisław Spychaliski Street and Krapkowicka Street – current conditions (photo taken by authors).

A new concept:

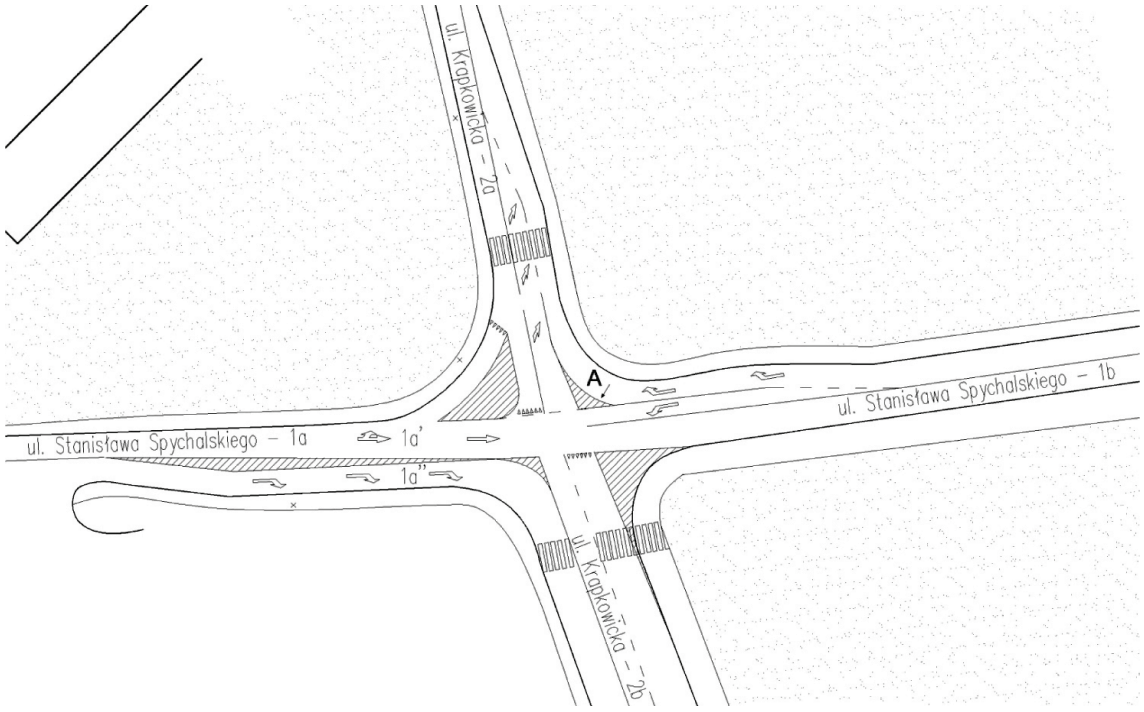

Fig. 6. The crossroads of Stanisław Spychaliski Street and Krapkowicka Street – a new concept (Elaboration by authors).

A new concept assumes crossing the main road - Spychalskiego street with the road, without the right of way - Krapkowicka street.

A part of Spychalskiego street needs to be changed into a one-way street, and on one of traffic lanes a bus lane must be created, with the possibility to use it by the dwellers of a near estate. This idea will expedite public transport and shorten the detour for the aforesaid dwellers.

Public transport buses would go straight and wend towards the existing bridge (1b in fig. 6) where a bus lane would be continued up till the ramp. In contrast, estate dwellers should pull over to the left turn lane directing the users to Krapkowicka Street (2a in fig. 6). A part of this lane should be long enough to provide room for two up to three cars. This requirement is necessary in order not to bar the bus lane.

The traffic expected in this case is so small that is should not cause any impediments. Buses goes by every two minutes and the traffic towards the estate should not be big.

The second traffic lane -1a would be destined for vehicles up to 3.5 tones which would have to keep right to Krapkowicka street (2b in fig. 7). It would serve as an access road to the temporary bridge with one-way traffic - towards the city centre. Krapkowicka street 2a, in fig. 7, towards 2b, in fig. 7, would be a two-way street, up till the ramp to the temporary bridge. It is caused by the slip road from the near supermarket. Currently, there are two short roads from the supermarket to join the main road and two short roads to leave the main road and go to the supermarket. During the renovation four slip roads should be reduced to two slip roads - one from Spychalskiego street (2a in fig. 7) and one from Krapkowicka street (2b in fig. 7). The traffic on Krapkowicka street -2a- would be directed straight towards -2b. For the above-mentioned estate dwellers, it is the only one way which is planned to get to the temporary bridge.

Krapkowicka street behind the slip road to the temporary bridge will be transformed into a one-way road. It is motivated by the fact that driving on the bridge should be smooth, with the right of way. This change would not impede significantly the traffic on this street.

Car and buses going from the bridge-1b, would be directed to the traffic lane which enables only turning right, towards Krapkowicka street-2b. In principle, the traffic should be smooth. The only problem is connected with a sharp turning with banked turn (on the map it is marked with the arrow A.) It is worth putting there some temporary barriers which would protect vehicles from losing their course.

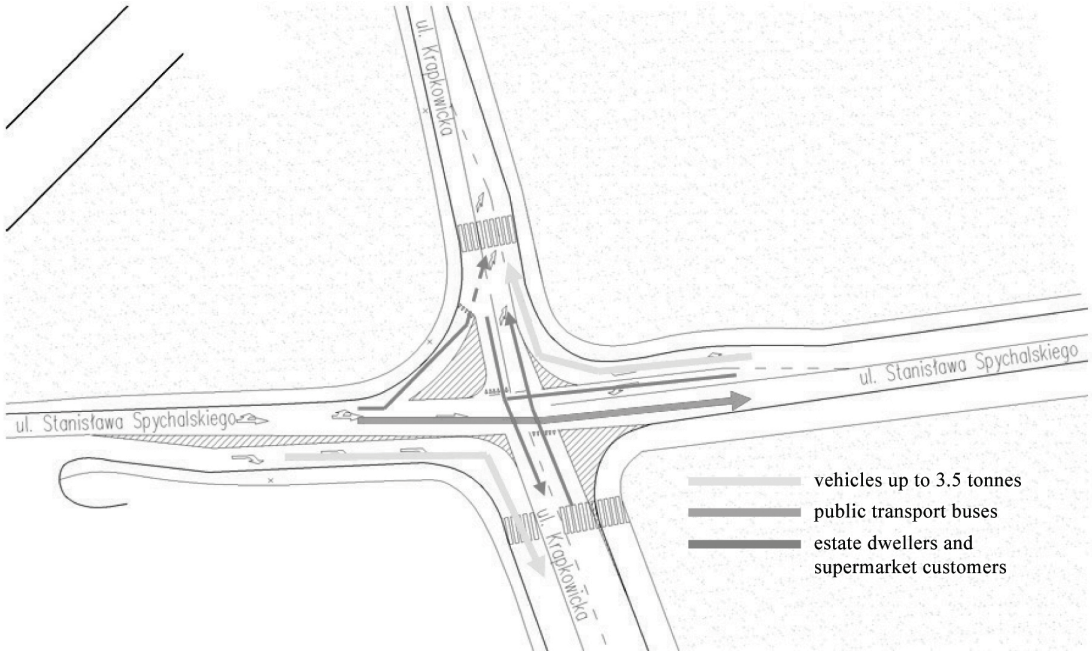

Fig. 7. The crossroads of Stanisław Spychalski Street and Krapkowicka Street – a new concept with driving tracks (elaboration by authors).

Leaving the temporary bridge:

The project assumes using the existing road in order to transform it into a slip road from the temporary bridge to Spychalskiego street. (access road).

Vehicles entering the traffic to Spychalskiego street will be allowed to use a lane which is 50 meters long [4]. They should enter the road which would serve as a continuation of a bus lane on the bridge that should end just after the object. There are not expected any significant impediments in this area because buses which could impede described traffic go every two minutes.

Fig. 8. The road lane which is visible on the right side of Spychalskiego street may be widened to three metres (photo taken by authors).

However, buses would pull over in a lay-by (it is visible on the map). The remaining area would be transformed into two traffic lanes.

The project assumes widening the right side of the road (for the vehicles going from the city centre). It would be made partly at the expense of lay-bys, parking areas and pavements situated along the traffic rout.

This condition is not necessary to realize this project but it would significantly improve the traffic [5]. Besides, when the renovation is completed, drivers will have the possibility to use a single carriageway with three lanes, which will facilitate travelling around the city [6].

Fig. 9. The lay-by and parking areas on the pavements may be replaced by additional lane (photo taken by authors).

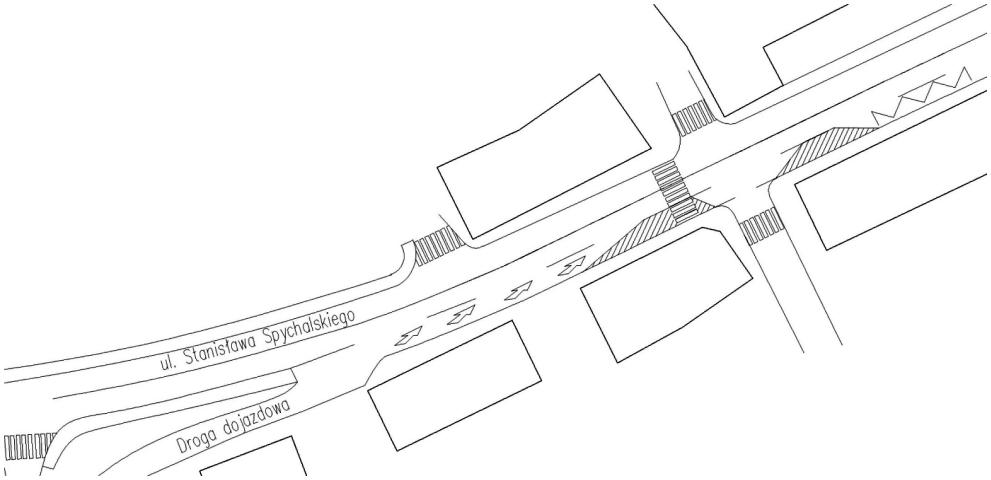

Fig. 10. Additional lane on Spychalskiego street (elaboration by authors).

3.3. THE CROSSROADS OF SPYCHALSKIEGO AND WROCAŁAWSKA STREET

This lane-splitting has a great significance to traffic in this part of the city. It is situated on the traffic island called "Pasieka" and it may have some troubling aspects due to the throughput that this crossroads has.

Some ways to obtain the best throughput in this place will be presented.

An important aspect that will influence driving condition on this road is removing the pavement in Wrocławska street. This area is big enough to use the existing bus lane to widen the roads and obtain another traffic lane [7]. If we add a right-turn lane from Spychalskiego street, from the Oder river side, an efficiently working road system will be obtained.

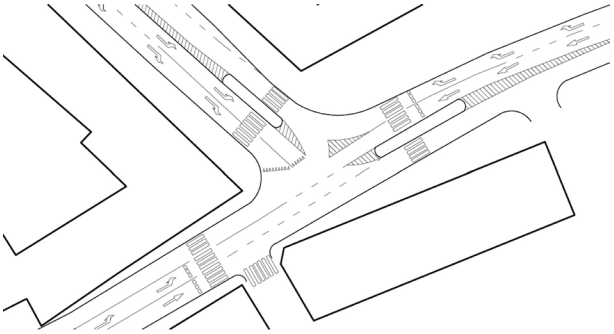

Fig. 11. The crossroads of Spychalskiego and Wrocławska street - current condition (elaboration by authors).

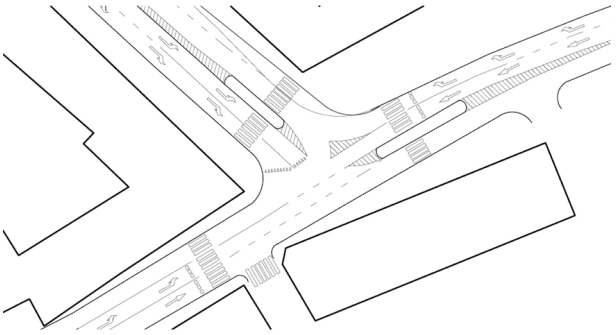

Fig. 12. The crossroads of Spychalskiego and Wrocławska street- a new concept (elaboration by authors).

The reorganization of the infrastructure on this crossroads is also very important. However, besides widening the pavement, all other the changes are only of cosmetic nature, and they will have little influence on driving conditions. Everything is controlled by the traffic lights.

Due to these changes, a faster right- turn from Spychalskiego street to Wrocławska street will be obtained. Additionally, the traffic on the other parts of this crossroads will be expedited.

Fig. 13. View on Wrocławska street (photo taken by authors).

3.4. THE CROSSROADS OF WROCŁAWSKA STREET AND NIEMODLIŃSKA STREET

Fig. 14. The crossroads of Wrocławska street and Niemodlińska street (photo taken by authors).

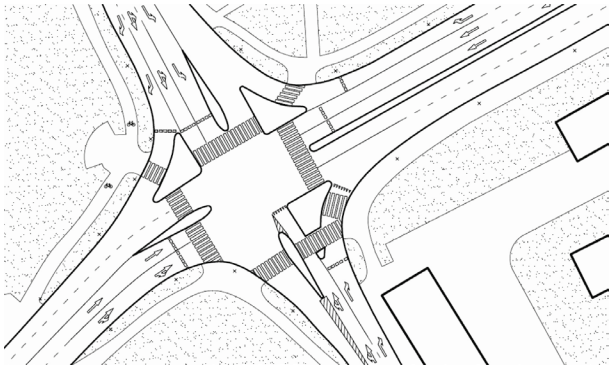

Fig. 15. The crossroads of Wrocławska street and Niemodlińska street - current conditions (elaboration by authors).

Closing the bridge crossing above the Ulga canal will force all drivers travelling from the downtown to Zaodrze to go via Wrocłwska street to the north or to the south. Therefore, the reorganization of this crossroads is necessary in order to enable drivers to get across the canal.

We assume widening the street and creating two right-turn lanes in order to clear this crossroads for drivers travelling to the north part of Wrocławska street. In the street another lane will be created up till Wrocławski bridge which is being renovated because the additional lane is being created there. This solution is needed in order to obviate a traffic congestion which starts from this crossroads and continues along Nysa Łużycka street, up till the roundabout at the crossroads on Budowlanych street. The way to the bridge will be temporarily closed right next to the crossroads. The two lanes that will be free will serve as a construction site for building workers. The remaining two lanes will be left for dwellers of blocks situated nearby. Driving in these lanes will be possible only from Nysa Łuzycka street and from the northern part of Wrocławska street. Driving in will be possible through Jan Kaziemierz square by one-way road, next by Ściegiennego street and to Wrocławska street.

Currently, the traffic lights work quite efficiently, but when one of the inlets of the road is closed, the change of traffic signal system will be needed. In order to maximize the throughput, a three-shift traffic signal system will be created. It will allow all drivers and pedestrians to move safely.

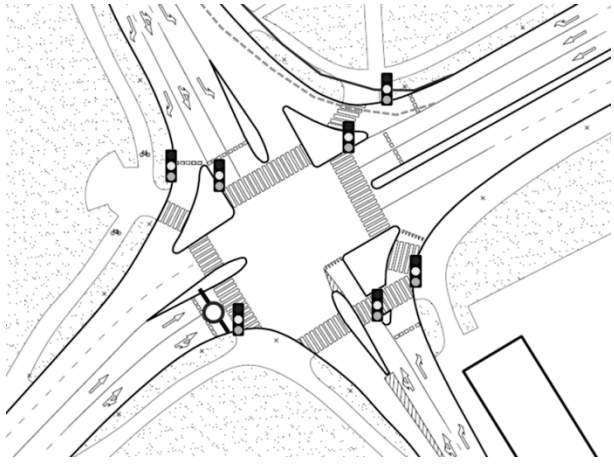

Fig. 16. The crossroads of Wrocławska street and Niemodlińska street – a new concept - extending the right turning (elaboration by authors).

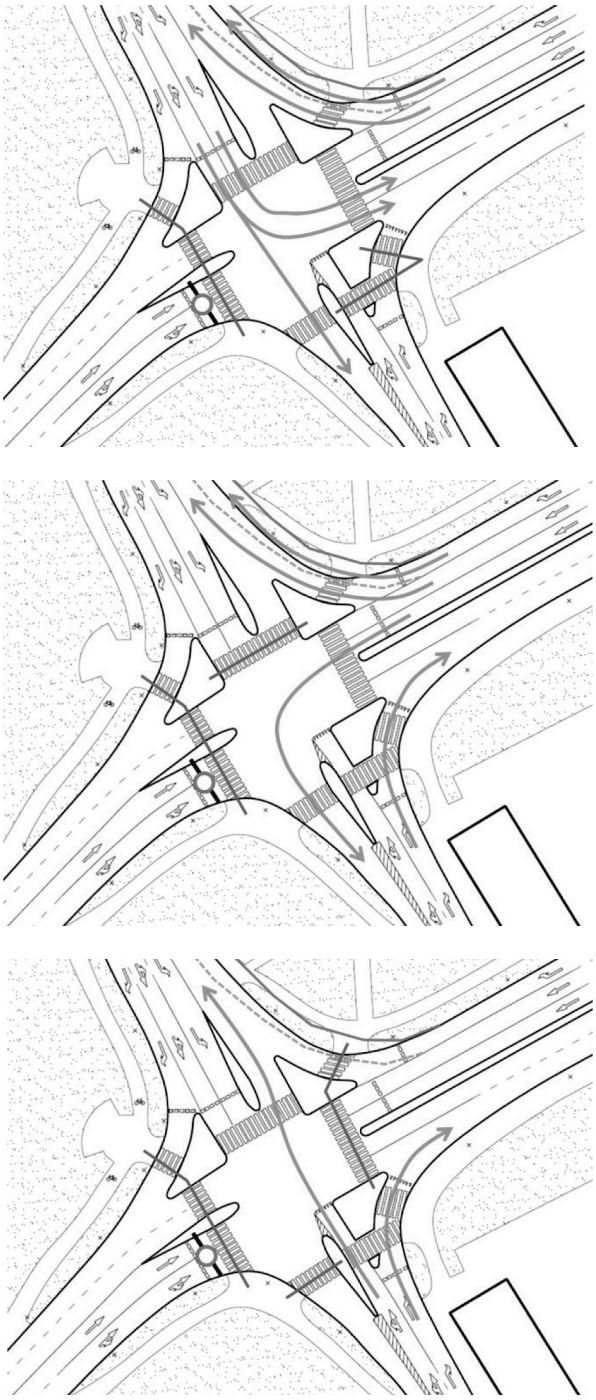

Fig. 17. The crossroads of Wrocławska street and Niemodlińska street – a new concept - extending the right turning and a 3-phase change of lights will shorten the waiting time for the green light (elaboration by authors).

3.5. KATEDRALNY BRIDGE

This is another place which increases traffic at the crossroads of Wrocławska street and Spychalskiego street. This object is too narrow and consequently traffic in this place is significantly stymied.

As a result, there is a problem connected with drivers who try to get from the right-bank part of the Oder river to the Bolko island, and further - to the western part of the Opole city. There is a need to direct the traffic to Książąt Opolskiech street in order to enable drivers to cross over the object along Nysa Łuzycka street, then by Wrocławska street, driving the charted detour. This solution will lighten the crossroads of Wrocławska and Spychalskiego street.

There is an idea to create one-way traffic on the bridge along Katedralna street towards the city centre.

Fig. 18 Congested Cathedral bridge (photo taken by authors).

Fig. 19 Implementation of a one-way road on the Katedralny bridge will relieve the Spychalskiego street (elaboration by authors by [8]).

III Three stages of the traffic reorganization

The changes presented in the paper show a solution implemented during the third stage of renovation of the crossing above the Ulga canal, with a use of a temporary bridge. Additionally, some solutions connected with the first and second stage of the bridge renovation have been prepared.

I-before the bridge renovation
- widening of the aforementioned roads, including Spychalskiego street
- adding traffic signs

II-renovation, Niemodliński bridge as a temporary bridge
- lightening of the bridge
- creating a footbridge next to the bridge
- directing cars along Spychalskiego street

III-bridge dismantling
- crossroads reorganization, when
  - temporary bridge on the southern part of the Ulga canal
  - lack of any bridge

After the renovation some street, traffic signs and other infrastructure changes may be saved and used, for example by creating bus lanes, parking areas or bike lanes, but this is a topic that may be described in another paper.

4. CONCLUSIONS

Traffic in Opole is a very difficult issue, especially considering the fact that even when the bridge was fully operational, drivers complained about the crowded streets. Given the fact that during the renovation of the bridge the city will be very congested, the proposed ideas can make life easier for residents, services and all other road users. It should be also taken into account that the ideas have been appreciated by many respected people associated with the university, and above all the employees of the Office of Opole, i.e. the Deputy President Marcin Pietrucha, Piotr Rybczyński the Deputy Director of the Road Administration in Opole, who offered cooperation for subsequent projects.

REFERENCES

[1] PN - EN- 12368 norm: Equipment for traffic control
[2] Law on Road Traffic . Law of 20.06.97 (Journal of Laws of 2003. No. 58, pos. 515)
[3] Regulation of the Minister of Transport and Maritime Economy of 2 March 1999 on the technical conditions for public roads and their location. Journal of Laws 1999 No. 43, item. 430
[4] Regulation of the Minister of Infrastructure and the Interior and Administration dated 31.07.2002 on Road Signs and Signals, Journal of Laws No. 179 item. 1393
[5] Regulation of the Minister of Infrastructure of 23 September 2003 on the detailed terms of traffic management on the roads and to exercise supervision over the management, Journal of Laws 2003 No. 177, item. 1729
[6] Regulation of the Minister of Infrastructure of 03.07.2003 on the detailed technical requirements for road signs and signals and road traffic safety equipment and conditions of their placement on the road, Journal of Laws of 2003 no. 220 item. 2182 of 23.12.2003, with attachments
[7] Wierzchowski M.: *Konstrukcja Programu Drogowej Sygnalizacji Świetlnej*, Warszawa, 2011
[8] www.google.pl

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