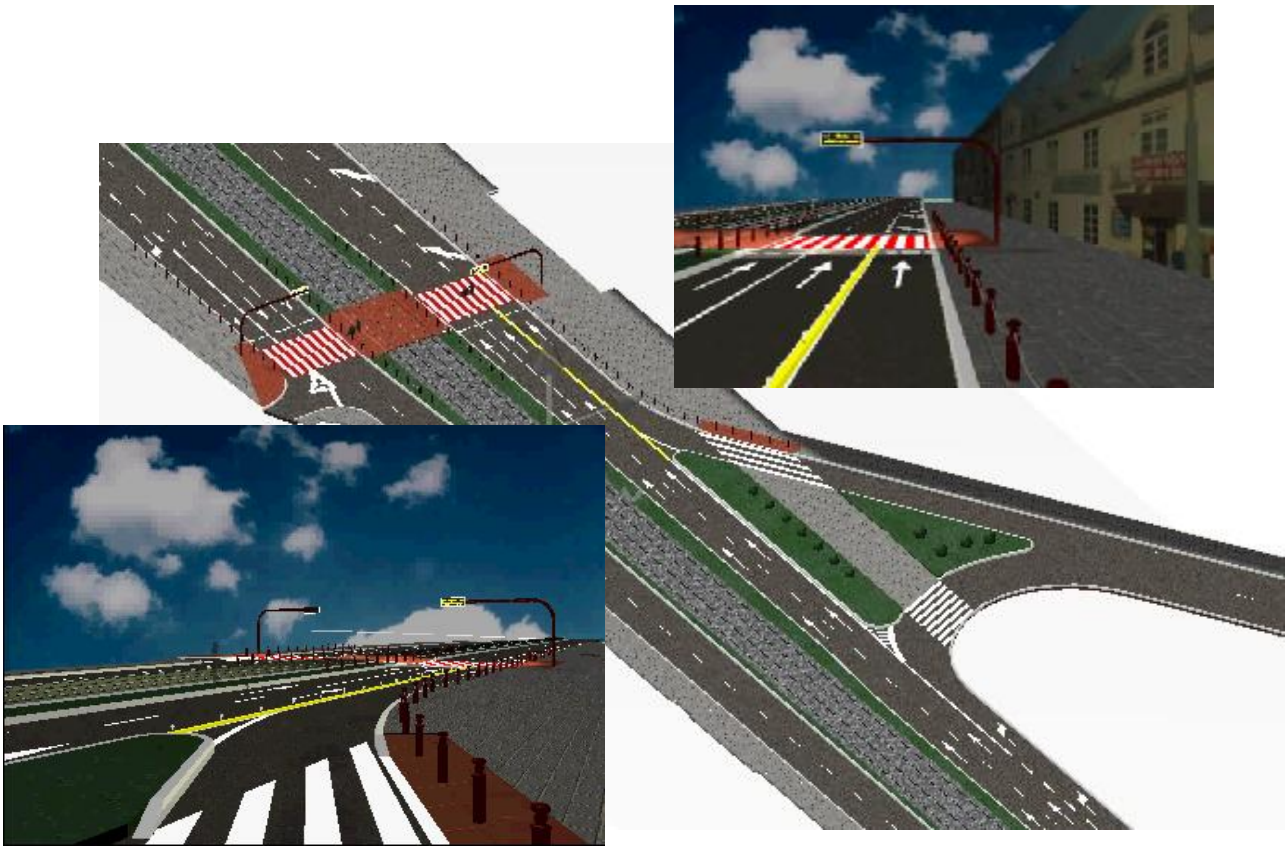
VOICE

Vulnerable road user Organisations In Cooperation across Europe

Theme:

TRAFFIC SAFETY IMPROVEMENT IN THE AREA OF GROCHOWSKA AND MIŃSKA STREET CROSSROAD

with the special attention to unprotected transport system users



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List of content

1. Introduction
2. Problem of traffic safety in Warsaw
3. Methodology of work
4. Characteristic of the existing situation – problem identification
   - 4.1. Spatial development
   - 4.2. Traffic data
   - 4.3. Public transport
   - 4.4. Traffic safety of pedestrians crossing Grochowska Stree
   - 4.5. Summary of status quo
5. Solutions proposal
   - 5.1. Assumptions
   - 5.2. Safety improvement measures
   - 5.3. Characteristic of the suggested solutions
6. Summary

1 INTRODUCTION

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The aim project preparation was to improve traffic safety in the area of Grochowska and Mińska Street crossroad, with particular attention to unprotected transport system users. Cross is situated in Warsaw (Praga Poludnie district- see fig. 1.1).

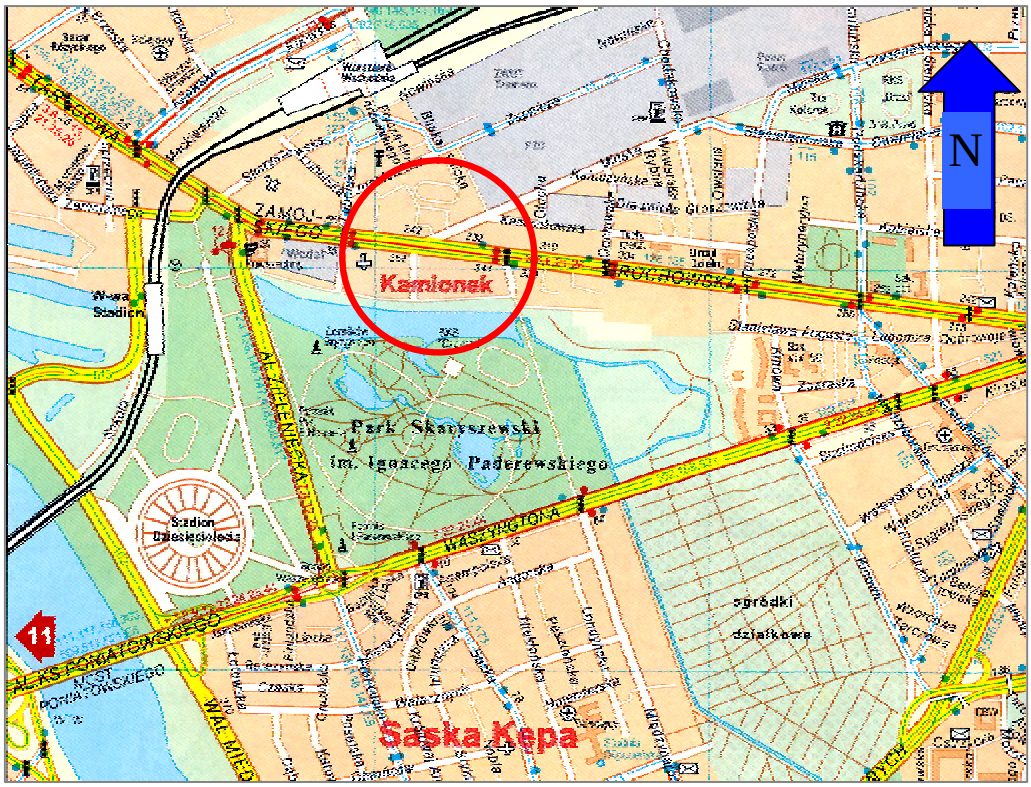


Fig.1.1 Situating of cross Grochowska Street with Mińska Street

2. PROBLEM OF TRAFFIC SAFETY in WARSAW

Statistics indicate, that in a big city 60% of road accidents are connected with pedestrians. According to the police databeses (period 2003-2005) crossroad of Grochowska/Mińska street is very dangerous. In the year 2005 planty incidents happened, and 88% of them with pedestrians. It shows the urgent necessity of situation improvement, thorugh engineering or organisaton measures, forcing drivers and pedestrian behaviour changes.

3 METHODOLOGY OF WORK

The following competition targets were defined:

- Correction of the traffic safety of unprotected road users without worsening of car traffic conditions.
- Proposal of solution easy to be utilized and inexpensive.

During work execution a detail analysis of the existing situation was carried out supported by the additional traffic surveys concerning:

- Pedestrians traffic volume measurement together with whit generic structure.
- Instant speed measurement (with the utilization of speed counter).

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Analysis of existing situation and research analysis enabled better identification of Grochowska street traffic safety problems .

4. CHARACTERISTIC OF THE EXISTING SITUATION – PROBLEM IDENTIFICATION

4.1 Spatial development

Grochowska Street is a G-class street (main street), with two-lanes and two carriageways, with the tram line placed in the middle. It is a significant traffic corridor, connecting Grochów residential district with the centre of Praga district. Mińska Street is a local class street. The crossroads of Grochowska and Mińska streets (without traffic lights) is situated between the two other Grochowska crossroads with Lubelska and Gocławska streets, both with traffic lights, tram stops and pedestrian crossings.

In the area of analysed crossroad a pedestrian crossing through both roadways of Grochowska street (and tram line) is situated. The crossing is not equipped with traffic lights. No pedestrian refuges together with huge car traffic intensity as well as intensive tram traffic creates many traffic safety problems. Moreover, narrow pavements along Grochowska street (esp. on the south side of the street) and disorganized car parking, reuduces pedestrian's saferty especially due to imposing visibility.

Additionally, high class of Grochowska street and its function in the road system, significantly limits the freedom of traffic calming measures introducing. This fact is treated by the author's as a condition restricting the scope of feasible solutions. On the other hand forcing practical appliance of the changes proposed. It was assumed also, that more radical solutions can increased pedestrian's mobility introduced in case of Mińska street.



Fot. 1. Grochowska st. – view on the pedestrian crossing without traffic lights.



Fot. 2. Grochowska st.. View on the pedestrian crossing not visible because of cars parked closely to the crossing.

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Fot. 3. Grochowska st. – tram track situated in roadway division belt – without refuge for pedestrians crossing the street.



Fot. 4 Inlet of Mińska st. - unfavourable angle of intersection (approx. 30^0). Visible pedestrian crossing with isle for pedestrians (car parked) and area excluded of the traffic on Grochowska st..



Fot. 5. Grochowska st. – narrow sidewalk on the south side of the street with additional limitations – stairs to shops.



Fot. 6. Grochowska st. – intersection with acces road to esteta Kamionek (near to pedestrian crossing).

Spatial development in the area of Grochowska and Mińska streets crossroad causes increase pedestrians mobility. The basic objects generating vehicular and pedestrian traffic are:

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1. primary school
2. school complex, secondary school
3. market-wise store
4. small stores and service points
5. new residential estate
6. religious cult object
7. green area, recreational objects

4.2 Traffic data

Traffic measurements of pedestrians and cyclists within the range of the analyzed crossroad

The measurements of pedestrians and cyclists traffic were made on April the 12th at 3 chosen sections. Surveys were done for both traffic directions, and together with identification of pedestrian structure. Special attention was paid to the identification of handicapped people. Survey sections location plan is presented on the picture 4.

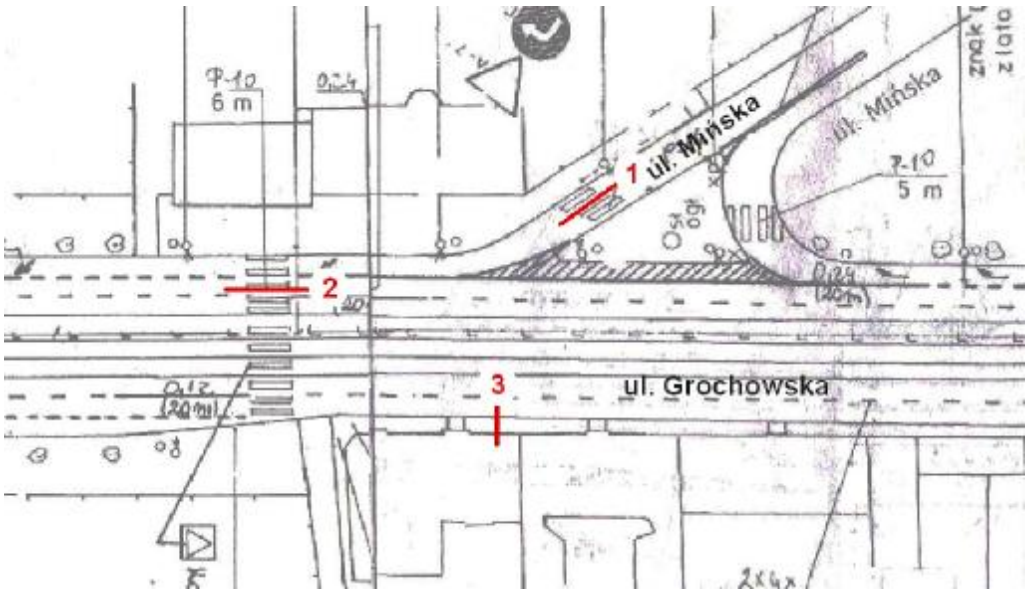


Fig. 4.2 Plan of localization of measuring section

On the basis of surveys it was identified that maximum intensity of pedestrian traffic takes place during afternoon rush hour, i.e. between 17 and 18 o'clock. The highest traffic was observed at the crossing through Mińska street (section no 1) – ca. 210 person/hour/section. Intensity of pedestrian traffic at sections 2 and 3 was almost identical – ca. 140 person/hour/section.

Structure of the pedestrians moving in the area of Grochowska and Mińska streets crossroad is presented in the table 2.

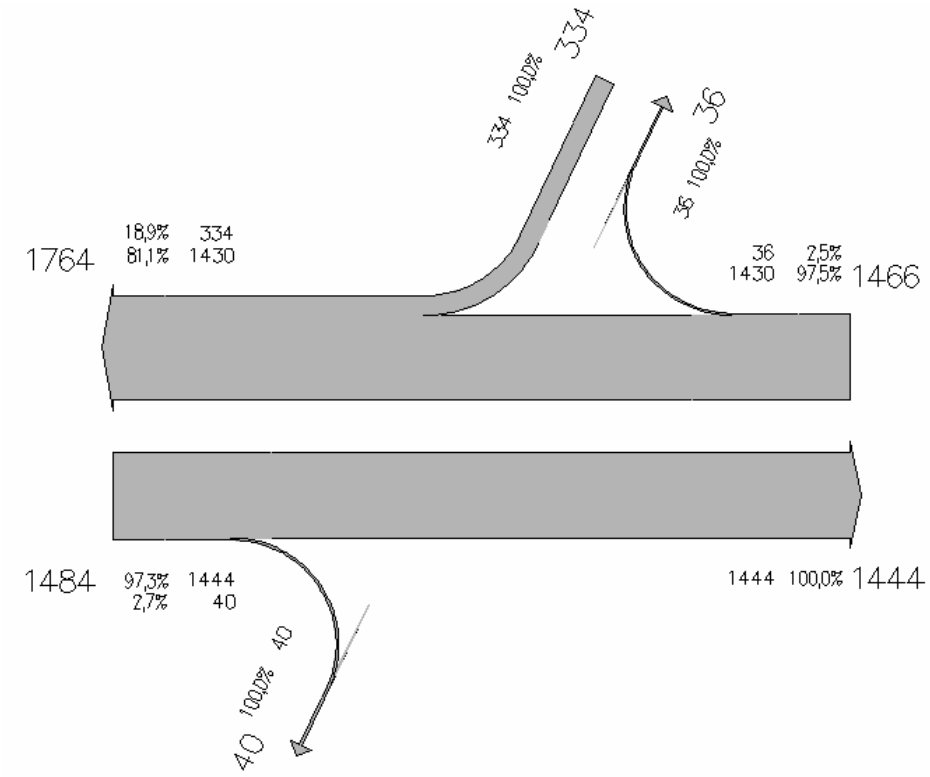
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Pedestrian's groups	Section 1 Mińska	Section 2 Grochowska crossing	Secion 3 Grochowska sidewalk
1. able people	**76,8%**	**83,5%**	**78,1%**
2. elderly people	**8,5%**	**5,1%**	2,7%
3. people with luggage	**4,6%**	**5,7%**	**9,4%**
4. people moving by means of crutches, canes and protheses	0,2%	**2,9%**	2,3%
5. people with small children	0,7%	0,6%	1,2%
6. people with prams	**3,5%**	1,1%	2,0%
7. people with wheelchairs	0,0%	0,0%	0,0%
8. cyclists	**5,7%**	1,1%	**4,3%**
Total:	100%	100%	100%

Table 4.2 Structure of pedestrians and cyclists traffic in the area of the crossroads of Grochowska and Mińska streets

Vehicle traffic volumes

On the basis of car traffic data (obtained from the contest organizers) a very high traffic intensity is observed on Grochowska Street (ca. 3250 vehicles/hour/section) and farly lower on Mińska street (ca. 370 vehicles/hour/section).



Rys. 4.3 Cartogram of vehicle traffic structure on the crossroads of Grochowska and Mińska streets

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Vehicles velocity in the area of pedestrian crossing through Grochowska street

Measurements of instant velocities were made on the April 22th, between 10.30 and 11.30. survey were done on Saturday in order to find conditions that incline vehicles' drivers to drive with higher speed (without traffic clutter that is typical for working days). Measurements were made on both roadways of Grochowska street; each time before the side of pedestrian crossing analyzed in the project. Spewed of 193 vehicles were registered.

Results of measurements indicates that no significant problems connected with speed exceeding were identified.
Approximately 84% of vehicles were moving slower than 60 km/h.

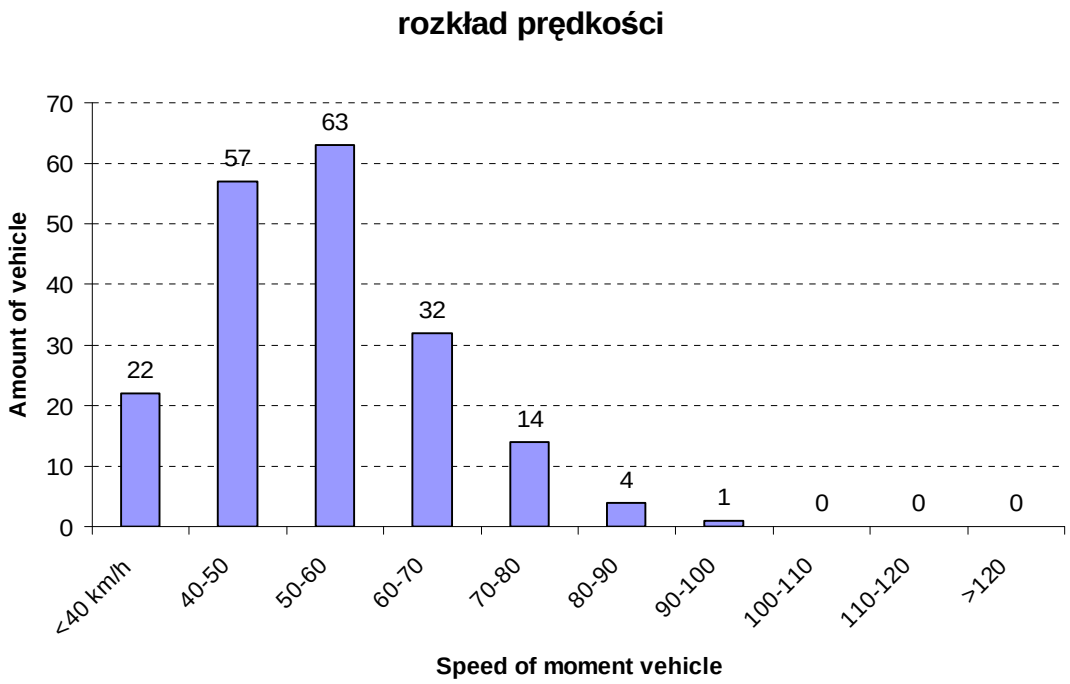


Fig. 4.4 Instant velocity distribution of vehicles moving along Grochowska Street in the neighbourhood of pedestrian crossing.

4.3 Public transport

Bus and tram stops

Public transport stops are placed 500 m far from crossroads of Grochowska and Mińska streets. Four stops (2 bus and 2 tram) close toLubelska Street are located west to the analysed crossroad. Four stops (2 bus, 2 tram) are located near Bliska street - east to the analysed crossroad.

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Pedestrains which are public transport users are walking to stops along Grochowska street, crossing the street at crossings close to Lubleska and Bliska streets. Both of them are controlled by traffic lights. Thus, it can be assumed that public transport stops do not influence neither the functionality of the crossroad of Grochowska and Mińska streets nor pedestrian traffic through Grochowska Street. The assumption was additionally justified by field observations.

Location of PT stops is shown at picture 8.



Fig. 4.5 PT stops along Grochowska street

4.4 Traffic safety of pedestrians crossing Grochowska Street

Data obtained from the accident database allowed for conducting of a detail analysis of traffic accidents within the period of 2003-2005. In the year 2004 there was a significant increase of a number of accidents, and then in 2005 a noticeable uplift of injured pedestrians. What is important an incease was very rapid, from 20% share of pedestrian accidents in total numer of accidents (in 2004) to almost 80% in 2005. This confirms previous thesis about insufficient safety of unprotected road users..

All traffic accidents with participation of pedestrians took place at pedestrian crossing through Grochowska and Mińska streets Incorrect drivers behaviours near pedestrian crossings was the main reason of accidents.

4.5 Summary of status quo

Main problems

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Results of the analysis of an existing situation indicate that in the area of analysed crossoroad level of traffic safety of unprotected road users is very low. It is basically connected with:

1 **traffic geometry and organization,**
2 **spatial development impact,**
3. **high volumes of traffic and drivers behaviours**,
4. **public transport (trams)**.

Reasons of bad traffic safety conditions.

Traffic safety analysis proved that bad situation justifies changes as it concerns crossroad geometric solutions as well as traffic organization.

Identified main reasons of poor situation of traffic safety are the follwong:

- **lack of relevant traffic segregation,**
- **to long pedestrian crossing (through two roadways and tram track) without refuge,**
- **low visibility of pedestrian crossings**
- **low visibility of pedestrians on the crossing through Grochowska street**

5 SOLUTIONS PROPOSAL

5.1 Assumptions

Significant project limitations were imposed due to a spatial development of the area analyzed and important transport function of Grochowska street. This as well as authors' aspirations to present feasible and unexpensive solutions, lead to a proposal of a set of mainly traffic engineering solutions instead of multilevel structures such as under or ober passes. Morover manner of spatial development as well as level of a pedestrian traffic do not justify introducinon of an expensive solutions. **That's why, it was assumed that the effect of the competition project require to allow for an essential improvement of traffic safety through a small corrections of crossroads' geometry and utilisation of traffic engeneering measures.**

Additionally, considerning Grochowska street function, it was assumed that suggested solutions will not significantly limit traffic capacity of the street. As a conseqeunce, it was also assumed that no application of traffic lights is possible. This is because of the fact that neighbouring crossroads sare controlled by lights, and are located very close to the analysed crossroad. (anathor traffic light and stopping car traffic and trams would cause excessive wastage of time of road users and specially public transport passangers).

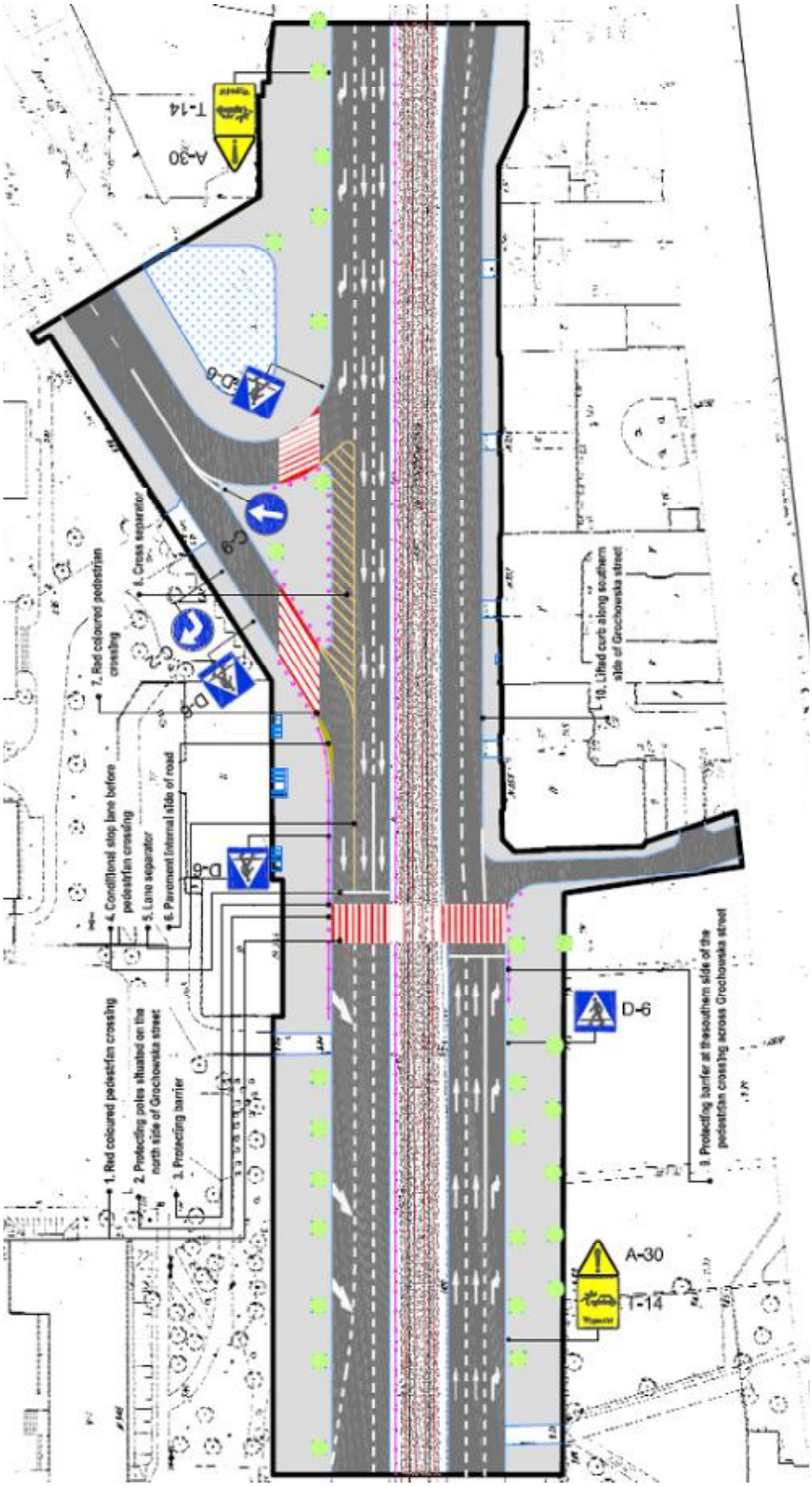
Therefore efforts were made in order to find solutions ensuring pedestrians safety, especially using pedestrian crosiing (but not nly) minimasing influence to car and tram traffic.

5.2 SAFETY IMPROVEMENT MEASURES.

At the beginning several road safety improvements ideas were analysed. Thre of them were checked more etaily. And finally one og them was selected as an author's proposal. Both solution analysed (also interesting according to the author's) are presented on figures 1 and 2.

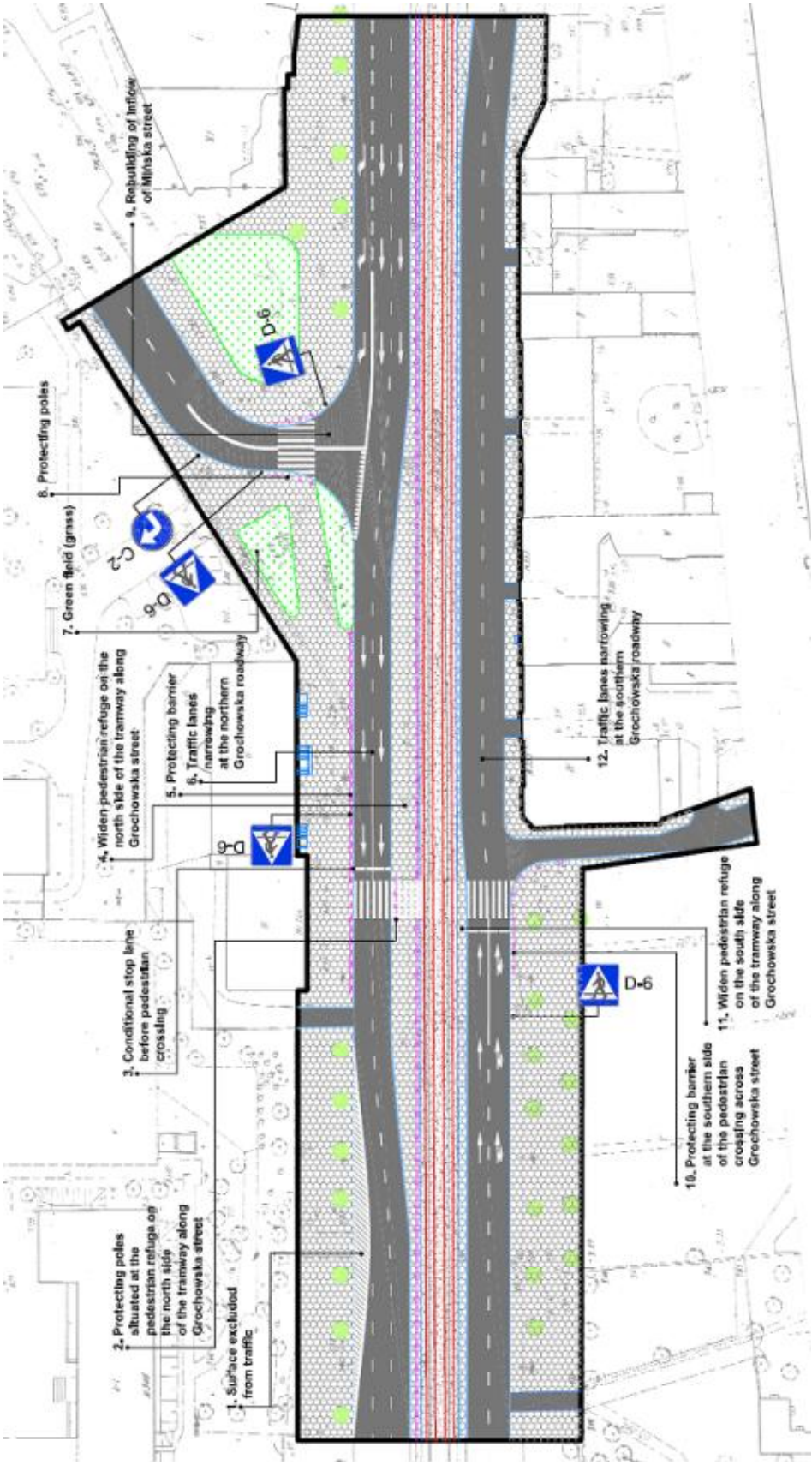
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1. **Variant 1** (minimum) – solution based on the idea of minimum cost of the project. Rejected because of not enough protection of pedestrians in the traffic. Fig. 1.



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Variant 2 – based on the idea of particular priority for pedestrians crossing Mińska street. Solution rejected because og higer interference to geometry at reletively smaller effects,specialy as it concerns Grochowska street. Fig. 2



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5.3 CHARACTERISTIC OF THE SUGGESTED SOLUTIONS

Suggested solutions improving traffic safety concern the following grouo of measures:

- geometry of the road,
- traffic managment,
- traffic safety devices,
- other actions.

SOLUTIONS IN RANGE OF GEOMETRIC OF THE ROAD

Solution 1

Widen pedestrian refuge on the north and south side of the tramway along Grochowska Sreet and narrowed traffic lanes at southern and northern Grochowska Street roadlane.

Fig. 5.1 Pedestrian crossing by Grochowska Street- state existing.





Fig. 5.2 Pedestrian crossing by Grochowska Street- state design.

Solution 2

Traffic lane narrowed at the inlet of Mińska street.

Solution 3

Widen sidewalk along the southern side of Grochowska street.

Solution 4

Lifted curb along the southern side of Grochowska street.

Solution 5

Widen pedestrian refuge and cancelled precinct

SOLUTIONS IN RANGE OF TRAFFIC MANAGMENT

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Solution 6

Conditional stop lane before pedestrian crossing at the southern at northern Grochowska roadlane.

Solution 7

Stop lane at the southern inlet.

Solution 8

Stop sign at the southern inlet.

Solution 9

Street over marking, variable message sign togeher with motion detector mointed on the cantilever jib. Information displayed on sign:

„!!! UWAGA PIESZY NA PASACH !!!”
(!!! PEDESRTRIAN ON ZEBRA CROSSING !!!)

Fig. 5.4 Pedestrian crossing by Grochowska Street- state existing.





Fig. 5.5 Pedestrian crossing by Grochowska Street- state design.

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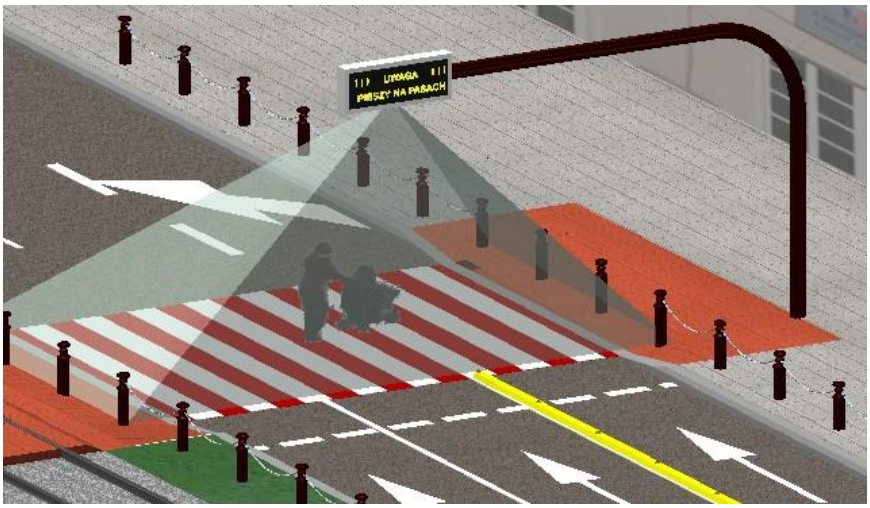


Fig. 5.6 Surface monitored by scanner - state design.

Solution 10

Extra lighting mounted on the cantilever jib.



Fig. 5.7Ilumination of pedestrian crossing.

Solution 11

Red coloured pedestrian crossing

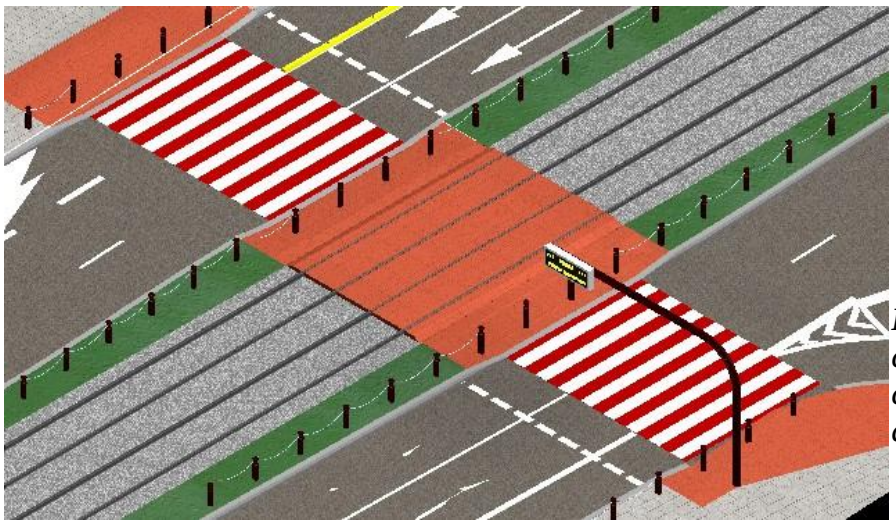


Fig. 5.8 Red coloured pedestrian crossing - state design.

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Solution 12

Lane separator mounted before pedestrian crossing at the northern Grochowska roadlane.

SOLUTIONS IN RANGE OF TRAFFIC SAFETY:

Solution 13

Protecting poles situated at the pedestrian refuge on the northern side of the tramway along Grochowska street.

Solution 14

Protecting barrier and protecting poles at the northern and southern side of the pedestrian crossing across Grochowska street.

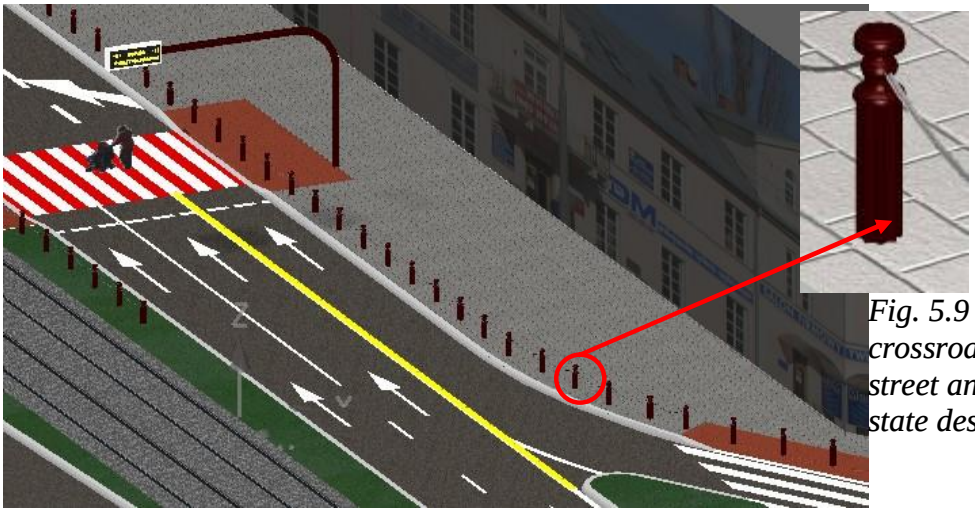


Fig. 5.9 Pillars within crossroad Grochowska street and Mińska street - state design.

DIFFERENT ACTIONS:

Solution 15

Installing of Flower boxes.



Fig.5.10 Developing of area within pedestrian refuge.

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Solution 16

Poster pillar transfer outside pedestrian refuge next to Mińska street.

In table 5.1 is presented composite juxtaposition sugested operations improving traffic safety.

tab. 5.1 Juxtaposition of suggested operation

No	Action name	Problem to solve	Expected effects
		GEOMETRY	
1	Widen pedestrian refuge on the north and south side of the tramway along Grochowska street and narrowed traffic lanes at southern and northern Grochowska roadlane.	A lack of posibility to cross the Grochowska street in to rates. A lack of posibility to force vehicles to reduct their speed in the area of pedestrian crossing .	Pedestrian safety and comfort increase. Posibility to cross the Grochowska street in to rates. Vehicles speed reduction.
2	Traffic lane narrowed at the inlet of Mińska street.	Forming a double waiting line of vehicles on one-lane inlet of Mińska street. To fast entering Grochowska street from Mińska inlet.	Traffic put in order, speed reduction.
3	Widen sidewalk along the southern side of Grochowska street.	Danger of unexpected entrance on the southern roadway	Increase of safety and flow capacity of the southern sidewalk along Grochowska street.
4	Lifted curb along the southern side of Grochowska street.	Danger of vehicle invading sidewalk and lack of sufficient traffic separation.	Limited posibility of vehicles invading the southern sidewalk, traffic separation.
5	Widen pedestrian refuge and cancelled precinct	High speed of vehicles crossing the pedestrian crossing.	Vehicles speed reduction.
		TRAFFIC MANAGEMENT	
6	Conditional stop lane before pedestrian crossing at the southern at northern Grochowska roadlane.	Large traffic disorder.	Pedestrian safety and comfort increase.
7	Stop lane at the southern inlet.	Large traffic disorder	Traffic put in order, pedestrian safety increase.
8	Stop sign at the southern inlet.	Executing manoeuvres of entering Grochowska street from the southern inlet under great pression of vehicles moving along the southern roadway of Grochowska street.	
9	Street over marking, variable message sign togeher with motion detector mointed on the cantilever jib.	A lack of enough visibility for pedestrians. Danger of running into pedestrians.	Pedestrian crossing visibility increase, pedestrian safety increase.
10	Extra lighting mounted on the cantilever jib.	A lack of enough visibility for pedestrians. Danger of running into pedestrians.	
11	Red coloured pedestrian crossing.	Not egough visible pedestrian crossing. Danger of running into pedestrians.	
12	Lane separator mounted before pedestrian crossing at the northern Grochowska roadlane.	Vehicles interlacing directly before pedestrian crossing.	Vehicles interlacing before pedestrian crossing made imposible, traffic put in order.
		ELEMENTS TRAFFIC SAFETY	
13	Protecting poles situated at the pedestrian refuge on the	Lack of sufficient traffic separation.	Pedestrian safety and comfort increase.

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	northern side of the tramway along Grochowska street.		
14	Protecting barrier and protecting poles at the northern and southern side of the pedestrian crossing across Grochowska street.	Improper parking causing greatly limiting crossroad visibility.	
DIFFERENT ACTIONS			
15	Flower boxes.	Improper parking causing greatly limiting crossroad visibility.	Preserving sufficient visibility and improper parking preventing, improved crossroad esthetics
16	Poster pillar transfer outside pedestrian refuge next to Mińska street.	Limited crossroad visibility.	Visibility increase.

6. SUMMARY

In the presented proposal of modernization of Grochowskia st. crossroad with Mińska street, a priority was to improve safety of unprotected road users (mainly pedestrioans). Suggested solutions can be divided into three groups:

- Improving safety of road traffic through reduction of speed of the vehicles in the area of passage for pedestrians. Main measures adopted are the following: narrowing of traffic lanes, vehicles path curving, optical narrowing of the roadway through introduction of protective pillars with chains, lifting of southern curb of Grochowska roadway. and narrowing of Mińska st. inlet.
- Improving of traffic safety through the increase of visibility of pedestrian crossing. This effect will be achieved through: introduction of a bright color (red) of crossing pavement, affirmation of proper visibility for pedestrians (physical fencing field making parking close to pedestrian crossing impossible), removal of advertisement pillar, installation of vaiable maessage sign abov pedestrian crossing nforming about pedestrians on the street, improvement of pedestrian crossing lighting during evening, night and bad weather conditions.
- Improving traffic safety due to regularization of traffic and parking and boost of segregation of traffic. This effect will be achieved through: introduction of lane separator, separating traffic of vehicle entering from Mińska st. and trasffic alng Grochowska st., installing of fencing at crossroad making parking impossible and boosting segregation of pedestrians from the car traffic. A segregation of car and pedestrian traffic was proposed through the elevation of curb along Grochowska street..

Suggested solutions grouped into three fundamental groups of elements improving traffic safety will lead to substantial change of the situation at the analysed crossroad of Grochowska/Mińska st.. Proposed measures will create safe solutions, friendly and adjusted to the users requirements

Surveys of structure of pedestrians indicated the necessity of infrastructure adjustment to the disabled persons (old persons, with baggage, with children's and with wheelchairs). Proposed solution will assure their safety memorial and comfort of moving. Elements, which formed a barrier in the past for these persons, will be replaced by creating safe and friendly area for them.

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Moreover proposedsolution is not interesting from the functional point of view. It will also improve esthetic of the crossroad . This is important taking into consideration that the area along Grochowska street is treated as special, and belongs to the municipality “Program of Prag District Revitalisation”.

It has to be underled that proposed solutions take into consideration real conditions. They enable substantial change in termsof quality of pedestrians treatment, assuring convenient conditions of traffic of all vehicles and safety of all users of transport systems. Proposed solutions will maximize protection against undesirable situation, leading to unsafety of traffic. Obviously authors of the project are conscious, that by reason of impossibility to fundamentally eject points of car traffic and pedestrian collisions (collision at the same level) crossing the street will stil require special attention of pedestrians and drivers.

On the other hand the authors do not consider two level pedestrian crossing (over and under paths) as a solution worth to be promoted in city centers with antique elements (Praga district). Solutions of these types do not create friendly streets for pedestrians, creating additional barriers (specially for disabled people).

Authors of the project are convinced that, that proposedsolution will be advantageous from the point of view of all Grochowska street users and will be feasible technically and financially.

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