„Intersecting Safely”
An International Student Competition
to improve the safety of vulnerable road users
at urban intersections

POLAND 2006

The conception of improvement of vulnerable road users safety at the section of Grochowska Street in Warsaw



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1. Introduction

A very dangerous and onerous for traffic participants, pedestrian crossing in Warsaw at Grochowska Street by the property no. 355 (fig.1) was selected to the International Student Competition to improve the safety of vulnerable road users at urban intersections organised by the European Transport Safety Council in cooperation with the Motor Transport Institute in Warsaw.

The aim of the project is to present the conception of improvement of the vulnerable road users safety in the area of analysed pedestrian crossing. Entering the competition we received the materials (situational plans, locations of accidents) from the analysed area.

Fig. 1. The location of analysed pedestrian crossing at Grochowska Street in Warsaw.

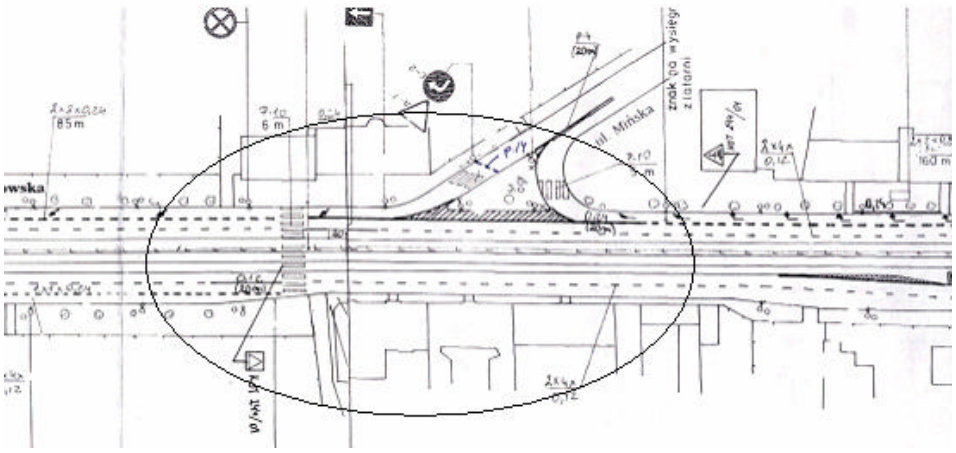


2. Analysis and evaluation of present state

After studying the competition topic the local vision was performed, the survey among the users of the studied pedestrian crossing and speed measurements were conducted, additionally we got access to the data from collisions record from 2003 to 2006 and traffic volume research from 2006. The studies were conducted in cooperation with the other teams from Gdansk.

Multiple local visions in the analysed area allowed for performing the in-depth analysis of the present state and problems at the pedestrian crossing. Local vision combined with numerous researches and the analysis of gathered materials outlined the direction and the scope of works essential for the road safety improvement in the analysed area (fig. 2 and 3).

Fig. 2. The scheme of existing traffic organisation in the area of analysed pedestrian crossing at Grochowska Street in Warsaw.



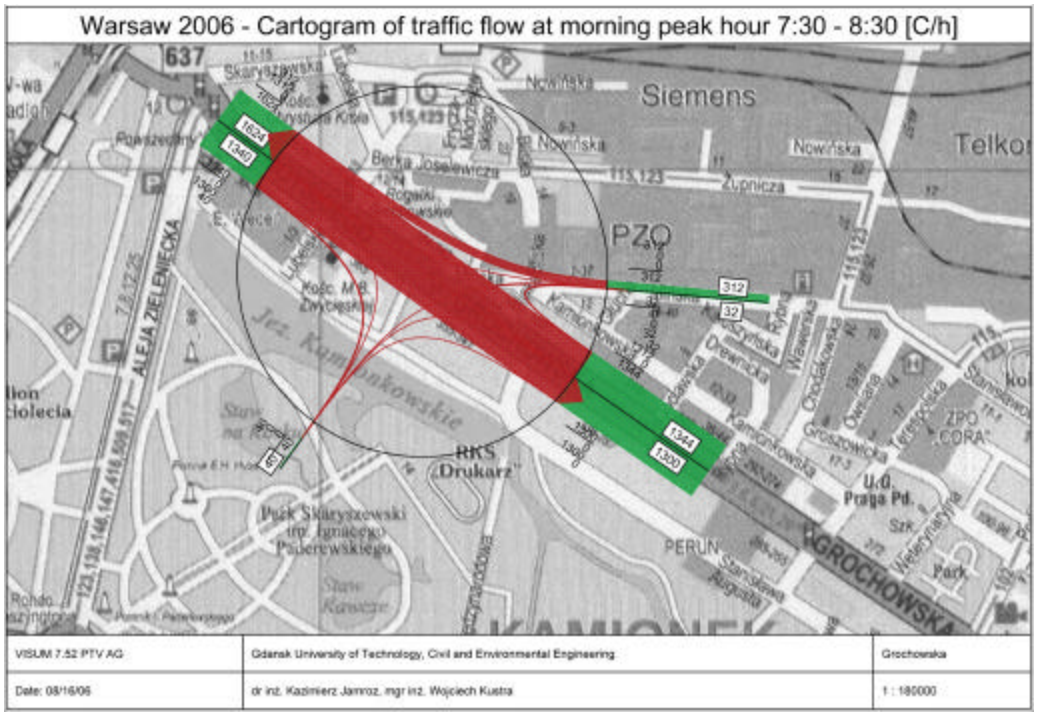
On the basis of wheeled and pedestrian traffic measurements it was stated that there is high volume of motor vehicle (almost 4000 v/h in both directions in the area of pedestrian crossing) and tram traffic (38 trams per hour) at Grochowska Street and that the pedestrians have great difficulty getting through the pedestrian crossing safely (fig. 4). Speed measurements conducted with radar speed indicators in proximity of analysed pedestrian crossing in both directions show (fig. 5), that more than 60 % of drivers in the direction of Wiatraczna Roundabout and 40 % of the drivers in the direction of Zieleniecka Street exceed speed limit (50 km/h).
Exeeding speed limit and lack of safe distance betwwen vehicles are the main causes of accidents at Grochowska Street.In 99% of accidents the inhabitants of the area are both perpetrators and victims.

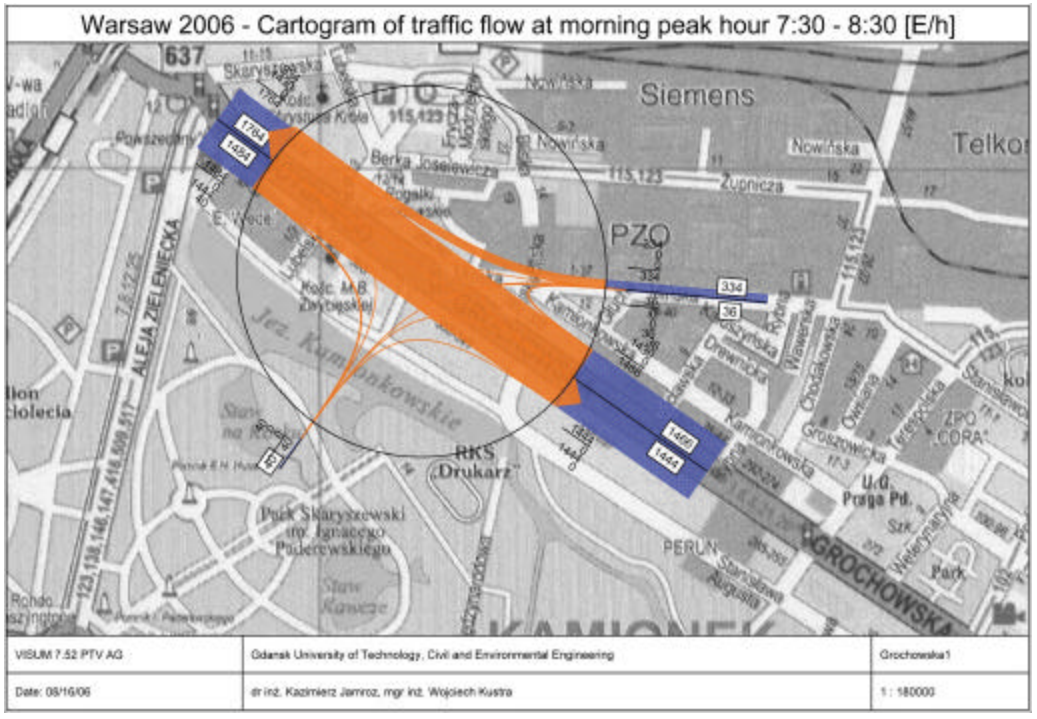
The research and local visions confirm that the visibility from the right side of roadway, both for pedestrian and vehicle is poor because of a car park located along the edge of the right turn lane into Lubelska Street. A pedestrian walking along right roadway is forced to use a narrow pavement and to look out for the steps of nearby buildings. The passengers who get off the tram on Zamoyskiego Street side shorten their route by tramline zone in the direction of pedestrian crossings at Grochowska Street which causes the risk of accident. From the left roadway side, the visibility of pedestrian crossing for vehicles heading to Minska Street is insufficient. The excessive speed of vehicles – there are the periods when the additional obstacle for a pedestrian is exceeded speed amounting even to 90 km/h (2% of drivers) and exceeded speed limit of 50 km/h by over 50% of drivers. The vehicles from the left roadway coming from the east fail to respect acceleration lane from Minska Street and use the lane closed to traffic. That also makes crossing Grochowska Street difficult. The cars travelling from Minska Street pass the pedestrian crossing with too high speed



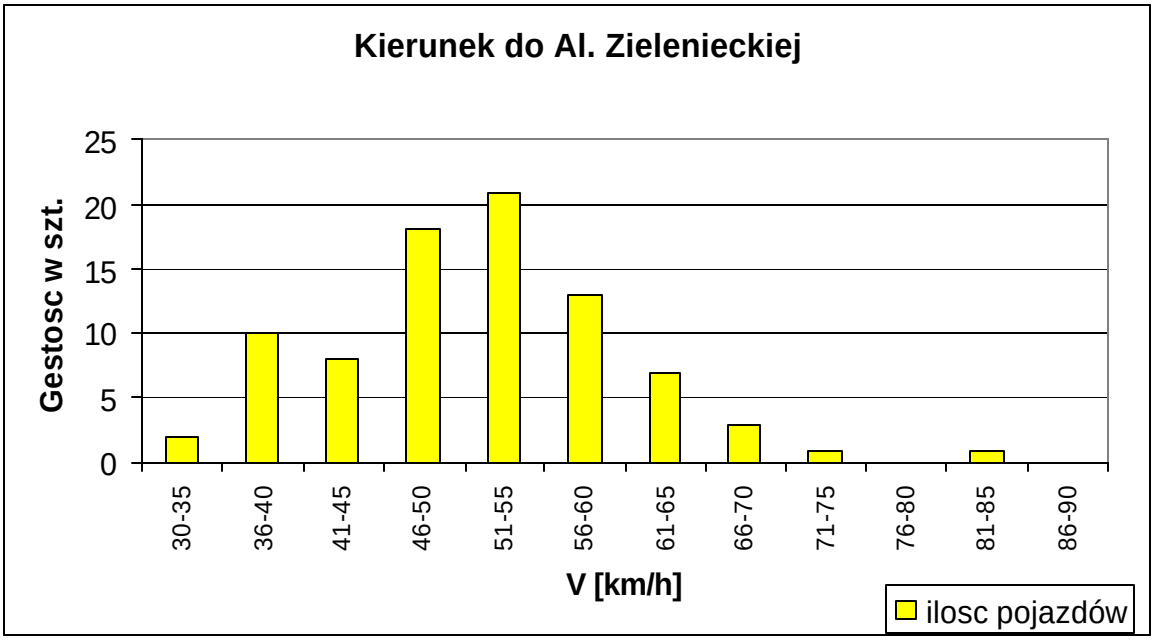
Fig. 3. Photographic documentation

Fig. 4. Cartogram of traffic volume in the area of analysed pedestrian crossing at Grochowska Street .

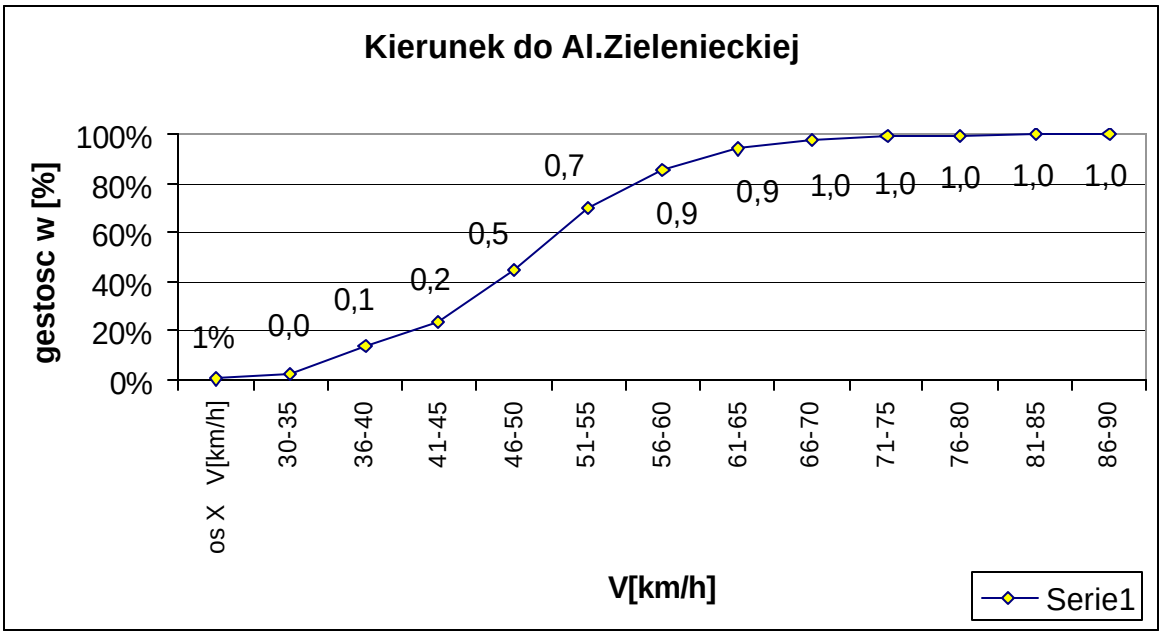




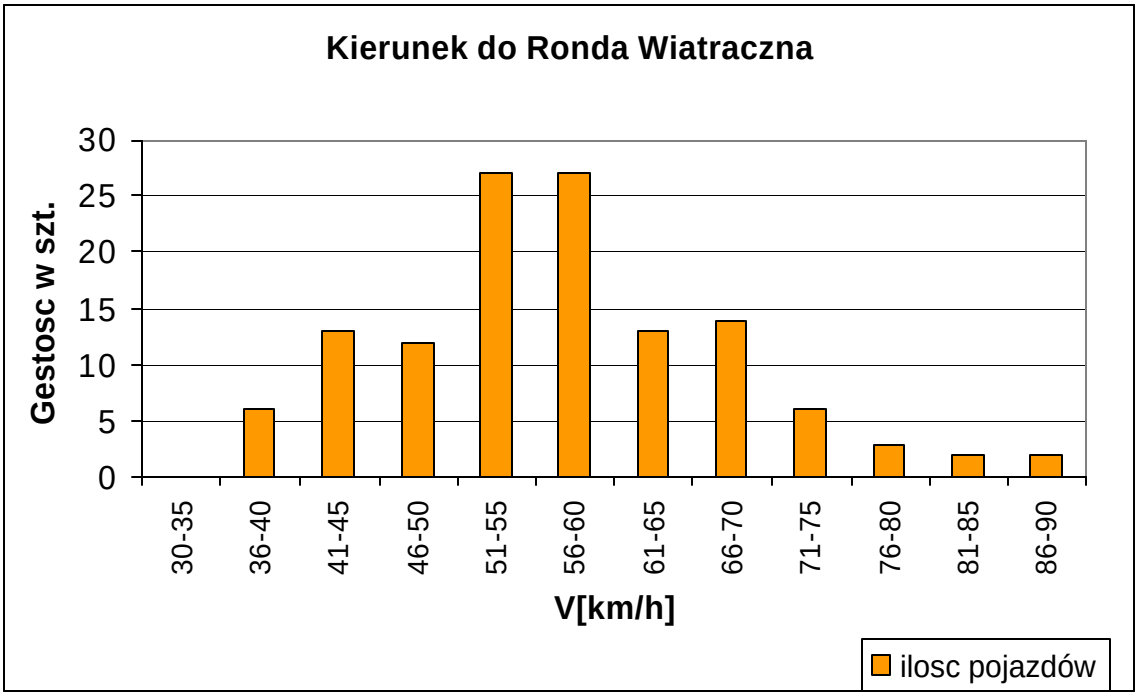
Percentage speed distribution



Distribution function



Percentage speed distribution



Distribution function

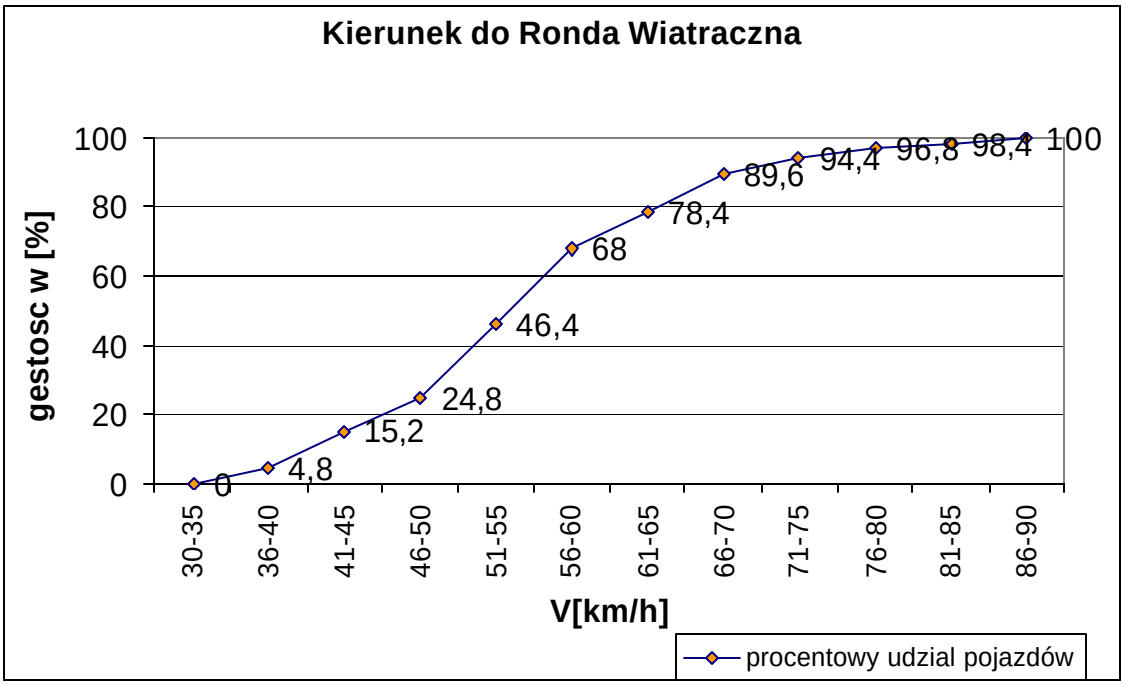
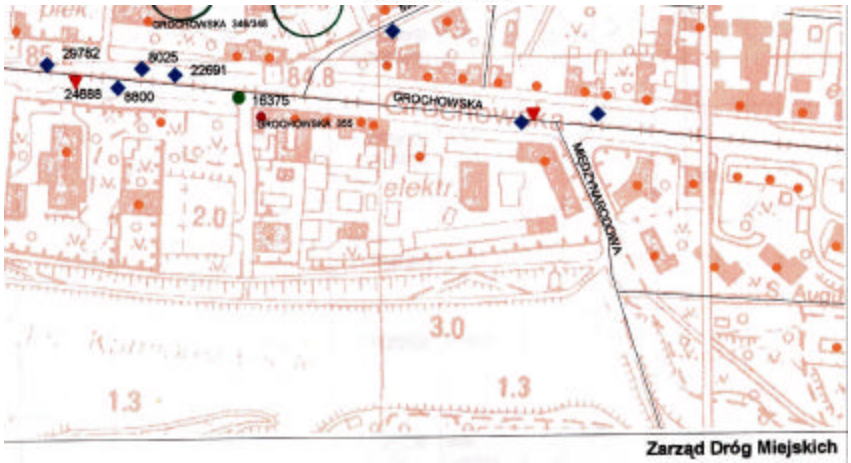


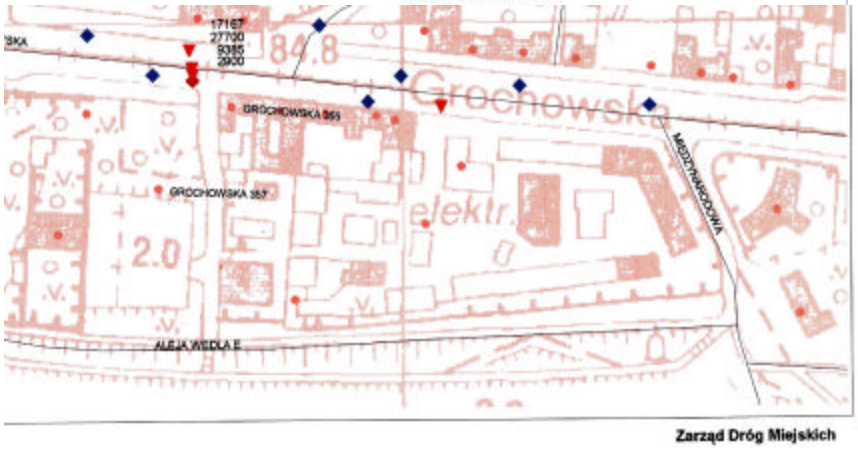
Fig. 5 The distribution and speed distributions at Grochowska Street in the proximity of analysed pedestrian crossing



MAPA WYPADKÓW
Rok 2003
ul. Grochowska 355

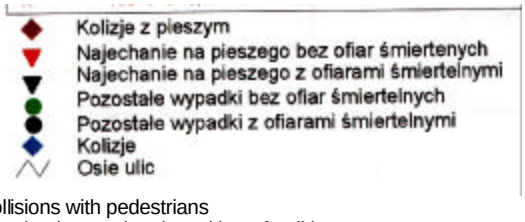


MAPA WYPADKÓW
Rok 2004
ul. Grochowska 355



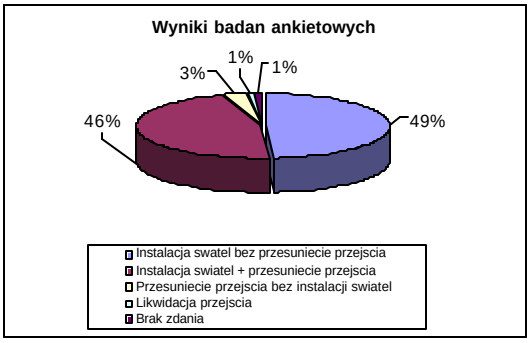
MAPA WYPADKÓW
Rok 2005 (bez aktualizacji grudnia)
ul. Grochowska 355, 357

Fig. 6 Accidents location (according to data from MZD in Warsaw)



Collisions with pedestrians
Running into pedestrian without fatalities
Running into pedestrians with fatalities
Other accidents without fatalities
Other accidents with fatalities
Collisions
Street axes

Up to 97 % of surveyed pedestrians indicated the necessity of reconstruction of the pedestrian crossing and installation of traffic lights, and almost half of them agreed on the change of location of the discussed pedestrian crossing (fig. 7).



The results of the survey
Installation of traffic lights without moving pedestrian crossing location
Installation of traffic lights + moving pedestrian crossing location
Moving pedestrian crossing location
Removal of pedestrian crossing
No opinion

Fig. 7 The results of surveys conducted among pedestrians related to the type of suggested improvements at the analysed pedestrian crossing.

Analysing the gathered data in the first stage the following were observed:

- The necessity to pass the wide crossing through Grochowska Street without protection of refuge island or traffic lights
- Too narrow pavement along the right roadway
- The pavement blocked by the vehicles parking on the pavement along the right roadway.
- The pedestrian crossing is not adjusted for the other users (the disabled, cyclists).
- Poor marking of pedestrian crossing.
- Narrow space for pedestrian stop at the tramways crossing.
- Acute angle of Minska Street.

The identified shortcomings confirm the necessity of application of road facilities improving the safety of traffic participants in the area of analysed pedestrian crossing.

3. The conception of road safety improvement

The conception of improvement of pedestrian, cyclist and motor traffic safety in the analysed area was presented in figure 8 and 9.

Pedestrian protection will be ensured through the implementation of the following measures**:**

- Moving tramways in the direction of Minska Street, this will cause the widening of pavement on the right side of the roadway as well as will allow for installation of traffic lights at the entry to Lubelska Street.
- Installation of pedestrian crossing - reflective white and red colour visible at night.
- Installation of barriers separating pedestrian from the roadway and from the cycling path, and protection barriers on the both sides of track-ways.
- Steel concrete block built into tramways, between rails separated from the rails with rubber plates which will allow for free crossing from one side to another.
- Pedestrian refuge islands at the entry to Minska Street and bending the entry to Minska Street at right angle to Grochowska Street (reduction of the entry speed),
- Moving the bus stop from the east side behind the pedestrian crossing.

The protection and facilities for the disabled will be provided through the implementation of the following measures**:**

- Lowering the kerbs,
- The use of yellow or bright orange bumps marking on every approach to the roadway, which is indispensable for the disabled pedestrians,
- Smoothening and sealing the surface of tramways crossing and introduction of wide stripe for a wheelchair to stop.

Protection and facilities for cyclists:

- the space was gained, thanks to which along left side of the roadway two-directional cycling path was designed, and one-directional along right roadway,
- the use of path surface of „Chameleon" type
- crossing for cyclists next to pedestrian crossing.

Road safety improvement for drivers and passengers will be provided through the following measures**:**

- the decrease of the width of right roadway
- introduction of bends on both roadways (speed reduction measure),
- bending the entry to Minska Street will make a driver cautious and will enable joining the traffic in Grochowska Street safely, without the risk that a vehicle travelling from the east uses the lane closed for traffic and causes the collision,
- the system of active information on the pedestrian crossing at Minska Street introduced to improve visibility,
- thanks to coloured stripes a driver is able to notice a pedestrian crossing from a large distance in case traffic lights do not work

4. Conclusion

The analysis and evaluation of the present state indicate the necessity of undertaking road safety improvement measures in the area of analysed pedestrian crossing at Grochowska

Street in Warsaw. The set of measures proposed in this project, even though expensive, should contribute to improvement of road safety of vulnerable road users.

Fig. 8. The conception of traffic improvement on the analysed section of Grochowska Street in Warsaw – situational plan

Fig. 9. The conception of traffic improvement on the analysed section of Grochowska Street in Warsaw – cross-section

Bibliography:

1. Rozporzadzenie Ministra transportu i Gospodarki Morskiej z dnia 2 marca 1999 r. w sprawie warunków technicznych, jakim powinny odpowiadac drogi publiczne i ich usytuowanie.
2. Rozporzadzenia Ministrów Transportu i Gospodarki Morskiej oraz Spraw Wewnetrznych i Administracji z dnia 21 czerwca 1999 r. w sprawie znaków i sygnalów drogowych.
3. Wytyczne projektowania skrzyzowan drogowych cz.1, GDDP w Warszawie 2001
4. Inzynieria ruchu, S. Datke, W. Suchorzeski, M.Tracz, WKL 1999
5. Systemy sterowania ruchem ulicznym, K. Jamroz, WKL 1984
6. Wezly drogowe i autostradowe, R. Krystek, WKL 2001