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Idea of improving the safety of vulnerable road users at Grochowska and Minska intersection in Warsaw

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1. Description Base

Description base of this analysis is th plan of Grochowska and Minska intersection , polish deeds and instructions concerning road design and traffic rules :

- Polish technical regulations
- Intersection design instruction
- Accidents data
- Existing traffic organization plan
- Railway design instruction
- Traffic intensive data

2. Localization and traffic intensive

Grochowska Street is situated between Bronislaw Czech Street and Targowa Street to Aleje Solidarnosci intersection. At 355 Grochowska Street segment there isn't any international track . Near by there is an East Warsaw Train Station connected through Lubelska Street which is the beginning of 355 Grochowska segment . That intersection has traffic lights.

The end of this segment is located at Miedzynarodowa Street intersection leading to housing development and Kamionka Lake (traffic lights as well). There are three bus tracks and five tramway lines at detached subgrade. Traffic intensive at this section amounts 1764 V / h in Aleje Solidarnosci direction (included 4 % of heavy vehicles) and 36 trams per hour. Traffic intensive towards Miedzynarodowa – Grochowska intersection amounts 1444 V / h, (4 % of heavy vehicles) and 28 trams per hour .

Minska Street is connected to Grochowska Street through intersection with no traffic lights There is an adverse acute angle between Grochowska and Minska axis. There isn't any public bus line . Traffic intensive at this street is 36 vehicle / h out of Grochowska direction and 334 V / h towards Grochowska . Grochowska and Minska connection is dextrorotatory intersection. Behind this intersection there is a pedestria n crossing. Pedestrian intensive amounts 100 people per hour.

3. EXISTING CONDIOTIONS

Grochowska is a two-roadway, two-lane street. Lane width is very diverse and runs from 7,5 to 9,1 m. This segment is straight. In existing traffic organization there are located lanes of merge and exit at the Minska – Grochowska intersection. The pedestrian crossing is situated at merge lane and two lanes of main roadway (about 8 m to pass three lanes, in Lubelska direction) , there is no pedestrian refuge at subgrade, about 8 m to pass three lanes – two of main roadway, one of exit lane (towards Miedzynarodowa), no room to place traffic lights. In addition there occurs no permition parking in intersection zone (at street refuge and pavement) which limits pedestrian's sight distance . After wearing surface repair there has been higher traffic speed.

Pavement width runs from 1,2 to 8 m. At the segment of 1,2 width there are stairs which reduce pavement width.

There is no detached bus station at Grochowska Street towards Lubelska Street, before Minska – Grochowska intersection.

There is a place to leave the car behind intersection at the island and before separate lane to house development. This "parking" reduces sight distance for pedestrians.

There are no cycle tracks .

All the geometry alignment at Grochowska segment is simple (straight segment and wide lanes) and doesn't force drivers to reduce speed.

4. TRAFFIC ACCIDENTS AND ROAD USER'S TRAFFIC THREAT.

Based on ZDM Warszawa data (Streets and Roads Authorities in Warsaw) .

'2003 - no traffic lights at Lubelska – Grochowska intersection.

4 fatal accidents
5 fatal accidents at Targowa Street, behind Lubelska – Grochowska intersection
2 fatal accidents at Grochowska segment , near to school
2 fatal accidents at Minska Street.

'2004 – traffic lights at at Lubelska – Grochowska intersection.

1 collision at Lubelska – Grochowska intersection
5 collisions at Grochowska segment
3 no death - pedestrian accidents at Grochowska segment

‘2005 – house development, pedestrian crossing at existing place.

6 collisions at Grochowska segment
1 collision at Minska – Grochowska intersection
3 casualties among pedestrian at the pedestrian crossing
1 casualty at Grochowska segment, near to pavement of 1,2 m width.

Traffic accidents causes

‘2003

- high speed

‘2004

- no given way
- no safe distance between vehicles
- no safe entrance at roadway from behind obstacle or vehicle

‘2005

- wrong running over pedestrian crossing
- high speed despite bad weather conditions

The authors of this study are convinced that the segment of Grochowska is very dangerous for all road users. The main cause of accidents is high speed and also limited sight. All these things are the result of wrong geometry alignment and wide lanes of road which allow drivers to exceed the speed limit.

5. SUGGESTED SOLUTIONS

What the authors propose is to reduce speed and to increase drivers’s attention. It is advisable to narrow lanes width - more room to widen pavement of 1,2 m , narrow slants allow to make a pedestrian refuge at the subgrade and geometrically force to reduce speed .

It is suggested to set constant lane width of 2 x 3,5 m (according to polish technical regulations) at roadways at the exits of Grochowska – Lubelska and Grochowska – Miedzynarodowa intersections. In front of the pedestrian crossing it is advisable to narrow a roadway from 7 m to 6,54 m. Lane narrows are realized by 1:20 drive in and 1:10 drive out slants , fillets 200 and 100 m – towards Miedzynarodowa Street.

Drive in slant 1:20 towards Lubelska Street, drive out slant more than 1:50 because of connection to existing edge of roadway.

Despite the roadway narrow it is advisable to put a continuous edge line P-7b (horizontal road sign according to polish technical regulations), 5 cm of the edge of the curb. Lane width at pedestrian crossing is 2 x 3,10 estimated from P-7b edge line axis to P-1b separation line axis. As a result of lane narrow it is obtained two-sided pedestrian refuge between the subgrade and roadway and wider pavement more than 1,2 m .

The authors improve Minska – Grochwska intersection. It is suggested to get rid of merge and exit lanes. Traffic island is designed so as to traffic steam intersection would be perpendicular. Island is moved 60 cm away of lane edge. Minska alignment is bend to obtain about 90 ^{o} "T" – intersected crossing and to force to reduce speed right in front of the intersection. Island length gives possibility to stop the car and to give way with no pedestrians and cyclists disturbing at the pedestrian crossing. This is the second pedestrian crossing parallel to Grochowska Street. Lanes width at Minska entry and exit of this junction amount 6 m (extended, paved surface for heavy vehicles) for radius of 8 and 12 m according to technical regulations.

A separated dextrorotatory lane at exit of Grochowska to house development is removed. It advisable to make a small refuge at this exit. It will let to make the pavement a little longer and to increase pedestrian sight area around the Grochowska 355 building corner.

The authors apply safety traffic tools which draw drivers's attention. It is advisable to use U-5 obstruction posts together with D-6b traffic signs, suitable situated street lamp flashing the pedestrian crossing and transverse point reflex along the crossing. In addition the authors suggest to use reflex yellow-grounded D-6b sing with two yellow pulsing lights at the sign above axis of each roadway. This lights work when a pedestrian or cyclist is getting close to a pedestrian crossing.

There are two bus bays planned , legal parallel parking among Grochowska Street, slanting parking at Minska including 4 positions for handicapped people.

It is advisable to make the pavement, cycle track and house exits in different colors. Pavement – gray sett , cycle track – red sett, exits – dark gray or sand yellow sett.

The authors design cycle tracks. It is suggested to negotiate the conditions and the direction of the cycle track. The authors advise two-sided cycle track of 2,0 m width to crossing and after the crossing one-sided track towards Miedzynarodowa Street. (see the plan).

It is advisable to use traffic fence at the subgrade though the whole segment, between Lubelska and Miedzynarodowa. This tool will not let the pedestrians or cyclists cross the roadway in wrong place.

6. CONCLUSIONS

All the solution the authors suggest will let reduce speed. The best way to exclude any accidents it to make a two-level pedestrian crossing above the roadway and subgrade. Unfortunately there is no enough room to build such a gangway. The authors don't expect to knock down any buildings to obtain some room. Lane narrow, edge lines parallel to curbs and geometry alignment bend will force speed reduce. Yellow-grounded and reflex traffic safety tools will draw the drivers's attention at the pedestrian (cyclists) crossing.