Analysis of Pedestriam Speed of Movement Within Signaled Pedestrian Crossings

Oleh Hrytsun[1], Vladyslav Davosyr[2]

1. Transport Technology Department, Lviv Polytechnic National University, UKRAINE, Lviv, S. Bandery street 12, E-mail: oleggrutsyn1993@gmail.com

2Transport Technology Department Lviv Polytechnic National University, UKRAINE, Lviv, S. Bandery street 12

E-mail: davosir2012@yandex.ua

Abstract – Mathematical model for determination the duration of the passing by pedestrians the crossing depending from roadway width is given. Depending from the speed different classifications of pedestrian flow are proposed. Within pedestrian crossings correspondence of speeds of movement to weather conditions and the length of crossing path is determined.

Keywords – pedestrian flow, pedestrian speed of movement, crossing length, traffic light control, field research, weather-climatic conditions.

Introduction

Pedestrian movement is the most common type of people travel by the city territory. In city transport planning it covers, first of all, providing the comfort and safety of pedestrian movement on city streets, providing the movement of large masses of people in zones of trading, cultural and sport centers, near stations and large transfer facilities. Solution of this task depends from many factors, the main are: town-planning, road-planning, social and economic [1].

Research and methology

Speed of pedestrian movement is the main factor which determine conditions of pedestrian movement, capacity of pedestrian crossing, traffic light control parameters etc. Investigation of speed of pedestrian movement on signaled pedestrian crossings is necessary for setting the determination of traffic light signal duration which allows pedestrian movement [1,2]. The aim of research of pedestrian movement parameters on signaled intersections is in receiving computing values of quantities which are used for desighning the traffic light objects. Working regime of traffic light control in this case depends from intencity of traffic and pedestrian flows; speed of pedestrian movement; existence of enough place for cumulating the pedestrians which wait for permissive signal of traffic light. On speed of movement by pedestrians have special impact age and social composition of pedestrians. On the crossings near schools and children`s institutions the speed of pedestrian flow is the highest, near passages of enterprises and organizations, especially in the end of day – the lowest [2].

Time, which is needed for pedestrian to cross the roadway after turning on the green traffic light, is determined including speed of pedestrian movement and time of delay [1,2]:

$$t_P = b_{RW} / V_P + t_{del} \quad (1)$$

where t_{del} – time, which is needed for pedestrian flow to cross from waiting zone to the start of crossing, sec.

Depending from speed it is proposed different classifications of pedestrian flow (km/hour) [2]: free – more than 4,5; unstable pedestrian flow – 4,4-4,5; stable pedestrian flow – 4,1-4,4; dense flow – to 4,0.

Results and discussion

Deriving from formulated task about research of speed of pedestrian movement within ground crossings it is performed range of measurements on the road network with different crossing length. Measurements are performed with the use of technical means of traffic management of city municipal enterprise LME “Lvivavtodor” in dry, solar and rainy weather.

During the measurements such factors could be determined: pedestrian crossing length (street width); traffic light cycle duration on signaled crossings and also its compounds (time of restrictive and permissive signals); time for cross by pedestrians the roadway.

In result of experimental research, conducted on motorway street of city-wide significance Horodotska in Lviv city, such amounts of speed of movement are received (fig. 1).

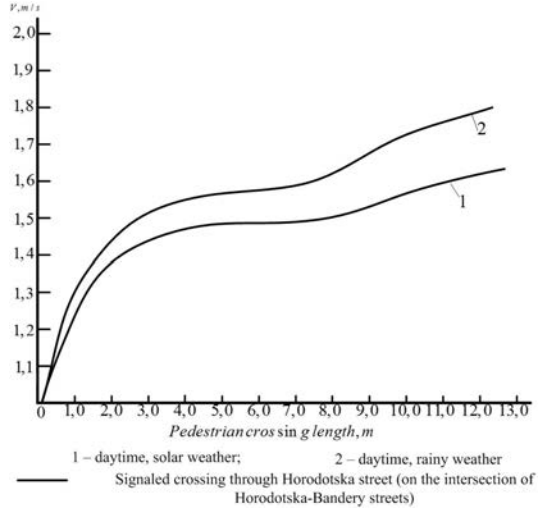

Fig.1. Results of experimental determination of speed of pedestrian movement on ground pedestrian crossings with two-way movement

From the fig. 1 it can be seen than the speed with distance from pavement increases from 1,3-1,4 to 1,7-1,8 m/sec. Pedestrians accelerate the movement as they wish to leave the most dangerous section of the crossing. In the middle of roadway speed reduction can be seen. This reduction the most abruptly appear in pedestrians which started the movement during restrictive signal of traffic light. We can assume that it is connected with the necessity for pedestrians to estimate again transport situation (but on the second half of the roadway) and make a choice of accepted interval in traffic flow.

Conclusion

So, further field research on pedestrian movement factors provide opportunity to: determine the character of pedestrian behavior depending from weather-climate conditions, time of day, location of the crossing and way of operating the movement on it; determine the reduction of capacity of CRN section in result of arrangement of pedestrian crossings; increase road safety in places of interaction of traffic and pedestrian flows.

References

[1] Teply S. «Canadian Capacity Guide for Signalized Intersections». Toronto: Institute of Transportation Engineers, District 7, 2008, 230 p.

[2] Alhajyase M.A. «Proposed Methodology for Modeling Pedestrian Crossing Time at Signalized Crosswalks Considering Bi-directional Flow». Proceedings of Infrastructure Planning, 38. Japan: Society of Civil Engineers, 2008, pp. 1-18.