

GENERALLY STATE OF THE LEVEL-CROSSINGS SAFETY IN BULGARIA

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Abstract: *Without doubt railway level crossings are “unique” equipment of the transport infrastructure. On these specific places every year come into being dozens of transport events unfortunately, most of them are connected with dead and injured peoples. Despite this fact not rarely the problem of level-crossings safety underestimates as from the responsible for safety specialists as from users of them. Based on the statistical data concerning safety in the railway transport current paper has a aim to describe current situation of the level-crossings safety in the transport infrastructure in Bulgaria. .*

Key words: *railway transport, safety, level-crossings*

1.INTRODUCTION

Every year transport events cause dead or injury of peoples (railways clients, drivers or passengers of car, busses etc., pedestrians etc.) One no so careful look on the statistical data concerning safety reveals existence of the high “potential” for rising of similar undesirable events on this specific “transport place”. Undoubtedly the problem has two sides. First is connected with the normal functioning of the railway transport system which is responsible for creation and support of the necessary safety conditions. The other side of the problem (and much more hard for control) is connected with the transport culture and behavior of the participants in the road traffic (pedestrians, car drivers, drivers of the vehicles with animal power, animals etc.

Bulgarian transport infrastructure consists of common 852 level-crossings, that means at an average 1 level-crossing on 5043 meters from the current railway network (or on 7435 meters from the whole railway network including tracks). Level-crossings without special signaling technical means when the train при passes

(unprotected) are 140, 29 of them are located on the main railway lines (from common 490 level-crossings, located on the main lines). Separated level-crossings are located on lines with different intensity of the rail and car traffic as on the level-crossing with the most load the intensity is over 1000 road-side vehicles and till 70-80 trains for twenty-four hours period. The velocity of the trains varies for different level-crossings (up to 120 km per hour).

2.SAFETY CASE

Accident on the level-crossings are with the comparatively lower part from the whole number railway accidents because of the tendency for decreasing of such a kind events. (Table 1, figure.1). Интересно е да се отбележи това, че най-много произшествия са допуснати на прелези с бариери, където условията за безопасност са най-добри и би следвало да се очаква много по-малък риск за движението.

In table 2 are presented data for some character accidents. Obviously cars are “most active” participants in accidents on the level-crossings. Interesting is the fact that at accidents all technical means work normally. This

circumstance more demonstrates (unfortunately) lower “safety behavior culture” of the participants in the traffic which obviously is the main safety level-crossings factor in Bulgaria.

Year	LC with barriers	LC with automatically operated barriers	LC without barriers	Generally
2000	19	5	12	36
2001	8	10	4	22
2002	19	10	4	33
2003	15	8	3	26
2004	11	6	1	18
2005	9	8	1	18
2006	15	8	1	24

Table 1

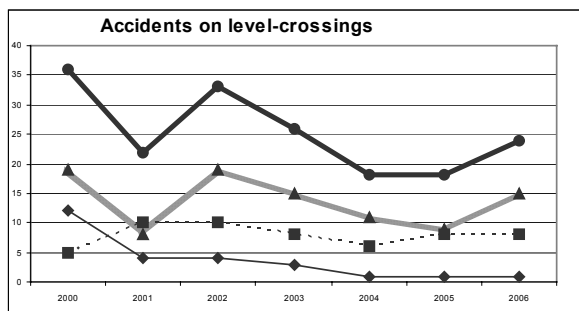


Figure 1

Most of the level-crossings accidents are connected with dead or injury people. Most often participants from road side dead or injury (car drivers, passengers, pedestrians). Data are given in table 3 (figure 2 and figure 3). They show the tendency for keeping of constant level of number of injured peoples on level-crossings.

3. MAIN CHARACTERISTICS OF THE LEVEL-CROSSING IN BULGARIA

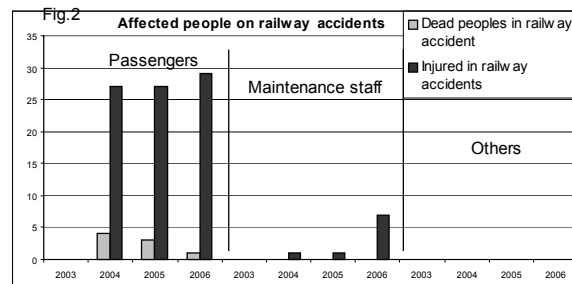
As regards to railway technical exploitation and safety in the Bulgaria are used basically two types of level-crossings (LC).

First type is not equipped with technical means for signaling. They are “passive LC” because railway transport system does not ensure special safety measures.

Second LC type – so called “active LC” are equipped with signaling means. They can be with manually operated barriers or with automatically operated barriers. Installation, maintenance and exploitation of the LCs are according to the developed norms [1].

Type LC	LC without barriers		LC with automatically operated barriers		LC with manually operated barriers	
	2004	2005	2004	2005	2004	2005
Bus						
Bicycle						
Car	1	1	3	8	10	8
Minibus			1			
Motorcycle						
pedestrian						
Vehicle with animal power			1			
Road-construction on vehicle			1		1	1
Tramway						
Trolley						
generally	1	1	6	8	11	9

Table 2 Number of accidents depending on LC type



4. EVALUATION AND CATEGORIZATION OF THE LEVEL-CROSSINGS

Level-crossings in Bulgarian railways are categorized according to values of two numbers B_q and B_A , defined by as follows [1]:

$$B_q = \frac{q \cdot I}{24}; \quad B_A = \frac{q \cdot A}{24};$$

Where:

$$I = A + M + \mathcal{K};$$

A -number of the passing busses in two ways over LX per day;

M -number of the passing cars over the LX per day;

\mathcal{K} -number of the passing vehicle with animal power per day.

Four categories are defined and the first is that with the highest values of B_q and B_A . Type of the safety technical means for each level-crossing

defines according to type of the LX category and its location (station, interstation or settlement). Special commissions (with normative defined structure of experts) do inspections for availability of these conditions.

Year	Passengers				Maintenance staff				Others (car drivers, passengers, pedestrians)			
	2003	2004	2005	2006	2003	2004	2005	2006	2003	2004	2005	2006
Dead peoples in railway accident	0	4	3	1	0	0	0	0	0	0	0	0
Injured in railway accidents	0	27	27	29	0	1	1	7	0	0	0	0
Dead peoples on LC accidents	0	0	0	0	0	0	0	0	7	3	2	4
Injured on LC accidents	0	0	0	0	0	1	0	0	4	2	7	7

Table.3. Dead and injured in railway accidents

3. CONCLUSION AND DISCUSSION

Transport safety statistics shows that the probability of occurrence of accident on level-crossing is no big. However at the same time the accidents consequences are essentials and very often with dead or injury of peoples. In this sense shall to recognize the fact that the risk of people in the train is lower in comparison of road side traffic participants. This leads to provide adequate actions aiming creation of possible the best conditions for passing the LCs. According to the technical conditions and the level of the safety of LCs in Bulgaria some conditions and recommendations can be done:

-Working norms in Bulgaria treats mainly technical and technological questions connected to ensuring of safety conditions on level-crossings;

-Methods for risk evaluation misses to account characteristics of the given LC (its technical and exploitation parameters) and influencing on safety outside factors. This methods will allow to LCs grade according the

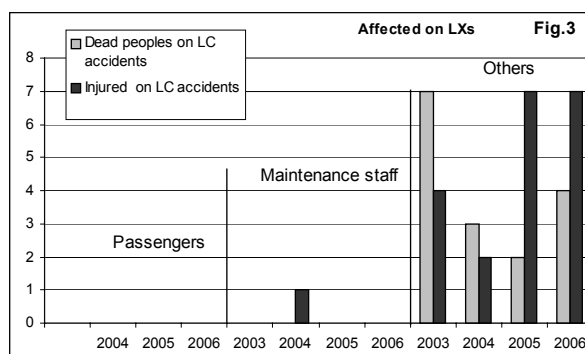
hazard level and do possible to trace out the measures for safety exploitation improvement.

-The exploitation and technical state of the level-crossings infrastructure is extremely unsatisfactory: badly road surface, bad visibility, old technical means, etc.;

-The transport culture of all participant in the rail-road traffic is low: dangers and requirements of the norms are underestimated from the participants in the traffic;

-There are no resources, projects and will by side of responsible government and local authorities to improve safety of level-crossings. There are different possibilities for example: more strict control, appropriate educational programs, etc;

-There is a significant growth of traffic intensity at some parts in the transport network and this is a premise for safety disturbance.



LITERATURE

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ОБЩО СЪСТОЯНИЕ НА БЕЗОПАСНОСТТА НА ЖЕЛЕЗОПЪТНИТЕ ПРЕЛЕЗИ В РЕПУБЛИКА БЪЛГАРИЯ

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Резюме: Без съмнение, железопътните прелези са „уникално“ съоръжение на транспортната инфраструктура. С голямо съжаление обаче трябва да се признае, че на тези специфични места ежегодно възникват десетки транспортни произшествия, голяма част от тях свързани с убити и ранени хора. Независимо от този факт, не рядко проблема с безопасността на железопътните прелези се подценява, както от специалистите които са отговорни за осигуряването на условия за безопасност, така и от хората които ги ползват. Въз основа на статистически данни относно безопасността в железопътния транспорт и наличната нормативна база, настоящата статия има за цел да разкрие моментното състояние на безопасността на железопътните прелези в транспортната инфраструктура на Република България.

Ключови думи: железопътен транспорт, безопасност, железопътни прелези