Lithuania

Zero traffic accidents at road work zones Still a challenge

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Road operation and maintenance are the main part of road asset management. Only cost efficient and timely repair of deteriorated pavements ensures optimal and balanced use of funds allocated to road maintenance, as well as cost savings for the society. However, it should be noted that any intervention into traffic lane, where works are carried out without closing of traffic, causes discomfort to road users. In road work zones, the likelihood of accidents increases.

Scientific research and studies indicate that within work zones, the accident risk for road users is considerably increased. Dealing with the safety in road work zones, two aspects should be differentiated: safety of road users and safety of road workers. In 2009, in the Netherlands, 18 people were killed in road work zones. In 2010, 120 road accidents occurred in Austria in road work zones, with 4 fatalities. In 2012, Sweden reported 385 accidents in road work zones and 3 fatalities. In 2014, 24 people were killed at road construction sites in Pennsylvania (USA), 9 of them – road workers. In 2011, in Poland, 11 accidents occurred in road work zones where 18 people were killed (Żochowska, 2014). Countries all over the world fight this problem and seek to reduce the number of accidents in road work zones by introducing innovative measures, implementing education campaigns, instructing road workers on their behaviour in work zones.

The report of European Transport Safety Council (ETSC) *"Ranking EU Progress on Improving Motorway Safety"* indicated that, in Austria, accidents in road work zones account for 4% of the total number of road accidents on motorways. In Belgium, this rate is 9%. Lithuania also takes measures to reduce the number of accidents in work zones, though this figure there is only 0.123% (2012-2015) of the total fatal and injury accidents *(illustration 1)*.

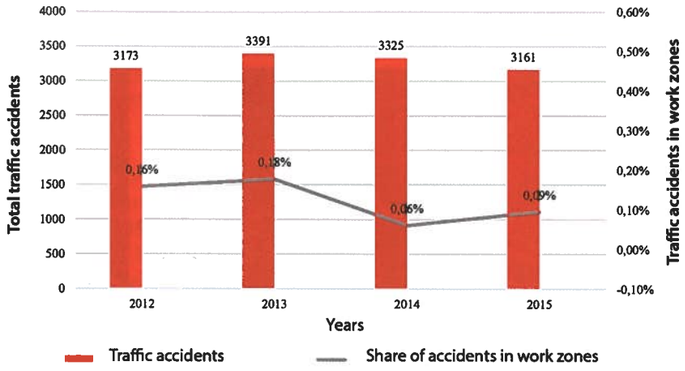

Illustration 1 - Total road accidents and the percentage of accidents in work zones in Lithuania

Illustration 2 - Road accident classification in Lithuania

It should be mentioned that in 2014, the number of accidents in road work zones decreased more than twice in comparison with previous years. In 2015, the total number of road accidents was lower than in 2014, though the number of casualties increased. Decrease in the total number of accidents is a good tendency, showing that legal regulations and engineering measures used in road work zones ensure better comfort and safety. However, when looking for a zero vision not only on roads but also in road work zones, it is necessary to identify the behaviour of road users in work zones and the efficiency of traffic control solutions.

In Lithuania, between 2012 and 2015, 63 accidents took place in road work zones, in 16 of which 1 person was killed and 17 injured. Four types of accidents were recorded then: collisions, collisions with obstruction, collisions with pedestrians and miscellaneous road accidents. *Illustration 2* depicts the classification of road accidents in Lithuania. Every accident is attributed to one of 11 accident types. Every type has an appropriate number of typical accident schemes assigned to the accident. This methodology enables to identify accident causes and to compile detailed statistics of accidents. The currently used accident scheme does not include road works, though this is very important for identifying the exact place and cause of an accident.

The ARROWS project (Advanced Research on Road Work Zone Safety Standards in Europe) gives the most common types of accidents – rear-end collision, collision with obstruction and collision with road workers. In Great Britain, rear-end collisions represent 60% of the total accidents which occurred in work zones. In Germany, this type of accidents represents 63% of the total accidents. In Sweden, rear-end collisions between 2003 and 2012 accounted for 34% of the total accidents in work zones. Rear-end collisions are caused by speeding, inattentive driving and misbehaving.

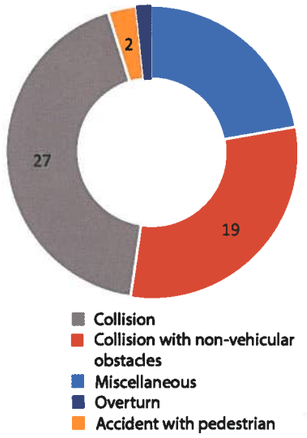

Illustration 3 - Distribution of road accidents in road work zones in Lithuania (2012-2015)

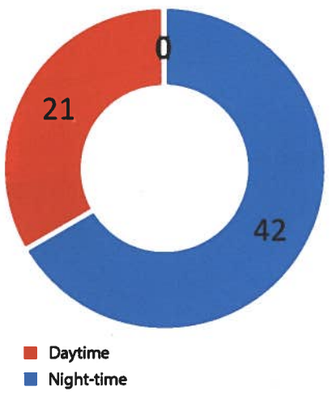

Illustration 4 - Distribution of road accidents by the time of the day in work zones in Lithuania (2012-2015)

Accident analysis in road work zones shows that the most frequent accident causes are collision with non-vehicular obstacles and collision *(illustration 3)*. A more detailed analysis of the most frequent collision type indicates that "Miscellaneous" accidents, having no typical scheme, are prevailing.

Another fairly frequent collision type is rear-end collisions. In the period 2012-2015, 6 accidents of this type occurred where 3 road users were injured. Rear-end collisions account for 9.5% of the total number of accidents in road work zones.

Though only one head-on collision took place during the study period, it resulted in the injury of one person. Due to the difference in speeds of the oncoming vehicles, the occupants are subject to large impact forces (the force of head-on collision doubles, e.g., the collision force of two oncoming vehicles driving at a speed of 50 km/h is equal to the collision of one vehicle with a stationary obstruction when driving at a speed of 100 km/h,). Thus, accidents of this type are more dangerous and likely to result in death or injury of road users.

Between 2012 and 2015, 5 damage-only accidents occurred due to improper lane-changing manoeuvre. Accidents of this type are caused by insufficient attention of drivers to the warning road signs (warning about merging traffic lanes).

The most frequent type of accidents in road work zone is collision with non-vehicular obstructions. They could be caused by improper traffic organization in road work zones, improperly selected measures of traffic control or work zone fencing. Though this type of accidents is very frequent, they injured only one road user.

During the other-type accidents – off roadway to left, off roadway to right, lost control turning right, lost control turning left, off roadway at intersection – 4 road users were injured. All types of off-goings are dangerous, though accident severity depends on safety of the vehicle, driving speed, landscape, etc. Therefore, it is impossible to determine which type of off-goings is most dangerous since each case is individual depending on many other circumstances.

Illustration 5 - Safety measure in road work zone: lorry-mounted attenuator © www.thestar.com

The off-goings mostly occur in a dark time of the day under bad weather conditions or improper illumination of work zone. Several accidents of this type were also caused by drunk drivers.

Another important cause of accidents is time of the day. Distribution of road accidents by the time of the day is given in *illustration 4*.

Accident analysis in road work zones suggested that, though the largest part of accidents occurred at daytime (day + dusk), relatively more people are killed or injured (i.e. the accidents are more severe) during night time. Almost one in three accidents during night-time involves people; at daytime – one in five. Accidents could be caused by improperly selected or absence of traffic organization and illumination measures, misbehaviour of road users.

During road works, especially in a dark period of the day or under poor visibility, a large attention must be paid on active road safety measures, which would help to avoid severe accidents.

It is also worth mentioning that safety in road work zones must be ensured not only for drivers, but also for road workers. Road work zone is a workplace of increased risks, where extremely strict safety requirements should be established and obeyed. Most severe accidents occur when a vehicle fails to change its traffic lane and further follows the same trajectory. Therefore, the approaches of a road work zone must be equipped with physical measures to protect road workers and road users from accidental entering into the work zone: protective barriers (metal, concrete), heavyweight vehicles with rear-mounted attenuator *(illustration 5)*.

During routine maintenance works, the work zone can be separated by heavy truck mounted mobile barrier trailer *(illustration 6)*.

When aiming to reduce and control vehicle speed through work zones, it is advised to implement intelligent transportation systems (speed cameras, variable message signs).

Road work zones make driving conditions difficult and lengthen travel time. Accidents in road work zones can be caused by inadequate organization of works and traffic, as well as irresponsible driver behaviour. It is necessary to constantly search for and implement innovative measures that would help to solve problems in work zones and at the same time to reduce accident risk.

The studies made in Lithuania have determined that 70% of vehicles exceed the speed limit when driving through road work zones and this increases accident risk.

In *illustration 7* the axis *"Average of speed"* represents the average of speed in a certain section. The axis *"Violations"* shows the percentage of vehicles exceeding the speed limit in that section. The study made in Lithuania showed that the speed limit is most frequently violated in sections with the highest speed limit – in this case at 50 km/h. However, the highest number of violations was recorded when the speed limit was exceeded

Illustration 6 - Mobile barrier in road work zone © www.mobilebarriers.com

by up to 10 km/h, the lowest number of violations – when the speed limit was exceeded by more than 20 km/h. At the vehicle speed meter ●, which was located in the road section with the speed limit of 50 km/h, a stationary speed camera was installed. The results showed that this speed meter ● recorded 6% less violations of the average speed (in the 11-20 km/h interval) compared to another meter ● located at a distance of 550 meters. A frequency of speeding up to 10 km/h can be influenced by the current law of Lithuania, which makes no provision for the financial responsibility of the violator of traffic rules but only warning.

The implementation of only passive measures is not sufficient (road signs, road markings, etc.) to control speed limits. A stronger impact on road safety is obtained by a combination of active (speed camera, variable message signs, etc.) and passive measures in road work zones.

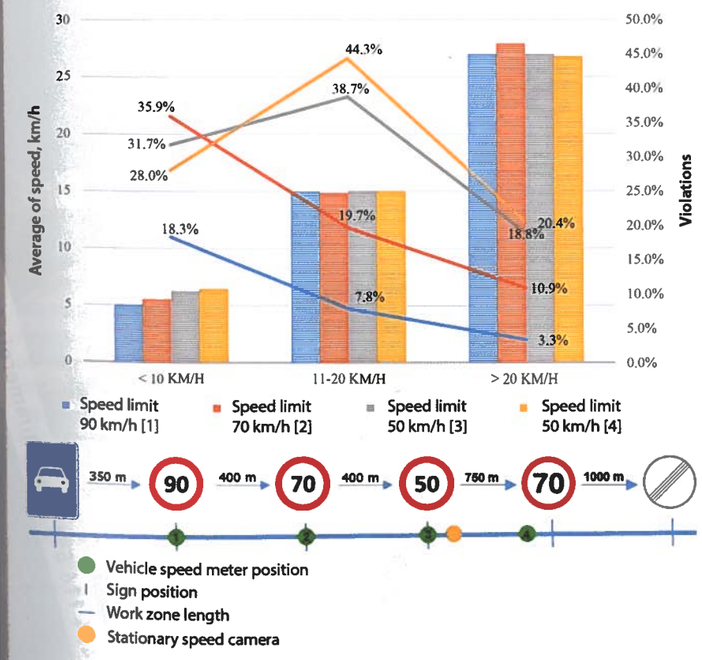

Illustration 7 - Distribution of driving speed in road work zone (research date - August 2015)

CONCLUSION

Speeding increases time of reaction and braking, thus, in case of speeding the road workers are mostly exposed to the risk of being struck. To ensure safe conditions within road work zone, the adequate fencing of construction site is necessary by using concrete, plastic or metal barriers which would physically prevent vehicles from moving off the trajectory.

A special attention should be paid to the pavement marking of temporary traffic lanes, pavement marking technologies, etc. When permanent marking (of white colour) is left and topped with temporary marking (of yellow colour), this frequently causes a chaotic driving in road work zone. In order to avoid conflict situations, the white-colour marking should be eliminated or otherwise hidden.

Road work zones require particular vigilance and responsibility of the drivers. Seeking to increase mobility and safety within road work zone, it is recommended to use innovative technologies, to inform about the road works in mass media, or to otherwise force the drivers to choose an alternative route for reaching the destination. During road works in a dark period of the day, it is strictly necessary to install illumination elements within the work zone and to responsibly check their operation.

A road work zone is a road section of increased risk where each road user should take additional safety measures, to take account of road signs set up on the carriageway, and to obey their requirements. Road companies should pay high attention to the safety of passing vehicles and workers working on the road, to ensure the best possible traffic conditions and to cause the least possible delays for the drivers. However, safety within the road work zone must be ensured by the joint efforts of both the drivers and the road companies.#