Overview of road safety activities

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Abstract. The review article is devoted to the issues of ensuring road safety. The work examines the main causes of road accidents. The work of technical means of ensuring traffic flows, such as traffic lights and road construction, is analyzed. The specifics of the organization of traffic in densely built urban environments are considered, which directly affects the safety of the transport process. An analysis of the factors influencing the provision of comfortable working conditions for drivers, ensuring their maximum concentration during the trip, was carried out. The means of maintaining the necessary microclimate in a vehicle and protecting drivers are described.

1 Introduction

Modern life cannot do without the use of road transport. Road transport is used for commercial activities (various cargo transportation, passenger transportation, etc.), as well as for personal purposes of citizens. The operation of road transport is inextricably linked with the concept of “Road Safety” [1, 2].

Ensuring road safety is entrusted to specialized organizations in the regions of Russia [3]. These organizations include: Federal Service for Supervision of Transport - Rostransnadzor (Office of State Road Supervision, abbreviated as UGADN); State Traffic Inspectorate of the Ministry of Internal Affairs of Russia (also State Road Safety Inspectorate, State Traffic Safety Inspectorate, State Traffic Inspectorate); departments and services of motor transport enterprises to ensure road safety. These organizations are responsible for the condition of the road surface, markings, road signs and traffic lights, as well as various information stands and other infrastructure [4].

2 Organization of vehicle traffic

Reducing the number of traffic accidents on highways is a labor-intensive task, the solution of which requires an integrated approach. The basis for traffic safety on a highway is its technical and operational indicators. Such indicators include the width of the roadway, the evenness and roughness of the surface, the presence of strengthened shoulders, visibility on
curves in plan and longitudinal profile, illumination of road sections at night, the presence of road markings, signs of the appropriate size, limiting and restraining fences, traffic lights and etc. [5].

A major role in organizing traffic is played by technical means of organizing traffic, which are used: – in places where conflicting flows occur; – in places where it is necessary to regulate and inform road users; – at railway crossings, ferry crossings, drawbridges; – to regulate the movement of public vehicles [6, 7].

When conducting research on the causes of road accidents, the data presented in Table 1 were obtained. The severity of the consequences of road accidents in various cases was also assessed.

<table>
<thead>
<tr>
<th>Cause of accident</th>
<th>Number of accidents</th>
<th>Death toll</th>
<th>Severity of consequences*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violation of rules for crossing intersections</td>
<td>22 640</td>
<td>911</td>
<td>2.7</td>
</tr>
<tr>
<td>Speed mismatch for specific conditions</td>
<td>20877</td>
<td>3051</td>
<td>10.3</td>
</tr>
<tr>
<td>Violation of location rules on the roadway</td>
<td>15 639</td>
<td>2200</td>
<td>9.9</td>
</tr>
<tr>
<td>Wrong choice of distance</td>
<td>13810</td>
<td>833</td>
<td>4.4</td>
</tr>
<tr>
<td>Violation of crossing rules</td>
<td>11 875</td>
<td>558</td>
<td>4.4</td>
</tr>
<tr>
<td>Drifting into oncoming traffic</td>
<td>11744</td>
<td>3738</td>
<td>15.6</td>
</tr>
</tbody>
</table>

* Number of deaths per 100 victims (total number of dead and wounded).

An analysis of the causes showed that the most serious consequences occur when a car enters the oncoming lane and exceeds the speed limit. This is especially true in the dark. The number of accidents in the dark is 52% of their total number.

In some cases, road safety is influenced by regional conditions for regulating traffic flows. For example, when organizing traffic on narrow streets with tram tracks, many drivers use them as a roadway, which can lead to accidents. An example is Chelyuskintsev Street in Barnaul (Figure 1).

![Chelyuskintsev Street in Barnaul](image)

This is a two-way street with one lane in each direction. There is a tram track in the middle part. During rush hours, many drivers move along tram tracks, which often leads to accidents (Figure 2).
Road services took action to prevent the occurrence of accidents in the form of installing marking posts that fence off the roadway from the tram tracks (Figure 3).

However, such measures are not always effective. Drivers continue to enter the tram tracks. This driving style is explained by heavy traffic on roads during rush hours and the habits of drivers in this region.

In addition, the formation of the speed limit for the movement of vehicles is influenced by the length and width of the main transport routes, especially within the city limits. The longer the highway, the higher the speed of transport. For example, in Novosibirsk Bolshevistskaya Street is the longest, its length is almost 7 kilometers (Figures 4, 5). The speed limit in some places is 70 km/h.
The introduction of a speed limit does not always effectively limit the speed of vehicles. For example, a maximum speed limit of 50 km/h makes it possible to travel at speeds of up to 70 km/h, since exceeding the speed of no more than 20 km/h is considered acceptable by some drivers due to the absence of penalties.

Ensuring road safety has specific features of both legal and organizational and managerial nature. This is explained by the fact that its decision goes beyond departmental activities and is of a broad social nature [7].

In many regions of Russia, when organizing traffic, special attention is paid to the capacity of intersections. Regulation is carried out using traffic lights with variable time intervals depending on the load of both the intersection itself and subsequent ones.

It has been established that the optimal duration of the permissive traffic light signal on the main highway is a time interval from 45 to 60 seconds. During this time, the intersection has time to unload and drivers do not have to increase their speed to overcome it. This condition can significantly reduce the likelihood of a road traffic accident (RTA).

The decision to introduce “waffle” markings at particularly busy intersections will also reduce congestion and reduce the likelihood of accidents.

To ensure road safety and reduce road accidents, it is necessary to determine the scope of organizing the movement of vehicles and pedestrians and improving road conditions. This area of activity contains significant potential for streamlining the movement of road users.
and, as a result, improving road safety and includes: maintaining the transport and operational characteristics of highways and city road networks; possible timely response to adverse climatic factors; speed optimization; distribution of traffic flows along suburban and urban roads; application of regulatory regimes at intersections of streets and roads that ensure safe movement in these places with minimal delays; installation of technical means of regulation that are clearly and unambiguously perceived by traffic participants; expanding the implementation of automated traffic control systems [8].

3 The impact of vehicle ergonomics on safety

I would like to pay special attention to the issue of comfort in the vehicle. It is these conditions that will determine how far and how long the car can travel before the driver gets tired [9]. One of the main causes of road accidents is the physical condition of the driver. A decrease in the functionality of drivers as a result of fatigue, as well as driving in difficult road conditions, lead to a decrease in the speed of information processing [10, 11]. Often, due to fatigue or other reasons, the driver’s consciousness becomes distracted, inattention occurs, and sometimes sleep occurs. All these factors reduce the level of safe driving.

The driver’s work efficiency is directly dependent on his working conditions, professional training, physiological state and other factors. One of the main indicators of the physiological state is neuro-emotional stress while driving a vehicle, determined by the situation on the roads, the design of the car, the location and design of controls, the information delivery system, noise and vibration, the interior of the cabin and its color scheme [12].

It is necessary to create comfortable working conditions for the driver in the car and eliminate obstructions to the view (drivers themselves often reduce the view by installing various gadgets). Comfortable conditions also include ensuring the ergonomics of controls, seats and mobile controls (for example, navigation devices). Seats and seat belts are designed to hold the driver and passengers in place, both while the vehicle is moving and in the event of a collision [13].

The heating and air conditioning system is also directly involved in the organization of road safety. The problem of increased thermal impact on the driver of a vehicle in the summer exists, and it is relevant [14].

4 Conclusion

Preventive work to ensure road safety should be carried out at all levels, starting with the education of the younger generation in educational institutions. Purposeful work at school should be carried out not only in contact with representatives of the State Traffic Inspectorate and health care, but above all in close cooperation with parents. However, without increasing the legal culture and legal awareness of citizens, it is impossible to ensure road safety at the proper level [15].

In addition, it is necessary to conduct regular training sessions with drivers in organizations providing road transportation services, aimed at ensuring trouble-free operation [16]. As a means of increasing driver responsibility, it is proposed to introduce a mandatory course of training programs for drivers with a detailed analysis of road accidents, consideration of the causes of its occurrence and consequences, as well as training drivers in measures to prevent such incidents [17].

References

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