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Improvement of Road Equipment and Separation Barriers on Roads and Effective Use of Innovative Technologies in Maintenance Work

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Abstract: This article describes the effective use of modern technologies in the maintenance and repair of road equipment, road barriers, road signs, and information road equipment on the roads of our country and developed countries, mainly to reduce the level of human (factor) and power consumption in maintenance work, further optimize the night visibility of road equipment and its impact on vehicle traffic. In addition, it is discussed about the increased use of innovative modern technologies in maintenance work, especially in ensuring that the condition of road barriers is constantly the same.

Keywords: Road Equipment, Road Barriers, Road Signs, Maintenance Work, Technologies, Repair, Manpower, Traffic, Visibility Distance, Innovative Technology, Traffic Accident.

Introduction

Highway - a complex of engineering structures designed for the movement of vehicles, ensuring their continuous and safe movement at a specified speed, weight, dimensions, as well as land plots allocated for the placement of this complex and a space within a specified area above the complex. Road barriers are installed on highways to regulate the movement of vehicles and pedestrians, prevent road accidents and reduce their severity. The requirements for road barriers are given in GOST 26804-86. The conditions for the use of road barriers depending on changes in road conditions are given in GOST 23457-86. Depending on the conditions of use, road barriers are divided into 2 groups[1,2,3].

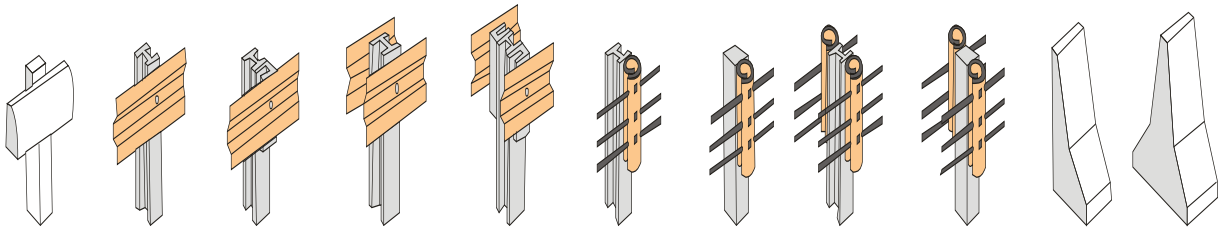

Figure 1. Group 1 roadblocks

The first group of road barriers is installed on the side of the road on I-IV class roads in the following cases: When the roadbed passes on a slope and has a side slope of 1:3 or steeper. When the distance from railway tracks, swamps, canals (with a water depth of 2 m or more), ravines and mountain gorges is not less than 25 m from the edge of the carriageway, in places where the road runs parallel[3]. At complex intersections with intersections at different levels. On sections where the road direction does not change in plan. On dividing strips, bridges, overpasses, overpasses. The

first group of roadblocks is placed on the side of the road, at a distance of not less than 0.5 m and not more than 0.85 m from the edge of the roadway, depending on the severity of the roadblock.

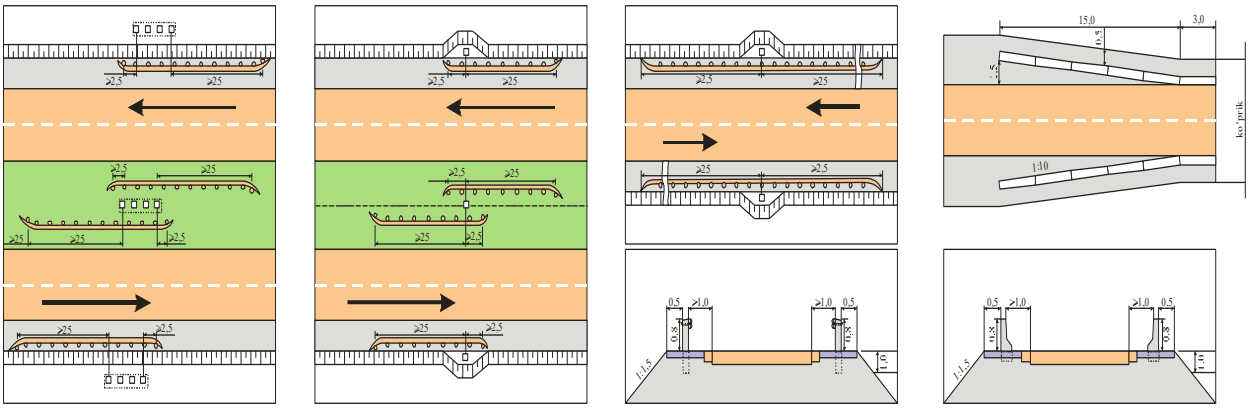

Figure 2. Application of group 2 roadblocks

Barriers made of steel slats meet the most safety requirements. The slats, which have a W-shaped cross section, are fixed to a rigid console, and the console is attached to channel No. 12. Four types of one-way road barrier structures (according to GOST 26804-86) have been developed with a spacing of 1 m, 2 m, 3 m and 4 m between the posts[4,5,6]. The operation of these structures is as follows: When a vehicle hits a barrier, the main impact falls on the slat, and the post, through which part of the impact passes, bends.

Currently, special rotating rollers are being installed to reduce the damage that may occur as a result of a vehicle hitting a barrier and to transfer the force of the impact in another direction. This reduces the degree of bodily injury to the driver and passengers as a result of a vehicle hitting a barrier.

Methodology

This study applies a комплекс methodological approach combining comparative, observational, and analytical methods. A comparative analysis was conducted to evaluate road equipment and barrier systems based on international practices and standards such as GOST 26804-86 and GOST 23457-86. Field observation methods were used to assess the actual condition, visibility, and defects of road barriers, signs, and related equipment under various environmental conditions.

Statistical analysis was employed to examine the relationship between maintenance quality and traffic safety, including the impact of visibility and equipment condition on accident rates. Additionally, an experimental approach was used to evaluate the efficiency of innovative technologies, particularly remote-controlled maintenance devices for cleaning and monitoring road barriers[7].

A systematic approach enabled the development of practical recommendations aimed at improving maintenance efficiency, reducing manual labor, and ensuring continuous monitoring of road infrastructure for enhanced traffic safety and operational performance.

Results and Discussion

The effective and efficient operation of all road equipment is associated with its constant condition, visibility, and the absence of defects in the road equipment. After winter storage, the implementation of spring improvement works, including maintenance of road equipment, is of great importance in improving the movement of vehicles[8]. In order to reduce and eliminate the blockage of road signs by foreign tree branches, their visibility due to dust, dirt, weather effects, fading of road lines, and similar defects, it is necessary to increase maintenance work in early spring.

As a result of the effects of weather, defects appear on some road signs and road equipment. In rainy,

dusty, and snowy climates, their cleanliness creates many difficulties in maintaining them. There is a device in the form of a small warning stop sign on the belts of the road barriers (iron barriers) separating the opposing directions. The function of the small signs on this iron barrier is especially necessary and important when the visibility distance is reduced at night[9,10,11]. The driver visually perceives the barrier through this device in the middle.

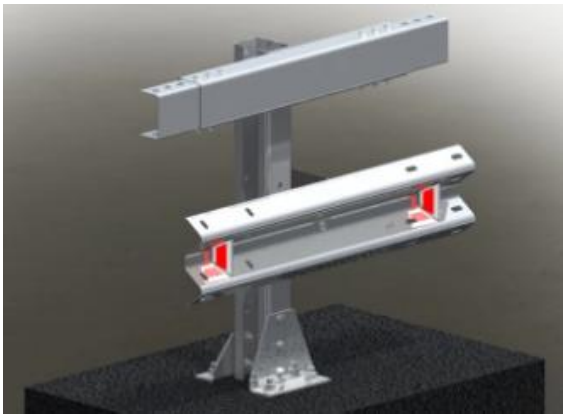

Figure 3. Small information device placed at the dividing road barriers[12]

In many cases, this small device becomes dull (dirty), which reduces the perception of the dividing barrier, which causes the vehicle to crash into the barrier. Regular cleaning and maintenance work also reduces the aforementioned dullness.

Road barriers serve to improve the movement of vehicles. In many cases, they are used for safety purposes, to prevent traffic accidents. Of course, it is important to ensure their safe movement on roads with a large traffic flow[13,14]. Keeping road barriers in good condition at all times, ensuring the visibility of every detail on them, helps the driver to perceive the road.

We know that road barriers are installed along the length of the road. This complicates their maintenance, because highways connect large distances. It is impossible to carry out maintenance work on large-scale road obstructions through manual labor. It is only possible to clean and wash up to a certain distance. Therefore, in such cases, the use of modern and remotely controlled technologies in landscaping works is much more effective.

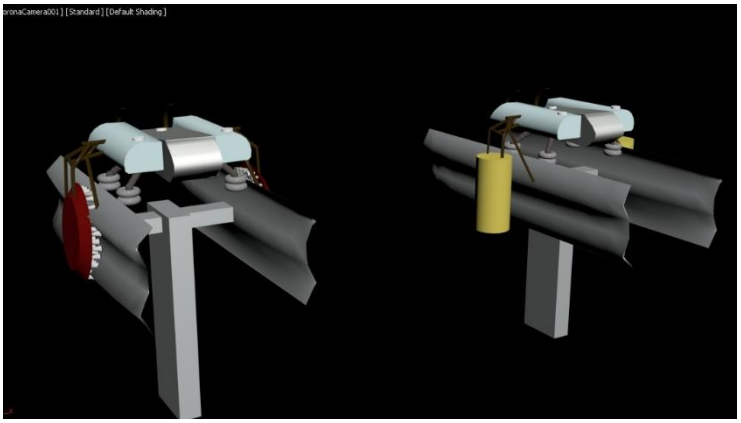

Figure 4. Modern, remote-controlled roadblock-clearing technology[15]

This device can be used to clean, wash and maintain road barriers over long distances.

Conclusion

If the use of innovative technologies such as the above is increased on highways, it will lead to a quality maintenance and a reduction in manual labor. As a result, road equipment, road signs, road markings will always be in good condition. The number of traffic accidents will decrease, and road safety issues will be solved to some extent. The traffic on highways will be ensured to be efficient even at night.

As a result of using this technology, we will achieve the following convenience and success:

-constant control of road barriers;

-road barriers will always be clean and in good condition;

-reduction of labor, reduction of manual labor;

-no impact on traffic flow during maintenance;

-cost reduction, etc.

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