



SAFETY PARAMETERS CONSIDERATION AT ALL STAGES OF ROAD CONSTRUCTION

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This article deals with the problems of road construction taking into account safety issues. It allows to get acquainted with the procedure of the construction of the roadway with illustrations and images, graphs and calculation tables that enable to imagine the scope of work in more detail and get an idea of the technologies associated with road construction. The author studied the issue related to the smooth and comfortable movement of vehicles and revealed the ways of solving the problem associated with traffic jams and congestions. The necessary calculations were made in accordance with the standards related to road construction, and conclusions were drawn about the work done.

Key words: *Road safety, construction, comparative analysis, natural conditions research*

INTRODUCTION

Unfortunately, today travelling by road can't be considered the safest, as it depends not only on the driving manner but also on the quality of the roads. According to the data of Russian Statistics agency related to road accidents only in 2019 approximately 17000 people became victims in road accidents. These facts determined the relevance of this research which lies in a consideration of the construction of transport links from the road safety standpoint. It seems to be of great theoretical and practical significance so it is important to become more familiar with the problems in the Kaliningrad region associated with road traffic and safety. [1-3]

OBJECT OF RESEARCH

The object of research of this project is the construction of the design project of a highway passing between two settlements Nivenskoe – Tishino in Bagrationovsky district, as well as the ratio of safety parameters and how the quality of the road surface affects the safety of transport and the reason why this issue should not be ignored. [5]

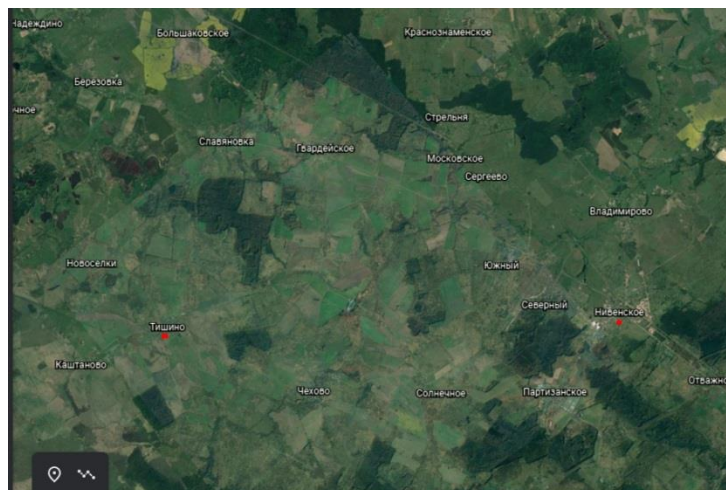


Image 1-The main direction of the future route

This image helps to visually represent the direction of the future route and the location of the construction areas, as well as the landscape

GOALS AND OBJECTIVES OF THE RESEARCH

The purpose of the research given was to develop the most optimal option for designing a new road, taking into account the most adequate ratio of cost and safety. To achieve this goal, it was necessary to solve the following objectives:

1. Firstly, it was necessary to study scientific literature documents and standards related to road construction and safety.

2. Secondly, to move to the area in order to make a visual assessment of the terrain, existing road surface, and natural conditions of the area. This was done in order to make sure the future design is necessary and makes sense.

3. Thirdly, to analyze and process the data obtained using methods of simulation and mathematical statistics.

4. And finally, necessary conclusions were made and recommendations to interested parties were given. [4]

RESEARCH METHODS

In the course of this project, two main methods were used: theoretical and practical. The first includes evaluation of natural conditions and their impact on the construction of the future road, and a theoretical analysis of the literature. Documents and standards related to road construction have also been studied in order to assess the conditions that affect the development and calculation of the necessary route. In the practical part, calculations of the roadbed and drainage structures were made, also comparative analyses were carried out, and a calendar schedule of work was calculated in which time, shifts, and volumes of work are illustrated.

RESULTS OF THE STUDY

Even at the initial stages of construction, it is necessary to consider two important issues: cost and safety.

Unfortunately, for the designers and constructors cost is a priority as the entire fate of the future project depends on the amount of funding, and sometimes it is much more important to meet the deadlines than to pay a close attention to the road quality, so only after that, safety is taken into account.

Before building a new road, we needed to analyze the existing route, conduct a comparative analysis which allowed to reveal some problems. First of all, this route is quite narrow. As a result of long exploitation and lack of repair, there are deformations on the roadway, a grid of cracks, in some places there are no fences. In addition, this highway was built many years ago, as a result of which many standards have been outdated and do not meet modern needs. For example, this route wasn't designed for such large loads as the ever-growing number of vehicles.

Another point to be taken into consideration was characteristics of the natural conditions of the area like river network, soil type, and presence of vegetation. Based on the received data it became clear that this area has a dense river network which can cause subsidence of the ground. Although in general, natural conditions of this area are favorable enough for construction of the new road. So, after this step, development of options for a feasible route has been calculated in order to understand which route appears to be the most suitable. And the results are illustrated in the table below. [1]

Table 1 – Comparative analysis of three routes

№	Name of indicators	1 Option	2 Option	3 Option	Advantages		
					Option 1	Option 2	Option 3
1	Track length	9097,90	10098,00	10099,51	+	-	-
2	Elongation coefficient	25°20'28''	40°56'32''	30°38'20''	+	-	-
3	Number of intersections	0	0	0	=	=	=
4	Number of watercourses crossed	0	0	0	=	=	=
5	Maximum longitudinal slope	80,95	112,36	32,86	-	-	+
6	Total length of sections with maximum longitudinal slope	1100	1300	1300	+	-	-
7	The length of the sections passing through the forest	0	0	0	=	=	=
8	The length of the sections passing through agricultural land	0	0	0	=	=	=
	TOTAL				3	0	1

The comparative analysis of these routes helped to conclude that they are almost equal to each other in the terms of track length, the length of the sections passing through the forest and agricultural land and many others.

However, the first option seems the most favorable for a more detailed design.

After that two variants of the road surface design have been developed for the optimal choice of material for the construction of the coating layers and the base. [2]

So, according to the results of comparison, the second version of the road surface is the most favorable from an economic point of view, but from the point of view of installation, the first one is more reasonable and promises a longer service life. Therefore, we opt for the latter. (table 2)

Table 2 - Technical and economic comparison of road surface design options

Name of the material				
	1 option		2 option	
	Amount	Cost, RUB	Amount	Cost, RUB
Asphalt concrete of hot laying dense grade II from crushed stone (gravel) mix of type B, grade of bitumen BND/BND-60/90	14405,75	38895552	14405,75	38895552
Hot-laid porous asphalt concrete grade II of coarse-grained crushed stone (gravel) mixture grade BND 60/90 bitumen	24849,94	65852330,4	19327,73	51218479,2
Fractionated crushed stone 40..80 (80..120) mm easily compacted with a small fractionated crushed stone filling	-	-	42016,6	27310920
Sand of medium size, with a content of dust-clay fraction of 5%	60024	54021600	60024	54021600
Crushed stone mixes with continuous granulometry C4-80 mm (for bases)	36014,4	46818720	-	-
Geospan TN 50	120048	13618245,12	-	-
TOTAL	-	270424926,72	-	215348104,8

Since there are a large number of reservoirs and accumulation of water in this area, it was decided to lay several pipes having previously calculated their capability to divert water from the road.

Ultimately, in order to understand how much time will be required for construction, a calendar schedule of work was calculated in which time, shifts, and volumes of work are illustrated.

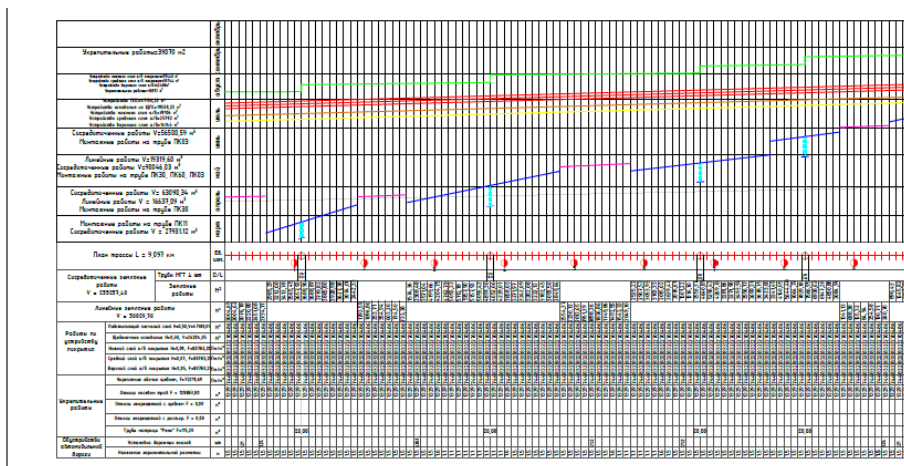


Image 2 - Linear calendar chart

After the calculations, it became clear that the construction of this section of road could take half a year.

CONCLUSION

In the course of this work, it was found out that many aspects affect the safety of the road, such as: quality of the surface, absence of holes and sharp turns, presence of road barriers, warning signs and timely maintenance. Since they directly affect the comfort and safety of driving cars.

Solving the second task, it was possible to study the natural aspects that affect the future construction of the road, as well as to conduct a comparative analysis of the old route to understand whether this project is really necessary.

And finally, it became clear that for the safe and comfortable movement of vehicles, it is necessary not only to follow the standards, rules and recommendations, but also to comply with all the necessary safety standards at all stages of road construction.

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УЧЕТ ПАРАМЕТРОВ БЕЗОПАСНОСТИ НА ВСЕХ ЭТАПАХ СТРОИТЕЛЬСТВА ДОРОГ

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В данной статье рассматриваются проблемы дорожного строительства с учетом вопросов безопасности. Она позволяет ознакомиться с процедурой строительства дорожного полотна при помощи иллюстраций и изображений, графиков и расчетных таблиц, позволяющих более детально представить объем работ и получить представление о технологиях, связанных с дорожным строительством. В ходе данного проекта автор изучил вопрос, связанный с плавным и комфортным движением транспортных средств, и раскрыл пути решения проблем, связанных с пробками и заторами. Также были проведены необходимые расчеты в соответствии со стандартами, касающимися дорожного строительства, и сделаны выводы о проделанной работе.

Ключевые слова: *безопасность дорожного движения, строительство, сравнительный анализ, исследование природных условий*