

Study of Deformations That Occur on Road Surfaces and Develop Measures to Prevent Them

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Annotation: In this article, you can pay attention to the fact that today's road construction is growing rapidly. It is being repeated again and again that we should pay great attention to the road sector.

Keywords: Coatings, repair period, resistance to deformation, service life, consumption costs, fixed period, repair period, subsidence, service life.

INTRODUCTION: The operational period and quality of the road is adversely affected by the constant increase in the number of heavy vehicles and the increase in the speed of traffic. This trend is likely to continue in the near future. In the 70s of the last century, insufficient assessment of these factors in the design of road surfaces and the formation of road transport infrastructure led to the complete destruction of highways on a large scale. Pavement cracks, undulations, dips and dips are caused by the accumulation of stresses throughout the pavement structure from the cumulative effects of moving load and changing weather and climate factors. In addition, the condition of the main layers of the pavement and the subsoil is also affected. Deformation and failure of coatings can occur due to violation of technological requirements during road construction, as well as materials and quality of mixtures. Deformation cracks formed under the influence of temperature are often found in the distance of 20-25 m. [1].

Laboratory results show that deformations occur in the following order: Vertical plastic (residual) deformation - in the base layers

➤ Horizontal deformation – in the asphalt concrete layer

Many studies show that the plastic deformation of asphalt concrete is the result of plastic deformation of the asphalt concrete layer at high temperature when the layers are not sufficiently compacted during the construction process. [3]

MAIN PART: The most common type of deformation seen on the road surface is longitudinal deformation. It is a type of deformation of the transverse profile of the roadway, and wavy depressions are formed parallel to the road. It has 3 types [4].

- Residual (plastic) or pitted (lubinnoe) - mainly occurs due to the accumulation of small deformations in the upper layer of the coating
- Wavy (rutted) - it is often formed due to the impact of car tires, as a result of toothed tires.
- Across the entire road surface - this is caused by insufficient reinforcement of the main road layers.

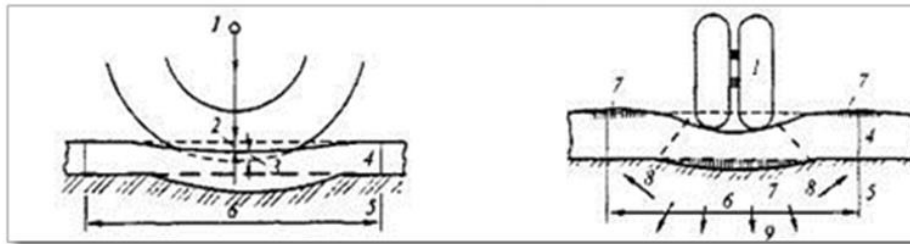


Figure 1. The scheme of formation of wave deformation of road surfaces under car wheels: 1 - wheel; 2 - bending of the coating; 3 - tire compression; 4 - road surface; 5 – road pyi; 6 - turning width; 7- stretching zones and cracks in the coating; 8 - bulging of the grout; 9 - direction of soil compaction.

Wavy deformations are also formed as a result of the temperature of the road surface being overheated under the sunlight. Basically, small frequent deformations (0.2-2 m) are formed in coatings containing a large amount of organic binder (bitumen).



Figure 2. Longitudinal deformations in the upper layer of the road

In addition to longitudinal deformations, transverse deformations can also occur on the road, as a result of which the road surface becomes wavy.

This type of deformation occurs due to excessive plasticity of the coating, heat resistance of the mixture at high temperatures, or insufficient crushed stone. If the base soil is not compacted enough or due to cold, subsidence and heaving will occur (Fig. 3).



Figure 3. Transverse deformation of the road surface

In addition to geometric parameters and road pavement damage, other types of defects also appear. These types include: transverse and longitudinal cracks, depressions and depressions, collapses. In most cases, the initial stage of the formation of pits and cracks is due to the period of unfavorable weather conditions, especially to the period of frequent transitions of air temperature from hot to cold temperature, excessive moisture of the subsoil and cover layers. is coming. When water enters the cracks, it increases the corrosive physico-chemical processes in the coating materials, and after freezing, it has a stretching effect on the walls of the cracks and individual particles of the materials. At the same time, together with the dynamic effect of traffic loads moving on the pavement, the pavement material in the zone where the cracks are formed begins to disintegrate and crack. The crack quickly

turns into a pit. Therefore, an unfilled crack is always a potential source of pits. Another source of the formation of pits is from unevenness allowed in the construction of pavement layers, when the requirements for flatness and density are not met during the process of leveling and compacting materials, as well as cracks, shifts and it is formed in the construction of coatings from mixtures with high plasticity. A dynamic effect on the pavement occurs at a certain distance immediately after the car wheel passes through the appearance of a crack or pit (Fig. 4). Repetition of such an impact causes the material structure to loosen, resulting in the appearance and development of larger cracks or pits, which later coalesce into one large pit.

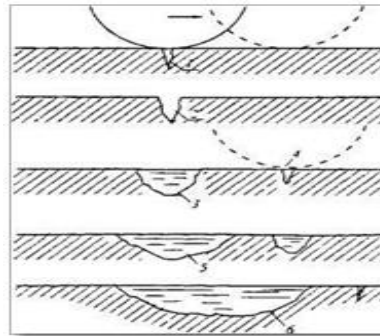


Fig. 5 An example of the transition of cracks or gaps to pits: 1,2 - cracks or gaps during the transition; 3 - formation of cracks in the zone of repeated impact of water and ice; 4 - secondary shock of the wheel; 5, 6 - formation of side pits and their merging. Table 1 shows the cause and classification of coating deformation below.

Classification of asphalt-concrete pavements by damage types and appearance		
Type of damage Appearance of damage Probable causes	Type of damage Appearance of damage Probable causes	Type of damage Appearance of damage Probable causes
Violation of the integrity of the coating	Transverse cracks	Defects in work organization, mixture laying and rolling technology. Insufficient deformation of the coating and low resistance to pressure caused by temperature changes and repeated loading, as well as a number of random factors
	Longitudinal cracks	
	Inclined and intersecting cracks	
	Cracks along the edges	
	Secondary cracks	
	Reticulated cracks ("Krokodilovaya koja")	Inadequate strength of the road structure
Violation of the geometric parameters (shape) of the coating	Carvings and depressions	Inadequate adhesion of the binder to the stone material
	Longitudinal deformation	Change of coating top layer
	Plastic deformation (shifts, embossing and engravings)	Excessive bitumen (in low frequency waves), consolidation of basic soils
	Waves	
Violation of the condition of the coating surface (friction, adhesion) Defects on the coating surface The coating does not have sufficient durability	Restlessness (dips and dips)	Poor compaction of foundation soils
	Failure to carry out repair and patching works correctly and not to connect the joints of the coating	
Violation of the condition of the coating surface (friction, adhesion) Defects on the coating surface The coating does not have sufficient durability	Violation of the condition of the coating surface (friction, adhesion) Defects on the coating surface The coating does not have sufficient durability	Violation of the condition of the coating surface (friction, adhesion) Defects on the coating surface The coating does not have sufficient durability

CONCLUSION

This article analyzed the types and causes of deformations that occur on roads with asphalt concrete pavement. According to this, if damage occurs in the pavement structure or asphalt concrete, it depends on a number of factors:

- external factors - load, climatic factors, the influence of air temperature and solar radiation, as well as levels of subsoil compaction;
- internal factors - properties of underground soils and their compaction; granulometric composition and compaction of structural layers of the coating; structural stability against displacement along the subgrade; deformation stability of asphalt-concrete pavement layers.

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