

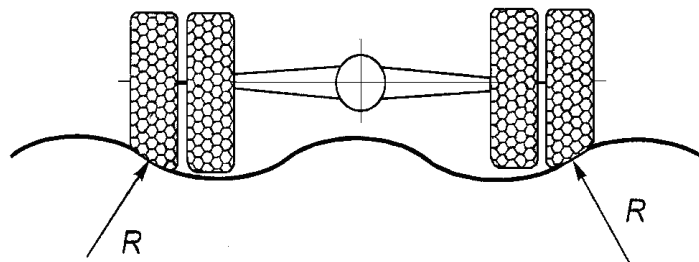
Deformation of Asphalt-Concrete Paving Roads Caused by Influence of Vehicles and
Possibilities of Its Prevention

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Under such climate conditions of South wherein is situated our country and under the conditions of increased traffic flow there are arisen on the roads the transverse wave and longitudinal rut deformations that increases the traffic accident risk. The traffic accident risk particularly increases during hours of darkness and in rainy weather. As it determined by investigations, the different types of vehicles in different intensity further the formation of ruts on trafficways. An influence of passenger cars on this process equals to zero. The particular role in the ruts formation process is taken by high carrying capacity vehicles. As result of motor transport's wheels action and through an influence of horizontal components of force arisen by it there is taking place an interchange of road pavement layers or pavement layers and road bases. Therewith, during high traffic intensity and under high temperature conditions as result of vertical forces interaction from the point of tangency between undercarriage wheels and road pavement there is occurred an ejection of paving materials and pavement moving aside as a consequence of this there is taking place an appearance of deep rut along a trajectory of wheel and in the contiguous part of trajectory on the both sides on the contrary there is occurred the pavement upheaval. There is determined by observations that appearance of longitudinal ruts on the road pavements takes place over high intensity plane relief sections of roads where the high carrying capacity vehicles are moving at a high speed. The arising possibilities of ruts and their sizes are comparatively high on those curvilinear sections of roads where the mentioned vehicles are beginning to move reducing the speed. Frequently, the depth of the rut in such road sections equals to 5 sm. There is established that during the vehicle's speed reduction there is increasing the height of rut formed as result of plastic deformation on trafficway. At this time there is a considerably high influence time of forces causing the deformations on trafficway's unit of area. The ruts formation process as result of motor transport road influence is not sufficiently investigated but at this juncture we can conclude that in this case when interaction of forces on the

pavement surface there is taking place an intensive wearing of pavement materials at the point of tangency between pavement and vehicle's wheels as result of interaction of friction forces; due to vertical load there is taking place a vertical deepening into the pavement's bottom layers of mineral stuffs in material. It is noticeable that recently the high carrying capacity trucks have a single-layer tyre that considerably increases the vertical loads on the roads and ruts formation probabilities. At this time there is arising more narrow and high rut and moving over with two-layer tyre car only one wheel comes to tangency with pavement and its interaction with pavement is the same as in case of single-layer tyre.(Pic. 1).



Pic. 1.

The diagram of two-layer undercarriage's action on road rut caused by single-layer undercarriage's action

It is noticeable that an asphalt-concrete surface paved on the cement-concrete base as result of motor transport's wheels undergoes various types of deformations with more intensity. Owing to research works carried out in Moscow Auto-Road Institute there have been determined the influence coefficient value of force action on undercarriage caused by single- and two-layer tyre undercarriage in compliance with loads on axle.

Table 1.

Single-layer axle load, kg	Influence coefficient		Two-layer axle load, kg	Influence coefficient
500	0.03		2000	0.09
1000	0.05		3000	0.14
1500	0.14		4000	0.20
2000	0.2		5000	0.27
2500	0.27		6000	0.33
3000	0.33		7000	0.38
3500	0.38		8000	0.42
4000	0.42		9000	0.47

4500	0.47		10 000	0.52
5000	0.52		11 000	0.58
5500	0.58		12 000	0.62
6000	0.62		13 000	0.67

The observations of ruts formation areas on motor roads will show us that on these sections the vehicles have to move at variable speeds, they are starting the intensive braking and moving in acceleration regime and by means of action of forces arisen exactly during the variable operating regimes there are appeared the permanent deformations of motor asphalt-concrete pavements including formation of ruts with the same orientation.

After repairing the motor roads' deformed sections the new types of deformations including the same orientation longitudinal ruts are arisen within the lesser period of time than in case of new road pavement and this means that during rut formation as result of interaction of forces there is taking place the come off deformation between paving layers. It is reasonable to note that besides the value and character of load on asphalt-concrete pavement it is necessary to give attention to technological peculiarities of paving the asphalt-concrete layer and quality of paving materials. In case of high clutching index value and more than 5 sm thickness of layer the probability of longitudinal ruts formation goes down by 20-25%.

Furthemore, if the asphalt-concrete structure is presented with large-seeded mineral stuffs the probabilities of permanent deformations on the asphalt are considerably lower. Therefore, with the purpose of a decrease of longitudinal ruts formation probability on the motor road surface it is important as result of conducted in the proper way monitoring to reveal the character of vehicular traffic over the separate sections of roads and those critical sections where is a high probability of permanent deformations in consequence of vehicles operating regimes in order to pave these sections with suitable asphalt-concrete materials enduring to appropriate degree of permanent deformations. In addition, in order to prevent an interchange of layers caused by their interaction force it is necessary to observe the paving requirements that enables to achieve the maximum connection between layers. For that the bottom layer is covered with special bituminous liquid and there is making a new layer until cooling the bituminos thin coat.

References:

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резюме

В статье рассмотрено степень и возможность воздействия ходовой части и колесь много осного выского грузоподемной автоморбилей. Установлено зависимость между состояные и содержанные асфальтобетонного покрытия иб скорости передвижения и грузоподемности и выда ходовой часты грузоподемных машинь. Определено фактории влияющий устойчивости жесткости и нежелательного деформаций асфальтобетонных покрытие от воздействия транспортного потока и их динамических показателей