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ENSURING THE STABILITY OF THE COASTAL SUPPORT UNDER THE INFLUENCE OF SEISMIC AND VIBRODYNAMIC FORCES

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ABSTRACT

The article considers the reasons for the destruction of transport structures under the influence of seismic and vibrodynamic forces and ways to reduce the active pressure of the soil acting on the shore support.

Keywords: Shore support, pile, ground, active pressure, seismic force, accident.

INTRODUCTION

Unfortunately, accidents and destruction of building structures, buildings and structures, including transport structures, have recently become commonplace, as evidenced, for example, by the results of the analysis conducted by the authors of the works [1]. On the basis of this analysis, the following conclusions can be formulated in relation to transport structures:

- accidents and destruction of transport structures have occurred in the past, are taking place at the present time and are likely to occur in the future;
- accidents and destruction of transport structures occur in all corners of the globe, in all countries, regardless of their economic condition; at the same time, the presence of a large number of transport structures can cause more of their accidents and destruction;
- economic deterioration and crises usually lead to an increase in the number of accidents and destruction of transport facilities;
- real reasons for reducing the number of accidents and destruction of transport structures in the near future are not expected, and the destruction will be mainly subjected to transport structures that have been in operation for a long time;

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- systematization of information about accidents and destruction of transport structures, the study of the causes of their occurrence, bringing this information to the specialists involved in the design, construction and operation of transport structures, will reduce the number of accidents, reduce the severity of their consequences;

- the study of the causes of the occurrence of accidents and the destruction of transport structures and ways to prevent them in the training of engineering and scientific personnel for the transport construction industry will also reduce the intensity of the occurrence of such events [1].

METHODOLOGY

The embankment in front of the shore support of the bridge fluctuates under the influence of seismic and vibrodynamic forces. As a result of these oscillations, due to an increase in the amplitudes of the natural oscillations, destructions occur 1-fig.



Fig. 1. Destruction of the embankment in front of the shore support.

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The safe operation of transport facilities mainly depends on the implementation of the design, construction and operation processes according to the standards. Reducing the forces acting on the shore support of the bridge will reduce the amplitudes of the maximum vibrations of the structures.

The stress state of the bridge under the influence of seismic forces is mainly due to the compression and deformation of the ground on the construction site under the influence of external forces. Depending on the amplitude characteristics of the ground vibrations, work on strengthening railway bridges should be carried out in various ways. Otherwise, seismic and vibrodynamic forces will cause the collapse of the structures. In this case, it is necessary to ensure the joint operation of the bridge and the roadbed under the influence of seismic forces [2].

RESULTS AND DISCUSSION

Numerous studies of the increased damage to the coastal bridge supports during operation and especially under the action of seismic effects, as well as from high-speed train movements, revealed a number of reasons that influenced the deformation of the structure to varying degrees:

The effect of active soil pressure on the coastal support, which increases sharply with increasing speed of transport and seismic effects during an earthquake.

The dynamic stiffness of the sub-grade, which is interrupted at the coastal bridge support, is significantly reduced and depends on the rigidity of the bridge span and the interface with the bridge support [3].

These analyses allow us to conclude what it is necessary to develop a system of a shock-absorbing unit, this complex connection, which would be able to reduce the difference in the amplitude-frequency characteristics of these parts [4].

In this case, basically, the shore support should perceive the active ground pressure (E_a) arising from the oscillatory force of the rolling stock and transmit it to the base, as well as ensure the safe operation of the structure [5].

We achieve a reduction in the actin pressure of the soil acting on the bridge support by driving piles. The driving pile resists the active pressure of the ground, perceiving the pressure, directly transmits it to the base. In addition, the soil layer is compacted when driving piles into the ground [6].

CONCLUSION

In order to ensure the safe and long-term operation of transport structures under the influence of seismic and vibrodynamic forces, it is recommended to use the following data based on the above data:

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1. Increasing the stability of the structure by reducing the logarithmic decrement of vibrations of the shore support;

2. Increase in dynamic rigidity by driving piles into the ground mass in front of the shore support and reduce the active pressure acting on the structure.

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