



Management of risk of exceeding design loads for reinforced concrete highway bridges

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Abstract

The following topic is analyzed in this study: risks of exceeding the required levels of load capacity of reinforced concrete bridge superstructures due to the variability of operational traffic loads on bridges. Decrease of load capacity during operation is mainly due to the corrosion wear of the working reinforcement. The following types of risks of loss or decrease of load capacity are considered:

undesirable – when restriction of the traffic on the bridge or reducing its durability is required;

unacceptable – when termination of traffic on the bridge is necessary

critical - the danger of a catastrophic collapse with possible human victims.

During the entire period of operation, the exceedance probability of operating loads should not be lower than the one of the design load at the final stage of the bridge service.

Keywords: bearing capacity, bridge, exceedance probability, live load, load capacity, load class, reinforcement, repair, risk, service life.

1. Introduction

The task of risk management is to maintain the required reliability during the service life of the structure and to determine time of repair works for restoration of the necessary load capacity of the structure.

Risk R is defined as the probability of failure, that is, violation of normal operation of bridge structure.

The method of calculation and design of bridge structures (hereinafter - bridges) according to the limit state analysis [1] allows an autonomous analysis of the risks related to operational loads

and risks associated with the variability of the strength of structural materials.

Risks of exceeding the required load levels due to the variability of traffic loads on bridges and the reduction of their load capacity due to physical wear is analyzed. Risks of exceeding the design live loads and proposes criteria for determination of repair time, restoring the design load capacity are also analyzed in the report.

2. Design parameters of live load on the bridges in Russian building codes

In accordance with limit state method two values of each type of load are taken into account: