

ASSESSMENT OF THE STABILITY OF CONTINUOUS WELDED RAIL TRACKS UNDER THE CLIMATIC CONDITIONS OF UZBEKISTAN**Jumaniyozov Munisbek Ozodovich** – Master's student

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<https://doi.org/10.5281/zenodo.20112801>

Abstract: This article examines the issues related to assessing the stability of continuous welded rail (CWR) tracks under the climatic conditions of Uzbekistan. The study analyzes longitudinal forces generated in rail strings due to high and low temperatures, their influence on the condition of the rail-sleeper grid, and the probability of track buckling. It is substantiated that the sharply continental climate of Uzbekistan significantly affects the operational condition of rail tracks. In addition, the importance of rail temperature monitoring, proper selection of neutral temperature, and the use of modern diagnostic systems is highlighted. The research results demonstrate the necessity of considering local climatic factors in order to improve the safety and stability of continuous welded rail tracks.

Keywords: continuous welded rail, rail string, temperature stress, rail-sleeper grid, track buckling, stability, climate conditions of Uzbekistan, diagnostic systems.

At present, continuous welded rail (CWR) is considered one of the most efficient structures in modern railway infrastructure. This type of construction reduces the number of rail joints, increases ride smoothness, decreases dynamic impacts, and lowers эксплуатация costs. However, the reliable operation of CWR largely depends on the stability of rail strings under temperature influence.

Uzbekistan is located in a sharply continental climate zone, where air temperatures in summer can reach up to +45 °C, while rail temperatures may exceed +60 °C. During winter, temperatures in some regions may fall to –20 °C. Such significant temperature differences create considerable longitudinal stresses in rail steel.

When temperature increases, rails tend to expand. However, due to the resistance of the rail-sleeper grid and ballast, free expansion is restricted. As a result, compressive longitudinal forces arise inside the rail. When these forces reach critical values, the transverse stability of the rail track structure is disturbed, which may lead to the phenomenon known as “track buckling.”

This risk becomes even greater on curved sections of track because additional centrifugal and horizontal wheel forces act together with temperature stresses. Therefore, the operation of CWR on curves with small radii requires enhanced monitoring and maintenance.

One of the most important factors in ensuring the stability of rail strings is the correct selection of neutral temperature. Neutral temperature is the condition at which longitudinal stresses in the rail are minimal. If rails are fastened at an incorrect temperature, excessive compressive forces may occur in summer, while tensile stresses may increase in winter. This can result in rail deformation or even rail fracture.

To improve track stability, it is recommended to use reinforced concrete sleepers, high-quality ballast, and reliable fastening systems. In addition, continuous monitoring of rail temperature and the implementation of modern diagnostic systems play a crucial role. Modern electronic sensors make it possible to monitor the condition of rails in real time.

Experimental studies show that when rail temperature approaches critical limits, small elastic transverse displacements first appear in the rail-sleeper grid. Further temperature increase causes rapid deformation development. Therefore, during periods of extremely high temperature, railway sections with continuous welded rails require intensified supervision.

Furthermore, the design of rail strings and the selection of fastening temperature must take into account local climatic conditions. This is especially important in the southern regions of Uzbekistan, where rail heating reaches extremely high levels and additional preventive measures are required.

In conclusion, ensuring the stability of continuous welded rail tracks under the climatic conditions of Uzbekistan requires constant monitoring of temperature stresses, the application of modern diagnostic technologies, and the improvement of the structural strength of the rail-sleeper grid..

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