Investigations on the buckling behaviour due to different launching bearings

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Abstract

In general, today two types of launching bearings are used in the construction of large steel and steel concrete composite bridges, sliding rockers and systems with hydraulic bearings. During incremental launching, the center of the webs of the superstructure is not perfectly in line with the center of the launching bearings due to unavoidable tolerances. The advantages and disadvantages of the respective systems are under discussion. At the Technical University Munich, large-scale buckling tests were carried out on longitudinally stiffened plates under biaxial stresses with different types of launching bearings and eccentric load introduction. In this paper the test results as well as differences of the respective systems are presented. Based on experimental results, a numerical model is validated. The test results as well as the results from the validated numerical model demonstrate the influence on the buckling behaviour from different types of launching bearings.

Keywords: incremental launching; buckling behaviour; eccentric load introduction; large scale buckling tests; multi axial stress states

1 Introduction

During incremental launching of steel and composite bridges, the superstructure is subjected to different stages of construction, loads and boundary conditions. During the launching, the superstructure acts as a continuous beam supported by different bearings. Just before reaching the next pier the superstructure behaves temporarily as a long cantilever. As a result, hogging bending and shear are combined with concentrated patch loading at the last support. The interaction of the internal forces creates a biaxial stress state in the cross section above the last support. This load case is usually the critical one for the structural design of the webs. A schematic representation of the resulting internal forces of the superstructure and the biaxial stress state at the last support is presented in Figure 1.

In this case, the buckling check must be performed considering the combined loading from biaxial compression and shear stresses. While the longitudinal compression results from the hogging bending moment during the incremental launching, the transverse compression is introduced locally by the launching bearings at the pier head.

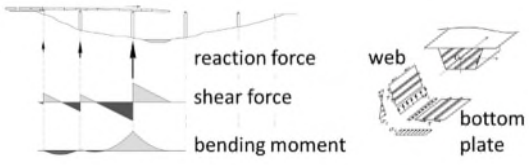

Figure 1. Schematic representation of the loading over the launching bearing [1].

The load introduction from the bearings into the web depends strongly on the type of launching bearing used. Therefore, experimental and numerical investigations were developed to

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