A Survey on Patch Loading Models for Bridge Launching

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Summary

During the incremental launching of steel and composite bridges high support reactions have to be introduced into the slender steel webs of the bridge girder. In the past, the specific characteristics of bridge launching such as long loading lengths and longitudinal stiffeners were not covered appropriately by existing design formulae for patch loading. In the frame of the research project “Competitive Steel and Composite Bridges by Improved Steel Plated Structures (COMBRI)” a clear improvement of the patch loading resistances for I-girders and box sections could be derived leading to more economic solutions for this type of loading. The paper introduces the basic concepts of the developed models for both unstiffened girders and girders with open-section and closed-section longitudinal stiffeners as well as a software tool for the advanced determination of elastic critical buckling loads and modes. A comparison of the main area of application and the resulting economic advantages concludes the survey.

Keywords: steel and composite bridges, longitudinal stiffeners, incremental launching, patch loading, plate buckling

1. Introduction

One of the most competitive bridge construction methods for long-spans is the incremental launching technique. Bridge girder elements are assembled behind the abutments and then launched by the length of the completed superstructure member. Such an assembly on the ground does not greatly affect the area below the bridge. With regard to design aspects high support reactions have to be introduced during the launching process as transverse forces into the girder web which also interact with shear forces and bending moments, see further information in [5]. The progress of the steel industry has introduced steel plates with a higher resistance and thicknesses up to 150 millimetres are commonly used in some European countries. Consequently the bridge spans are longer and it is now nearly common to launch steel girders with spans up to 120 metres. However, the longer the span is the deeper the girder becomes. If the web panel depth is smaller than 3 metres the trend is not to use any longitudinal stiffeners. But for a 120 metres long span the girder may have a web of 4 or 5 metres height. Even if the trend is to reduce the stiffening of bridge girders, such deep webs often have one or two longitudinal stiffeners for technical reasons such as transportation and web breathing. Since thirty years, experimental patch loading tests have shown

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