

Development of Integral Bridge Design in Austria

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Summary

Integral abutment and joint-less bridges are structures without bearings and expansion joints. These types of structures do gain much popularity among bridge owners, since they expect reduced costs in maintenance due to the missing of significantly endangered details like bearings and joints. Nevertheless, the acceptance by designers is not that high since there are a lot of uncertainties with regard to material strength development, creep, shrinkage and availability of suitable numerical models. These topics are currently being addressed by several research projects with the aim to work out an Austrian guideline for the design of joint-less bridges and to verify or improve current design criteria. Work includes monitoring of the actual structural response of newly built joint-less bridges, their interaction with the underground and numerical simulations.

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1. Introduction

Bridges without expansion joints and bearings – the so called integral or joint-less bridges – have different advantages as compared to conventional load bearing structures. Expansion joints (bridge joints) and bearings will always make a construction potentially vulnerable. The average life span of a bridge is currently up to 100 years. The elimination of expansion joints – which can be much more short-lived depending on the wear caused by traffic and weather - turns into an advantage in terms of the life expectancy and maintenance costs of a bridge. In many cases this also brings an increase of the load bearing capacity of the system which is important especially in terms of the redundancy versus exceptional actions.

On the other hand, based on their marginal conditions, joint-less bridges are statically indeterminate structures so that changes in temperature, shifts of the bearings, pre-tensioning and long term effects will generally trigger undesired restraint actions which can hardly be quantified – especially axial forces. This is the reason why expansion joints and bearings have been employed with bridge construction without reservation so far.

Basically, the integral construction method offers so many technical and economical advantages that this load bearing structure type has become the rule for small bridge lengths. Bridge engineers are currently trying to also make use of the advantages of this construction type for longer bridges. However, the difficulties of this endeavor are of a very diverse nature and, alongside with the numerous questions which still do not have an answer, they are being studied in the framework of a series of national and international initiatives.