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# AN ALTERNATIVE PROPOSAL FOR A "MOVABLE" ABUTMENT FOR INTEGRAL BRIDGES

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## SUMMARY

The present investigation proposes a type of an integral full height abutment which can be implemented in short as also in long integral bridges. The abutment is founded on micropiles which provide flexibility to the abutment and participate to the in-service movement, due to thermal expansion, contraction, creep and shrinkage, abutment's head. The proposed abutment is an alternative to the nowadays implemented integral abutment in the US namely the stub-type abutments with flexible H-steel piles. The alternative proposal combines on the one hand a full height web, whose thickness is determined from the in service requirements of the deck and on the other hand a foundation of micropiles, which have the ability to contribute to the foundation's flexibility. The necessary rotational flexibility is provided through the flexibility of the thin abutment's web and its foundation. Appropriate measures against ratcheting effect were considered. The proposed configuration of the abutment is possible to be implemented also in long integral bridges as the required flexibility is possible to be adjusted through the micropiles foundation and the thickness of the abutment's web.

## 1. INTRODUCTION

The construction and the serviceability of integral bridges, which are jointless bridge systems whose deck is monolithically connected to the piers and to the abutments, constitute the current state-of-the-art of bridge engineering. The competition between the States of America gave an advance to USA referring to the construction and to the level of knowledge of the in-service problems of integral bridges. In Europe, integral bridges of total length up to 180m were built the last years, mostly in Germany, which has adopted some basic structural configurations of the American technique, however preserves, in most integral bridges, a conventionally reinforced non-prestressed superstructure. The Sunniberg-Bruecke, the Nesenbachtal-Bruecke and the La Fertre-Steg are a representative sample of integral bridges in Germany.

Despite the fact that integral bridges have explicit aesthetics and earthquake resistance advantages towards the conventional seismically isolated bridges, the implementation of integral systems is restrained due to the in-service problems of creep (***c***), shrinkage (***sh***), thermal actions ($\boldsymbol{\Delta T}$), prestressing (***P***) and differential settlements ($\boldsymbol{\delta P}$) which are distressing the piers, the abutments and the approach embankments, and due to structural methods which discourage the monolithical connection of the deck to the piers (incremental launching). However, integral bridges remain a major structural challenge for Bridge Engineers as they (a) allow the redistribution of action effects due to their hyperstatic systems, (b) take advantage of the ability of the reinforced concrete to dissipate part of the induced seismic energy by hysteretic behaviour and (c) they do not require maintenance and replacement of expendable elements, such as bearings and expansion joints.

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