



Strengthening old steel railway bridges: a review

Giorgia Venturi

Politecnico di Milano, Milan, Italy

Peter Simonsson

Swedish Transport Administration, Luleå, Sweden

Peter Collin

Luleå Tekniska Universitet | Ramböll Sverige, Luleå, Sweden

Contact: giorgia.venturi@polimi.it

Abstract

Strengthening old bridges is an increasingly relevant strategy for risk prevention and operation continuity in management of infrastructures. Transportation networks are subjected to progressively stricter environmental and load conditions, leading to a growing number of deficient structures, also due to aging and deterioration. However, employable resources are finite, from both economical and environmental points of view. For these reasons, strengthening opportunities should be considered as a viable option, improving bridges behaviour with low economical and environmental impact. With this perspective, a selection of some of the most interesting strengthening techniques for old truss railway bridges is presented. To address effective solutions, the most frequent problems in old truss railway bridges are first presented. Literature analysis and experts' interviews were conducted and compared to results obtained from a representative bridge cluster. Different solutions addressing highlighted problems are then collected and qualitatively evaluated, in terms of efficacy on structural behaviour and typical construction requirements. Finally, general remarks and recommendations based on collected evidence are presented.

Keywords: truss bridges; railway bridges; steel bridges; strengthening.

1 Introduction

Strengthening in bridge engineering refers to the process of upgrading structures to improve their performance under their current conditions or to increase their load carrying capacity for higher or more frequent loads. This has become an essential practice among bridge network administrations: consequences related to lack of upgrading and repair have been highlighted by the number of

bridge collapses in the last years. In fact, infrastructures throughout the world are aging [1-2] and climate change can significantly affect operating conditions for the structures, but it is not possible to substitute all of them, economically nor environmentally. For this reason, a circular approach should be adopted [3], including strengthening interventions.

The evaluation of a strengthening solution requires several aspects to be considered, such as: the