



## Fatigue and Corrosion as a Threat for Steel Heritage Bridges

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### Abstract

The combined effects of corrosion and fatigue have become a topic issue in recent times. Decades-old steel bridges that are still in service need to be reassessed. However, there is no relevant background information that can be used in assessment of this phenomenon. For this reason the aim of the research presented in this paper was preparation and execution of laboratory tests on real bridge components that were deteriorated by corrosion. Experimental tests were performed to find out how corrosion weakening affects the fatigue strength of members. The evaluation of the tests indicates that the service life of members may be significantly reduced due to fatigue. The paper ends with recommendations on how the loss of material due to corrosion could be taken into account for an assessment the residual lifetime of members.

**Keywords:** experimental test; fatigue life; corrosion; steel bridges; performance indicators.

### 1 Introduction

Metallic bridge structures built many decades ago represent historical and cultural significant structures. Nevertheless increasing demands on transportation in combination with unfavourable environment have negative effects especially on the state of existing railway steel bridges. Civil engineers reassessing such existing structures face several sources of doubt, especially if the structure is deteriorated by a combination of corrosion and fatigue load.

The effects of corrosion weakening on the behaviour of steel elements has been the subject of many research projects.

A set of corroded steel riveted stringers was subjected to laboratory tests to find the influence of material loss on the remaining bearing capacity of these bridge structure elements [1], [2]. In several cases [3], [4], the influence of corrosion on the fatigue behaviour of corroded steel plates was investigated. The origin and propagation of fatigue cracks on corroded elements were also studied [5], [6]. The response to cyclic loading of steel webs and flanges with material loss due to corrosion was the topic of another study [7].

In the case of riveted connections, the effect of rivet head corrosion on the pre-stressing of the rivet was investigated by laboratory tests and numerical simulations [8], [9]. From the point of view of fatigue, the shear category of rivets for riveted shear splices is considered to be category