



Evaluation of Strengthening Applications for Old Railway Bridges in Egypt

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Abstract

Egyptian railway transportation network is one of the oldest networks worldwide. Recently, an extensive assessment campaign has been initiated for a group of railway steel bridges in Egypt. In many cases, major repair and rehabilitation activities were observed due to accidents that may have happened to the structure such as: fire, derailment, or collision. The strengthening and rehabilitation of the considered bridges usually include - but not limited to - adding steel plates or replacing damaged members. The current study focuses on evaluating the different repair procedures applied on several aging steel railway bridges in Egypt. Field tests and analytical models are used to deduce deviations from the expected behaviour and pinpoint possible defects. The previous performed strengthening and rehabilitation applications are determined. Hence, their effect on the steel bridge behaviour is assessed.

Keywords: Assessment; Deterioration; Field Measurements; Repair; Riveted Bridges; Railway; Steel; Strengthening.

1 Introduction

Many of the existing steel bridges on the Egyptian railway transportation network were built during the end of the 19th and the beginning of the 20th centuries. Most of these bridges have suffered from deterioration over the years due to the poor applied maintenance practices, aging, corrosion, and poor environmental conditions. In addition, heavier axle loads are imposed along with the increasing traffic demands. Hence, the assessment of the existing bridges is a demanding matter in order to extend their service life. Assessment of old steel bridges have been conducted in different

countries. Ghosh and Ghoshal [1] discussed the possible rehabilitation procedures through assessment of three case studies. Hai et al. [2] and Hai [3] explored the condition of the railway bridges in Vietnam while focusing on the steel deficiencies. Geissler [4] explored the condition of old steel bridges in Germany while focusing on the typical problems associated with such structures. The most critical observed deficiencies were corrosion and deterioration due to aging. Spyrakos et al. [5] and Ermopoulos and Spyrakos [6] assessed the structural condition of a 19th century railway bridge and suggested possible repair procedures. Akgul and Frangopol [7] performed a