17th Symposium on Earthquake Engineering
November 14-17, 2022
IIT Roorkee, India
Paper No. 438

Fatigue Life Evaluation of Corroded Steel Truss Bridge Girder

Sidhesh Sakore[1], Diptarka Ghosh[2], Ashwin Kumar P C[2], Saurabh Shiradhonkar[2]

[1]Housemaster Home Inspections, Pune, India
[2]Indian Institute of Technology Roorkee, Roorkee, India

Abstract

Truss bridges are one of the most typical configurations used for the medium to long-span steel bridges. Under railway loading, such bridges are subjected to reversal of loads, leading to fatigue damage. Fatigue life is affected by corrosion, as corrosion reduces the net section available for resistance and also affects the regions of connections and bearing locations. Pitting corrosion in small areas leads to formation of small pits, which on application of fatigue load develop as cracks. Due to the reduced cross sections, the pits cause stress accumulation, and behave like stress raisers. Together with the stress concentrations, the residual stresses form the datum for stress reversals, during loading cycles of vehicles. These actions compound up to result in the enhancement of initial cracks (due residual stresses and material reshaping). The damaging effect of corrosion and fatigue are interwoven, and superposing independent results will lead to erroneous overestimations. Therefore, to determine the structure's service life, a time-based coupled assessment of corrosion and fatigue is required. In order to relate to real-world scenario, the deterioration of the bridge needs to be observed under the effect of incremental train speed. Hence, in this study, a numerical model of a truss bridge span using currently available codes is developed. The cross girder and stringer, which experience high levels of fatigue stresses and corrosion, are numerically assessed for their residual life due to increasing train speed and daily carriage volume.

Keywords: Fatigue, Corrosion, Truss, Bridges, Residual stress