FATIGUE LIFE PREDICTION OF EXISTING BRIDGES

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ABSTRACT

Fatigue is progressive, localized, permanent structural change that occurs in materials subjected to fluctuating stresses and strains that may result in cracks or fracture after a sufficient number of fluctuations.

A cyclic plasticity model to predict the low cycle fatigue behaviour was developed in this study by using the fundamentals of plasticity theories such as yield criteria, flow rule, hardening rule etc. Fatigue fracture is assumed to be initiated when the internal state variables of the material reach threshold values.

The bridge considered for the case study was a riveted semi-through bridge having Warren girders supported on cylindrical piers. A condition survey was carried out to assess the present condition of the bridge and the bridge material was tested to obtain the required mechanical properties of the material. From that, specified hardening rule for the model was developed. A FE analyses were performed to find out the localized stress distributions in the bridge and to determine the state of stress at critical locations. Considering the stresses in the critical locations of the bridge and the model developed to describe the fatigue behaviour, the service life of the bridge was estimated under different scenarios of the riveted connections of the bridge.