

**SERVICE LIFE PREDICTION OF BRIDGES USING STRUCTURAL
RELIABILITY THEORY**

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ABSTRACT

This study presents how to predict remaining service lives and to evaluate serviceability conditions of bridges using structural reliability theory.

In this study, structural reliability was used for four different types of bridges found in Sri Lanka, namely steel truss bridges, reinforced concrete deck bridges, masonry arch bridges and wooden plank deck bridges. For each type of bridge, a case study was done. First, depending on the bridge, the critical failure mode was found. This selection was based on certain amount of field study and understanding of the particular bridge type. For truss bridges, the safety margin was based on fatigue failure of its members. In reinforced concrete deck bridges, the safety margin was derived based on corrosion of reinforcements. For arch bridges, it was based on axle loads whereas in wooden plank deck bridges, based on tensile stresses of the outermost fiber in wooden planks.

From safety margins, reliability indices and then failure probabilities were found at the time considered. From that, the serviceability condition of the particular bridge was determined. Then, a target failure probability was set and assuming that the current rate of loading magnitude and frequency will be constantly followed, the remaining service life of bridge was determined. Finally, a reliability based maintenance strategy was proposed.