Factors influencing the design life of old steel bridges

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ABSTRACT
When deciding about the specific design life for bridge structures, care should be taken to ensure that the structure fulfils all the fundamental requirements of structural reliability in terms of robustness, safety and serviceability in order to achieve the service life of the bridge. Load and material properties, cross-section and system geometry are the basic variables or parameters that are being used when considering the design life of bridge structures. The design life of bridge structures as specified in the Eurocodes and British Standards is 100 and 120 years respectively while in AASHTO-LRFD it is for 75 years. However, in all these codes of practice, there are no specifications or provision or guidelines related to sustaining the service life of bridge structures (Bartholomew, 2007 & 2009). This is because the service life depends on the durability of the structure which is heavily influenced by several factors such as fatigue, corrosion and changes in superimposed loads. Therefore, with an increase in traffic loading together with climate changes, the demand to ensure service life is very acute because of the importance of bridge structures in the infrastructure network, which is especially true for long span bridges. Also, with different load applications of heavy good vehicles (HGVs) occurring during the design life, this will affect the structural integrity of old steel bridges. For example, old bridges in many countries including Malaysia were designed using British Standard compliances. Since the Eurocodes have been widely practising nowadays, the estimation of loading applied might be different with the old code of practice. Plus, with the traffic increasing every year without any control, the maintenance for the old bridges especially should be more frequent as these bridges may not have benefited to the remedial measures to improve the fatigue performances. Therefore, the actual service life may not reach the expected service life as the actual service life depends on the exposure condition of the structure, quality of materials, design and construction and also the level of maintenance performance. In addition, with the increase in traffic load and frequency, this could seriously jeopardise the integrity of old bridges to meet their actual service life. This paper discusses the issue concerning the design and remaining service life estimation used when designing and appraising steel bridges.

KEYWORDS:
Design life; Old steel bridges; Robustness