Influence of vertical holes on creep and shrinkage of railway prestressed concrete sleepers

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Abstract. Railway prestressed concrete sleepers (or railroad ties) must successfully perform two critical duties: first, to carry wheel loads from the rails to the ground; and second, to secure rail gauge for dynamic safe movements of trains. The second duty is often fouled by inappropriate design of the time-dependent behaviors due to their creep, shrinkage and elastic shortening responses of the materials. In addition, the concrete sleepers are often modified on construction sites to fit in other systems such as cables, signalling gears, drainage pipes, etc. Accordingly, this study is the world first to investigate creep and shrinkage effects on the railway prestressed concrete sleepers with vertical holes. This paper will highlight constitutive models of concrete materials within the railway sleepers under different environmental conditions over time. It will present a comparative investigation using a variety of methods to evaluate shortening effects in railway prestressed concrete sleepers. The outcome of this study will improve material design, which is very critical to the durability of railway track components.