FIELD INVESTIGATION ON DISTRIBUTION OF CONTACT PRESSURE BETWEEN SLEEPER AND SATURATED BALLAST WITH FLOWING SAND

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ABSTRACT
For analysis and design of concrete sleeper, it is necessary to have a complete and comprehensive vision of the loads transferred from other components of track into the sleeper. In this case, two topics should be investigated: Share of load for the sleeper under the wheel and status of contact pressure distribution underneath the sleeper. About these two issues, several factors are involved, including: Sleeper type (material and physical characteristics), sleeper spacing, rail-sleeper fastening system, track maintenance conditions and conditions of the sleeper bed. Sleeper bed conditions, is one of the most important and influential factors in the amount and distribution status of sleeper loads. This issue is important, because the track modulus is dependent to the sleeper bed conditions. Change in track modulus, makes many changes in the applied loads and their reactions. Desert regions are one of the critical areas in this field that in these areas, flowing sand causing the ballast layer to be filled with fine sandy aggregate and consequently by the change in track modulus, amount and distribution status of applied loads to the sleeper change as undesirable.

In this paper, results of the field investigations about the effects of increasing amounts of flowing sand into the sleeper applied loads and changes occurring in the pressure distribution under the sleeper are presented. This work has been done with some load cells insertion underneath the sleeper and the results are compared with results of field tests relating to non-sandy areas.
KEYWORDS: Sleeper-ballast contact pressure, Railway in sandy areas, Ballast fouling

INTRODUCTION

Sleeper is one of the railway track components placed between the rail and the ballast layer. Load transmission and distribution of the rail to the ballast layer, providing sufficient mechanical strength in vertical and lateral directions and keep the track width, are the most important tasks of the sleeper (Kerr, 2003). In railway track system, recognition forces entered the sleeper is the first step towards analysis and design of sleeper. In other words, to achieve certain standards for the design of a concrete sleeper, at first it is necessary to be certain the forces from the track into the sleeper. In the international arena, this issue has been suggested as theoretical, and mostly without backing field tests. Therefore many of world's railway expertss have tried to define local and more accurate patterns of entered load to the sleeper by creating internal experience (Zakeri & Sadeghi, 2007).

Field studies conducted in this area have also generally done without consideration to conditions of ballast layer and track foundation, while conditions in parts of the track that are located under the sleeper is very determinant about the amount of force applied to the sleeper and distribution status of forces in the sleeper bottom. In this paper, the effects of ballast pollution levels in sandy areas on the sleeper received