Bearing systems for light rail bridges

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Abstract

Light Railways are very frequently utilized for Mass Transit Systems to reduce the traffic impact in congested urban areas. Bridges for the Light Railways, even if their static scheme is often very simple, are peculiar structures where the interactions between vehicles, rail and bearings play a fundamental role. An important aspect of the bearings for Light Rail bridges, frequently requiring special solutions, is also the very high train frequency and the relatively high deformation of the structures under load, implying extremely high performance requirements and fatigue resistance of the bearings . In some cases, as for instance in monorail lines, also uplift forces shall be considered. The authors, currently involved in the design and supply of the structural bearings for several Light Rail projects in the world (Thailand, Egypt, Indonesia and others), describe the different solutions of the bearing systems currently utilized, putting in evidence the fatigue and wear resistance problems.

Keywords: bridge bearings, pot bearings, spherical bearings, sliding materials, fatigue resistance

1 Introduction

Bridges are quite often a very relevant part of Light Rail lines.

Bridges for any kind of railways and light rails in particular shall first of all respond to the requirements of the line. As many responsible of railway organizations claim: the structure is a service for the rail and not vice-versa. In addition to the geometrical and stiffness requirements the most stringent demand arises from the fact that the rail shall be continuous, avoiding as far as possible the joints on it. This is surely due to the comfort (joints of the rail cause noise to the passengers and to the environment) but also to the maintenance problems that would be increased by the presence of joints in the rails.

Structures like bridges are subjected to length variations that are normally restrained in one point (the fixed bearing) and causes a concentrated movement, proportional to the distance from the fixed point, at the ends of the structure.

The simply supported beam is the preferred static scheme for the railway bridges because it minimizes the problems arising from the adoption of continuous rails, with great advantage for the maintenance of rails and rolling stock and for the comfort of the passengers.

Even if the static scheme of the bridges is normally very simple, railway bridges are peculiar systems where the superstructure interacts with tracks and vehicles in one side and with the structural bearings from the other side in a complicated manner, involving strongly non-linear effects.

In the paper are described the different static schemes frequently adopted for the railway bridges, the possible bearing systems and their impact on the design and the behavior of the structures

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