



STEEL RAILWAY BRIDGE DECK DESIGN FOR NOISE EMISSION AND MAINTENANCE COST REDUCTION

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Summary

Recently, new developments in steel railway bridge deck design have been induced by noise emission and maintenance cost reduction. The tendency is towards simple and smooth deck designs because they need less maintenance to prevent corrosion. In addition, composite and concrete deck systems are designed for minimum noise emission and lower (track) maintenance costs. Traditional deck designs, consisting of cross and longitudinal steel beams with bridge sleepers on top of them, frequently give problems with respect to fatigue. Therefore, the bridge sleepers were replaced by new special silent longitudinal deck sections enhancing the lifetime of these bridges. In this paper, the developments in steel railway bridge deck design to meet noise emission and maintenance requirements for new and existing steel railway bridges are illustrated. These developments bring new opportunities for the use of steel as a construction material for railway bridges.

Keywords: steel, railway bridge, deck, design, noise, maintenance, cost, lifetime, fatigue.

1. Introduction

The Dutch railway network is one of the busiest in the world and it is necessary to have a reliable railway system. In order to prevent disruptions, the track must be in perfect shape. Preventing rail track maintenance is of extreme importance. Preventing corrosion protection maintenance is another important aspect. Also, in very densely populated areas like The Netherlands, noise emission of existing steel railway bridges, forms a serious problem. Preventing maintenance and noise emission strongly influence the competitiveness of steel railway bridges.

At the end of the 19th century up to about 20 years ago, steel railway bridges were built without any attention paid to noise emission. It was more or less accepted that steel railway bridges needed also a lot of maintenance. Therefore, we have in The Netherlands, as probably elsewhere in the world, a heritage of noisy steel railway bridges with high maintenance costs. These bridges have therefore a very bad reputation from environmental point of view.

Recently, new developments in steel railway bridge deck design have been introduced. These new developments have been induced by noise emission and maintenance cost reduction. In the last 15 years, there has been a tendency from complex railway bridge decks towards simple and smooth deck designs. Simple and smooth structures are preferred because they need less maintenance to prevent corrosion and therefore they have lower maintenance costs. In addition, composite and concrete deck systems are designed for minimum noise emission and lower maintenance costs. At the same time, these newly developed bridge deck designs also yield track maintenance reduction.

For upgrading the Dutch railway system for more and heavier train traffic, all the existing bridges in the main cargo lines were recalculated. These calculations show that the designs of many existing