Management, Design, Maintenance and Rehabilitation of Major Steel Bridges
Minimum Life Cycle Cost and Interference with Function

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Major steel bridges are usually the crucial elements to the road and railway infrastructure. Very often they constitute a part of critical links between highly habited areas. As a consequence their closure or traffic capacity reduction causes major inconveniences for the users and result in significant losses to the economy. Furthermore, Major Steel Bridges are rather costly to construct, maintain and rehabilitate. Therefore, the design, maintenance, management and rehabilitation of this kind of structures are complex and challenging tasks. Consequently, they have to be performed using state-of-the-art technical solutions and the best practice gained over many years of experience. Also, they should account for the results of Life Cycle Cost analysis and the interferences with the bridge function.

This paper presents the experience collected by engineers from COWI during involvement in design, maintenance, rehabilitation and management of several major steel bridges all over the world. First, the major problems encountered during the exploitation of major existing steel bridges are discussed. Then, several aspects of maintenance and management of such bridges are presented. Finally, the main issues related to the proper design and rehabilitation of major steel bridges are analysed.

At the end of the paper several case studies related to the maintenance, management, rehabilitation and design of major steel bridges are shown. The first case study is the rehabilitation of the Aquitaine suspended bridge, in France, involving replacement of the main cables and widening of the bridge deck from 5 to 6 lanes. The second case study is the installation of the dehumidification system for the main cables at Little Belt suspension bridge, in Denmark, and at the Höga Kusten Bridge, in Sweden. The third case study is the design and maintenance management of the Great Belt Bridge in Denmark, involving inspections of all bridge elements including dehumidification system for the interior of the box girder. The last case study is the Messina Bridge in Italy, where all the best experience and the state-of-the-art solutions (i.e. dehumidification systems, continuous monitoring systems, etc.) have been planned in order to optimize the performance and extend the service life of the bridge to 200 years.

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