# Sustainable Large Arch Bridge Maintenance through Inspections, Assessments, Monitoring, Repairs and Service Life Modelling

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## Summary

The paper provides an overview of maintenance activities on seven large reinforced concrete arch bridges in Croatia located on Adriatic coastline, built in two periods: in the 1960's and 1970's and at the last turn of the century. Inadequate attention to durability issues in combination with very aggressive maritime environment has led to expensive and technically demanding repair works on older arch bridges. The design of more recent constructed bridges took into account the experience from the in-service performance of older arch bridges. Moreover, structural health monitoring systems have been installed on those bridges. As chloride-induced corrosion is the major cause of deterioration of the Adriatic RC arch bridges, a numerical model, which can realistically simulate effects of reinforcement corrosion in concrete is developed and implemented into the finite element code to predict service life of new or already damaged structure.

**Keywords:** reinforced concrete, arch, corrosion, repair, inspection, monitoring, service life.

## 1. Introduction

Transportation network is one of the most important elements of sustainable development of country. Bridges are a vital part of any transportation network. Typically they comprise just a few percents of the total length, but their share in the overall value of the network is approximately ten times higher. Ever increasing degradation of bridge structures and inevitable increase in requirements posed on bridges during their service-life is pressing issue worldwide, which leads to spending huge financial resources.

Today it is generally recognized that selecting an optimum strategy for bridge maintenance and repair is a key issue in effective bridge management. Existing bridge management systems used worldwide are generally well suited to data collection and analysis on network level. However, the project level management, particularly regarding large and significant bridges, as the practice has shown, requires bridge-specific maintenance program.

Large bridges are often complex structures which include out-of-ordinary structural solutions. Thus, technically feasibility of the repair, and not the cost itself, is generally the governing issue in management decisions. It is impossible to decide on repair methodology by simply following standard repair procedures. Major bridges are generally regarded as "irreplaceable" so the management of such bridges should incline towards developing efficient and effective preventive maintenance program, and not so much towards minimum cost.

Structural health monitoring techniques may be implemented to improve bridge management on project level in order to inspect behaviour and response of structures at various construction stages, under load-testing prior to bridge opening and/or during its service life.

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