

Surveillance Research Results of Road Bridges in Finland

Risto Kiviluoma

Director
WSP Finland Ltd
Helsinki, Finland
risto.kiviluoma@wspgroup.fi

Dr Risto Kiviluoma, born 1967, received his academic degrees from Helsinki University of Technology. He is the secretary and one of the consultants for the surveillance research project dealt in the paper.



Jouko Lämsä

Development Manager
Finnish Road Administration
Helsinki, Finland
jouko.lamsa@wspgroup.fi

Born 1947, Mr Jouko Lämsä received his civil M.Sc. degree from Helsinki University of Technology. He is bridge maintenance specialist and the project manager of the surveillance research project.



Summary

This paper describes results of the long-term surveillance research on construction and repair of road bridges in Finland. This research, started 1998, has been focusing on specific issues arising in maintenance of Finnish Road Administration's (Finnra's) bridges. Finnra's bridge stock consists on 14'431 bridges, among the most are made of concrete. Issues dealt contain 17 named problem areas on various types of bridges, which have been identified by the maintenance specialists. These are related to those, on which Finnra has released own guidelines; tested new materials; or prepared standard drawings for structural details. Typical problem areas include drainage systems; performance of bearings and expansion joints; strengthening systems; cracking of concrete decks; durability of concrete coatings, i.e. the issues which often have notable effect on quality and economy of bridge maintenance.

Keywords: bridges; bridge management; bridge maintenance; bridge inspections; field testing; load testing.

1. Introduction

Bridges on public roads in Finland are mainly owned by single organization; namely Finnish Road Administration (Finnra). Leading owner position and the homogeneity of the bridge stock have helped Finnra to maintain bridges in well organized manner. Here, the word homogeneity refers to material, age and type of the bridges. Concrete bridges, mainly slab-type flyovers and underpasses, comprise 68% of the number of bridges.

Typical maintenance problems include freeze-thaw cycles and implications of de-icing salt used in winter road maintenance. Repair methods of concrete bridges can be considered to be rather standard in Finland. The costly operations are related to replacement of edge beams, deck's waterproofing and contaminated concrete layers. These operations are at least by the theory suitable for cost-optimisation. For construction and repair materials, Finnra's policy is that every product needs to be approved for bridge use by Finnra.

Need and benefits of systematic maintenance of bridges have been long recognized in Finland, with the most notable implications including early development of Finnra's bridge management system and the bridge repair manuals SILKO.

2. Methodology and results

In setup of the project, a bridge maintenance specialist group have selected problem areas to be included in the research. Problem areas already dealt are shown in Fig. 1 with the results shortly described in the present paper.

Majority of issues have been investigated by eye and hand-held tools during the general bridge inspections, while some details have been studied with distinguished measurements in the field.

Measurement-based studies have been more complex to implement. Example is a crack-width measurement of a steel-concrete composite bridge over the electrified railway yard. This has required a special lift gage to be used and track voltage interruptions.

Bridges are mainly selected randomly based on type-data from Finnra's bridge management system's data base, namely as the bridge register. Source data also include earlier bridge research reports of Finnra, containing about one hundred special inspection and load test reports.

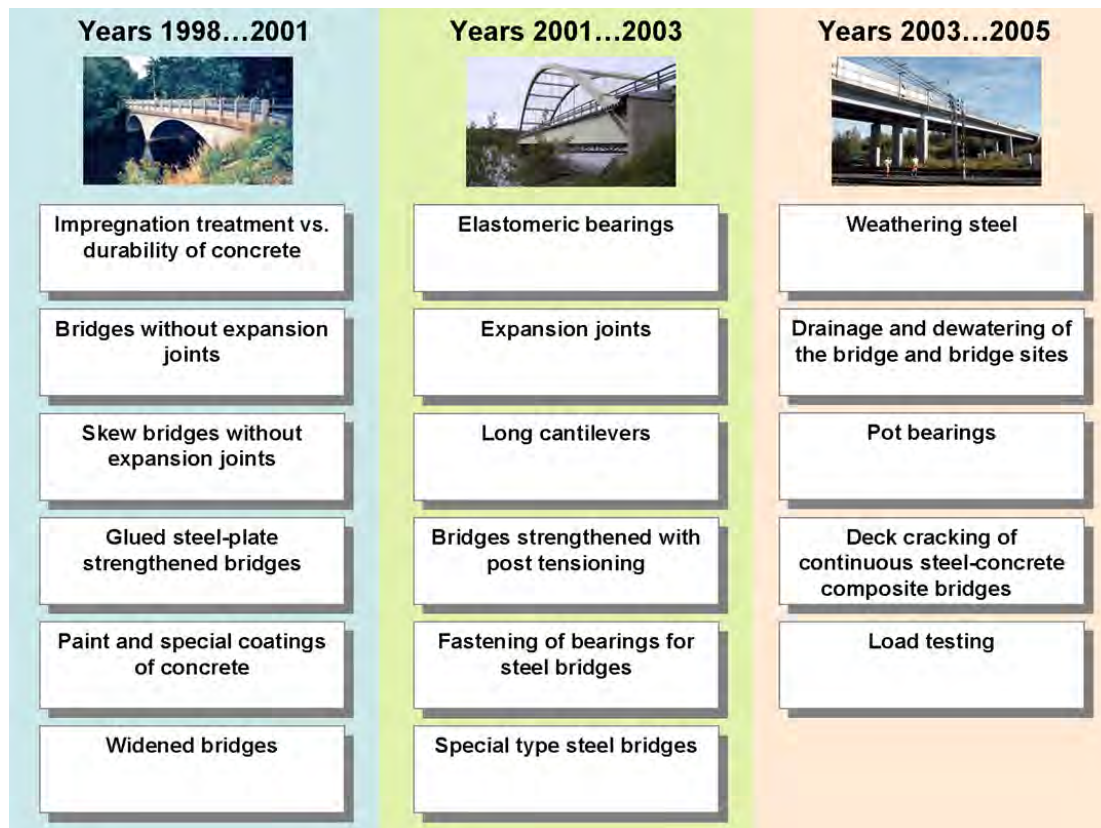


Fig. 1: Content of the surveillance research project.

3. Conclusions

- Common guidelines for annual and biannual bridge maintenance: like cleaning the drainage systems; washing the rubber profiles of expansion joints; renewing the joints of deck etc. are necessary and have notable implication to success of the maintenance. The problem is that there still exist frequent omissions on doing the work
- specific guidelines for steel-concrete composite bridge design, deck widening and bridge strengthening have worked well
- methodology for systematic surveillance research has been found useful. Results obtained have supported senior experts' conception on the problem areas, and helps documenting and interchanging the knowledge gathered in a decades time frame
- present experiences obtained for the Finnish bridge stock are typical to Nordic countries, which have concrete as the governing material, and who have specific cold-region issues at winter time. The methodology of surveillance research is, however, evidently movable to other countries and organizations having a high number of ordinary bridges.