Widening and Rehabilitation of some bridges in Indiana Toll Road.

Santiago PÉREZ-FADÓN
Technical Director
Ferrovial Agroman
Madrid, Spain
sp.fadon@ferrovial.es

José Emilio HERRERO
Head Dpt. of Bridges
Ferrovial Agroman
Madrid, Spain
j.e.herrero@ferrovial.esr

Javier LEÓN
Dir. Maintenance Dpt.
Fhecor
Madrid, Spain
jlg@fhecor.es

Jesús González Fernández
Civil Engineer
Ferrovial Agroman
Madrid, Spain
Jesus.g.f@ferrovial.es

Summary

This paper shows a new approach to the problem of rehabilitation and widening of bridges. Some unique factors are being employed to improve the Indiana Toll Road. The first requirement for the design was to keep two lanes in each direction during the whole construction process minimizing the traffic impediments so the complete demolition of structures was not an option. Therefore a very important engineering effort has been done. After a careful identification of the pre-existing damages, the right treatment was implemented in each. A special treatment against damages produced by de-icing salts has been designed using cathodic protection to avoid cell effect. Each stage of the construction process for the widening has been analyzed coordinating geometrical and structural conditions with traffic management.

Keywords: Indiana Toll Road; Rehabilitation; Patching; sacrificial anodes; de-icing salts; freezing-thaw.

1. Introduction

In operation since 1956, the Indiana Toll Road stretches 157 miles. A segment near Chicago had to be improved, and this included more than 600.000 Sq.Ft of structures. All eight existing structures

Fig. 1. Left: Steel corrosion below transverse joints. Centre: Delamination and pitting corrosion. Right: Freeze-thaw attack in abutment.

https://doi.org/10.2749/222137908796294207

consist of statically determined decks of a reinforced concrete slab on several longitudinal steel beams.

2. Scope of the problem

Almost all of these structures had to be improved: repairing some damages and widening them.

Because the important traffic already supported by this highway, the main requirement was **to keep 2 lanes in each direction** during the whole construction process.

Demolition becomes a problem for maintenance of traffic due to the problem to design detours.

Most of these structures had durability problems due to the effect of massive amounts of de-icing. Structural steel has undergone different levels of degradation.

The most important damages were detected in concrete elements. However, in general the area of re-bars was not decreased.

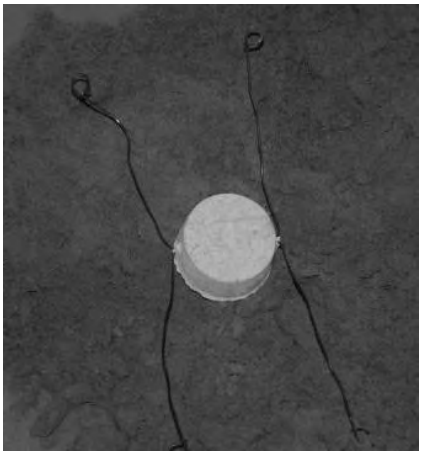

Fig. 2.Sacrificial zinc anode installed

3. Strategic solution for rehabilitation and widening

First a careful identification of the pre-existing damages was done.

The new and most important part of this rehabilitation has been the installation of sacrificial zinc anodes embedded in a highly-alkaline mortar (figures 6 and 7); hence controlling the initiation of corrosion by ensuring that reinforcing steel is polarized to a level of resistance to the initiation of corrosion.

4. Discussion and Conclusion

Fig. 3. Hobart Bridge after rehabilitation

To improve the behavior of these bridges it is necessary to avoid the contact of de-icing salt with the concrete surfaces in deck, piers, abutments, etc. In case of decks the sealing of the upper surface of the concrete slab is really useful for this goal. Besides, a proper design of the drainage system and joint details are important.

A new strategy of maintenance that increases the level of repairs improving the protection with high tech solutions in order to reduce demolition or patching in the future should be also considered.