XV International Conference on Durability of Building Materials and Components
DBMC 2020, Barcelona
C. Serrat, J.R. Casas and V. Gibert (Eds)

Assessing the Condition of Reinforced Concrete Bridge Using Visual Inspection Ratings

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Keywords: *Concrete, Bridge, State, Assessment, Durability.*

1 Introduction

In the United States (USA) around 188 million users cross a structurally deficient bridge every day (ASCE, 2017). In Canada, 60% of structures in the national highway network are more than 40 years in 2020 (RRN, 2010). The fundamental interest of a project manager is to perfectly understand the permissible service and failure limit states in order to plan appropriate repair activities. This allows to consider the acceptable risk of service failure to minimize the consequences associated with the different limit states such as: accidents, interruptions of service to users and repair costs (Adey, *et al.*, 2003).

In this paper, an effective management framework for a bridge is proposed using field observations from visual inspections. The element ratings were combined to obtain an overall rating for the bridge considering its defect and impact on the behaviour of the complete structure. The methodology has been applied on 60 years reinforced concrete bridge in Quebec. This approach introduces a new management methodology for taking an optimal and sustainable decision for bridge maintenance.

2 Degradation Analysis Process

The objective of the experimental procedure was to assess separately by the visual inspection method: (i) the material deterioration and (ii) the structural behaviour of the bridge. Then the defects of each element (rating of each element) and the impact of the default on the structure was obtained by a decision tree analysis. Finally, the element ratings are merged considering failure assignment links to obtain the bridge global index I_M and I_B respectively material and structural behaviour.

3 Results and Discussions

For the entire bridge, the results of the assessment model computations, based on the visual inspection, to assess its state condition are: I_M = 78.76 % and I_B = 79.97 % (Figure 1). The results of this model show that the deterioration level of the bridge, both in material and behaviour is lower than the accepted limit of 80% defined by public sector managers.

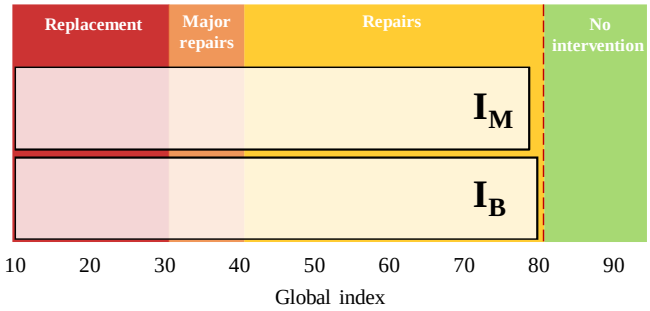

Figure 1. Bridge behaviour and material condition by visual inspection.

4 Conclusion

This assessment model based on visual inspections allows to improve the degradation rating used by traditional public managers. Further works in progress will improve the assessment of the bridge state condition by coupling the visual inspection model presented in this paper with a deterioration prediction model. This approach will refine the deterioration assessment to forecast preventive maintenances.

Acknowledgements

The authors gratefully acknowledge the “Islamic Development Bank”, “Fonds de recherche du Québec – Nature et technologies” for their financial support. The authors also want to thank “Service des infrastructures, de la voirie et des transports” of the city of Montreal and the “Quebec Ministry of Transportation” for their collaboration.

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