



Accelerating the Construction Process of Highway Bridges

Description

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Primary Sponsor Contact Info : University Transportation Research Center City College of New York-Marshak 910 160 Convent Avenue New York, NY 10031 USA Syracuse University

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Abstract :

Functional obsolescence and structural deficiencies of highway bridges are posing significant threats to commuters and transportation agencies throughout the United States. Recently, New York State Department of Transportation (NYSDOT) classified approximately one quarter of its bridges as functionally obsolete and one-eighth as structurally deficient. Highway bridges located in urban areas are especially at high risk of functional obsolescence as the aging highway systems in these areas face significant increases in traffic volumes.

As a result of increasing needs associated with upgrades and repairs, the decision makers are urged to determine the best use of limited resources. In addition to mitigating risks that emerge from ordinary operating conditions, agencies also need to determine appropriate methods to reduce impacts of natural disasters and accidents as part of an emergency response system. Employing traditional construction methods for repair or upgrade activities may cause lengthy traffic disruptions, which results in high user costs and environmental impacts and raises issues of safety and congestion. Accelerated construction refers to project delivery methods that combine innovative construction techniques and contracting methods in order to reduce the environmental and socio-economic impacts of construction activities and to reduce the downtime of highway bridges.

The objective of this study was to investigate opportunities to reduce the negative impacts of bridge closures due to repair and upgrade activities by:

- Exploring various alternative construction materials and methods, such as - use of

prefabricated/precast systems, and innovative contracting methods such as A+B bidding, incentive/disincentive contract, and lane rental that can be used to accelerate construction activities of bridges.

- Identifying important factors (both qualitative and quantitative) which affect the decision making procedures for selecting the most appropriate upgrade or repair strategy,
- Providing a decision support framework that will allow evaluation of alternatives

In order to fulfill these objectives, a comprehensive review of the available literature was performed with a focus on accelerated construction methods and contracts, factors affecting decision-making procedures for selection of appropriate bridge upgrade and repair methods and contracting approaches. In addition, a national survey of state DOTs was conducted in order to determine the current state of practice throughout the United States.

The decision support framework developed in this study consists of Traditional vs. Accelerated Bridge Construction (ABC) Analytical Hierarchy Process (AHP) decision making model as well as flowchart models to select appropriate construction techniques and contracting alternatives. The framework altogether provides a systematic procedure for comparing various upgrade and repair strategies. Thus, decisions regarding selection of appropriate upgrade/repair methods and contracting approaches made using the above-mentioned models are expected to be more objective and justifiable. The models are also validated using several case studies in the state of New York.

Group : Design-Making Tools

Category : Completed Projects