Demolition Requirements for Bridge Construction Projects – Best Practices Guidelines

QUARTERLY REPORT

Ending March 31, 2016 Period

Submitted by:
David Garber
Department of Civil and Environmental Engineering
Florida International University
Miami, Florida

Submitted to:
Atorod Azizinamini
Director, ABC-UTC
April 2015

ABC-UTC
Quarterly Research Progress Report
April 2016
A. DESCRIPTION OF RESEARCH PROJECT

Accelerated Bridge Construction (ABC) is generally used in scenarios where an already existing bridge must be removed and replaced in a short amount of time. While significant effort has gone into techniques and technology for the new structure, there has been little effort on the removal techniques of the existing structure.

Currently there are two primary documents used in bridge construction: the AASHTO LRFD Bridge Design Specification addresses the minimum bridge design requirements and the AASHTO LRFD Bridge Construction Specifications stipulate bridge construction aspects. There is very limited information available to guide both design engineers and contractors on how to approach deconstruction or the removal aspects of an existing bridge. The design and construction specifications provide very little direction on demolition and each state approaches this work very differently. The need for a national specification has been highlighted in the past year with two worker fatalities occurring in two separate instances due to the collapse of a bridge structure while undergoing demolition.

The goal of this project is to determine the current state of practice and state of the art in bridge demolition (both conventional and accelerated) and develop a best practices guideline for bridge demolition. The work of this project will include a literature review and state DOT survey (to better understand the current state of practice), development of a best practices guide, and identification of areas in bridge demolition that require further investigation.

A.1. PROBLEM STATEMENT

The bridge design and construction industry has a duty to evaluate the demolition aspects of bridge construction from a national perspective, and provide a best practices guideline to improve upon the safety to both the workers and the traveling public.

The objectives of this research is to identify bridge demolition requirements and techniques that have been utilized when reconstructing bridges and develop a summary report/guideline of best practices. This will include the methods of communicating project specific needs in the form of specifications, design details, stability requirements, review types, contractor responsibility, owner oversight, and acceptance. The project will also focus on investigating rapid demolition techniques and practices; these will be a central part of the document.
A.2. CONTRIBUTION TO EXPANDING USE OF ABC IN PRACTICE

Accelerated Bridge Construction (ABC) is generally used for bridge replacement, which first requires the removal of the existing bridge. Bridge demolition is an area of bridge construction that is not well specified and each state approaches the work very differently. A best practices guideline for bridge demolition is needed to improve safety to both the workers and traveling public.

The main product of this work will be the development of a best practices guideline for bridge demolition. This guideline will include demolition tools and techniques for rapid bridge demolition and conventional bridge demolition (both of which are commonly used in ABC projects). The use of this guideline in ABC will lead to safer and more efficient demolition of existing bridges.

This topic was identified to have a high priority by the AASHTO Technical Committee for Construction (T-4) and will draw upon work already conducted by the ABC-UTC.

A.3. RESEARCH APPROACH AND METHODS

The research will be focused in three areas: (1) understanding current state of practice and state of the art in bridge demolition, (2) organizing this information into a best practices guideline for bridge demolition, and (3) identifying needs for further research in bridge demolition. The work of this study will be primarily in the form of (1) communicating with bridge owners to determine what is most needed from their perspective, (2) reviewing available specifications, reports, and case studies related to bridge demolition, and (3) communicating with engineering firms and contractors that conduct demolition work. This work will be conducted in the below list of project tasks.

A Project Advisory Committee (PAC) will be assembled and will consist of state bridge engineers from multiple states and consultants who work in the bridge demolition field. Bi-monthly meetings and meetings at the conclusion of major project tasks will be conducted to relay progress on the project and receive industry input.
A.4. DESCRIPTION OF TASKS TO BE COMPLETED IN RESEARCH PROJECT

Following are description of tasks as described in the proposal and their current status. The project is currently on hold until final approval is given by the steering committee.

**Task 1: Literature Review.**

A comprehensive literature review has begun looking into currently available demolition techniques, practices, and methods. This review has included research conducted through the NCHRP, Strategic Highway Research Program 2 (SHRP2), FHWA (and its pilot-project programs), and other national, state and pooled-fund research.

The PI also attended the International Bridge Demolition Summit to gain an international perspective of bridge demolition practices.

**Task 2: Bridge Owner Survey.**

The main objective of this task will be to determine the current state of practice and needs of the bridge owner with regard to bridge demolition execution and administration.

A survey was created and distributed to all State DOTs. This survey gathered information related to:

1. Past accidental incidents or unintentional collapses that have occurred during demolition
2. Current liability policy and procedures
3. Requirement of bridge demolition plans
4. Information required for a bridge demolition submittal
5. Approval requirements of bridge demolition submittal
6. Construction engineering inspection and field oversight during the work

Survey results have been gathered and are currently being compiled.

**Task 3: Comparative Study.**

The main objective of this task will be to organize and summarize the information and data collected in Task 1 and Task 2. This gathered information will be organized using a side-by-side comparison of the demolition requirements and methods used for a particular bridge and/or bridge
components. Items that will be included are (but are not limited to): contract and specification requirements, limitations, equipment and labor used, rates of production, level of complexity, permitting, and planning. This comparative study will be used to develop the outline for the best practices guidelines.

**Task 4: AASHTO Specification Review.**

The main objective of this task is to review the current AASHTO LRFD Bridge Design and Construction Specifications to determine what guidance is currently provided for demolition of bridge infrastructure. Related sections of the specification will be documented so that they may be referenced in the final report.

**Task 5: Final Report and Guide Development.**

A draft best practices guidance document for the safe, effective and efficient demolition of bridge infrastructure will be submitted three (3) months prior to the completion of the project, allowing for a final review cycle prior to the project close. Results will also be disseminated through national and state activities via webinar and conference speaking engagements.

**A.5. EXPECTED RESULTS AND SPECIFIC DELIVERABLES**

The proposers have already begun the work of several tasks in the preparation of this proposal. A preliminary literature search has been conducted to determine an initial project and guideline scope. The proposers have assembled an initial Project Advisory Committee consisting of four (4) state bridge engineers and representatives from FHWA, CME, and Michael Baker International. The proposers have also made contact with several US and international demolition contractors and have begun to gather case studies and other information on completed bridge demolitions.

The primary deliverable that is expected as a result of this work is a best practices of bridge demolition guideline. This guideline document will be published and made available to the public.

**A.6. OTHER COMMENTS, CHALLENGES, MODIFICATIONS, ETC.**

The project is currently on hold until it has final approval by the steering committee.

**References:**