

**PERFORMANCE OF EXISTING ABC PROJECTS –
INSPECTION CASE STUDIES**

**Quarterly Progress Report
For the period ending November 30, 2020**

Submitted by:
PI- Dr. Katelyn Freeseaman
Co-PI- Dr. Brent Phares
Justin Dahlberg, PE

**Affiliation: Department of Civil, Construction, and Environmental Engineering
Iowa State University
Ames, IA**



**ACCELERATED BRIDGE CONSTRUCTION
UNIVERSITY TRANSPORTATION CENTER**

Submitted to:
ABC-UTC
Florida International University
Miami, FL

1. Background and Introduction

Accelerated bridge construction (ABC) has been implemented with greater frequency over the last decade, with successful projects geographically spread across the country. As these initial deployments of ABC methods age, it becomes necessary to inspect the structures for both maintenance decision making and for assurance of adequate service life performance. This data collection in the form of detailed inspection information allows for active management of the infrastructure and assessment of performance via key metrics. As such, it would be useful to broadly assess the performance of past ABC projects across the nation using consistent and effective inspection methods and metrics. This effort is further strengthened by the national presence of the ABC-UTC partner universities who will collaborate on this project.

2. Problem Statement

Great efforts have gone into establishing protocols for successful and timely bridge inspection efforts, perhaps most notably by the Long-Term Bridge Performance (LTBP) program, sponsored by the Federal Highway Administration. These protocols established by the LTBP program are broken down into Previsit, Field visit and Postvisit protocols, all of which establish guidance for cohesive bridge inspections. The hierarchy of these efforts is shown in Figure 1, which also illustrates the high level of detail given to outlining these procedures.

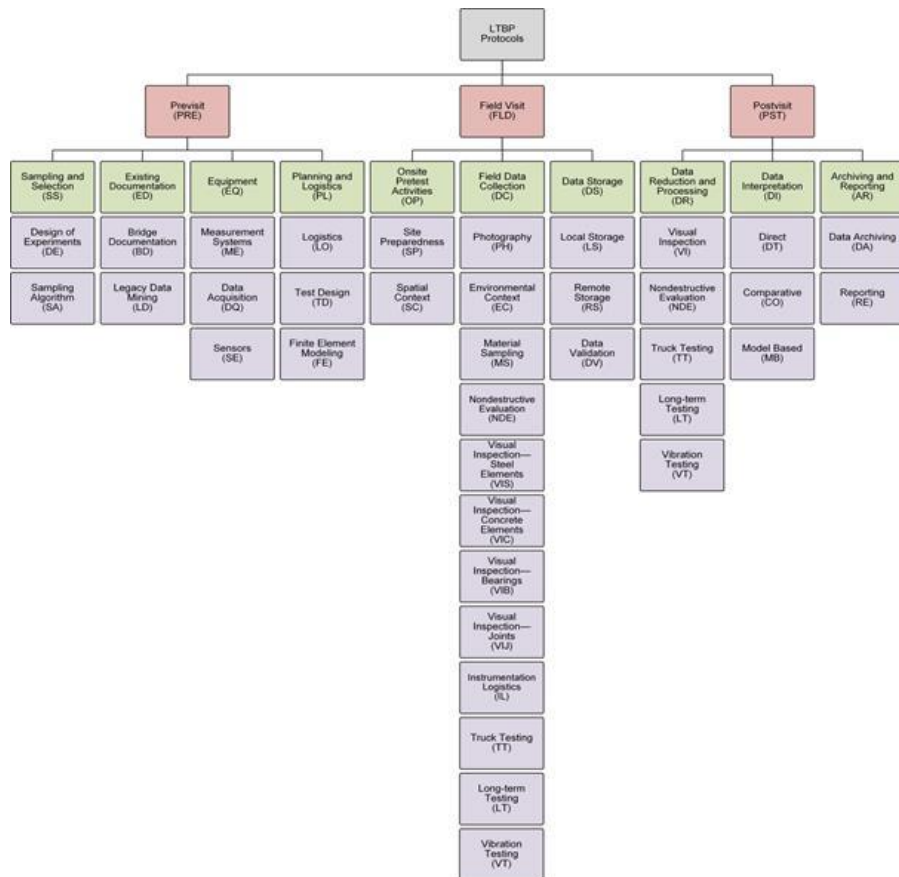


Figure 1: Hierarchy of LTBP Program Protocol (FHWA 2016).

The following statement summarizes the purpose and intent of the FHWA document:

“To maintain consistency in the manner in which data are collected and stored, a set of protocols has been developed. These protocols provide guidance on what kinds of information to obtain from existing bridge records and how each field testing activity is to be conducted; how to identify and classify the defects and how to measure their extent; and how to document the location and severity of the defect in the bridge element being evaluated. The protocols also specify the accuracy to which defect measurements are to be recorded.”

Due to the relatively young age of ABC projects, these structures have not yet been the sole focus of inspection efforts often associated with aging infrastructure. This research project aims to develop protocols for the inspection of ABC bridges which can then be used by the partner universities to inspect local ABC projects using a unified approach, with clear expectations for the quantity and type of data necessitating collection. It is the intent that the LTBP protocols will be used as a starting point and further refined by the research team for efficient implementation by all partner universities. The data that is acquired can then be summarized to provide a cohesive understanding of the performance of ABC projects.

3. Objectives and Research Approach

The proposed research will consist of a thorough exploration of current inspection methods for traditional bridge structures, the establishing of inspection protocols for deployment by all partner universities, and the summarizing of the data collected.

4. Description of Research Project Tasks

The following is a description of tasks carried out to date.

Task 1 – Literature Review.

Proposed task description

A literature review will be completed to help guide the preparation of the inspection methods. The main data sources is expected to be the LTBP program protocols, though other resources will be referred to for guidance as needed. The main objective of this task is to obtain an exhaustive understanding of current inspection methodology for obtaining thorough and consistent performance metrics from bridge inspections.

Description of work performed to this period

Two documents have been studied and used extensively during the literature review: 1) LTBP program protocols and 2) Bridge Inspector’s Reference Manual. Each of these documents have been reviewed for content and structure to help inform and form the basis for inspection of ABC bridge projects. The goal was to derive inspection protocols that can seamlessly be introduced to the previously created LTBP.

Task 2 – Establish Inspection Protocol.

Proposed task description

Based upon the review of pertinent documents in Task 1, an inspection protocol will be developed and established for the inspection of ABC bridges by partner universities. The Iowa

State team will develop this protocol and ensure that adequate guidance is given to ensure cohesive data collection. It is again anticipated that the LTBP program protocols will greatly assist with this effort. Anticipated guidance that will be provided in the protocol include: consistent photos from established viewpoints, necessary equipment, level of detail of data collection, and others. After the protocols have been prepared, they will be provided to the partner universities for review and comment to ensure broad acceptance of the proposed inspection efforts.

Description of work performed to this period

Inspection protocols have been developed in the same format as those in the LTBP. While being cognizant of what is prescribed in existing protocols, new protocols were developed to specifically address prefabricated bridge elements and systems, geosynthetic reinforced soils integrated bridge systems, and bridges moved and/or placed in a non-traditional, accelerated manner. These protocols were forwarded to the partnering universities for review and comment, after which online meetings were conducted between partners to finalize the protocol for use in their respective field inspections.

Task 3- Field Inspections.

Proposed task description

After the protocols for the field inspections have been established via Task 2, they will be provided to the partner universities for deployment within their state. Due to the national presence of the universities, a broad geographic sampling of ABC bridges will be inspected. It is expected that approximately 2-3 bridges will be inspected by each university. The deliverables that will be expected include full reports from each bridge, complete with supplemental data and photographs. These reports will serve as mini reports within the final report.

Description of work performed to this period

Field inspections of two ABC Iowa bridges were completed: Keg Creek and Massena. Short summary reports of the two Iowa bridge inspections have been completed. Field inspections of two ABC Florida bridges were also completed, College Drive and SR90, and a summary report was received by Iowa State. Similarly, OU has completed inspections and a draft summary report was sent to Iowa State. The remaining reports completed by partnering universities will be sent upon completion of bridge inspections. Two other universities, UNR and UW, have not been able to complete their inspections due to the Covid-19 pandemic. The full compilation of reports will be completed once all inspections have been performed and summary reports drafted.

Task 4- Summary of Inspection Results.

Proposed task description

After all inspections have been completed, the reports will be reviewed and summarized to determine trends in the data and to provide a current performance assessment of ABC projects. The precise content of the summary will be dependent upon the results found from the field efforts, but it is anticipated that the performance of elements, such as cast-in-place joints for example, can be broadly reported upon if cohesive results are found.

Description of work performed to this period

Iowa State, FIU, and OU have completed summary reports for the two (Iowa), two (Florida), and two (Oklahoma) ABC bridges inspected. Review of other reports will be completed upon receipt

from partnering universities. Partnering universities, UNR and Washington, have yet to complete their bridge inspections due to the ongoing restrictions due to Covid-19.

Task 5- Final Report.

Proposed task description

The project findings from the previously identified tasks will be prepared by means of a final report. This document will include the identified best practices, case studies, and other key project findings.

Description of work performed to this period

No work has been performed on this task to this period.

5. Expected Results and Specific Deliverables



As a result of this research effort, an overview of the current performance of ABC projects will be developed based upon the representative sample bridges that will be inspected. This inspection effort will allow for a broad understanding of ABC projects with respect to service life and maintenance expectations.

6. Schedule

Progress of tasks in this project is shown in the tables below.

Item	% Completed
Percentage of Completion of this project to Date	65%

	Month																	
	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A
Task 1																		
Task 2																		
Task 3																		
Task 4																		
Task 5																		

 Work Performed
 Work to be Performed

7. References

Culmo, Michael P. 2009. *Connection Details for Prefabricated Bridge Elements and Systems*, FHWA-IF-09-2010, Office of Bridge Technology, Federal Highway Administration, McLean, VA

Hooks, John M. and Weidner, Jeff. 2016. *Long-Term Bridge Performance Program Protocols, Version 1. (LTBP)*, FHWA HRT 16-007, Office of Infrastructure Research and Development Federal Highway Administration, McLean, VA

Ryan, Thomas W., et al. 2012. *Bridge Inspector's Reference Manual (BIRM)*, FHWA NHI 12-049, Federal Highway Administration, Arlington, VA