DESIGN OF LINK SLABS: A SHORT COURSE MODULE

Quarterly Progress Report
For the period ending March 31, 2019

Submitted by:
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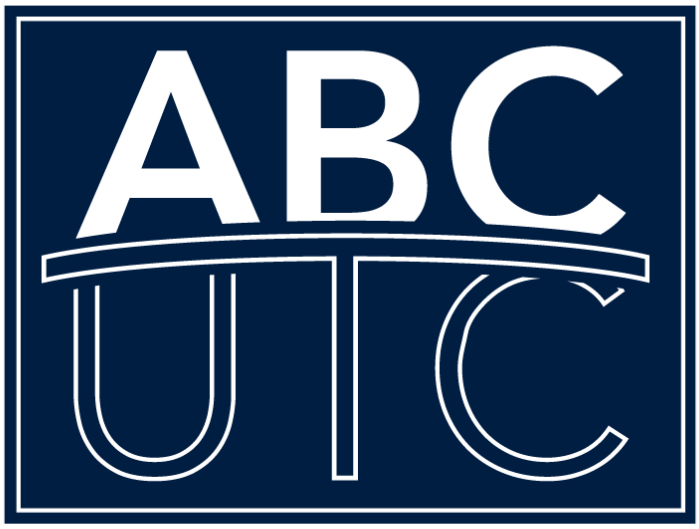

ACCELERATED BRIDGE CONSTRUCTION
UNIVERSITY TRANSPORTATION CENTER

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

1. Background and Introduction

One of common techniques in Accelerated Bridge Construction (ABC) is using Prefabricated Bridge Elements and Systems (PBES). The bridge components are built outside of the construction area, transported to the site, and then rapidly installed. This helps significantly reduce the time lost due to concrete placement, curing in the construction zone, and formwork erection/removal. Another benefit to using the PBES is the improved quality control. Damaging effects due to weather is minimized because elements are built in a controlled environment. However, there is a standing question on how the long-term performance and durability concerns associated with the joints that connect high-quality bridge elements can be addressed. One approach that has gained significant attention is to eliminate the joints through revised design strategies. While such strategies have been successfully developed for integral abutments used for ABC applications, no systematic approach is available on removing the expansion joints between bridge girders. To address this issue, the current project builds on the findings from a former ABC UTC-sponsored research project on link slabs and develops a short course module to provide the design guidelines and practical recommendations necessary to properly implement a link slab in jointless bridges.

2. Problem Statement

Application of ABC techniques has been significantly increased owing to the unique advantages of the bridges built with ABC, including short duration of construction and high quality of prefabricated bridge elements. By decreasing the construction time from months to days, the ABC techniques contribute to the safety of work zones by minimizing the on-site activities that can cause accidents for construction workers and motorists. On the other hand, with improved product quality, which can be achieved in prefabricated bridge elements built under controlled environmental conditions, the durability and performance of bridges are enhanced during the design life. Despite major advances in the design and construction of the main bridge elements for ABC applications, the joints that connect the bridge spans are still in need of attention. The expansion joints play a critical role in accommodating unrestrained deformations of adjacent spans due to thermal expansion and traffic loads. The existing joints, however, deteriorate rapidly and require major maintenance efforts. To address this issue, the idea of using link slabs to eliminate the joints has been explored through a set of experimental tests and numerical simulations performed through a former ABC UTC-sponsored research project. In the absence of any established design methodology, the proposed educational project aims to explain various fundamental and practical aspects of using link slabs in bridges.

3. Objectives and Research Approach

This project will follow a systematic plan to develop a short course module that will cover the basics, material considerations, and structural aspects of design and configuration of link slabs. This is expected to create a unique learning opportunity for a wide group of practicing bridge engineers and graduate students.

4. Description of Research Project Tasks

This project benefits from the outcome of experimental tests and numerical simulations performed on link slabs to explain their structural performance under various loading conditions. A design guideline will then be presented for the implementation of link slabs in appropriate bridges. This will cover a range of practical aspects, including crack criteria, bonding/debonding requirements, and rebar details.

This course module is envisioned to consist of the following parts, which will be developed one by one through the task listed below:

Task 1 - Development of course outline

Description of work performed up to this period: An initial outline has been developed for this course module.

Task 2 - An introduction to link slab

Description of work performed up to this period: A preliminary literature review has been completed and the necessary information has been collected to form this part.

Task 3 - Material considerations and structural aspects

Description of work performed up to this period: The content of the course module is being prepared based on the available literature and the studies performed at ISU.

Task 4 - Design guidelines and practical notes

Description of work performed up to this period: Not started yet

Task 5 - Solved example(s)

Description of work performed up to this period: Not started yet

5. Expected Results and Specific Deliverables

The primary deliverable resulting from this project will be a two-hour course for practicing bridge engineers and graduate students. The course will be offered through a set of slides supplemented with necessary handouts.

6. Schedule

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

Item	% Completed
Percentage of Completion of this project to Date	45%

Tasks	**Q1**	**Q2**	**Q3**	**Q4**
Task 1				
Task 2				
Task 3				
Task 4				
Task 5				