IDENTIFY THE RISK FACTORS THAT CONTRIBUTE TO FATALITIES AND SERIOUS INJURIES AND IMPLEMENT EVIDENCE-BASED RISK ELIMINATION AND MITIGATION STRATEGIES

Quarterly Progress Report
For the period ending February 29, 2020

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1 Background and Introduction

Construction activities related to bridge replacement and rehabilitation are significant contributors to safety hazards. The safety hazards attributed to construction work zones are alarming and accordingly, safety is a major focus of 2018-2022 US DOT Strategic plan. One of the most important advantages of ABC is to improve the safety, which is achieved by reducing onsite construction activities and thereby reducing accidents, injuries to workers and public. No good documentation is available yet for this major ABC advantage. This collaborative project with FIU and ISU aims at filling such gap. The overall objective of this project is to provide quantitative data supporting the fact that ABC does improve safety relative to conventional construction. The output of this project can provide future evidence and justification that can be used by state DOTs to further implement ABC and consider ABC for new construction.

2 Problem Statement

Construction activities related to bridge replacement and rehabilitation are important contributors to traffic jams and reduced mobility and, most importantly, to safety hazards. The safety is a major focus of 2018-2022 US DOT Strategic plan. The safety hazards attributed to construction work zones are alarming. "There were 87,606 crashes in work zones in 2010. There were 37,476 injuries in work zones in 2010. This equates to one work zone injury every 14 minutes (over 102 per day), or about four people injured every hour. In 2010, there were 514 fatal motor vehicle crashes in work zones, resulting in 576 fatalities. These 576 fatalities equate to one work zone fatality every 15 hours" (http://www.ops.fhwa.dot.gov/). One of the most important advantages of ABC is to improve the safety, which is achieved by reducing onsite construction activities and thereby reducing accidents, injuries to workers and public. However, up until now there has been no good documentation of this ABC advantage. This project will provide quantitative data supporting the fact that ABC does improve safety.

3 Research Approach and Methods

Onsite construction time required for a bridge replacement can be reduced from a year or more using conventional construction, to a few weeks or less using ABC technologies. This significant reduction of time in the work zone translates to vastly improved safety for the traveling public and construction crews. A benefit/cost analysis for the reduced number of days of work zones due to the use of ABC requires 1) an estimate of the number of crashes avoided, and 2) the monetary value of each avoided crash, including a breakdown of fatalities and injuries for each. The U.S. DOT's Value of Statistical Life (VSL) can be used to determine the monetary value of each avoided crash, as discussed on the U. S. DOT Office of Safety website. Also discussed is the use of the Maximum Abbreviated Injury Scale (MAIS) for fractional values to assess the benefit of preventing an injury crash.

In this project, the data described above can be compiled and interpreted through collaborative efforts between UNR, FIU, and ISU. A detailed research plan will be outlined. However, a

preliminary plan is for data that can be provided by FIU and processed and interpreted between UNR and ISU. The overall objective of this project is to provide quantitative data supporting the fact that ABC does improve safety relative to conventional construction. Literature search will include work of USDOT Office of Safety and recently completed ABC-UTC total costs research projects at FIU. The output of this project can provide future evidence and justification that can be used by state DOTs to further implement ABC and consider ABC for new construction.

4 Description of Research Project Tasks

Based on the identified problem statement above, proper data is not yet available and accordingly, the following research tasks are proposed and will be conducted to provide foundational work for future safety analysis. A summary of the proposed research tasks is as follows:

Task 1 – Conduct a thorough literature review to identify safety analysis procedures and results related to work zones in general, and specify any bridge-related analyses.

This task is completed and a preliminary breakdown for the content of the conducted literature is as follows:

Chapter 1 Introduction

1.1 Background Information: It concludes work zone definition, the influence of work zone to local traffic(delay, safety data added.)

1.2 Work Zone Characteristics: It introduces the definitions for work zone type, network form, size and analysis dimension.

1.3 Work Zone Performance Measures: It introduces some performance measures for evaluating work zone (safety, mobility, construction efficiency and effectiveness, public perception(1)).

Chapter 2 Existing workzone mobility analysis methods

2.1 Summary of Analysis tools: It concludes the comparison(advantage and disadvantage) for existing analysis tools and the criteria and method for selecting tools according to demand.

2.2 Some methods from other reports from other states: Try to find some other methods or models used in other states.

2.3 Methods and tools available to use: It introduces the methods that we can use in this project more detailed

Task 2 – Workzone safety analysis

The analysis is ongoing but with the conduted prelimimary analysis for this project, using the received SHRP 2 NDS workzone trajectories and data, it can be demonstrated that there is reduced speed and congestion at workzones. The study investigated speed change, vehicle-following distance, workzone types, and environmental factors of the sample trajectories. When the qualitative analysis shows the inter-influence of different factors, the size of data is not enough for quantitative results describing the interactive relationships between various factors. Extended

study with a large amount of NDS data or other trajectory-level data is recommended for modeling how various factors influence bridge workzone mobility and safety.

Task 3 – Summarize the investigation and the results in a draft final report

Currently, we are on the final stage of writing the final report to describe the details of the different tasks done in this project. This report will be submitted to the ABC-UTC steering committee soon for review and comments.

5 Expected Results and Specific Deliverables

- Final Report
- 5-minute Video

6 Schedule

The expected timeline for ompleteing the project and delivering the report and summary video is May 31, 2020. The progress can be reported as follows:

- Completed wrok = 60%
- Remianign work = 40%