

2016 UDOT RESEARCH PROBLEM STATEMENT

*** Problem statement deadline is March 14, 2016. Submit statements to Tom Hales at tahales@utah.gov. ***

Title: Data Based Testing & Decision Process for Traffic Signal Steel Replacement

No. (office use): 16.03.05

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Select One Subject Area

Materials/Pavements

Maintenance

Traffic Mgmt/Safety

Preconstruction

Planning

Public Transportation

1. Describe the problem to be addressed.

Many current, in-use signalized intersections in Utah were constructed during the 1970s and 1980s, making the steel mast poles and arms 30-40 years old. Recent crashes where signal steel was struck and in some form or another 'failed', have highlighted the need for UDOT to be more proactive in testing older steel elements for fatigue, micro-fracturing, and corrosion. There is currently no testing procedure or data-driven approach in Utah regarding when signal steel needs to be replaced. The need is to prevent a catastrophic failure where a mast arm or pole collapses over live traffic due to stress induced by device loading, wind, etc.

2. Explain why this research is important.

UDOT will benefit from this research by defining testing protocols for aging steel and thresholds for when steel elements need to be replaced in the interest of safety and preserving infrastructure.

3. List the research objective(s):

1. Identify state of the practice currently in place across the nation and in other countries.
2. Produce a procedure and policy – based on empirical data and best practices of other agencies that would define testing protocols for aging steel and thresholds for when steel elements need to be replaced in the interest of safety and preserving infrastructure.

4. List the major tasks:

1. Develop a project scope of work and detailed cost estimate.
2. Conduct kickoff meeting.
3. Conduct a best-practices survey and literature review to identify similar programs currently in place in other States or Countries, and summarize the results of this research.
4. Conduct a historical review of incidents – in Utah or otherwise – involving signal steel failure from the past 25 years, and

summarize this information for reference, identifying any notable trends or causalities.

5. Identify non-destructive testing procedures that are cost effective for evaluating steel condition at existing, aged traffic signals currently in operation.
6. Perform the recommended testing procedure(s) at a sample of locations around the State, of variable age, to produce a scatterplot of data points that relate steel age to steel condition.
7. Based on the empirical data and the best practices research above, develop a recommended testing policy for signals across the state – how often, at what age it is required, and expected data results with thresholds for ‘failure’ clearly defined.
8. Based on these same items above, develop a simple, data-based series of thresholds for the following events;
 - a. When testing should begin at a given site (age, other contributing factors like wind, salt, etc.).
 - b. How often testing should be conducted.
 - c. A formulaic or data based decision matrix for when steel should be considered to fall into one of the following categories, such as: (A – Like New), (B – Worn), or (C – Risk of Failure, Replace).

5. List the expected results:

1. A modest report summarizing best practices, the literature review, and historical incidents.
2. A recommended testing procedure/policy, with costs per unit and expected results.
3. A recommended set of thresholds, based on data and/or age, defining when testing should begin and how often it should be conducted.
4. A decision matrix that can be used to categorize signal steel as grade A, B or C as defined above.

6. Describe how this research will be implemented.

This research would be implemented jointly by the UDOT Traffic Management Division and the UDOT Traffic & Safety in better defining a plan when to replace aging steel at signalized intersections. The results of this research would assist UDOT in future decisions and budget forecasting when to replace aging steel at signalized intersections.

7. Requested from UDOT: \$60,000
(or UTA for Public Transportation)

Other/Matching Funds: \$

Total Cost: \$60,000

8. Outline the proposed schedule, including start and major event dates.

It is recommended that this project begin summer or early fall 2016 with the project scope of work and detailed cost estimate, followed with the literature review. The work will continue with the remaining tasks as outlined. The results of the research will then be reported to UDOT in the form of a written report. The research is anticipated to take 12-16 months.