2019 UDOT RESEARCH PROBLEM STATEMENT

*** ***Problem statement deadline is Feb. 6, 2019. Submit statements to UTRAC@utah.gov.*** ***

Title: Measurement of Air Voids in Utah Pumped Concretes **No. (Office Use):** 19.01.03

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Select ONE Subject Area ☒ Materials/Pavements ☐ Maintenance ☐ Traffic Mgmt/Safety ☐ Structures/Geotech ☐ Planning ☐ Perf Mgmt/Data Analytics ☐ Public Transportation ☐ Other

1. Describe the problem to be addressed:

Pumping concrete results in a seemingly random effect on the fresh air voids of the concrete, causing problems for engineers, contractors and specifiers. Furthermore, recent research has shown pumping concrete may detrimentally affect entrained air content and spacing when measured in fresh concrete, but often hardened air contact in higher and satisfactory freeze thaw performance is identified. Because of this there are legitimate questions as to the proper time to sample fresh concrete for air content and spacing in new construction, this research is needed to properly time sampling and measurement for UDOT specifications.

2. Write the project objective (25 words or less):

Develop guidelines for sampling of fresh concrete that correlate to hardened properties for pumped concretes.

3. Explain why this research is important:
(In response, consider addressing specific UDOT goals, applicability in Utah or other states, etc.)

The pumping pressure, the vacuum that occurs as concrete goes over the boom and the impact of placement can affect the air void content and are often different on every job. Recent research has suggested that pumping concrete makes air voids dissolve, but seem to come back at some point in time after pumping to more resemble the pre-pumped content. This results in jobsite and specification challenges. By understanding the appropriate time to sample concrete better specifications can be implemented that better control long term behavior of pumped UDOT concrete.

4. List the major tasks:

1. Review of existing literature, AASHTO and UDOT specifications
2. Measure air volume of field placed concrete on active UDOT projects before and after concrete placement by pumping using:
    a. Air meter
    b. Super air meter, air void spacing factor (AASHTO TP 118)
    c. Spacing factor, petrographic analysis (ASTM C457 to be performed by Oklahoma State University)
    d. Freeze Thaw Performance (ASTM C666)
3. Analyze data
4. Preparation of final report.

5. List the expected deliverables (reports, manual, specification, design method, training, etc.):

1. Literature Review
2. Final project report, detailing literature review, activities, developed procedures, and results.
3. Recommended modifications to existing UDOT specification for timing of air measurement for pumped concrete

6. Describe how the research results will be implemented:

(In response, consider addressing UDOT leader support, process or standard improvement, etc.)
Following analysis of the results, recommended modifications to UDOT specifications will be provided to UDOT specification engineers.

7. Requested from UDOT: $30,000 **Other/Matching Funds:** $0 **Total Cost:** $30,000
(or UTA for Public Transportation)

8. Outline the proposed schedule, including start and major event dates:
The proposed project period is 12 months. The proposed schedule is shown in the table below.
Timing of experimental sampling is contingent on construction season so project should begin in January 2020

Major Task	2020											
	Jan	Feb	March	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1												
2												
3												
4												