

Number: 25-59

Proposed Title: Monitoring of moisture content in concrete bridge decks for optimal deck treatment application

1. Concisely describe the **transportation issue** (including problems, improvements, or untested solutions) that Oregon needs to research.

Bridge decks are critical assets for a DOT and concrete bridge deck preservation work is typically the most common action performed on bridges. ODOT expects to spend more than \$82M on deck work for the future 2022-2024 STIP, which is nearly 1/3 of the overall Bridge Program funding. Increasing durability to extend service-life is thus one of ODOT’s central efforts. If applied under suitable conditions, applying deck treatment options such as a membrane can significantly increase the service life of a concrete bridge deck. In addition to chloride content and rebar condition, determining moisture content and monitoring it over time is critical to ensure a deck treatment is durable. Newly available sensors and methods will be evaluated to allow accurate moisture monitoring of concrete bridge decks and relate it to existing field investigations stipulated in Oregon’s Bridge Design Manual.

2. Document how this **transportation issue** is important to Oregon and will meet the Oregon Research Advisory Committee Priorities

Ensuring high durability of deck treatments such as polymer overlays for membranes requires adequate knowledge of the decks condition, including chloride content, rebar corrosion status, and moisture content. High durability means less maintenance and preservation action, which is also more sustainable. This research will specifically address the priority “stewardship of public resources” by evaluating in-situ measurement of moisture content based on “innovative technologies and systems”. The underlying objective of the research is to keep Oregon’s concrete bridge decks in a state of good repair, which ensures they last for a long time. An innovative approach based on a combination of sensors will help determine when a deck treatment can be applied safely so that it can prevent moisture and chloride ingress effectively.

By keeping our existing bridge inventory in a state of good repair, this research will also support “economic and community vitality” in that bridge decks require less preservation work, which minimizes bridge closure times.

3. What **final product or information** needs to be produced to enable this research to be implemented?

The final product of this research is a practical guide describing a moisture monitoring methodology that integrates with ODOT’s current stipulations regarding field investigations to be conducted prior to the application of a deck treatment. To determine optimal sensor placement and measurement protocols, laboratory experiments on small specimens under varying environmental conditions will be conducted as well as on a deck mockup specimen stored outside. Pertinent inspection techniques such as half-cell potential, resistivity, and moisture monitoring will be evaluated.

4. (Optional) Are there any individuals in Oregon who will be instrumental to the success of implementing any solution that is identified by this research? If so, please list them below.

Name	Title	Email	Phone
David Dobson	Structural Materials Engineer	David.DOBSON@odot.oregon.gov	

5. Other comments:

Other State DOTs as well as local agencies such as the Portland Bureau of Transportation and Multnomah County Bridge Section might also be interested in and benefit from the final product.

6. Corresponding Submitter's Contact Information:

Name:	Thomas Schumacher	
Title:	Professor	
Affiliation:	Portland State University	
Telephone:	503-725-4199	
Email:	thomas.schumacher@pdx.edu	