

Number: 25-07

Proposed Title: Developing a Standard Mixture Proportioning Method to Minimize Portland Cement in Concrete

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

A recent research program (SPR823) successfully developed a method to substantially reduce the portland cement required for concrete paving mixtures. Reduced cement contents have been shown to significantly reduce the carbon footprint of the concrete mixtures. In addition to developing this new method, the research confirmed that this new method could produce concrete that is placeable and can achieve required strengths and durability when used for concrete pavements. However, this method only focused on concrete for pavements and assessed constructability using the Box test. The Box test is not applicable for structural concrete. The objective of this proposal is to assess the mixture proportioning method developed for concrete pavement but will use other methods to assess placeability and constructability of the concrete mixture. The research will assess methods that can quantify constructability, mechanical properties, and durability. The objective of this research is to identify, or if necessary develop, assessment tools or tests to produce low-carbon structural concrete that will ensure constructability, strength, and long-term performance. The research will ensure investments of Oregon's transportation funds are used with integrity to produce safe, efficient, innovative and low-carbon concrete. The proposed research directly addresses stewardship of Oregon's public resources and sustainability.

2. Document how this transportation issue is important to Oregon and will meet the [Oregon Research Advisory Committee Priorities](#)

Reducing Oregon's carbon footprint is part of ODOT's strategic action plan. SPR823 developed a method that significantly reduces the portland cement in concrete for pavements while achieving good constructability and adequate longer-term strengths. This research proposes to use this method for structural concrete. The SPR823 report showed that the amount of portland cement (and overall cementitious materials) can be significantly reduced while maintaining constructability, strength, and durability. In fact, the report indicated that the new mixture proportioning method could likely reduce shrinkage, which should improve long-term performance and durability. However, this approach has not been applied to structural concrete and methods need to be developed to reliably assess placeability and constructability and the properties and characteristics that are associated with these mixtures. The new proportioning method will improve the sustainability of concrete structure in Oregon by minimizing portland cement content and will ensure stewardship of public resources by improving durability of concrete structures.

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

The final product of this research will be a comprehensive final report. The report will report the data generated in the research and, using these data, will include clear and simple guidance on how to proportion low-carbon structural concrete that is constructable, can achieve necessary strengths and durability, and is economical and has a reduced carbon footprint.

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

5. Other comments:

6. Corresponding Submitter's Contact Information: [1 individual]

Name:	David Trejo
Title:	Professor
Affiliation:	Oregon State University
Telephone:	541-737-9304
Email:	trejo@oregonstate.edu