

Number: 25-06

Proposed Title: Assessing Low-carbon Concrete Mixture Proportions for Pavement Durability

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

Concrete pavements are generally durable and long-lasting. A recent research program (SPR823) successfully developed a method to substantially reduce the portland cement required for concrete paving mixtures. Reduced cement contents significantly reduce the carbon footprint of the concrete mixtures. In addition to developing the new method, the research confirmed that this new method could produce concrete that is placeable and can achieve required strengths. However, before the new method can be fully implemented, research is needed to assess whether mixtures made with this new method can provide better constructability and long-term performance. The objective of this proposal is to assess methods that can improve the rate of strength gain of mixtures produced with the new method (a characteristic critical for contractors), and to assess the shrinkage, abrasion resistance, and freeze-thaw performance of these reduced cement mixtures. It is imperative to quantify the long-term performance of these mixtures prior to full implementation. The research will ensure investments of Oregon’s transportation funds are used with integrity to produce safe, efficient, and innovative concrete.

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. In addition, reducing congestion is a critical strategic plan item. SPR823 developed a method that significantly reduces the portland cement in concrete for pavements while achieving good constructability and adequate longer-term strengths. Although the new method reduces the initial carbon footprint of concrete, if the new method results in concrete that does not perform over the long-term, the reduced carbon footprint of the concrete could be off-set by having to replace the concrete at earlier ages. The objective of this research is to quantify key performance criteria and, when needed, to develop new approaches that can ensure pavements constructed with the new low-carbon concrete can perform as well as or better than conventional concrete pavements currently specified by ODOT. This research will ensure ODOT is reducing the carbon footprint of their concrete pavements and reducing congestion by reducing construction times and increasing concrete pavement service lives.

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 concrete that can achieve higher early strengths, reduced shrinkage and cracking, improved abrasion resistance, adequate freeze-thaw performance, and long service lives.

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.

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5. Other comments:

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