Oregon Department of Transportation

Stage 1 Research Problem Statement

Number*: 25-17*

Proposed Title: Work Zone Safety Warning Sign Identification and Training

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

Construction and maintenance work zones on active roadways are complex and dynamic environments that can create hazardous working and driving conditions. ODOT and contractor personnel working on roadways must exhibit mindfulness (i.e., chronic unease) to be alert for the presence of potential hazards. Importantly, they must also know when specific conditions and/or hazards are likely to lead to a crash or injury incident, and if so, when to stop the work and revise the work operations to prevent an injury or fatality from occurring. Examples of warning signs (i.e., precursors) indicating a high likelihood of a crash or worker injury could include, among others: a lack of understanding of the planned work process, fatigued workers, high pressure to complete the work in a short time period, drivers confused about the driving path, and severe weather conditions. ODOT personnel and construction workers may not know what warning signs to look for, the most impactful warning signs, or the combination of warning signs that together are especially dangerous. Additional training can educate workers on the warning signs to be mindful of and when the work should be stopped to prevent a crash or worker injury from occurring.

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

The transportation issues associated with the proposed research are: (1) the need to ensure the safety of drivers and workers in active work zones, and (2) the ability of ODOT and contractor personnel to recognize warning signs and make the right decision to prevent crashes, injuries, and fatalities in work zones. These issues relate to the safety of the travelling public, ODOT employees, and contractor personnel in roadway work zones. The issues directly relate to transportation network safety, a topic that is a priority for both the ODOT Research Advisory Committee (RAC) and the ODOT Research Construction and Maintenance (CM) Expert Task Group (ETG). Moreover, the training component of the proposed research entails workforce development, which is one of the RAC's research focus areas. The proposed project is applied research that is expected to create practical guidance and training. These outputs have a high likelihood of implementation in practice and potential impact on ODOT and contractor work practices. Successful implementation of the research results is not only expected to help prevent worker and motorist injuries and fatalities in work zones, but also to improve mobility on Oregon's roadway network as a result of fewer crashes in work zones. Mobility is also one of the topics contained within the Oregon Transportation Plan (OTP) and a priority for research problem statements.

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

Implementation of the expected research outputs requires detailed information related to the common warning signs present prior to a work zone crash or injury incident. Specifically, information is needed regarding the worker behaviors, site conditions and operations, driver behaviors, traffic conditions (volume, speed, trajectory, etc.), and other impacting factors which are associated with crashes and injury incidents. This information could be developed through data collection, analysis, and development efforts that include:

- An initial literature review of current knowledge and practices related to work zone hazards and crash/injury incident causes

- An analysis of crash and injury incidents to quantitatively highlight those conditions and behaviors that are prominent in crashes and injury incidents (e.g., warning signs)
- Development of guidance and training to educate workers on the warning signs
- Evaluation/testing to confirm the impacts and benefits of the guidance and training on worker ability to identify warning signs
- Prepare final guidance documents for implementation in practice

Implementation of the results requires that workers are aware of these impacting factors, understand when the factors (individually and in combination) are at a level that is hazardous, and know when to stop the work and re-plan. The information needs to be provided to those ODOT construction and maintenance personnel who plan and conduct work operations on active roadways. An implementation guide that provides the information mentioned above and training materials to educate field staff and improve their "mindfulness" would be useful final products for practical implementation of the research results.

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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Justin Moderie	State Construction and Materials Engineer	Justin.G.Moderie@odot.state.or.us	(503) 986-3115

5. Other comments:

Mindfulness: Liang, H. and Zhang, Y. (2021). "Safety Mindfulness: A Buffer between Job Stress and Safety Performance of Construction Workers." *International Conference on Construction and Real Estate Management (ICCREM) 2021*, ASCE, 348-355.

Chronic unease: https://media.dekra.com/media/dekra-fa-what-is-chronic-unease.pdf

Precursor: Corcoran, W.R., "Defining and Analyzing Precursors." In *Accident Precursor Analysis and Management: Reducing Technological Risk Through Diligence*. Phimister, J.R., Bier, V.M., and Kunreuther, H.C., Editors. The National Academies Press, Washington, D.C., pp. 79-88, 2004.

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