



Research Problem Statement

ODOT Research Section
555 13th Street NE; Ste 2
Salem OR 97301-5192

Phone (503) 986-2700
Fax (503) 986-2844

Before starting this form please read the Research Problem Statement Guidance document online at:
http://www.oregon.gov/ODOT/TD/TP_RES/docs/Research_ProblemStatement_Guidance.pdf

I. TITLE

17-002 Construction Emissions Impact on Highway Construction and Maintenance Workers

II. PROBLEM

Highway construction and maintenance projects have major impacts on the environment and the communities around the projects. Many of these impacts are known and have been studied in the past. One of the identified environmental impacts is the emission of airborne and other pollutants. Previous research has focused on emissions from different sources. There is still more work needed to calculate the quantities and types of pollutants to which construction and maintenance workers and other ODOT employees are exposed during their work and the effect that these pollutants can have on their health.

Studying the pollutants produced during construction activities can help to determine the pollutants that are present on the construction site on a daily basis. Even when daily doses of some of the chemicals produced during construction are under the dangerous limit, workers and equipment operators are exposed to these emissions daily for extended periods of time. The long-term effect of exposure to these chemicals has not been studied. Research on work zone safety has resulted in better working conditions for construction and maintenance workers and reduced the risk of injuries and fatalities. Reducing the possible negative effects of pollutants in the work environment can further improve the working conditions for construction and maintenance workers.

Emissions during construction and maintenance can be produced by different sources. One of those sources is the emissions generated from the combustion of fossil fuels by equipment. The amount of emissions produced by the equipment depends on engine characteristics and hours of operation [Arocho 2014]. Another source of emissions is the fugitive dust that results from traditional construction and maintenance processes and the movement of vehicles over unpaved surfaces [Kinsey et al. 2004]. One emissions source that is particular to highway work is the emissions from asphalt production and placement. Vehicles using the roadway are an additional source of pollution during work on an existing highway. Much of the transportation work performed is maintenance and improvement of existing facilities that remain open or partially open to traffic during construction.

Research has been conducted in the past to estimate emissions production from each of the pollution sources mentioned above. However, limited work has been done to assess the impact of all the emissions combined on construction and maintenance workers. Additional research is needed to quantify the emissions to which the workers are exposed and to assess the effect of that exposure on workers' health and wellbeing. Working conditions for construction workers, equipment operators, and other employees could be improved by reducing daily exposure as well as the unknown long-term effects to their health. Reducing emissions from construction projects can help to improve the air quality of the communities surrounding the projects. Projects that produce less air pollutants could be healthier for workers and at the same time reduce the environmental impact of the project.

III. PROPOSED RESEARCH, DEVELOPMENT, OR TECHNICAL TRANSFER ACTIVITY

The goals of the proposed research are to determine the pollutants emissions that are present during construction and maintenance of highways and to which construction and maintenance workers are exposed and provide

guidance to ODOT regarding management of the work operations to protect employees from any health impacts. To fulfill this objective, the following research tasks will be performed.

1. Identify all of the sources of emissions on a typical construction site and maintenance operation and in the immediate surrounding area. Record the different chemicals produced by each source. Determine the effect that those chemicals have on human health and the environment both in the short- and long-term.
2. Measure or estimate total emissions produced by each one of the sources identified in the first task. Use total emissions produced to calculate the total quantity of pollutants to which the workers are exposed. Studying the exposure will help to determine the dose of chemicals that are actually being absorbed by workers and equipment operators.
3. Develop alternative techniques to reduce or eliminate the exposure of workers to dangerous emissions. Some of these techniques could include reducing the emissions produced by each source while other techniques could reduce the exposure of each worker.
4. Prepare guidelines that show the exposure level for construction and maintenance workers and other ODOT employees. The document will also include best practices to reduce the dangerous exposure for workers and the community around construction projects.

IV. POTENTIAL BENEFITS

ODOT will benefit from having accurate data on emissions exposure for construction and maintenance workers. This information will allow the development and use of mitigating techniques to reduce exposure. The results from the research can also be used to benefit the public by reducing emissions from the construction process and maintenance operations. Communities around construction projects are also exposed to the emissions and could benefit from better air quality. Safer and cleaner construction processes could reduce the environmental impact of future efforts to improve the road and highway network in Oregon.

V. IMPLEMENTATION

The results of this research could be used by the Construction and Maintenance Offices to improve conditions for their employees. ODOT can use the results to reduce exposure of the employees and the public to possible dangerous pollutants.

VI. LIST OF REFERENCES (optional)

Arocho, I. (2015) “The Impact of Transportation Construction Projects and Activities on Emissions,” PhD Dissertation, North Carolina State University, Raleigh, NC.

Kinsey, J. S., Linna, K. J., Squie, W.C., Muleski, G. E., and Cowherd, Jr., C., (2004) “Characterization of the Fugitive Particulate Emissions from Construction Mud/Dirt Carryout,” *Journal of the Air and Waste Management association*, Air and Waste Management Association, Vol. 54, No. 11, Pgs. 1394–1404.

VII. CONTACT INFORMATION

Your name: Ingrid Arocho and John Gambatese
Affiliation: Oregon State University
Telephone: 541-737-4351 / 541-737-8913
Email: ingrid.archo@ / john.gambatese@oregonstate.edu

Person Responsible for Implementation: _____
Affiliation: _____
Telephone: _____
Email: _____
