



SPR RESEARCH PROGRAM

SECOND-STAGE PROBLEM STATEMENT

FY 2009-10

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I. PROBLEM NUMBER -- IM-10-06

II. PROBLEM TITLE -- Development of Guidance on Effective Lighting of Pedestrian Crossings

III. RESEARCH PROBLEM STATEMENT

Motor vehicle crashes involving pedestrian are far more likely to result in serious or fatal injuries. Of the 8,505 pedestrian crashes reported in Oregon from 1997-2007, 36% happened at night (21% coded as occurring with no roadway lighting present). Pedestrian crashes at night are also much more likely to be fatal -- 63% of fatal pedestrian crashes occur at night. Both of these percentages are out of proportion to pedestrian activity; this highlights the need to improve the conspicuity and visibility of pedestrians.

Engineering treatments to improve safety at crossing locations include crosswalks, removal of parking, installation of curb and median refuges, enhanced warning devices (e.g., in-pavement flashing lights, stutter beacons, internal illuminated warning signs, pedestrian-specific signalization), and enhanced lighting. Effective lighting of pedestrian crossing locations has the potential to reduce crashes by making pedestrians more visible. Before-after studies of enhanced illumination of pedestrian crosswalks indicate these practices have been shown to improve safety (*Retting, 2003*). A recently released FHWA report titled "*Informational Report on Lighting Design for Midblock Crosswalks*" documents lighting designs to improve pedestrian visibility in a controlled field-based environment (*Gibbons et al., 2008*). The report suggests that optimal lighting design for midblock crossings may require adopting practices that are not standard in many agencies.

Currently, the Oregon Department of Transportation (ODOT) does not have any specific standards for the lighting of midblock pedestrian crossings. In the ODOT *Lighting Policy and Design Manual*, both the *Roadway Lighting – Design Guide* (AASHTO) and *Roadway Lighting* (IES RP-8) are adopted as policy. These documents provide limited guidance on lighting at pedestrian midblock crossings. This proposed research would be designed to be the first step in developing standard Oregon-specific guidance for illumination of pedestrian crossing locations. The research tasks would include a state-of-the-practice review and field-based assessments of existing illumination.

IV. RESEARCH OBJECTIVES

The objective of this research would be to evaluate current illumination configurations of pedestrian crossings as a first step towards ultimately developing Oregon-specific design guidance for illumination of pedestrian crossing locations. While the design of illumination is complex and site specific, there could be significant benefits to incorporating the most up-to-date knowledge in policy that is likely to be found in this research. The results of the field-based evaluation will be useful in quantifying the limitations of current designs (if any) and contribute to the development of Oregon pedestrian crossing lighting recommendations.

V. WORK TASKS, COST ESTIMATE AND DURATION

Successful completion of this proposed research effort will include the following tasks:

1. **Literature Review:** The research team will conduct a comprehensive literature review that seeks to summarize the technical literature on pedestrian lighting and safety issues. This review will also inform the state-of-the-practice survey and the appropriate techniques for field-based evaluation of illumination. Examples of techniques to improve the energy efficiency of lighting (e.g. LED, lower energy use devices, motion sensor, or push-button activation) will also be included. **Estimated cost:** \$10,000
2. **State-of-the-Practice Survey:** The research team will design an electronic survey instrument to identify jurisdictions that currently have or are considering design guidance for the illumination of

pedestrian crossing locations. As part of this task, the research team will first develop a targeted email list of those individuals who are likely to be aware these practices. Potential contacts will be obtained from TRB committees, state highway safety contact lists, illumination designers, and pedestrian safety advocates. The results of the survey will guide identification of a subset of individuals for specific follow-up questions. An interim report will be produced summarizing the results to task 1 and 2 and presented to the TAC. **Estimated cost:** \$30,000

3. **Field-Based Observational Analysis:** One recommendation of the FHWA report was for agencies to test various combinations of commonly used luminaire types, crosswalk configuration and other parameters to establish design guidance. Because such a field-based experiment is costly (in terms of required equipment, data collection, and labor) the research team is proposing a limited observational analysis. The research team will first identify a sample of existing lighting configurations at pedestrian crossing locations. Based on guidance from the literature, field-data collection procedures will be designed to measure relevant variables (pedestrian detection distance, vertical and horizontal luminance, ambient light levels, lighting type and placement and other design parameters). Though this evaluation will likely focus on midblock crossing locations, the selection of the site types will be guided by the ODOT Technical Advisory Committee (TAC). The sample will be constructed to balance data needs and costs. **Estimated cost:** \$70,000
4. **Data Analysis:** The data for task 3 will be analyzed to inform the final recommendations. Data analysis will attempt to control for various external parameters. **Estimated cost:** \$25,000
5. **Recommendations and Report:** The research team will develop guidance language that could be incorporated in the ODOT technical guidance documents. These recommendations will be informed by the literature review, survey, and field experiment, and TAC input. Finally, the research team will prepare draft and final reports compiling the results of the interim reports as well as final recommendations. **Estimated cost:** \$10,000

A cost estimate for this research is \$145,000, plus \$5,000 for ODOT Coordination = \$150,000 total estimate; with duration of 18 months.

VI. IMPLEMENTATION

The results of this research could easily be implemented in ODOT policies and design guidance (such as the *Lighting Policy* or *Traffic Manual*). The research team's expectation is that the necessary ODOT persons will be involved with the TAC to increase the likelihood that the recommendations are adopted. Because many local agencies look to ODOT for guidance, these results would be extrapolated statewide.

VII. POTENTIAL BENEFITS

The research could result in an improved design practice for illuminating pedestrian midblock crossings. Since it known that improved visibility results in an improvement in safety, this research has the potential to reduce the cost of crashes and severe injuries. If the overall perception of safety at crossings could be improved, research has shown that increased walking is likely to occur which has health and quality of life implications. Finally, if energy-efficient options have been successfully deployed or considered by others and are adopted, Oregon could benefit from a reduction in energy use. Both increased walking and reduced energy use are associated with reduced greenhouse gas emissions.

VIII. SUBMITTED BY:

Stage 2 Submitters

<i>Stage 2 Submitters</i>			<i>ODOT champion</i>
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