

Research Project Work Plan
for
Safety Effectiveness of Pedestrian Crossing Enhancements

SPR # 778

Submitted by

Christopher M. Monsere, Ph.D., P.E.
Associate Professor
Portland State University
Department of Civil and Environmental Engineering
Portland, Oregon 97207-0751

and

Miguel Figliozzi, Ph.D.
Associate Professor
Portland State University
Department of Civil and Environmental Engineering
Portland, Oregon 97207-0751

for

Oregon Department of Transportation
Research Section
555 13th Street NE
Salem, Oregon 97301

July 2014

Research Project Work Plan

for

Safety Effectiveness of Pedestrian Crossing Enhancements

1 Identification

1.1 Organizations Sponsoring Research

Oregon Department of Transportation (ODOT)
Research Section
555 13th Street NE
Salem, Oregon 97301
Phone: (503) 986-2700

Federal Highway Administration (FHWA)
Washington, D.C. 20590

1.2 Principal Investigators

Christopher M. Monsere, Ph.D., P.E., Associate Professor (PI)
Department of Civil and Environmental Engineering
Portland State University
Portland, Oregon 97207-0751
Phone: (503) 725-9746
Email: monsere@pdx.edu

Miguel Figliozzi, Ph.D., Associate Professor (co-PI)
Department of Civil and Environmental Engineering
Portland State University
Portland, Oregon 97207-0751
Phone: (503) 725-2836
Email: figliozzi@pdx.edu

1.3 Technical Advisory Committee (TAC) Members

Lyn Cornell, ODOT Research Coordinator, 503 986-2853
Shelia Lyons, ODOT Bicycle & Pedestrian Facility Specialist, 503 986-3555
Mike Kimlinger, ODOT Traffic Standards Engineer, 503 986-3583
Gary Obery, ODOT Alternate Mode Traffic Engineer, 503 986-4062
Amanda Salyer, ODOT Senior Traffic Investigator, 503 986-6644
Nick Fortey, FHWA Traffic Safety Engineer, 503 316-2565
Julie Yip, ODOT Safety Div, Bike/Ped Safety, 503 986-4196
Sara Schooley, PBOT Pedestrian Coordinator, 503 823-4589

1.4 Friends of the Committee

To be determined

1.5 Research Coordinator

Lyn Cornell Phone: 503 986-2853

1.6 Project Champion

Mike Kimlinger, ODOT Technical Services: Traffic Standards

2 Problem Statement

ODOT's Tech Services Branch is implementing a pedestrian safety countermeasure program which will direct HSIP funding toward pedestrian safety counter measures (approximately \$4 million has been set aside for both pedestrian and bicycle safety improvements). Data-driven safety decision-making—including implementation of the Highway Safety Manual—requires the development of crash modification factors (CMFs) for various roadway improvements. Over the last decade, the Oregon DOT has systematically implemented many pedestrian crossing enhancements (PCEs) across the state. The most commonly deployed treatments include continental crosswalk markings, pedestrian median islands, curb bulb outs, pedestrian activated flashing beacons and advanced stop bars. The existing literature on driver yielding clearly indicates that medians are a significant pedestrian safety feature and pedestrian-hybrid beacons improve driver stopping compliance (both of these are included in the FHWA countermeasures clearinghouse and have CMFs). Rectangular Rapid Flash Beacons (RRFB) also improve driver stopping compliance but the safety effects (CMFs) have not yet been quantified.

Still, many questions remain regarding the quantification of the positive impact of PCEs on overall crashes (i.e. medians may also reduce vehicle crashes) and the transferability of national results. As driver behavior and culture vary, estimates of safety effects (CMFs) are more accurate and relevant when developed from or calibrated by a robust, local data set. In Oregon, installations of crosswalks on state highways at mid-block or uncontrolled intersections require the approval of the State Traffic-Roadway Engineer (STRE). Because of this approval procedure, there is already a comprehensive list of pedestrian crossing enhancements for the state highway system. A careful integration of the well-documented installations of PCEs across the state with relevant traffic, roadway features, and land use data provides a unique opportunity to conduct research to estimate safety effectiveness of PCE designs in Oregon for improved data-driven decisions.

3 Objectives of the Study

The objective of this research is to estimate the effectiveness of PCEs on multimodal safety in Oregon design contexts to derive CMFs calibrated to Oregon (i.e. not only pedestrian crashes but also motorized vehicles and bicycle crashes in the vicinity). This research will carefully consider the type of enhancement, the geometry, the surrounding land uses, and pedestrian/vehicle exposures. The results of this research will provide decision-makers with a valuable tool to guide future PCE deployments. The results of this research can also set the foundation for future cost/benefit analysis of PCEs.

3.1 Benefits

ODOT's Tech Services Branch is implementing a pedestrian safety countermeasure program which will direct HSIP funding toward pedestrian safety counter measures

(approximately \$4 million). The results of this proposed research can inform the investments made through the HSIP program and provide a solid framework for strategic investment.

4 Implementation

CMF's are best when developed from a robust, local data set. The results of this research can be incorporated into the ODOT Traffic Manual, the HSIP Program Guidelines and can inform local agencies across the state. This research would likely find a national audience as well.

5 Research Tasks

The specific tasks to complete the study are described below. The project is estimated to cost \$130,496 with an 18 month schedule (some tasks durations below overlap, see section 6.0 Time Schedule).

Task 0: Project Kick Off Meeting

The team will hold a project kick-off meeting with TAC to outline the project and review the work plan.

Task 1: Brief Literature Review

The review will focus on two components critical to this research: 1) methodologies for estimating the safety effectiveness of CMFs and 2) relevant PCEs studies in the published literature. There are a number of excellent references that are available such as: A Guide to Developing Quality Crash Modification Factors (FHWA 2010), Recommended Protocols for Developing Crash Modification Factors (NCHRP, 2012) and a very recent literature summary Evaluation of Pedestrian-Related Roadway Measures: A Summary of Available Research (Mead et al, 2013). Literature on estimating pedestrian activity levels will also be reviewed.

Time Frame: 2 months

Responsible Party: Research team

Cost: \$19,477

Deliverable: Summary of the identified literature

TAC Decision/Action: None

Task 2: Identify Treated Locations and Develop a Research Approach

In preparation of this research proposal, the Regions provided samples of logs for enhanced pedestrian crossings at uncontrolled intersections which, though detailed, are not consistent. This task will assemble the PCEs inventories in a consistent format. Following this, the team will consider the appropriate study design. Many of the locations include a combination of PCEs (e.g., medians, curb extensions, advanced stop bars) which were installed over several years. In addition to this challenging temporal aspect, the level of pedestrian activity is generally not known with precision (as pedestrian counts at marked crosswalks are not often gathered). Thus, another important element of the approach is to control for difference in pedestrian exposures across installations. The researchers will pilot test a data collection effort prior to the full data collection plan for Task 3. Depending on potential sample sizes, PCEs from off the state highway system may be needed.

Time Frame: 4 months

Responsible Party: Research team

Cost: \$25,970

Deliverable: TAC Meeting and Presentation, Interim Report #1 summarizing literature, describing proposed research approach and data collection plan

TAC Decision/Action: Review and comment on interim report and presentation

Task 3: Supplemental Data Collection

After the inventory is assembled and a suitable research plan is crafted, the research team will collect all the necessary data (e.g. ADT, functional classification, roadway characteristics and crashes for each location, before and after installation where one or more of these pedestrian enhancements were implemented). It is expected that most of this data collection can be gathered from existing databases, past projects, GIS files, and/or videolog or Streetviewer. It is anticipated that in a few locations, site-specific data collection will be necessary to effectively complete Task 4.

Time Frame: 5 months

Responsible Party: Research team

Cost: \$32,462

Deliverable: Interim report #2 – Description of data collection methods and summary analysis, suitable for inclusion in the final report as chapter describing the data collection process

TAC Decision/Action: Review and comment as appropriate.

Task 4: Safety Effectiveness Evaluation

The research team will use the findings and results of Tasks 1, 2 and 3 to estimate the safety effectiveness of the various groups and types of enhanced pedestrian crossings. In consultation with the TAC, PCEs will be grouped in a design context matrix or a limited set of combinations most relevant to ODOT for analysis. State of the practice statistical methods will be used.

Time Frame: 6 months

Responsible Party: Research team

Cost: \$32,462

Deliverable: result/analysis included in the draft final report

TAC Decision/Action: None.

Task 5: Final Report

Prepare and submit a final report which describes the research study, conclusions, and recommendations for future PCEs data collection and cost/effectiveness studies.

Time Frame: 5 months

Responsible Party: Research team

Cost: \$19,477

Deliverable: TAC Meeting and Draft Final Report incorporating feedback from TAC on interim report #1 and #2

TAC Decision/Action: Review and comment as appropriate.

5.1 Reporting

All reports shall be produced in the standard ODOT Research Section report format provided to the Project Investigator by the Research Coordinator unless some other format is deemed to be more appropriate. The Project Investigator shall be responsible for submitting reports of professional-level written composition equivalent to the writing standards of peer-reviewed journals. These writing considerations include grammar, spelling, syntax, organization, and conciseness.

The Project Investigator shall take and provide minutes for all TAC meetings.

The Project Investigator, in consultation with the TAC and Research Coordinator, shall deliver to ODOT in electronic format the data produced during the project. The Project Investigator shall ensure the data is labeled and organized to facilitate future access. ODOT shall warehouse the data.

5.2 Safety and Related Training

Prior to accessing ODOT right-of-way (ROW), all personnel who will work on ODOT ROW shall complete safety training appropriate to the work to be performed within the ROW. The Project Investigator shall notify the Project Coordinator in writing (email accepted) prior to the first day of work within the ROW that all project personnel who will access ODOT ROW have been trained. Until all ROW work is completed, the Project Investigator shall notify the Project Coordinator in writing (email accepted) annually that safety training appropriate to the work to be performed within the ROW has been completed by all personnel who will work on ODOT ROW. As part of this process ODOT District Manager needs to be informed when people are working on ODOT ROW locations. The Project Coordinator will assist with initial contact between the ODOT District Managers and the Investigator after which it is the Investigator's responsibility to make contact with the District Manager or designated contact before going on site each time.

6 Time Schedule

This section specifies the time line for the project, listing the task headings and showing monthly and/or quarterly time blocks in which each task will be accomplished. Also shown are interim and final deliverables. For the purposes of this proposal, the starting date has been assumed as January 15, 2015; however, this date is flexible and the schedule will be modified to reflect actual contract start time at some future date. Total project duration will be a period of 20 months.

Task	2015												2016											
	FY 2016						FY 2017						FY 2016						FY 2017					
	Jan - Mar			Apr - Jun			Jul - Sep			Oct - Dec			Jan - Mar			Apr - Jun			Jul - Sep					
Task 0 Project Kick Off																								
Task 1 Lit Review			*																					
Task 2 Identify Locations / Research Approach					*																			
Task 3 Data Collection											*													
Task 4 Safety Effectiveness																								
Task 5 Final Report																					R		F	

*Deliverables, R - Draft report submitted for ODOT review. F - Revised report submitted to ODOT for publication. End of contract.

7.0 Budget Estimate

An itemized budget for the project is shown below including total anticipated expenditures.

	1/1/15 - 6/30/15	7/1/15 - 8/30/16	Total
Personnel			
Chris Monsere, PSU	\$ 4,815	19,144	23,960
Miguel Figliozzi, PSU	\$ 5,099	20,271	25,369
Graduate Students	5,390	11,103	16,493
Hourly Students	1,200	3,600	4,800
Total Salaries	\$ 16,504	59,618	76,122
Fringe Benefits			
Faculty	\$ 2,524	10,035	12,559
Student	\$ 533	1,634	2,167
Total Fringe Benefits	\$ 3,057	11,669	14,727
Total Personnel Costs	\$ 19,561	71,288	90,849
Travel	\$ 250	250	500
Services and Supplies	\$ 200	200	400
Student Tuition Waiver	\$ 3,695	7,612	11,307
Total Direct Costs for PSU	23,706	79,350	103,056
Indirect Costs for PSU Activity (26.0%)	\$ 6,164	20,631	26,794
Total PSU Project Costs	\$ 29,870	99,980	129,850

