

***Deployment and Evaluation of Mobile Barrier in CDOT Research Branch
(Justification)***

Oversight Team

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Introduction

Deployment and evaluation of Mobile Barrier project in research branch has been selected through a competitive project selection process by the CDOT Research and Implementation Council (RIC) on March 8th, 2012. RIC is comprised of CDOT senior and middle management as well as FHWA staff, representing the multidisciplinary expertise in addition to diverse research needs. Research Implementation Council's decision reflects first and foremost its concern for safety and also its desire to evaluate and deploy new technology which will increase effectiveness and efficiency of setting up traffic control.

Benefits of Implementation

Safety

In the course of the year research staff conducts about 17 lane closures on freeways, bridges and high speed arterials. A significant portion of the work is performed in travel lane or adjacent shoulder while motorists travel by at high speeds and in very close proximity to research staff. The work is generally performed by CDOT research staff and university professors and students. Frequently out of state observers of research initiatives are also present in the work zone. University personnel generally are less sensitized and are less aware of work zone hazards and have limited exposure to work zone safety issues. Work zone traffic control efforts currently consist of a variety of measures to ensure researcher and motorist safety, such as variable message signs, and flaggers. However, current accepted practices for short duration work zones provide limited protection of the workers and separation from vehicles passing through the work zone. Current safety measures such as truck mounted attenuators (TMAs) and spotters typically require additional personnel exposed to the hazards simply to provide these safety measures. Even with TMAs and spotters, the immediate work area remains unprotected adjacent to the functioning travel lanes, allowing errant vehicles and distracted drivers to enter this most vulnerable work area. Lastly, in all locations around Denver metro area and many locations around the state, due to high traffic volumes, lane closure policy requires work activities to be performed at night. Unfortunately the percentage of impaired motorists is substantially higher than during the day.

A recent accident in the research work zone occurred in March of 2012 on Sunday morning when a distracted driver who was using a cell phone ran into the lane closure area at high rate of speed. Even though the lane closure work zone was designed and deployed in full compliance with the Manual on Uniform Traffic Control Devices (MUTCD), and in accordance with Region 4 Lane Closure Policy, the driver's inattention led to loss of control and subsequent crash. Fortunately no one was hurt in this specific accident; however, the outcome could've been much different should the circumstances that lead to loss of control altered only slightly. A definite and extremely valuable benefit of having and using Mobile Barrier Trailer (MBT) is

complete isolation and full protection of research staff from errant vehicles. This benefit is proven and demonstrated through the NCHRP 350 testing and acceptance. Societal costs of crashes provided by the FHWA (safety.fhwa.dot.gov) suggest that in addition to obvious importance of ensuring safety of researchers in the work zone (humanitarian and ethical considerations of protecting workers in the work zone) it is also cost-effective.

**COMPREHENSIVE COSTS IN POLICE-REPORTED CRASHES
BY ABBREVIATED INJUR SCALE (AIS) SEVERITY
(1994 Dollars)**

SEVERITY	DESCRIPTOR	COST PER INJURY
AIS 1	Minor	\$ 5,000
AIS 2	Moderate	\$ 40,000
AIS 3	Serious	\$ 150,000
AIS 4	Severe	\$ 490,000
AIS 5	Critical	\$ 1,980,000
AIS 6	Fatal	\$ 2,600,000

Considering that Mobile Barrier’s useful life is 20 years during which time it is likely to prevent one or more crashes the benefits of injury prevention are likely to exceed the cost of the barrier (~\$300,000).

Savings on Traffic Control

On the average CDOT Applied Research Branch conducts 17 lane closures per year using private traffic control companies and on occasion CDOT maintenance forces. The cost of providing traffic control, which includes equipment as well as manpower, is paid by the Research Branch using SPR funds. This cost will be significantly reduced through deployment of the MBT which comes equipped with truck mounted attenuator, arrow board, electrical power and worksite lights, on-board air for jackhammer and tools. The amount of time it takes to set up, move and remove lane closure is also expected to be reduced with deployment of MBT. Additionally reduction in duration of lane closure will reduce delays and crash potential for the traveling public. Amortized over useful life of 20 years at \$17,000 annually MBT will pay for itself just in savings in the cost of traffic control in addition to providing positive protection to workers and the traveling public.

Research Benefits

Deployment of MBT in research will enable CDOT to quantify the efficiency of deployment and removal of traffic control for lane closures in Colorado specific environment. This question is very important to CDOT because unlike other DOTs CDOT has implemented statewide lane closure policy which provides criteria and authoritative guidance for scheduling lane closures on all state highways and interstates. It was formulated in order to strike an appropriate balance between delays to the traveling public in the work zone and the cost of construction. It is based on extensive data collection and estimates of queues and delays expected during lane closures.

As a result many of the lane closures are now allowed only at night which places a premium on efficiency of setting up and removing traffic control devices. Proposed research aims to evaluate: the efficiency in deploying and removing the system; its impacts on the work operations, worker safety, and worker productivity; perceptions of safety provided by an MBT compared to traditional work zone protective measures; and the types of projects for which it is most suitable. More specifically MBT deployment project will address the following:

1. Evaluate an MBT when used during representative CDOT maintenance activities (case study projects). The performance metrics to be evaluated are: (a) time required to set up and break down the system; (b) limitations and enhancements to the work operations; (c) worker safety and safety perception; (d) worker productivity; (e) motorist safety and safety perception; and (f) system performance based on project/worksite attributes. Determine and assess any adverse effects of transporting the MBS to/from a work zone.
2. Evaluate the same performance metrics of traditional work zone protection practice when used during representative CDOT maintenance activities (comparison projects).
3. Compare the performance of the MBS to that of traditional work zone protection practice based on the identified performance metrics.
4. Develop guidance for CDOT and construction contractors to reference when planning and using an MBT for maintenance activities and potential use on CDOT construction projects.

Additionally preliminary evidence suggests that traffic flow speed and saturation rates around mobile barrier may be higher than next to a cone or barrel delineated work zone. This hypothesis will be tested under field condition as part of MBT deployment. More specifically MBT deployment project will address the following:

5. Identify speed, flow and saturation rates next to lane closure using traditional traffic control devices during typical maintenance operation and compare them with speed, flow and saturation rates next to MBT based lane closure.

Other Benefits

MBT will be controlled and maintained by the Applied Research Branch much like skid-number testing truck currently maintained and operated by research staff. The use of MBT is most effective when a given set of users are allowed to set it up for their specific needs and preferences. There are advantages to having MBT available to research staff to use on research projects and having it configured, loaded and shortened or lengthen as required by site and traffic conditions. Further use and systematic evaluation of MBT by the research branch will pave the way for possible statewide deployment of MBT by maintenance sections. Such deployment is expected to improve safety and efficiency in work zones on CDOT's maintenance and construction projects and is in concert with the intent of the FHWA's Every Day Counts Initiative.