



# Memorandum

Date July 27, 1999

From Team Leader, Special Studies Team, SFIB, DSR (P180)  
Team Leader, Injury Surveillance & Analysis Team, SFIB, DSR (P180)  
Statistician, Injury Surveillance & Analysis Team, SFIB, DSR (P180)

Subject Request for review of NIOSH highway work zone document

To Leroy Mickelsen, ECTB, DPSE (R5)

COMMENTS  
ON DOCUMENT

In early 1998, the National Institute for Occupational Safety and Health (NIOSH) became involved in efforts to prevent worker injuries in highway work zones. An important part of this initiative was a workshop held in December, 1998, entitled "Preventing Vehicle and Equipment-Related Occupational Injuries in Highway and Street Construction Work Zones." The workshop was attended by more than 50 individuals from federal government agencies, labor, private industry, state departments of transportation, trade organizations, and academia. Discussion at the workshop emphasized four topic areas: (1) safety of all workers on foot around traffic vehicles; (2) safe operation of construction vehicles and equipment in highway work zones; (3) planning for safe operations within work zones; and (4) special safety issues associated with night work in highway construction. Input provided by workshop participants has been synthesized with safety research and injury data to produce a draft NIOSH document: *Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment*. In preparing the attached draft, our goal has been to describe injury prevention measures that can be implemented by contractors, policy makers, and manufacturers, offering practical, sound recommendations that will be broadly acceptable to all with an interest in work zone safety.

You are receiving this draft document because you were unable to attend the December workshop but expressed an interest in reviewing, or because you have been recommended by others as a reviewer. We request that you review the draft and return your written comments to Ms. Diane Miller, at the address below, by September 15, 1999.

Ms. Diane Miller  
NIOSH Docket Officer  
Mailstop C-34  
4676 Columbia Parkway  
Cincinnati, Ohio, 45226-1998

Page 2 - Leroy Mickelsen

Early in August, the draft document will be posted to the NIOSH home page for public comment at this location: <http://www.cdc.gov/niosh/workzone.html>. We would appreciate your bringing this to the attention of anyone who may have an interest in providing comments.

Thank you for your interest and input in improving the safety of highway construction workers. We look forward to receiving your comments. You will receive a copy of the final document. We anticipate publication early in 2000. Please contact any of us if you would like more information.

*Stephanie G. Pratt*

Stephanie G. Pratt

*David E. Fosbroke*

David E. Fosbroke

*Suzanne M. Kisner*

Suzanne M. Kisner

Attachment

## Building Safer Highway Work Zones: Measures to Prevent Worker Injuries From Vehicles and Equipment

### Introduction

On a clear day, warm enough that he was wearing just a white tee shirt under his high-visibility vest, a 35-year-old highway construction worker was run over by a dump truck. With his orange vest, white ball cap, and rake, the worker was clearly visible as he worked on resurfacing a section of two-lane municipal road. The truck driver had been hauling highway materials for the company for 7 years. He drove up behind the victim, who was walking along the center of the road, running over him with the right front wheel. The worker died from multiple injuries 30 minutes later at a local hospital. With the worker walking directly in front of the truck, wearing his orange vest, how did it happen that a driver with seven years' experience "just didn't see him"? Given the evidence, it's unlikely that anyone would have noticed the worker [NIOSH, 1998a].

The police and State OSHA investigators compiled a series of photographs taken from the driver's point of view inside the truck. The view from the cab was obstructed. There were stickers on the window, and a fan mounted on the dashboard blocked the edges of the truck's hood from view. The truck was white and the hood stood 5 feet, 10 inches off the ground. The victim's cap was white and the top of his head reached 5 feet, 11 inches high. For the photograph, investigators placed a worker of the victim's height in the same position as was the victim when the incident occurred. In the photo, the top of the worker's head peeps over the right corner of the hood, his cap blending with its color and shape. Unless the driver had focused on that 1-inch molehill of white-on-white, there is no way he could have seen the highway worker.

This incident represents a typical highway construction fatality: in the five years between 1992 and 1996, 328 workers were killed in the work zone, many of them (45%), like this worker, in truck-related incidents. Workers employed in highway and street construction are exposed to risk of occupational injury from a variety of sources. Data from the Census of Fatal Occupational Injuries (CFOI) for 1992 through 1996 describe the characteristics of fatally injured workers in Standard Industrial Classification (SIC) 1611 (Highway and Street Construction), and the sources and circumstances of injury [Bureau of Labor Statistics, 1992-1996]. CFOI identified 600 worker fatalities in SIC 1611 during the 5 years; 328 (55%) were vehicle or equipment-related worker deaths that occurred in a work zone. Of these 328 workers, 72% were employed privately, the remainder by state or local governments. The leading occupations were construction laborer (42%), truck driver (9%), construction trades supervisor (9%), and operating engineer (8%). The most common primary sources of injury were trucks (45%), road grading and surfacing machinery (18%), automobiles (17%), and excavating machinery (6%).

In 213 (65%) of the fatalities identified by CFOI, the victim was a worker on foot. The worker was struck by a traffic vehicle in 111 of these incidents, and by a construction machine or vehicle

PLEASE  
GIVE  
NUMERATOR  
HOW MANY  
WORKERS  
ARE THERE  
IN THIS  
SIC?  
0

66/4R

120/4R

within the confines of the work zone in the remaining 102 incidents. In all but seven of the incidents involving a traffic vehicle, the motorist left the traffic space and intruded into the work space, striking the worker. For 77 (70%) of the intrusion fatalities, the CFOI narrative denoted the worker's activity at the time of the incident. The most prominent work tasks were repairing the road (33), flagging (21), and setting or moving traffic control devices (14). For intrusion fatalities, the primary sources of injury were cars (45%) and trucks (42%).

NUMERATOR?  
?

NUMERATOR?

Incidents involving backing vehicles were prominent among the 102 worker-on-foot fatalities that occurred within the confines of the work zone (49 of 102). In contrast with the intrusion fatalities, primary injury sources for these fatalities within the work zone were trucks (65%) and construction machines (30%). Twenty-four percent of the workers on foot who died within work zones were classified in vehicle and equipment operating professions.

In 87 of the work zone fatalities identified by CFOI, the victim was operating a vehicle or mobile construction equipment. An additional 19 victims were passengers, and location could not be determined for 9 workers. For vehicle and equipment operators, the primary injury sources were trucks (54%) and construction machines (40%). Thirty-two of the 87 workers operating equipment at the time of injury were not classified in equipment operating professions: 17 were employed in the skilled construction trades (e.g., carpenter, painter) 11 were laborers, 3 were managers, and 1 was a sales worker.

Unfortunately, nonfatal occupational injury data systems do not provide sufficient details about injury producing events to know how many workers are injured in work zones nationally. However, analysis of 240 incidents involving serious injuries to workers on highway and bridge construction projects in New York State [Bryden and Andrew, 1999] confirms that highway workers are at risk of being injured severely enough to require hospitalization when struck by, or run over by vehicles and equipment. This analysis, which covered incidents occurring between 1993 and 1997, revealed that although traffic accounted for 22% of worker injuries and 43% of worker deaths in New York, the remaining cases resulted from construction incidents not involving traffic. The most frequently occurring type of serious injury incident involved a worker struck by a construction vehicle or large equipment, including 44 hospitalized injuries and 3 fatalities.

NOT SURE WE HAVE A TAKE HOME MESSAGE ON INJURY?

WHAT IS THE MESSAGE OF THIS PARAGRAPH??

Fatal and nonfatal injury data suggest a need to focus work zone safety efforts beyond issues of motorist safety. Clearly, safety efforts must endeavor to eliminate vehicle crashes of the motoring public traveling through our work zones and ensure the safety of flaggers and other workers who work adjacent to traffic. However, safety efforts must also protect construction workers within work zones who are working on foot around moving vehicles and equipment, as well as those who are operating dump trucks, rollers, pavers, and other pieces of construction equipment.

WHY SINGLE OUT FLAGGER? WHY NOT ROAD REPAIR WORKERS?

The NIOSH workshop, "Preventing Vehicle and Equipment-Related Occupational Injuries in Highway and Street Construction Work Zones," held in Washington, D.C., December 2 through December 4, 1998, investigated the following areas of concern:

- ✓ Require consistency in traffic control devices within a single work zone area. Move toward uniformity in the type and placement of traffic control devices within local jurisdictions, at the state level, and nationally.

*WORKER SAFETY SPECIFICATIONS ON ALL CONTRACTS  
ENFORCE WORKER SAFETY SPECS.*

### Flaggers

*Employers can:*

- ✓ Train and certify all their flaggers. Flaggers should not be the least trained employees on the job site. Flaggers should know the traffic flow, the work zone setup, and proper placement of channelizing devices.
- ✓ Assign each flagger responsibility for monitoring operations in his or her immediate work area. Authorize flaggers to recommend to the traffic control supervisor that operations be temporarily halted and the hazard corrected when they see a hazard threatening the safe movement of traffic through the work zone. Authorize flaggers to halt operations in the event a hazard arises and a traffic control supervisor is not in the immediate area.
- ✓ Avoid using flaggers whenever possible. Use alternative traffic management systems such as lane shifts, portable traffic signals, or remote signaling devices operated by workers away from the flow of traffic.
  - Use alternatives to flaggers when traffic control is required under hazardous traffic conditions such as high traffic speeds, inclement weather, and other conditions which limit visibility.
- ✓ Have flaggers wear high-visibility apparel that is easily distinguishable from that worn by other highway workers.

### Motoring public

*Employers can:*

- ✓ Ensure that motorists have real-time information in signage and in travelers advisory radio broadcasts.
- ✓ Install warning signs that provide estimated time of delay and other road closure information so that drivers have sufficient opportunity to exit and take a different route.
- ✓ Keep warning sign messages simple and brief.
- ✓ Cover or take down warning signs when workers are not present.

*Policy makers (Federal, State, and Local) can:*

- ✓ Provide alternative transportation modes, alternative routes, and plenty of advance warning of upcoming work zones.
- ✓ Look at system-wide ways to reduce traffic volume, such as flex-time and telecommuting.





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To Kenneth Mead, ECTB, DPSE (R5)

*KEN HAS already  
left for Long-term  
training. LeRoy Mickelson  
will perform ECTB  
review.*

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Page 2 - Kenneth Mead

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