MIFACE INVESTIGATION REPORT: #07MI169

SUBJECT: Supervisor/Foreman Struck By A Pickup Truck While Placing Channelizer Drum in Road

Summary

On November 30, 2007, a 57-year-old male, who was the supervisor/foreman and part owner of a concrete curb and gutter installation company, was struck and killed by an oncoming pickup as he was placing a channelizer drum in the roadway. On the day of the incident, the decedent and the county road commission inspector met at the jobsite to discuss necessary repair to approximately 15 linear feet of curb near the intersection of two roadways. Discussions between the foreman and the county inspector outlined the traffic control to be used during the activity. The traffic control devices used during the duration of the original installation were still available on site and would be reinstalled. After the arrival of the saw truck and prior to all crewmembers arriving at the site, the decedent began to install the channelizer drums to taper the southbound travel lane next to the curb where the repair work would take place. No advanced warning devices had been placed into position by the decedent to provide upcoming traffic construction notification to the northbound or southbound traffic. The decedent had placed three drums to begin the taper on the southbound lane. Walking in front of the parked saw truck, he entered the southbound lane to place the fourth drum between the first tapering drum and the drum placed at the double yellow line (Figure 1, Drawing 1). A pick up truck traveling in the southbound lane struck the decedent. Emergency response was called. The decedent was transported to a local hospital where he was declared dead.

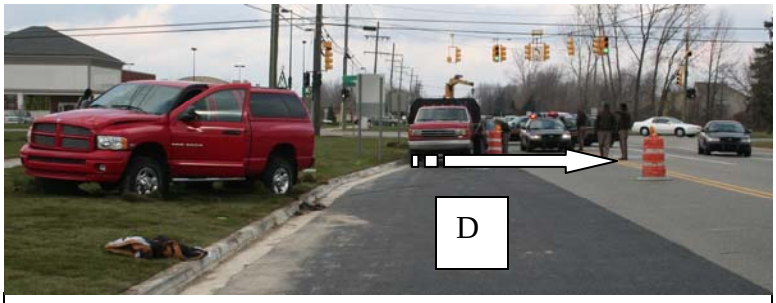
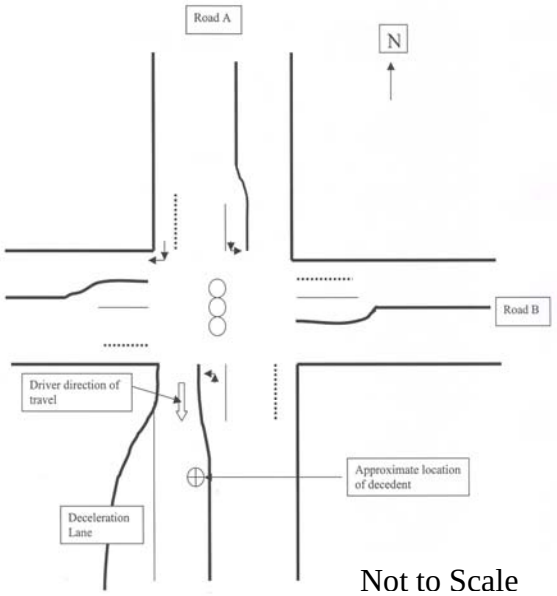


Figure 1. Incident scene showing intersection, ending position of pickup truck and decedent (D), location of channelizer drums, and path of decedent while placing 4th drum.



Not to Scale

Drawing 1. Line drawing of incident scene

RECOMMENDATIONS

- Road construction employers should ensure street construction work zones are set up in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD).
- Road construction employers should develop, implement, and enforce a comprehensive safety program that includes training on hazard recognition and avoidance of unsafe conditions. Training should include the hazards of work zone activities and Worker Safety Considerations as outlined in the MMUTCD Part 6, Section 6D.03.
- Road construction employers should provide and ensure that employees wear appropriate personal protective equipment, including high visibility vests, when working along roadways.
- Employers should consider all applicable elements of a traffic control management program in accordance with the degree of risk to personnel in a work zone.

INTRODUCTION

On November 30, 2007, 57-year-old male supervisor/foreman/part owner of a concrete curb/gutter installation company was struck and killed by an oncoming pickup as he was placing a construction barrel in the roadway. Within eight hours, MIOSHA was notified of the fatality and informed MIFACE personnel. MIFACE accompanied the MIOSHA compliance officer on a site visit on December 3, 2007. After observing the incident site, the MIOSHA representative introduced the MIFACE researcher to a representative of the site's general contractor. The MIFACE researcher introduced the MIFACE program, and the representative agreed to be interviewed. On May 13, 2008, MIFACE interviewed one of the company's co-owners (a family member) at the family member's office. During the writing of this report, the death certificate, medical examiner report, police report and pictures, and MIOSHA file and citations were reviewed. Pictures used in the report are courtesy of the responding police department. The MIFACE researcher removed identifiers from the pictures.

The company of which the decedent was a part owner installed concrete curbs and gutters. The company had been in business for over 50 years. At the time of the incident, the firm employed 12 individuals. The number of employed individuals fluctuated seasonally. The decedent was one of three owners. One of the owners was the "office man," and one of the owners had the same job responsibilities as the decedent, acting supervisor/foreman on a work site.

The decedent worked full-time. The normal work shift was 10 hours. He began work that day at approximately 9:00 p.m. He was a union member.

The firm's owner provided the MIFACE researcher with a copy of the company's written health and safety program, which included disciplinary action for willful disregard of the health and safety program policies. The foreman is responsible for maintaining safety on

the site. There is no health and safety committee at the company. The company held a company-wide whole day health and safety meeting at the start of the construction season. Among the topics covered were first aid, federal requirements, truck safety including load securement, and other road construction issues, such as traffic control, proper lifting, falling and flying objects, and heat/cold stress. In addition, supervisors hold "tailgate" talks every two or three weeks at the worksite. All training sessions are documented. The company's insurance provider performs on-site inspections.

Written instruction pertaining to traffic control was limited in the company safety program outlined in the company's "Yearly Work Packet" and a traffic regulator booklet. The MIOSHA file indicated that the Road Commission provided traffic control guidance to the decedent's company. The company owner indicated to the MIFACE researcher that employees typically perform work within work zones created and set up by other contractors on-site. There is one safety rule about traffic control in the company's safety program. The rule states: "maintain traffic barricades and lights in their proper positions."

MIOSHA Construction Safety and Health Division issued the following Serious citations to the employer at the conclusion of its investigation:

SERIOUS:

SIGNALS, SIGNS, TAGS, AND BARRICADES, PART 22, RULE 2223(1)
The temporary traffic control devices available and installed for the curb replacement activities that employees were preparing were not as prescribed in Part 6 of the 2005 Michigan Manual on Uniform Traffic Control Devices (MMUTCD). Road A's southbound vehicular traffic was being shifted from its normal path into the oncoming the northbound left-hand turn lane to provide adequate space to maneuver a cub saw perpendicular to the west side of the southbound lane's curb to initiate the curb removal process immediately south of the intersection of Roads A and B. No advance warning sings indicating a lane shift for the southbound traffic and no lane closure sign had been provided to the northbound traffic alerting of the re-designation of the left hand turn land. Barrels had not been installed on the northbound side of Road A, tapering traffic away from the left-hand turn lane being utilized by diverted southbound through traffic.

SERIOUS:

SIGNALS, SIGNS, TAGS, AND BARRICADES, PART 22, RULE 2221(2)
An employer shall provide training appropriate to the work assignment for each employee engaged in activities covered by this part. The following are examples of the training that may be required:

a) Recognition of hazards, such as, but not limited to, possible masonry wall collapse areas, crane swing area, floor opening covers, or traffic control hazards.
b) Traffic regulator training.
c) Proper placement and removal of signs signals tags and barricades.
d) Training in how to perform work in proximity to traffic to minimize vulnerability.

The employer has not provided training to the employees preparing to perform curb alteration work on the west side of southbound Road A immediately south of Road B that has instructed them in the proper placement of traffic control devices, on the appropriate temporary traffic control devices and methods as outlined in the 2005 MMUTCD. Employees have typically performed work within work zones created and set up by other controlling employers and have been instructed to "maintain traffic barricades and lights in their proper positions."

INVESTIGATION

A new store was being constructed at the intersection of Road A and Road B, which required improvement of Road A. A right-hand turn lane (deceleration lane) on the west side of the southbound lane of Road A was to be constructed to permit vehicle entrance into the store parking lot. The excavation contractor had rented and installed the necessary temporary traffic control devices and methods for the roadwork. All were still available on site. The original advanced warning signs provided information of "road work ahead," "be prepared to stop," and "shoulder work." The channelizer drums had a tire ring base and were approximately three feet tall.

The decedent was wearing weather-appropriate work clothing. His coat had a hood. He was not wearing a reflective vest. It is unknown if he was wearing a hard hat. The company owner stated to the MIFACE researcher that the decedent was partially deaf in his left ear.

Road A was a two-lane asphalt roadway with a posted speed limit of 50 mph. At the intersection with Road B, Road A had northbound and southbound left-turn lanes. Weather was sunny, cold, with heavy wind gusts (up to 40 mph).

The decedent's company had been subcontracted to install a curb for the road improvement. The decedent's work crew had completed the installation of the concrete curb structure on the west side of southbound Road A approximately one month prior to incident. The company owner indicated that the firm received a call the evening before informing them that there was water on the road. The owner stated that the asphalt company did not pave it correctly. In the morning of the following day, the decedent met with the general contractor to review the area in question as well as some other areas at the site.

The decedent then met with the road commission inspector to discuss the water accumulation issue. They determined that a part of the curb would be replaced so that the asphalt roadway and the concrete curb would meet at the "edge of metal" to county specifications. The MIOSHA file indicated that 15 linear feet of curb was to be replaced and reinstalled (owner stated 10 linear feet) near the intersection.

The decedent and the county road commission representative discussed the traffic control to be used during the re-curbing activity. The traffic control devices used during the

duration of the original installation were still available on site and would be reinstalled by the decedent's company. Additionally, a flagman/traffic regulator would be employed to divert or shift traffic during the saw cutting operations.

Upon final inspection by the county road commission it was determined that the asphalt roadway and the concrete curb did not meet at the "edge of metal" to county specifications (Figure 2).

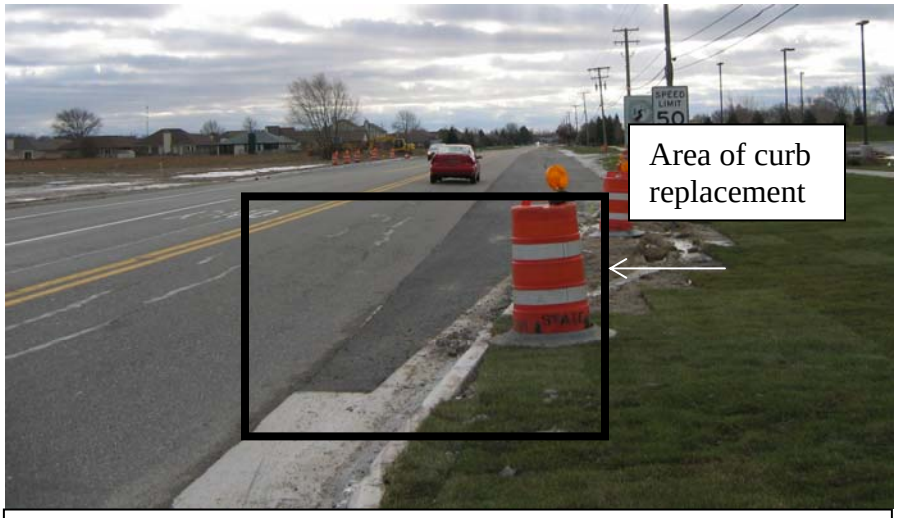


Figure 2. Curb area where water was accumulating and curb replacement was required.

The company owner indicated that the day of the incident was the last day of work for the season. Because the curb replacement was a "short duration" work project and inclement weather was on the horizon (an ice storm), the decedent decided to cut away the curb requiring replacement and lay new curb that day. The company owner indicated that the decedent returned to the yard, assembled the necessary equipment (dump truck, backhoe and saw truck) and people, and then returned to the site. The MIOSHA file indicated that the decedent radioed the shop manager.

The decedent was at the worksite and was organizing the upcoming work activity when the driver of the stake truck carrying the curb saw arrived. The driver pulled into the southbound deceleration lane (front of truck facing south). He positioned the truck as close as possible (just south) to the intersection. As he stopped, the driver turned on the yellow strobe light on the top of the truck. He exited the truck and then began to unload the saw machine.

The channelizer drums were being stored on the sidewalk about 25 feet west of the curb. As the stake truck driver was preparing to unload the saw, the decedent began to install the channelizer drums to form a lane taper in the southbound lane to allow room to unload the saw and to perform the curb replacement. It appears that the decedent's intent was to place the drums in a configuration to shift southbound Road A traffic into the left hand turn lane of northbound Road A. Prior to installing the channelizer drums in the southbound lane of Road A, the decedent did not, as required by the MMUTCD:

- install signs on the shoulders of both the northbound and southbound lanes of Road A in the Advance Warning Area to inform traffic what to expect

ahead. The “Be Prepared to Stop” sign on the west side of the southbound lane, south of the intersection was found lying face down on the shoulder. Grass discoloration was observed indicating that the sign has been lying on the ground for a period of time.

- did not place traffic signage on the eastbound and westbound shoulders of Road B
- did not have a flagman or traffic regulator to regulate traffic
- did not place channelizer drums in Road A’s northbound left-hand turn lane to “close the turn lane” prior to beginning to install the channelizer drums to create the taper in the southbound lane.

The decedent placed one channelizer drum at the sidewalk of the intersection. He then placed one at the rear of the truck. A portion of the tire rim of this drum was in the southbound active lane of travel. The third channelizer drum was placed several yards in front of the southbound facing truck in the southbound lane next to the double yellow line delineating the northbound left turn lane.

It is unclear if the decedent had the coat’s hood around his head, which could have limited his peripheral vision. The general contractor remembered the decedent having the coat hood around his head. The company owner indicated that the decedent’s work practice would be to not wear the hood.

The incident occurred as he was placing the fourth channelizer drum (Figure 3). It appears he was intending to place the drum in the roadway between the front of the stake truck and the drum placed at the double yellow line. The decedent walked with the drum from the sidewalk and then emerged onto the roadway from directly in front of the truck, moving west to east, across the southbound lane. Witness statements indicated that he looked to his left (north) and then immediately stopped and tried to reverse his direction. The witness noticed that the decedent’s feet, while attempting to run back toward the southbound road shoulder, touched the double yellow lines on the road.

The police report did not indicate from which road (Road A or a turn from Road B) the pickup truck was traveling. What is known is that the pickup truck was traveling southbound and entered the partially closed travel lane between the front of the stake truck and the drum located near the double yellow line. Responding police estimated that the pickup truck was traveling in a range of 36-42 mph at the point of contact with the decedent. The pickup truck, while attempting to brake, struck the decedent. The decedent was approximately 100 feet from the corner of the intersection when he was struck by the truck on the driver’s side. The decedent was thrown approximately 70 feet, landing on the asphalt. The truck skidded up onto the grassy area between the curb and the sidewalk.

Figure 3. Incident scene showing channelizer drum placement, location where decedent landed after being struck, and skid marks and final position of pickup truck

Police found fresh skid marks in the southbound travel lane. The skid marks started near the side of the stake truck and then veered to the right just past the front of the truck and ended at the west curb. It is unknown why the pickup truck veered to the west instead of veering to the east. It has been postulated that there was oncoming northbound traffic in the left-hand turn lane. The tire rim of the channelizer drum the decedent was moving was located along the skid path. The empty weight of the pickup truck was 6,850 pounds.

The decedent's brother indicated that he wished that the decedent had set up the site differently. The decedent's brother pointed out that this was a unique situation – timing, end of season, and weather. He wanted all employers and employees to know the importance of proper site preparation to minimize the risk of endangering themselves, "to prepare" before endangering themselves. He mentioned that prior to beginning the lane taper, the decedent could have directed the saw truck to park in the store parking lot and to await the arrival of all crewmembers. After all warning signs and the arrow board had been obtained and placed, the decedent could have then begun to minimize the risk to himself while placing the channelizer drums.

CAUSE OF DEATH

The cause of death as listed on the death certificate was blunt chest injuries with laceration of the aorta. Toxicology analyses indicated only medication consistent with emergency treatment.

RECOMMENDATIONS/DISCUSSION

- Road construction employers should ensure street construction work zones are set up in accordance with the Michigan Manual on Uniform Traffic Control Devices (MMUTCD).

The U.S. Department of Transportation's (DOT) *Manual on Uniform Traffic Control Devices (MUTCD)* sets forth the basic principles that govern the design and usage of traffic control signs and devices. The 2003 edition of the federal MUTCD was adopted as the official manual for a uniform system of traffic control devices for the State of Michigan subject to amendments adopted in the Michigan Supplement to address unique State laws and policies. Taken together, the Michigan Supplement and the National Manual became the *2005 Michigan Manual on Uniform Traffic Control Devices (MMUTCD*) (http://mdotwas1.mdot.state.mi.us/public/tands/plans.cfm). Part 6 of the MMUTCD provides specific work zone designs to be used during roadway construction, maintenance, and utility operations. To help ensure employee safety while performing these and other roadway operations, employers should follow the MMUTCD minimum standards and guidelines recommended in Part 6.

The MMUTCD may be downloaded from the Internet or purchased. To download the MMUTCD, click on http://mdotwas1.mdot.state.mi.us/public/tands/plans.cfm. In the box at left, click on MMUTCD, and then click on Manual. Click on the Search button at the bottom of the box on the left side of the page. Individual files (including Part 6) may be opened by clicking the on the links in the Title column for each Plan. Checkboxes on the left may be used to check the files to be downloaded, and then click the Download Checked Files button. The MMUTCD may also be ordered and purchased as a hard copy by accessing http://www.michiganltap.org/pubs/mmutcd_2005.html

The company owner indicated that the curb replacement was considered "short duration" work. The MMUTCD defines short duration work as work that occupies a location up to one hour. The curb work to be performed would be better defined as short-term stationary because it would have been daytime work that occupies a location for more than one hour within a single daylight period. The MMUTCD considers most maintenance and utility operations as short-term stationary work. More extensive temporary traffic control is required than if the work was considered short-duration work.

At a minimum, traffic volume, speed limit, existing road configuration and location where the work will be performed should be considered when determining the type and configuration of temporary traffic control devices. At the intersection, Road A had three lanes; a right hand turn lane, a travel lane, and a left-hand turn lane. The curb

replacement was very close to the intersection. Figure 6H-24, Half Road Closure on Far Side of Intersection (MI) (TA-24) would be a protective temporary traffic control device setup for the workers performing the activity. If the additional traffic control devices as designated in the MMUTCD had been used, there would have been additional warning for the driver of the pickup.

- Road construction employers should develop, implement, and enforce a comprehensive safety program that includes training on hazard recognition and avoidance of unsafe conditions. Training should include the hazards of work zone activities and Worker Safety Considerations as outlined in the MMUTCD Part 6, Section 6D.03.

Employees who are required to complete tasks in and around roadways are exposed to multiple hazards, one of which is being struck by oncoming motor vehicles. The employer had a health and safety program, but had not provided comprehensive training to the workers, including the decedent who was acting as the foreman, as to how to evaluate and set up temporary traffic control. The firm's safety manual mandated that the position of existing traffic control devices be kept in place.

A comprehensive written safety program that includes training on requirements of MMUTCD, Part 6, Section 6D.03 Worker Safety Considerations as well as hazard recognition and avoidance of unsafe conditions in work zones should be provided. Training workers in roadway work zone safety, including work zone set up and design and appropriate personal protective equipment, would provide these workers the knowledge to better protect not only themselves, but also the pedestrians and motorists in the communities in which they work.

The MMUTCD Section 6D.03 lists the following program elements that should be considered to reduce such a risk to personnel in a work zone: (1) employee training, (2) worker safety apparel, (3) temporary traffic barriers, (4) speed reduction, (5) activity area, and (6) worker safety planning. Additional elements that may be considered to improve worker safety are (1) shadow vehicle, (2) road closure, (3) law enforcement use, (4) lighting, and (5) special devices (e.g. rumble strips, changeable message signs, hazard identification beacons, flags and warning lights, and intrusion devices).

The application of each program element should be considered in the bidding of project work and adequately applied by work crews as the project progresses. Safety and crew management personnel should be sufficiently familiar with these elements and the options they provide, and they should be capable of deploying the appropriate protective measures in accordance with the pre-established work plan or otherwise in an abnormal or unusual circumstance.

Hazard recognition training should be based on an evaluation of the tasks employees will perform for all potential hazards. These identified hazards and their controls should be incorporated into hazard recognition training. The training should also include specific instructions that employees should not risk physical harm to accomplish tasks.

The employer should continue to retain the documentation of training program content, date of training, and employee attendance at the training sessions. Employers should ensure that the trainer who provides training is qualified through education and/or experience to conduct training.

There are several resources that can be found on the Internet that will assist employers in developing a roadway safety program for their employees.

- The Roadway Safety Awareness Program found at http://wzsafety.tamu.edu/training/courses_programs/rsa_program is available in English, Spanish, and Portuguese. This program provides an overview of common hazards in highway and road construction and prevention measures.
- National Institute for Occupational Safety and Health (NIOSH): Highway Work Zone Safety http://www.cdc.gov/niosh/topics/highwayworkzones/ has links to several highway work zone safety publications, educational materials and other general information. Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment (DHHS (NIOSH) Publication No. 2001-128 (April 2001). presents prevention measures to protect workers from hazards posed by construction vehicles and equipment as well as by traffic vehicles.

- Road construction employers should provide and ensure that employees wear appropriate personal protective equipment, including high visibility vests, when working along roadways.

The decedent was not wearing a safety vest as required by the company safety program ("when working around open traffic wear reflective safety vest or orange safety shirt").

The MMUTCD states that all workers exposed to the risks of moving roadway traffic or construction equipment should wear high-visibility safety apparel. The MMUTCD refers to the American National Standard Institute's standard for High–Visibility Safety Apparel (ANSI/ISEA 107-1999). The American National Standards Institute (ANSI) and the International Safety Equipment Association (ISEA) have published the ANSI/ISEA 107-2004 standard, which specifies different classes of high visibility safety garments based on wearer's activities. It was developed in response to workers who are exposed to low visibility conditions in hazardous work zones.

ANSI/ISEA 107-2004 recommends specific types of reflective equipment while working in or near moving traffic. Three classes of garments are specified based on the workers' activities. These classes are:

- Class III garments provide the highest level of visibility for workers who face serious hazards with high task loads that require attention away from their work where traffic exceeds 50 miles per hour (mph).

- Class II garments are intended for use where greater visibility is necessary during inclement weather conditions and when activities occur near roadways where traffic speeds exceed 25 mph.
- Class I garments **(not for use along highways and streets)** are intended for use in activities that permit the wearer's full and undivided attention to approaching traffic. There should be ample separation of the worker from traffic, which should be traveling no faster than 25 miles per hour.

The primary distinction of ANSI 207 versus ANSI 107 lies in the amount of fluorescent background material. ANSI 207 requires a minimum of 450 square inches. This would fall between ANSI 107 Class 1 (217 in^2) and Class II (775 in^2) garments. The minimum amount of required retroreflective area (207 in^2) did not change from ANSI 107 and 207. The difference in fluorescent material allow for design accommodation of equipment belts and for flexibility to incorporate colored panels to enhance easy, on-scene identification of wearers.

Class III garments provide the highest level of visibility to workers in high-risk environments that involve high task loads, a wide range of weather conditions and traffic exceeding 50 mph. Class III garments can provide coverage to the arms and/or legs as well as the torso, and can include pants, jackets, coveralls or rain wear. The standard recommends these garments for *all roadway construction personnel* and vehicle operators, utility workers, survey crews, emergency responders, railway workers and accident site investigators. These garments will assist approaching motorists to identify workers from a distance of approximately 1,300 feet.

The ANSI standard also states that a competent person designated by the employer should be responsible for selecting the appropriate class of garment for the workers. When the safety apparel is issued, employers should ensure that employees receive training that explains the purpose and use of their new high-visibility garments.

- Employers should consider all applicable elements of a traffic control management program in accordance with the degree of risk to personnel in a work zone.

Inattentiveness of the public motorist and consequent intrusion of the vehicle into the work zone might have been an underlying cause of this incident; however, driver behavior is not under complete control of the employer in the work zone. Accordingly, employers must protect work crews by planning for and providing traffic control devices that are appropriate for the conditions of and tasks within the work zone. Proper warning signs, adequate barriers or barricades, and temporary lane closure, all of which are acceptable methods should be implemented.

The decedent may have considered the placement of the channelizing drums as a “routine” activity. The drum placement activity, in reality, is a “high risk” activity. High-risk operations, for purposes of this discussion, are situations in which workers must be positioned, unprotected by a physical barrier, within six feet of an active traffic lane with

a speed limit in excess of 30 miles per hour. At a speed of 45 miles per hour, a driver need only veer 1.7 degrees from the roadway edgeline for a time period of three seconds to collide with an object that is six feet outside of the edgeline. This slim margin for error, combined with the force generated by a heavy vehicle traveling at this speed, defines an extremely critical risk for an exposed worker by every credible risk assessment model.

REFERENCES

MIOSHA standards cited in this report may be found at and downloaded from the MIOSHA, Michigan Department of Labor and Economic Growth (DLEG) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Labor and Economic Growth, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

- MIOSHA Constructions Safety and Health Division, Signals, Signs, Tags, and Barricades, Part 22, Rule 2223(1)
- 2005 Michigan Manual of Uniform Traffic Control Devices (MMUTCD) (http://mdotwas1.mdot.state.mi.us/public/tands/plans.cfm).
- The National Work Zone Information Clearinghouse. Roadway Safety +: A Road Construction Industry Safety Consortium Program. http://wzsafety.tamu.edu/training/courses_programs/rsa_program
- California FACE Case Report: 04CA008 – A Construction Laborer Died When He Was Struck by a Fast Moving Vehicle as He Crossed the Roadway in a Street Construction Work Zone. http://www.cdc.gov/NIOSH/face/stateface/ca/04ca008.html
- Massachusetts FACE Case Report: 06-MA-027 – A Municipal Worker Struck by a Motor Vehicle While Patching a Pothole. http://www.cdc.gov/niosh/face/stateface/ma/06ma027.html
- Oklahoma FACE Case Report: 03-OK-098-01 –Hispanic Laborer Died After Being Struck by a Vehicle in a Roadway Work Zone. http://www.cdc.gov/Niosh/face/stateface/ok/03ok098.html

Key Words: Highway Work Zone, Road Construction, Struck By, Channelizer Drums

MIFACE
Investigation Report #07 MI 169
Evaluation

To improve the quality of the MIFACE program and our investigation reports, we would like to ask you a few questions about this report:

Please rate the report using a scale of:	**Excellent**	**Good**	**Fair**	**Poor**
	1	2	3	4

What was your general impression of this MIFACE investigation report?

Excellent	**Good**	**Fair**	**Poor**
1	2	3	4

Was the report…	**Excellent**	**Good**	**Fair**	**Poor**
Objective?	1	2	3	4
Clearly written?	1	2	3	4
Useful?	1	2	3	4

Were the recommendations …	**Excellent**	**Good**	**Fair**	**Poor**
Clearly written?	1	2	3	4
Practical?	1	2	3	4
Useful?	1	2	3	4

How will you use this report? (Check all that apply)

- ❑ Distribute to employees
- ❑ Post on bulletin board
- ❑ Use in employee training
- ❑ File for future reference
- ❑ Will not use it
- ❑ Other (specify) _____

Thank You!

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Comments:

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