

REPORT#: 17MI012

REPORT DATE: 6/25/2019

INCIDENT HIGHLIGHTS



DATE:
Winter, 2017



TIME:
10:30 a.m.



VICTIM:
County Road Division
Worker in his 40s



INDUSTRY/NAICS CODE:
Public Administration/92



EMPLOYER:
County Road Commission



SAFETY & TRAINING:
Cold Patch Operations



SCENE:
Five Lane Roadway



LOCATION:
Michigan



EVENT TYPE:
Struck By/Motor
Vehicle/Crush



County Road Division Worker Crushed Between Asphalt Truck and Shadow Truck During Rolling Cold Patch Operation

SUMMARY

In winter 2017, a male county road division worker in his 40s died while conducting rolling cold patch activities on a five lane roadway. The decedent was a member of a 5-person crew: a supervisor ahead of the work operation identifying areas in need of repair; a lead truck driver hauling an asphalt-filled trailer; the decedent and a coworker, both on foot, shoveling and spreading asphalt; and a shadow truck driver hauling an arrow board. The work operation had slowed as it approached an intersection. The shadow truck driver leaned over to retrieve a water bottle which had fallen to the floor. As he did so, the shadow truck picked up speed... [READ THE FULL REPORT](#) > (p.3)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- No spotter was utilized for the workers on foot in violation of road commission policy
- Both workers on foot had their backs facing the shadow truck
- Shadow truck driver not attentive to work activities [LEARN MORE](#) > (p.11)

RECOMMENDATIONS

MIFACE investigators concluded that, to help prevent similar occurrences, employers should:

- Ensure all workers follow established standard operating procedures. [LEARN MORE](#) > (p.11)

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State **FACE** Program

Fatality Assessment & Control Evaluation

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SUMMARY

In winter 2017, male county road division worker in his 40s died while conducting rolling cold patch activities on a five lane roadway. The decedent was a member of a 5-person crew engaged in a rolling (continually moving) cold patch operation to repair potholes in a roadway. One crew member, the acting foreman, was driving the lead vehicle spotting the roadway for potholes and radioing back to the asphalt truck driver identifying roadway to be patched. Behind the asphalt truck with its attached trailer filled with asphalt were the decedent and another coworker, one of whom should have been acting as a spotter. Both were conducting cold patch activities, using shovels to obtain asphalt from the trailer and filling potholes at the time of the incident. The fifth member of the crew was the driver of the back-up vehicle, which had an arrow board to alert approaching drivers to the road patch work ahead and to protect the individuals on foot conducting cold patch activities. The sequence of events leading to the fatal incident are unknown; the police report indicates that the driver of the backup vehicle was attempting to retrieve a water bottle when the incident occurred and, according to the road commission, the driver fell asleep. The backup truck drove forward and did not stop. The truck struck and pinned the decedent against the asphalt trailer and struck his coworker. Feeling the collision, the driver of the lead asphalt truck placed the truck in neutral, set the air brake and left the vehicle. EMS was called and both workers were transported to a local hospital. One worker died as a result of the collision and one worker was severely injured.

INTRODUCTION

In winter 2017, a male county road division worker in his 40s died while conducting rolling cold patch activities on a five lane roadway. MIFACE learned of this incident from the MIOSHA fatal alert notification. MIFACE personnel accompanied the MIOSHA compliance officer to the county road division maintenance facility and explained the research program to a county representative at the facility, who agreed at that time to a MIFACE site visit. The county representative accompanied the MIFACE researcher to see the shadow truck involved in the incident and agreed to allow MIFACE to take pictures of the truck. The representative also shared the revised Cold Patch standard operating procedure with the MIFACE researcher. MIFACE reviewed the death certificate, medical examiner, hospital and police reports and the MIOSHA compliance file during the writing of this report. Pictures used in the report are courtesy of the responding police department, MIOSHA, and pictures taken at the time of the MIFACE site visit.

EMPLOYERS

The county road division was a department in the county's Department of Public Services. The roads division was formed in the 1950s and is responsible for the maintenance of approximately 1,440 county primary and local roadways and 462 miles of state trunk lines and freeways. The decedent was one of 48 employees at the maintenance facility and one of 500 employees in the road division.

The decedent was the third county road division worker to die conducting road patching tasks since 2000. All three individuals died after being hit by trucks driven by coworkers while patching roads.

MIFACE investigated the second incident (MIFACE Investigation Report [03MI005](#): Worker Dies As a Result of Being Struck and Pinned Between Two Vehicles While Repairing Potholes) and found that after the first fatality, which occurred in 2000, the county developed a training program addressing the cold patch work procedures, but it was never effectively implemented; the training had reverted to on-the-job training (OJT) given by the job foreman. It was not known if the worker in the 2003 incident received the training because no records were kept of OJT. The county had also indicated that they would test and install proximity sensing devices after the first fatality, but none had been installed on any of the

trucks in use. Appendix A in MIFACE Investigation Report 03MI005 contains vehicle placement guidelines dated 1/10/2003 for Back Up/Shadow Vehicles and Safety Guidelines for Cold Patching Operations dated 2/19/2003 that are specific to the function being performed (workers on foot (that included the requirement of a spotter) and vehicle drivers).

After the second fatality, the county was required to implement the following abatement measures:

1. Develop and implement an effective training program for cold patch repair crews and a tracking system for scheduling and documentation;
2. Train all road repair employees including summer-hired seasonal workers as well as fulltime workers in safe procedures for cold patch repair in a timely manner;
3. Use an observer/spotter (5th person added to crew) for cold patch repair to oversee operation and ensure appropriate procedures are being adhered to. This spotter is stationed between the trucks in the same area as the cold patch applier;
4. Install proximity alarms on road repair vehicles and continue to test devices to find the most effective one for the conditions under which it will be used.

Following the second fatality the county requested and received proposals from collision warning system vendors. The county selected a vendor that provided a radar-based warning system and installed the system on a trial basis on 15 work fleet vehicles to detect and alarm the presence of personnel at a minimum of 15 feet in front of the backup vehicle in order to avoid any type of vehicular crush/pinch point incident. However the system was deemed ineffective and removed from the vehicles. Several problems (see below) were encountered implementing the system.

- Drivers disconnected the units due to the sensitivity of the sensor (near constant beeping) and its inability to distinguish between potential hazards and non-hazards.
- Snow and ice removal operations cause failure of the installation bracketing.
- Issues with the location of the antenna: depending upon location, there was no detection of objects that are near the vehicle on the left or right side.

The shadow truck in the third incident (this fatality) was not equipped with a collision warning system.

WRITTEN SAFETY PROGRAMS and TRAINING

The county had an employee handbook for the Department of Public Service employees. The handbook contained general safety rules on multiple topics, including but not limited to: eye, foot, reporting injuries, personal protective equipment, machine safety, compressed air, no jumping on/off vehicles, tool misuse, compressed gas cylinders, housekeeping, hazard communication, lockout/tagout, emergency procedures, and workplace violence. All employees undergo a 2-hour new employee safety orientation which reviews these general rules.

The maintenance garage, out of which the decedent worked, had a safety engineer responsible for administering the safety program. The roads department had a written safety program in English. The senior employee on a work crew is responsible for enforcing safety on the job. The Safety Committee at the maintenance garage was composed of management personnel only. The Committee met bi-weekly.

Safety training, including Commercial Driver's License (CDL) training for truck drivers, was performed in house. All county drivers were required to have current CDLs. The drivers took the state exam to obtain their license. The safety training was provided by employer and included both classroom training and on the job. The "road group" had "safety

themes.” The cold patch training was included in the theme “Snow and Ice”. There were written safety guidelines for cold patch operations; one written procedure for drivers and one written procedure for workers on foot. Both of these procedures required both the trainer and the employee to sign and date and identify the yard to which the worker was working from. Management told the MIFACE researcher that training records were maintained and that the employees involved (with the exception of the coworker on foot) had received and signed off on the cold patch training. When the MIOSHA compliance officer requested such records and noted they could not be found.

The Roads Division had written “Guidelines for Back Up/Shadow Vehicles” which included general safety rules. The intent of the guidelines was to give a basic understanding of where a shadow vehicle should be placed during work on active road systems, recognizing that roll ahead space distances varied based on the traffic volume, type of road system, weather conditions, intersections, etc. Some examples of Guidelines for Back Up/Shadow Vehicles general safety rules: 1) When being used as a back-up and or shadow vehicle, the truck should be loaded; 2) When possible, all vehicles should be stopped during patching operations; 3) When possible and safe, maintain a minimum of 2 skips roll ahead space. When circumstances dictate closer distances, a minimum of 30 feet should be maintained (if you can’t see the patcher’s feet, you are probably too close); 4) Plow rams should be folded down and secured when not in use; 5) When stationary, the service brake shall be set and the front wheels turned away from traffic on back-up trucks, etc. The rules also contained roll ahead distance for varying shadow vehicle weights and speed limits of the roadway.

New employees ride along with experienced drivers to learn the job before performing the work. Additionally, the representative stressed to the MIFACE researcher that workers were not allowed to use cell phones, headphones or have other distractions while out of vehicle in work mode.

In addition to the above procedures, the roads division also had a standard operation procedure identifying work activities for Scheduled Road Maintenance Work Requiring 15 Minutes Or Less To Complete. Cold Patching was identified in this procedure and the required protection for cold patching on a major road (state trunk lines and paved county roads as shown on the most recently published County Highway map) was a back-up dump truck or equivalent with flashing, rotating or oscillating amber lights and lighted arrow panel or two roto-beam lights and warning sign at the rear of the truck.

WORKER INFORMATION

The decedent was hired in May 1991, but had been laid off for a period of time, and then hired back in 2010. He had worked full-time for the road division for 18 years. His work hours were 7:30 a.m. – 4:00 p.m. He was a member of a union. His job title was public service maintenance worker (PSMW). He was wearing eye protection, foot protection and a high visibility vest. MIFACE interviews with coworkers indicated he was a **highly regarded worker and did not have to do manual labor because he could drive trucks and operate heavy machinery/equipment**. The decedent volunteered to work that day; he was not scheduled to work. He had a valid commercial driver’s license (CDL).

The decedent’s coworker who was also spreading cold patch material at the time of the incident had been with the county since December 2016. The coworker, whose job title was laborer, had been assigned the role of the spotter for the shift during which the incident took place. The coworker indicated his work with the road division encompassed applying cold patch, repairing/maintaining/installing guard rails, and performing snow and ice removal. He did not recall seeing any safety guidelines for cold patching operations. He had received verbal instructions on the cold patch operations by his manager prior to his initial participation, was shown by a supervisor how to do it over the course of a couple of days, and had logged over 60 hours of cold patching prior to the incident.

The acting foreman/supervisor was in a van ahead of the dump truck hauling the trailer of cold patch material scoping out areas to be repaired. No foreman/supervisor-specific training was provided. The foreman/supervisor was routinely the most senior crew person. The county relied on the senior crew member's experience and competency to run the crew.

The shadow truck driver was also a PSMW and had 22 years as a truck driver with the county. As required of all county drivers, he had a valid CDL. The 10-yd shadow truck he was driving was weighted down with gravel (to absorb possible impact energy) and it pulled an arrow board.

INCIDENT SCENE

There were 2 lanes in each direction with a middle turn lane. The speed limit for the roadway was 45mph. The rolling patch operation was based in the far right lane traveling eastbound. The roadway was dry.

The 2013 International 7600 shadow truck was trailing the operation by approximately 10-15 yards. The plow ram was folded down on the front of the truck. The county was adhering to the requirements of the Scheduled Road Maintenance Work Requiring 15 Minutes or Less to Complete standard operating procedure.

WEATHER

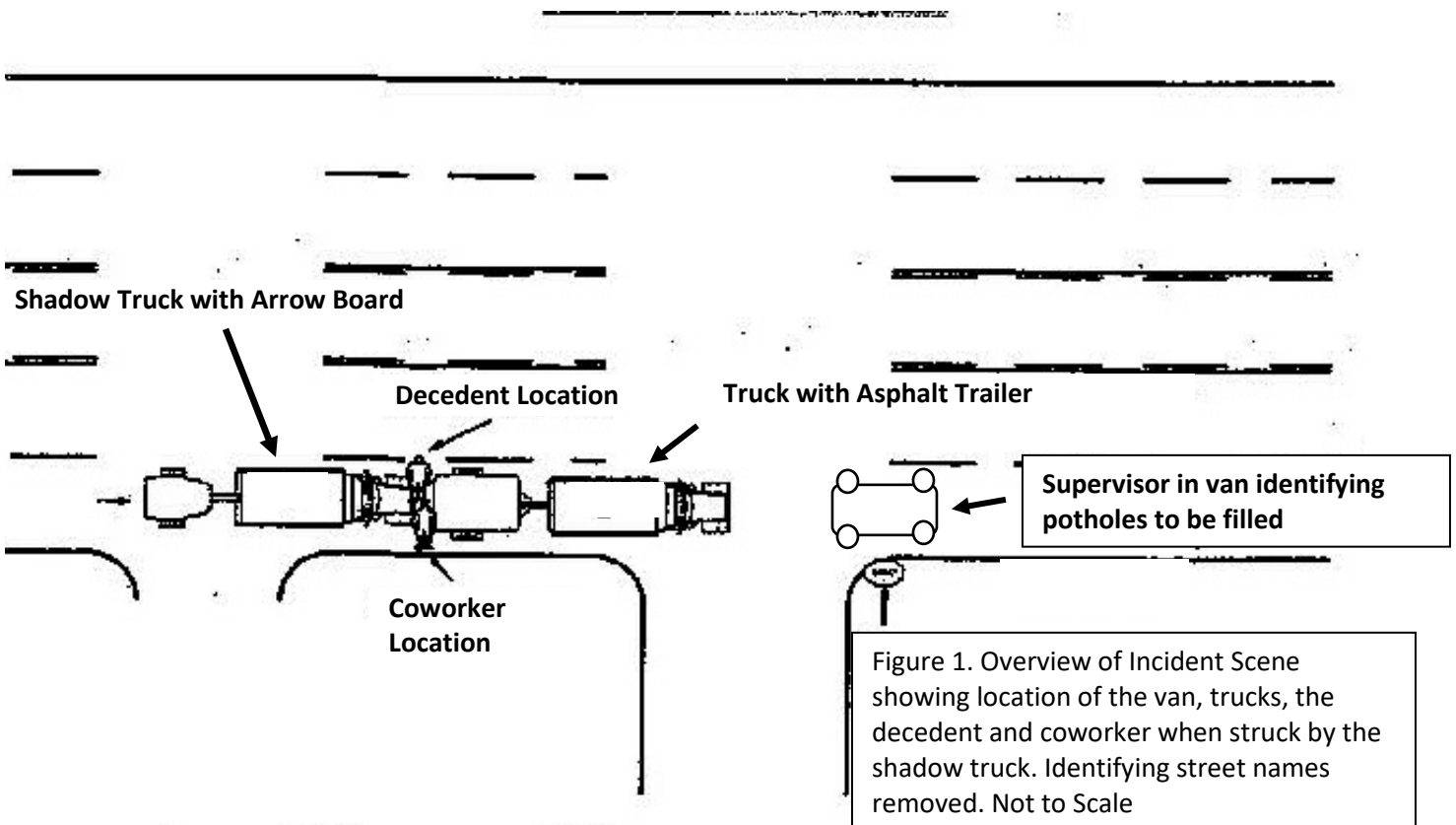
Weather Underground was utilized to check the weather conditions on the day of the incident. The weather on the day of the incident was in the high 20s-low 30s 42 degrees Fahrenheit with sunny skies. [[Weather Underground](#)]

INVESTIGATION

The department manager designated the work assignments for the day. The 5-member crew consisted of:

- Acting foreman/supervisor - he was in a work van approximately 10-15 feet ahead of the lead truck .The supervisor identified roadway areas in need of repair.
- Lead truck driver - hauling the asphalt-filled trailer.
- Decedent - individual applying road patch material.
- Spotter – 2nd worker on foot, also applying patch material.
- Shadow truck driver – driving 10-yard dump truck filled with gravel hauling an arrow board directing motorists to the left lane

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The standard operating procedure for road patching operations required two workers to spread the asphalt, but due to staffing issues, the department manager designated only one worker, the decedent, to spread asphalt. The crew left the yard after receiving instruction from the department manager at approximately 8:30am. His coworker on foot was designated to be the spotter.

The standard operating procedure permitted workers to rotate jobs during the operation. The crew supervisor was responsible to decide when the workers on foot and the drivers could change roles; employees noted that driving the shadow truck could become monotonous. The crew supervisor decided that the workers would change roles after lunch.

The operation being performed was a “rolling operation” meaning the vehicles were in continuous motion at walking speed (approximately a 3mph pace). The operation continued to move unless an area required additional cold patch, traffic issues made it unsafe to apply patch material, the presence of intersections, or other activities that would affect continuous motion. The vehicle drivers were in communication via radios. The worker spreading cold patch and the spotter used hand signals to communicate with the truck drivers. The worker spreading cold patch (patcher) was responsible for communication with the truck driver hauling asphalt and determined when it was necessary to stop the rolling operation to permit additional time to apply the patching material. The truck driver hauling the asphalt used his

driver's side mirror for the patcher's hand signals. The hand signals used by the patcher and the spotter to the truck drivers were agreed upon prior to beginning the work operation.

The crew had been working, proceeding eastbound, for approximately two hours when the incident occurred. The decedent's coworker was not acting as the designated spotter; he was also spreading cold patch material. Pothole patching was being performed in a "throw and go" technique: the cold patch was shoveled into an unprepared pothole until the pothole was filled. Compaction was left up to traffic. Both workers on foot were wearing high visibility vests.

The cold patch instruction indicated that workers could patch "1 ½ lanes". The 1½ lanes in the cold patch instruction was not consistently understood by employees. One individual indicated that 1½ lanes meant an individual could patch the lane the truck was in and ½ of the lane next to that lane. Another individual indicated that 1½ lanes meant the entire lane next to the lane the truck was traveling in and an additional half of the next lane.

In 2003 the road division issued shadow truck guidelines. It was apparent through MIOSHA interviews with employees that they did not know the recommended distances for the shadow trucks during the work operation. For example, one employee indicated that the shadow truck distance was about 2 skips (the white paint marking on the pavement) or traffic flow at the time that causes the truck to be closer to the walkers. Another employee indicated that the shadow truck driver, as a Rule of Thumb, should be able to see the feet of the workers on foot. Another truck driver indicated that the distance varies due to traffic, road type, 5-10 feet... 15 feet max. All employees indicated that adjustments to spacing were made near "crush zones" such as intersections, and that they must be more alert when in these areas.

In a surveillance video from a camera mounted on an exterior wall from a nearby business, the viewer could see the work convoy's lead vehicle, the truck hauling asphalt, and the two workers. The shadow truck was out of view of the camera. The work convoy was approaching an intersection.

The decedent had just filled a pothole in the middle lane (i.e., crossed the open travel lane next to the truck and filled a pothole in the middle turn lane). He walked back to the asphalt trailer. It appeared he looked back briefly in the direction of the shadow truck; he may have been checking for traffic and/or the position of the shadow truck.

While the decedent walked back to the asphalt trailer, the coworker had his back to the shadow truck. The decedent was positioned near the middle of the asphalt trailer and the coworker was positioned to the right of the decedent, a step or two behind him. The decedent placed his shovel into the asphalt trailer. Both workers had their backs to the shadow truck.

The shadow truck rapidly enters the view of the mounted business camera. The shadow truck driver does not apply the brakes and strikes both of the workers on foot as well as the cold patch trailer.

The actual sequence of events is unclear. The shadow truck driver indicated to the police that because the work operation was approaching the intersection, he sped up to close the gap to protect the two workers on foot. He dropped his water bottle and it rolled under the gas pedal. He was attempting to retrieve the water bottle when the plow attachment on the front of his truck struck the decedent and pinned him against the asphalt trailer. The road commission representative indicated to the MIFACE researcher that the driver fell asleep.

The plow attachment on the passenger side of the shadow truck struck the decedent's coworker, who was able to escape from being pinned against the asphalt trailer; he sustained serious injuries.

The driver of the asphalt truck felt "a bump". He moved the truck forward, placed the truck in neutral, set the air brake and got out of the truck. The supervisor driving the van heard the collision, stopped the van, exited the van and went to the scene. The shadow truck driver backed his truck up and saw the two workers; the decedent laying on the ground and the other worker on foot, who was sitting on the sidewalk.

Witnesses to the incident attended to the two injured workers while others called for emergency response. Emergency responders arrived shortly thereafter. The decedent and his coworker were transported to a nearby hospital. The decedent was declared dead at the hospital.

The shadow truck driver was charged with reckless driving causing death and serious impairment and causing death and injury in a work zone. He pleaded guilty to a moving violation causing the death of a construction worker. He was sentenced to 18 months to 15 years in jail.

MIOSHA Citations

MIOSHA General Industry Safety and Health Division issued the following Serious citation at the conclusion of its investigation.

Serious: MICHIGAN OCCUPATIONAL SAFETY AND HEALTH ACT, ACT 154, RULE 408.1011(a): An employer shall furnish to each employee, employment and a place of employment that is free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to the employee.

The employer did not furnish to each employee, employment and a place of employment that is free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to the employee, in that the employees were not protected from the hazard of being struck by trailing vehicles during the cold patching work operations. On or about *date 2017*, at approximately 10:30AM, EST, while performing cold patch operations, two employees were struck by a shadow truck, resulting in an employee sustaining fatal injuries and the second employee being hospitalized during the performance of the cold patching operation. During operation, work procedures were not implemented to maintain a safe working distance between laborers and the shadow truck, exposing employees to being struck by moving vehicles. (*MIFACE removed the date of the incident*).

Among others, one feasible and acceptable method to correct this violation may include, but are not limited to, the following:

- a. Designate roles within the work crew and require specific employees to perform as a safety spotter maintaining the required distance between employees performing cold patch operations and the shadow truck.
- b. Utilize the current technology for a collision avoidance system on shadow trucks.

- c. Conduct periodic evaluation of the operations to ensure established operating work procedures are being performed.

MIOSHA General Industry Safety and Health Division also issued the following Safety and Health Recommendation to the employer:

An inspection/investigation of your worksite revealed the following conditions that may constitute a safety or health hazard to your employee(s):

During cold patching operations, the public service maintenance workers applying the material are exposed to vehicle movements of the shadow truck and trailer hauler vehicles. It is recommended that research, testing, and acquisition of current technology for collision avoidance be performed to protect these employees.

COMPANY REMEDIATION

The Incident County personnel made the following changes to the Cold Patch Safety Guidelines.

1. Defined the word “distraction” in relation to the spotter’s duties. OLD: “The spotter’s duties include watching oncoming traffic, watching the back-up vehicle position and communicating with the crew. Spotters shall be alert to those tasks at all times and not be engaged in distractions nor carry shovels.” NEW: Additional language will be added that states “distractions are defined as talking, eating, drinking, telephone usage or focusing on anything other than the primary task of the spotter.”
2. Clearly defined the need for role changes during the shift. OLD: “Roles shall be changed at intervals during the shift at the discretion of the crew leader (Foreman). The Foreman shall ensure that each role is filled at all times.” NEW: Designate roles within the work crew and require specific employees to perform as a safety spotter maintaining the required distance between employees performing cold patch operations and the shadow truck.

NOTE: Please see Attachment #1 for the updated version of the Safety Guidelines for Cold Patching Operations.

3. Following a successful trial of a collision avoidance system on two backup trucks, the County has committed to install a collision avoidance system on 50 trucks. The collision avoidance system uses artificial vision sensors to view the road ahead and warn drivers with real-time visual and audible alerts if a threat is detected. The system interprets the driving scene to identify other vehicles, cyclists, pedestrians, lane markings and speed limit signs and provides vial time to react and avoid a potential collision. The collision avoidance system features consist of forward collision alert, lane departure alert, headway/following distance alert, pedestrian and bicycle alert, hi-beam alert and speed limit indication. Utilized the current technology for a collision avoidance system on shadow trucks.
4. Periodic evaluation of the operations to ensure established operation procedures are being performed.
 - Each District (Department) Manager is now required to perform daily inspections of all roadway operations (including cold patch crews) in their districts to ensure all safety procedures are being performed. The *Incident* County Safety Engineer will also conduct periodic evaluations of al roadway operations including cold patching. Failure to comply with or enforce all safety procedures results in disciplinary actions to the non-compliant parties.

- The Roads Training Manager and Safety Engineer shall provide refresher trainings on the cold patch procedures at the various yards on a quarterly basis. Refresher training includes distances (tighter in low-speed areas; shadow vehicle drops back in high-speed areas). Disciplinary action for noncompliance will also be discussed at those trainings.
 - After receiving Cold Patch Training, each employee is required to sign it as acknowledgement that they understand it.
5. The director ordered everyone to be retrained on cold patch procedures and any individuals not working at the time were trained when they returned.
 6. All existing Roads Division employees performing cold patching received refresher training on the procedures, and signed the forms acknowledging his/her receipt of the training. The cold patch procedures have been included in the New Roads Employee Safety Training and all new employees sign the cold patch procedure forms as acknowledgement. These records are maintained by Administration at both the Roads Division and the Department of Public Service. Additionally new employees take a quiz at the completion of that training and sign an Acknowledgement of Attendance form upon completion of the training which is filed with the County Personnel Department. Cold patch refresher training for all Roads employees, reviewing the procedures occurs annually at the yards during their Snow and Ice/Safety meetings.
 - a. Training includes distances between lead and shadow trucks (tighter in low-speed areas; shadow vehicle drops back in high-speed areas).

CAUSE OF DEATH

The death certificate listed the cause of death as multiple injuries. The decedent was not tested for illegal drugs or prescription or over-the counter medications.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. The following unrecognized hazards were identified as key contributing factors in this incident:

- *No spotter in violation of road division policy*
- *No collision warning system installed on shadow truck*
- *Shadow vehicle not placed in neutral while patching activities took place*
- *Shadow vehicle not placed in park prior to reaching for bottle which fell to floor*
- *Vehicle drivers/spotter/patcher communication*

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Use a job hazard analysis (JHA), the Michigan Manual of Uniform Traffic Control Devices (MMUTCD), and the Michigan Department of Transportation (MDOT) Maintenance Manual to develop and implement standard operating procedures for rolling (mobile) operations.

Discussion: Although the employer had developed standard operating procedures for a rolling operation, the procedures were not followed by the road crew involved in the incident. All crew members were present at the morning's daily

briefing when job roles were assigned. It is unknown if the road supervisor was aware of the spotter conducting patching activities. Additionally, the decedent's coworkers as well as the decedent did not notify the supervisor to inform him/her that the spotter was not performing his/her duties. Both workers had their backs to the shadow truck, in violation of the standard operating procedure, so neither employee was aware of the encroaching shadow truck.

Recommendation: Revise safety procedures for cold patching operations for PSMWs and laborers to specify a more structured use of job rotation and the distance of the lane into which a patcher may enter.

Recommendation: From a manpower standpoint, the individual sitting in the passenger seat "acting as a second set of eyes" is not labor efficient, both in terms of cost and safety. Labor costs increase as the number of personnel increase. Although the passenger in the shadow truck can watch the shadow truck driver to ensure he/she is not distracted and ensure the shadow truck stays a sufficient distance from the lead truck/workers, a more structured use of job rotation can assist to ensure all workers stay vigilant.

MIFACE recommends that the roads division utilize job rotation and/or mini-breaks to minimize the recognized hazard of monotony and complacency of all of the road patch crew. Offering "micro-breaks", short stretching or walking breaks (not 15 minute breaks) and/or rotating workers more frequently, for example, every hour, rather than at the discretion of the supervisor will give workers the opportunity to move, re-engage, re-focus, and also minimize ergonomic stressors (such as repeated back strain shoveling patch). This would be particularly important for the spotter and the shadow truck driver – the two workers assigned to ensure safety of the patcher.

The amount of lane into which the patcher may enter was unclear at the time of the incident. MIFACE spoke with several individuals not associated with the county road commission. These individuals were familiar with road patching work. MIFACE read Rule 12: *Workers should work an area of no more than a lane and a half when possible* from Attachment 2 (SAFETY GUIDELINES FOR COLD PATCHING OPERATIONS - (PSMW'S and LABORERS). The individuals came to different conclusions regarding what the instruction meant; whether the lane was the adjacent lane or the lane protected by the lead and shadow trucks. MIFACE recommends that the wording of this rule change to "Workers shall not work an area of more than one-half of the adjacent lane next to the lane occupied by the lead and shadow truck".

The roads division is planning to provide worker training with a diagram depicting the above area, but the safety guideline language is unclear as to what is expected.

Recommendation #2: The County should install visual or sensing devices on applicable mobile equipment to enhance the operator's ability to detect the presence of workers on foot near the machine.

Discussion: The County had successfully trialed a collision avoidance system that used artificial vision sensors to view the road ahead and warn drivers with real-time visual and audible alerts if a threat is detected. As of the date of the writing of this report, the purchase and installation of the sensors for 50 County trucks, are "on hold".

It is recommended that, when new trucks and equipment are purchased, visual and/or object sensing devices should be purchased as well.

Recommendation #4: The County should consider developing a county-wide distracted driving policy for all drivers operating motor vehicles on the road.

Discussion: The County does not have a distracted driving policy. Distracted driving is any activity that diverts attention from driving, including talking or texting on your phone, eating and drinking, talking to people in your vehicle, fiddling with the stereo, entertainment or navigation system—anything that takes your attention away from the task of safe driving. The National Highway Traffic Safety Administration estimates that the “secondary task distraction” of eating or drinking from an open container while driving increases the likelihood of near-miss crashes or crashes by nearly 39 percent. There are three common types of distractions that impair drivers’ abilities to safely operate their vehicles and avoid crashes:

1. Visual distractions occur when a driver’s eyes are diverted away from the road to complete or pay attention to another task.
2. Manual distractions require drivers to take their hands off of the wheel.
3. Cognitive distractions take a driver’s mind and focus away from driving.

A written policy might include both prohibited and restricted activities. [Road Safety at Work <https://roadsafetyatwork.ca/tool-kits/distracted-driving/distracted-driving-policy-examples/>](https://roadsafetyatwork.ca/tool-kits/distracted-driving/distracted-driving-policy-examples/) has two distracted driving policy examples which can be used as a starting point for the development of the county-wide policy.

The National Safety Council has a [distracted driver toolkit](#) which can be downloaded for free to assist employers wanting to establish a distracted driving policy for their business.

CDL drivers are made aware through training that using hand-held phones and radio devices is forbidden, subject to personal fines and suspension of CDL. The County also trains on the hazards of the distracted-driving epidemic, providing facts and instructing to always be alert while working.

Recommendation #5: Provide spotter training which includes, but is not limited to, duties, position, communication methods and safety drills between the spotter and the shadow truck and spotter and patchers.

Discussion: During the MIFACE site visit, supervisory personnel disagreed about the placement of the spotter during the work operation; whether the spotter goes into lane adjacent to the lane protected by the shadow vehicle, stay within the lane and be protected by the lead and shadow truck, or stand on the roadside shoulder. After the most recent fatality, the roads division determined, through extensive discussion, that the spotter should not enter the adjacent lane nor stand on the shoulder – the spotter should stay in the lane protected by the lead and shadow trucks and observe traffic and the shadow truck from this position.

The spotter duties are one of the critical safety elements in a rolling operation. Spotter training should not be taken for granted – Spotters must be constantly alert in the surroundings, particularly for vehicles approaching from each direction. This activity can be mentally taxing and cause mental distractions, one of which is complacency. All members of the work crew should participate in the spotter training when job rotation is incorporated.

All individuals, because of job rotation on the patching crew, should receive spotter training. Training should be documented. The following training must be reviewed with the importance of being understood: Training should include, but not be limited to: verbal signals between the spotter and worker(s), especially those words used for an emergency situation, hand signals used for the shadow truck, the significance of being constantly alert of the surroundings and vehicles approaching from each direction,

The county may wish to consider equipping spotters with a loud warning device rather than relying on verbal communication with the worker to warn of an emergency situation. A voice signal may be unheard or misunderstood. County may want to consider the use of an air horn or whistle to provide workers notice of an oncoming emergency so that the worker can take evasive action when necessary.

Additionally, the spotter uses county-wide standardized hand signals to communicate with the shadow truck driver, he/she uses verbal signals to the patcher, indicated “clear” to enter the adjacent lane to apply patch material. If the county determines that a verbal signal to the patchers will continue to be used for an emergency, then MIFACE recommends that the County establish a protocol word to indicate emergency and that crews “practice” an emergency situation as part of the spotter training. Safety drills are vital for all employees to know exactly what to do in the event of an emergency.

Recommendation 6: The Road Commission should reinforce to shadow truck drivers the roll ahead distance(s) the shadow truck should be from the work area.

Discussion: Shadow truck drivers had various opinions regarding the distance they should be from the lead truck and workers. The MDOT Maintenance Work Zone Traffic Control Guidelines offers guidance for distance, and relies on the judgement calls based on roadway speed, traffic volume, roadway configuration, etc. The preamble to the manual states: “This manual provides guidance to administrative, engineering and technical staff. Engineering practice requires that professionals use a combination of technical skills and judgment in decision making. Engineering judgement is necessary to allow decisions to account for unique site-specific conditions and considerations to provide high quality products, within budget and to protect the public health, safety and welfare. This manual provides the general operational guidelines; however, it is understood that adaptation, adjustments, and deviations are sometimes necessary.”

Table 4 in the MDOT Maintenance Work Zone Traffic Control Guidelines offers guidance on shadow vehicle distance from the work area. The shadow vehicle should be a loaded truck having 23,000 GVWR or greater with the brakes set, front wheels turned away from traffic and parked at the beginning of the roll-ahead space. The roll-ahead space is the space between the shadow vehicle and the work area. This additional space is needed only when a shadow vehicle is used. The speed limit on the roadway being patched was 45 mph.

Using skip lines as a rough estimator (guide, per Table 4), the shadow truck driver should maintain approximately three skip lines distance from the work area. It appeared in the video captured by the mounted building camera that the shadow truck was further than three skip lines from the work operation.

Table 4. Guidelines for Roll-Ahead Distances for Shadow Vehicles

Type of Activity	Prevailing Speed (Posted Speed Prior to Work Zone)	Weight of Shadow Vehicle	Roll-Ahead Distance (Distance From Front of Shadow Vehicle to Work Area)
Mobile	45 mph	5 Tons	100 ft
	50-55 mph		150 ft
	60-70 mph		175 ft
Stationary	40 or Less	5.5 Tons	25 ft
	45 mph	12 Tons	25 ft
	50-55 mph		25 ft
	60-70 mph		50 ft

ADDITIONAL RESOURCES

- Michigan Department of Transportation (MDOT). https://www.michigan.gov/mdot/0,4616,7-151-9625_54944---,00.html
- [MDOT Maintenance Work Zone Traffic Control Guidelines](#)
- Morrison, K. Distracted on the job: Identifying and minimizing worker distractions can help reduce injuries. Safety and Health Magazine, May 1, 2013. <https://www.safetyandhealthmagazine.com/articles/distracted-on-the-job>

DISCLAIMER

Mention of any company or product does not constitute endorsement by the Michigan FACE program or the National Institute for Occupational Safety and Health (NIOSH). In addition, citations to websites external to NIOSH do not constitute NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NIOSH is not responsible for the content of these websites. All web addresses referenced in this document were accessible as of the publication date.

REFERENCES

Weather Underground [2017]. Weather history for nearby weather station. The Weather Channel Interactive, Inc.

MIOSHA standards may be found at and downloaded from the MIOSHA, Michigan Department of Licensing and Regulatory Affairs (LARA) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to:



Michigan State University
Department of Medicine • Occupational and Environmental Medicine
909 Fee Road, 117 West Fee Hall • East Lansing, MI 48824 • 1-517-353-1846 • <https://oem.msu.edu>

Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling 517-284-7740.

- MICHIGAN OCCUPATIONAL SAFETY AND HEALTH ACT, ACT 154,

ACKNOWLEDGEMENT

The Michigan FACE Program would like to acknowledge the road commission representative for providing assistance and information for this investigation.

ATTACHMENT #1

SAFETY GUIDELINES FOR COLD PATCHING OPERATIONS

Prior to leaving the yard, Public Service Maintenance Workers shall-

1. Review and complete the vehicle pre-trip checklist. Special attention must be paid to warning lights, devices and air brakes.
2. Foreman and/or crew shall review the need for Personal Protective Equipment (PPE) {See Maintenance Memo 89-5}. Supply necessary PPE. All members of the crew shall review communication, such as hand signals.
3. Foreman and/or Supervisor shall make crew aware of safety concerns unique to the location of the work assignment.
4. All members of the crew shall identify responsibilities and assign roles to various members at this time.
5. Back-up trucks must be loaded appropriately.

On the Job-

1. The job, number and size of back-up trucks shall be in accordance with the ABC Guidelines (See Maintenance Memo 97-1).
2. No distractions, such as cell phones, headphones, newspapers, video games, etc., shall be used during patching operations.
3. Workers shall exit vehicle on the side away from traffic when possible.
4. Before patchers step between the vehicles, all crew members shall agree to the position and distance between the patch truck and the back-up truck.
5. Patchers shall not step between the vehicles until they receive confirmation from the driver that the back-up truck is properly distanced, put in neutral and the air brake is applied.
6. Back-up truck shall turn their wheels towards the shoulder or curb.
7. In rolling operation, patchers shall be aware of the traffic and potential “crush zones.”
8. The driver of the back-up truck shall be aware of the crew at all times.
9. All drivers shall respond to the patcher according to predetermined signals.
10. Rolling operation speed shall be set in order to allow patcher to keep up with the vehicle, i.e., “casual walking speed”.

Revised 05/14/18

ATTACHMENT #2

SAFETY GUIDELINES FOR COLD PATCHING OPERATIONS **(PSMW'S and LABORERS)**

1. All crew members will have on Personal Protective Equipment (vest, gloves, etc.)
2. All patch crews will have a spotter at all times during cold patch operations. (Spotter must remain alert at all times.)
3. The spotter's duties include watching oncoming traffic, watching the back-up vehicle position, and communicating with the crew. Spotters shall be alert to those tasks at all times and not be engaged in distractions, nor carry shovels.
4. Spotter should be the first to exit and the last to enter the vehicle.
5. All workers on crew shall identify responsibilities and assign roles to crew members prior to starting operation (such as spotters or patchers, etc.)
6. Roles shall be changed at intervals during the shift, at the discretion of the crew leader (foreman).
7. All workers on crew will review and synchronize all communications prior to start (such as hand signals or verbal commands).
8. Workers shall exit vehicles on the side away from traffic when possible.
9. Workers shall not step between the vehicles until they receive confirmation from the driver that the back-up truck is properly distanced, put in neutral, air brakes applied and the tires turned away from traffic.
10. In rolling operations, workers shall be aware of the traffic and potential crush zones (turn lanes, intersections, drive ways, etc.).
11. Workers should work from between the patch and back-up trucks when possible.
12. Workers should work an area of no more than a lane and a half when possible.
13. The speed during rolling operations shall be controlled by the workers not the drivers. (Casual walking speed.)
14. Workers shall not be distracted by cell phones, headphones, or be engaged in any distracting conversation while out of the truck in a work mode.

Trainer: _____

Date: _____

Trainee & Yard: _____

Date: _____

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ATTACHMENT #3

SAFETY GUIDELINES FOR COLD PATCHING OPERATIONS (DRIVERS)

1. Review and complete the vehicle pre-trip checklist. Special attention must be paid to warning lights, safety devices and air brakes.
2. Back up trucks must be loaded appropriately and plow rams should be folded down and secured.
3. All drivers on crew shall identify responsibilities and assign roles prior to starting operation. (Such as back-up, shadow, or working vehicles).
4. Roles shall be changed at intervals during the shift, at the discretion of the crew leader (foreman).
5. A second person shall be stationed in the passenger seat of the back-up truck, to assist as a look-out.
6. All drivers on crew will review and synchronize all communications prior to start (such as hand signals or verbal commands, etc.).
7. Shadow truck driver will make sure shadow truck is properly spaced, put in neutral, air brakes applied and tires turned away from traffic before signaling the worker to step between the trucks.
8. During rolling operations, drivers shall be aware of the traffic and potential crush zones (turn lanes, intersections, drive ways, etc.) so as to make adjustments in spacing when necessary.
9. All drivers will ensure proper spacing is maintained by actively communicating between vehicle's drivers.
10. All drivers shall remain focused on their job and be aware of workers at all times and shall not be distracted by cell phones, headphones, or be engaged in any distracting conversation while in work mode.
11. All drivers shall respond to the patcher according to pre-determined signals.
12. The speed in rolling operations shall be controlled by the workers not the drivers.
13. All warning devices (arrow boards, flashers, etc.) shall be checked for proper operation throughout each workday.

Trainer: _____

Date: _____

Trainee & Yard: _____

Date: _____

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