MICHIGAN State FACE Program
Fatality Assessment & Control Evaluation

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

REPORT#: 15MI061 **REPORT DATE:** TBD

Truck Driver Freeing Frozen Rear Brakes on a Dump Truck was Run Over When the Truck Rolled Forward

INCIDENT HIGHLIGHTS

DATE:
Late Winter/Early Spring, 2015

TIME:
7:25 a.m.

VICTIM:
Truck Driver

INDUSTRY/NAICS CODE:
Public Administration/92

EMPLOYER:
Public Works Dept.

SAFETY & TRAINING:
Commercial Driver's License

SCENE:
Public Works Yard

LOCATION:
Michigan

EVENT TYPE:
Motor Vehicle/Struck By

SUMMARY

In late winter/early spring 2015 a male truck driver in his 40s was run over when freeing a frozen, due to external weather conditions, rear passenger side brake of a 2006 Mack dump truck. A coworker asked the decedent to free up the brake while he watched "how it was done". The decedent asked his coworker to chock the tire and take off the air brake. The truck was on a slight incline, so his coworker chocked the back of the front right passenger tire. The decedent was using a small sledge hammer to tap on the brake drum. When the brake popped free, the truck rolled forward. ...
READ THE FULL REPORT> (p.3)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- The truck was parked in the public works yard for an extended period of time in adverse weather conditions.
- The truck was running, transmission in gear, and one wheel chocked in only one direction while the task was performed
- No standard operating procedure to minimize the likelihood of stuck/frozen brakes. LEARN MORE> (p.8)

RECOMMENDATIONS

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

- Establish written standard operating procedures to minimize the possibility of brakes freezing
- Develop safe work practices and train truck drivers and other appropriate personnel to safely free stuck/frozen truck or other vehicle brakes. LEARN MORE> (p.8)

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Michigan Fatality Assessment and Control Evaluation (FACE) Program

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SUMMARY

In late winter/early spring 2015 a male truck driver in his 40s was run over when attempting to free the frozen rear passenger side brakes of a dump truck. The brake was frozen due to cold winter weather. The decedent was asked by a coworker to free up the brake while he watched "how it was done". The decedent asked his coworker to chock the tire and take off the air brake. The truck was on a slight incline so his coworker chocked the back of the front right tire. His coworker released the air brake but did not take the truck out of drive. The decedent was using a small sledge hammer to tap on the brake drum. When the brake popped free, the truck rolled forward, over the decedent and his coworker's leg. The truck came to rest across the street against a wall. Emergency response was called. He was declared dead at the scene.

INTRODUCTION

MIFACE personnel contacted the employee representative who agreed to be interviewed by MIFACE personnel. MIFACE reviewed the MIOSHA compliance officer file, death certificate and police report during the writing of this report. Pictures used in the report are courtesy of the responding police department and pictures taken by the MIFACE researcher at the time of the site visit.

EMPLOYERS

The decedent worked for a city's public works department. The public works department had been in existence for more than 100 years. The department had 30 full time workers, 12 of whom were truck drivers.

WRITTEN SAFETY PROGRAMS and TRAINING

The public works department had written policies and procedures for many programs, including Lockout/Tagout, Respiratory Protection, Confined Space, Hazard Communication, Hot Work and a Contractor Orientation program developed by a private consultant. A supervisor at the public works department was responsible for administering the safety program, and reported to the city manager. All truck drivers were required to have a commercial driver's license (CDL). The department did not have a health and safety committee. Safety meetings, according to the employee representative, were held "every couple of months", but explicitly just before and immediately following the winter months.

There were no written procedures in the safety program on truck safe operating procedures, such as leaving the truck while the truck was running, no written policy regarding a person going under a truck while it was running, or for "freeing" a frozen truck brake. Training documentation for other types of safety-related issues, such as lockout, hazard communication, etc., was present. Coworker A indicated to the MIOSHA compliance officer investigating the incident that he had not received training on the truck's owner's manual. All truck drivers performed pre-checks on the truck to be driven as taught by the CDL class.

The 2006 Mack dump truck involved in the incident had a maintenance record which demonstrated that appropriate maintenance on the truck had been performed; the truck had a complete brake change on 2-20-14. The Michigan State Police inspection of the truck after the incident did not find any violations.

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WORKER INFORMATION

The decedent had worked at the public works yard for 20 years. He had operated dump trucks, snow plows, street sweepers, and bulldozers. He had a current CDL. He was not a member of a union. He worked seasonally for the public works department; he was hired to work November – May (variable end date). In the summer he drove a truck for another company and was laid off in November, at which time he was hired by the public work department. When working for the public works department, he worked full-time. He normally worked 3rd shift, beginning work at approximately 11:00pm. Depending upon the weather, he may work longer hours. On the day of the incident, his work shift was 11:00pm and scheduled to conclude at 7:00am.

His coworker (Coworker A) was a full time employee with the city as a heavy equipment operator. He started with city in 1991 as a part time employee and was hired to full time in 1993. He had a valid CDL and drove all of the trucks utilized by the public works department. The past winter he had driven the Mack truck involved in the incident many times and was very familiar with the location of the controls. He worked the day shift and was just starting his shift. He was injured and taken to a local hospital.

INCIDENT SCENE

The incident occurred in the public works yard. The responding police described the asphalt parking/roadway surface being in fair to good condition.

The 2006 Mack dump truck involved in the incident had a gross vehicle weight of 16,470 pounds while empty; the dump box was empty. The truck had five axles, one front axle and four rear axles. The front two axles on the rear dump part of the truck were recessed and did not touch the ground. The truck did not have a “park” setting, just a parking brake. The truck was facing northbound. To the north was a slight uphill driveway access to a two-lane roadway.

WEATHER

Weather Underground was utilized to check the weather conditions on the day of the incident. The weather was in the upper 30s, sunny, with clear skies. No moisture was present and the ground surfaces were dry. [Weather Underground]

COMPANY REMEDIATION

Following the conclusion of the MIOSHA compliance fatality inspection, the employee representative contacted MIOSHA Consultation, Education and Training Division to provide assistance in the development of various MIOSHA-required written programs and to provide employee training.

INVESTIGATION

Coworker A was just beginning his shift. On the day of the incident the foreman told him and another employee to pick up sand on the road put there by residents raking out their yards after winter. His coworker was going to run a loader while Coworker A drove the truck.

Coworker A retrieved the keys to the Mack truck and walked to the gated equipment yard. He entered the cab of the dump truck, turned it on and then got out of the truck and spoke with several coworkers while the engine warmed up and the air “built up” so that the air brakes would release. The gated equipment yard was located to the south of the employee break area, parking area, and driveway to access the two-lane road. Coworker A walked back to the dump truck and got in, released the brake, pushed the keypad gear to “D”, and started out of the yard heading straight out

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Photo 1. Small sledge hammer used by decedent

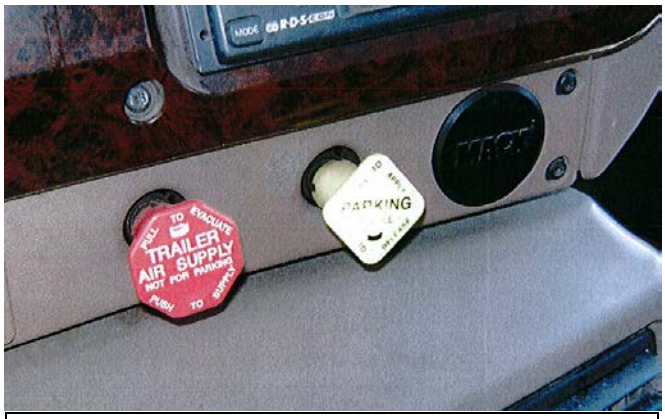

Photo 2. Example of position of Parking Brake when set

(north). The truck felt sluggish. When Coworker A looked in the mirrors, he noticed one of the wheels was frozen, the brake was stuck on the driver's side rear drive axle, and the tire was dragging. He kept moving because sometimes the wheel freed itself as it was rolling. The brake did not release so he rocked the truck back and forth several times. The brake freed from the drum.

Coworker A kept driving but noted again that the truck still felt sluggish. Checking the mirrors, he noted the passenger side tire was dragging on the same rear axle as the one that had just been previously noted frozen on the driver's side. Coworker A could see the skid mark and the tire not turning using the right side view mirror. He attempted to free the brake using the same rocking procedure, but this time, the passenger side brake did not release. Per Coworker A's police statement, he didn't call a mechanic because he "hated bugging them with minor things you can do yourself".

Per his police statement, Coworker A remembered some "tapping" technique that released stuck brakes. Coworker A knew he had a small sledge hammer (Photo 1) behind the seat of the sander he used in the winter. He set the parking brake (pulled the knob with the white diamond out) (Photo 2), and exited the cab to get the hammer. He left the truck running and in gear (not in neutral).

Photo 3. Example of a wheel chock in one direction

Coworker A retrieved the sledge hammer and headed back to the dump truck when he realized he didn't know what was "tapped" on to unstick the brake. Coworker A noticed that the decedent, who had finished his shift, was still at the yard. Coworker A walked to the employee breakroom. The decedent was in the breakroom with three other individuals - the city manager, a department of public works "lead man" and another employee. Coworker A asked the decedent for help to release the brake because of his prior working relationship with the decedent and the decedent's experience in driving trucks. The city manager heard the conversation between the two men and saw them go out carrying the small sledge hammer.

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Coworker A and the decedent went back to the dump truck. The decedent instructed the Coworker A to chock the front tire (Photo 3) and push the knob with the yellow diamond in towards the dash to release the parking brake. Coworker A did so. He placed a metal tire chock at the back of the front passenger side tire and accessed the cab through the passenger door to release the brake (Photo 2). The dump truck was positioned on a slight incline, facing the driveway and two-lane road. Coworker A expected the truck to roll back against the chock when the brake was freed. The decedent laid on his back in front of the passenger rear quad tires and started to tap the break drum with the hammer, waiting for it to "pop" (Photo 4). Coworker A, who was not sure of the procedure for "freeing" a brake using this method, stood between the rear quad tires to watch the decedent. After tapping the brake, the decedent asked the driver if there was a "pop". Not hearing a "pop", the decedent tapped on the brake drum a few more times.

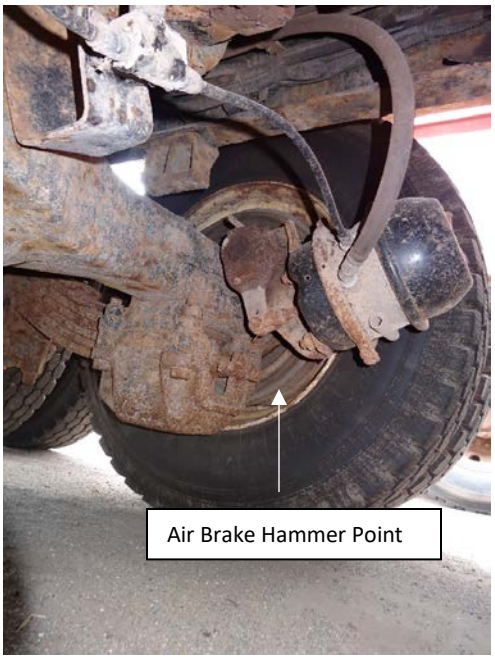

Photo 4. Air brake Hammer Point

The brake freed, but because the truck was in gear, it rolled forward. Coworker A stated to the responding police that he felt the dump truck start to move forward a little bit and thought the truck had just sprung loose and was just going to roll a little bit. He then could feel the truck was under its own power and was going forward and that his leg was stuck. The truck rolled forward. Coworker A called for the decedent but didn't get a response. After the truck rolled over his leg and moved away, he saw the decedent. Coworker A yelled for help, but the employees in the breakroom could not hear him. Coworker A called 911 but nobody answered so he called a coworker in the building as he had this individual on speed dial. Both of the rear quad tires ran over the decedent and struck Coworker A's leg as the truck moved forward. This employee ran outside, called for emergency response and then gave the decedent CPR while waiting for emergency response to arrive. The truck continued to move forward (northbound) approximately 175 feet, crossed the two-lane road, and came to rest against a concrete block retaining wall, partially blocking the westbound lane (Photo 5).

Photo 5. Location of truck when stopped by wall

Another employee ran outside when news of the incident occurred. The employee ran across the street and noted the truck was running and in gear against the wall across the street. He placed the truck in neutral, activated the park brake, and turned off the truck. Emergency response arrived. The decedent was declared dead at the scene.

The Michigan State Police's post-crash inspection did not identify any violations for the Mack truck involved in the incident. The responding police report noted two black skid marks behind the far rear dual passenger tire from the equipment yard where the truck was parked to the incident site as well as two marks from the driver's side tires where it appeared the tires moved forcefully forward to make up for the passenger side tire that was stuck due to freezing.

MIOSHA Citations

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

SERIOUS: AUTOMOTIVE SERVICE OPERATIONS, GI PART 72:

- RULE 408.17211(a): An employer shall provide training to an employee as to the hazards, safe operations of the assigned job, and applicable rules of this part.

  Employees were not provided training on the hazards of automotive servicing and available safeguards when performing servicing operations. An employee crawled underneath a running truck while in gear to perform maintenance on stuck brakes on the 2006 Mack dump truck in the Department of Public Works Yard.

- RULE 408.17234(1): A vehicle being serviced, adjusted or repaired while the motor is running shall have 2 wheels chocked from front and rear or parking brake set or other vehicle restraint controls provided.

  There was only one (1) wheel chocked while employees were performing maintenance on the braking system on the 2006 Mack dump truck in the Department of Public Works Yard. The truck was running at the time without the parking brake set or other vehicle restraint device utilized.

SERIOUS: THE CONTROL OF HAZARDOUS ENERGY SOURCES (LOCKOUT/TAGOUT), [REF 408.18502], GI PART 85:

- RULE 1919.147(c)(4)(i): Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in the activities covered by this section.

  Energy isolation procedures were not developed, documented or utilized for employees that performed maintenance to the braking system on the 2006 Mack dump truck while the engine was running and in gear at the *Public Works Yard. (MIFACE removed the name of the public works department)*

- RULE 1910.147(c)(7)(i)(A): Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

  There was inadequate energy isolation training for the recognition and isolation of hazardous energy on motor vehicles. Employees did not recognize energy to the drive train was not isolated while they performed maintenance on the braking system on a 2006 Mack dump truck in the Department of Public Works Yard.

CAUSE OF DEATH

The death certificate listed the cause of death as hemothorax and hemapertoneum due to or as a consequence of massive blunt force chest/abdominal trauma. 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:

- *The truck was parked in the public works yard for an extended period of time in adverse weather conditions.*
- *There was no standard operating procedure to minimize the likelihood of stuck/frozen brakes due to extreme weather temperatures when a truck is parked for extended periods in adverse conditions.*
- *The truck was running, the transmission was in gear, and one wheel was chocked in only one direction while the task was performed.*
- *There was no standard operating procedure for freeing stuck brakes due to extreme weather temperatures*
- *There was no standard operating procedure for when the driver leaves a truck while it was running.*
- *Truck driver was performing mechanic duties but had insufficient training on the hazards, safe operations of the assigned job and applicable rules of the MIOSHA automotive service operations standard.*

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers with heavy-duty commercial on-road vehicles should develop written standard operating procedures (SOPs) for truck maintenance in winter weather and train applicable personnel. The SOP should include driver actions to take to minimize the possibility of brakes freezing when parking the truck.

Discussion: MIOSHA interviews with the decedent's coworkers and the MIFACE interview with the employee representative indicated that the public works department provided adequate maintenance on the trucks. The dump truck involved in the incident had been parked in the yard for a long time during winter weather. The incident occurred because the last use of the truck was during inclement weather. The parking brake was applied during the inclement weather, and parked during an extended period of time, resulting in both rear brakes freezing.

MIFACE recommends that the public works department develop a standard operating procedure (SOP) for winter weather that addresses procedures to follow when parking the trucks, and train the truck drivers and other applicable personnel regarding this SOP. The truck's owner's manual should be consulted when developing the SOP and should be obtained if one is not available (the public works mechanic indicated that no manual was available at the yard).

If the owner's manual does not address parking the vehicle for an extended time in inclement weather, especially freezing temperatures, MIFACE recommends the following procedure to minimize the likelihood of wet parking brake(s) freezing during cold weather while the vehicle is parked outside:

1. Place truck in park, set brakes
2. Turn truck off, exit truck and
3. Set a minimum of two wheel chocks (front and back on one wheel) subject to grade of terrain to prevent truck movement.
4. Enter cab, start truck
5. Cycle the brake several times,

6. Place truck in park, turn truck off, exit

Because air brakes rely on the compressed air system, additional care for the system should be included in the SOP to ensure its integrity. The moisture in the air can condense and freeze in the air tanks. In freezing weather, if the truck does not have automatic air tank drains, the air tanks ideally should be drained at the end of each working day to remove moisture and oil to minimize freezing in the air lines. During non-freezing weather, the tanks should be drained at least every three months for typical use and at least monthly for vehicles with high air demand. If the air system has an air dryer, winter weather with its freeze/thaw cycles and chemicals used to de-ice roads, can affect the air dryer's purge valve. The winter weather SOP should also include fall replacement of the air dryer cartridge to start the season with an undamaged air dryer and purge valve.

Recommendation #2: Employers should establish and train truck drivers on safe work practices to unfreeze brakes that include, but are not limited to, ensuring a truck is in neutral and turned off, and wheel chocks placed prior to striking the brake shoe. Every effort should be made to strike the brake drum from outside of the vehicle rather than underneath the truck.

Discussion: The decedent laid on his back on the ground with his body perpendicular to the tire. Most likely he made the assumption that his coworker had placed the truck in neutral (instead of in gear) and that chocking the tire would keep the truck from rolling backward when the brake released. With the truck running and maintaining the air pressure in the system, he would be able to hear a "pop" when the brake released. The truck did not have to be running to perform this activity.

The employer should discuss with the truck drivers and mechanics the options available and develop written safe work procedures for releasing frozen brakes. Emphasis should be placed on releasing the brakes from the outside of the vehicle rather than from laying on the ground underneath the vehicle. Rocking the truck is one option but if it is not successful, the brakes must be released by exiting the truck and directly striking the brake shoe. The written procedure should include placing the truck in neutral, release the air brake, turn the truck off, and place two wheel chocks on each side of at least one tire before any work on the frozen brake commences.

One option to explore for freeing the brake while standing outside of the vehicle is to use a piece of #5 (5/8") or larger diameter rebar, position at the base of the drum and strike it hard several time, then position the rebar at the top of the drum and strike it hard again several times. Re-enter the cab, turn the truck on, wait for the air pressure to rise and then attempt to drive forward. Repeat as needed. Another option to consider is cycling the parking brakes on and off a few times, allowing the air pressure build until the compressor kicks off and release the brakes, then wait for full pressure and set them again. After a few cycles, try rocking the vehicle.

The least safe option, which was the decedent's "go-to" method, was to free the brakes working from underneath the truck. If that is the only option, the truck must be in neutral, turned off, key kept in the possession of the driver, and tires chocked. It is imperative that the driver positions his/her body in a manner that, if the chock does not "hold" the truck in position, that the individual is not run over by the tires.

The least desirable method would be to place your body under the truck. If that is the only option that will work, set the truck to neutral, chock both sides of at least one tire, and release the brake. Place your body under the middle of the truck, parallel to the wheels, not across any of the tires/their paths.

Recommendation #3: Any employee performing tasks included under MIOSHA General Industry Safety Standard, Part 72: Automotive Service Operations should be instructed in the requirements of the standard.

Discussion: Part 72, Rule 7201. Scope, in part, reads "This part sets forth rules for the safe maintenance and operation of equipment in, around and about places of employment where vehicles or tire and wheel assemblies are serviced, repaired and salvaged…" The decedent was servicing the dump truck's air brake system. The employee representative indicated to the MIFACE researcher that truck drivers, who perform some service or maintenance tasks (such as freeing frozen truck brakes) had not been instructed in the requirements of Part 72.

Rule 7234(1) requires a vehicle being serviced, adjusted or repaired while the motor is running shall have two wheels chocked from front and rear or parking brake set or other vehicle restraint controls provided. The decedent and his coworker had not been trained on the hazards, safe operation of the assigned job and applicable rules of the automotive service operations standard. This was evidenced by having only one wheel chocked on one side, the parking brake was not engaged, the truck was running and not locked out, and the transmission was in gear.

Recommendation #4: Written procedures should be developed to address exiting the cab while the truck is running, and performing work while underneath the truck.

Discussion: The public works department had an "informal" procedures for exiting and working under trucks, but no written procedures. The procedure was to leave the truck running: place the truck in neutral, apply the air brakes, and chock a tire. The public work yard mechanic indicated that when "he works under a truck, he turns off the truck, chocks it, and puts the key in his pocket". Written procedures standardize practices and allow for consistent understanding of policies. MIFACE encourages the public works department to perform a hazard analysis and develop written procedures for common practices, such as exiting the truck while the truck is running and when anyone performs work under any vehicle.

ADDITIONAL RESOURCES

- For Construction Pros.com. *3 Keys to Maintaining Commercial Vehicle Air System Through Winter*. December 5, 2016. https://www.forconstructionpros.com/equipment/fleet-maintenance/article/12284558/3-keys-to-maintaining-commercial-vehicle-air-system-through-winter
- Bendix Corporation. *Advanced Troubleshooting Guide for Air Brake Compressors*. http://www.bendix.com/media/documents/products_1/compressorsgovernors_1/troubleshootingguide.pdf
- Michigan Commercial Driver License Manual. Section 5. Air Brakes. https://www.michigan.gov/documents/Section_5_-_Air_Brakes_109900_7.pdf

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REFERENCES

Weather Underground [2015]. 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 Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

- General Industry Safety Standard, Part 72. Automotive Service Operations. https://www.michigan.gov/documents/lara/lara_miosha_GI_72_422576_7.pdf
- General Industry Safety Standard, Part 85. The Control of Hazardous Energy Sources (Lockout/Tagout), [REF 408.18502].

ACKNOWLEDGEMEMENT

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