KENTUCKY State FACE Program
Fatality Assessment & Control Evaluation

Kentucky Injury Prevention and Research Center
Bona fide agent for Kentucky Department for Public Health
333 Waller Avenue, Suite 242 • Lexington, KY 40504 • 859-257-5839

REPORT#: 17KY034 **REPORT DATE:** 6-29-2018

Dump Truck Driver Loses Control and Flips Truck Resulting in Fire

INCIDENT HIGHLIGHTS

DATE:
August 21, 2017

TIME:
2:45 pm

VICTIM:
54-year old truck driver

INDUSTRY/NAICS CODE:
Specialized freight local / 484220

EMPLOYER:
Brick, Stone, and Related Construction Material Merchant Wholesalers

SAFETY & TRAINING:
Ongoing training and annual driving evaluations

SCENE:
Two lane state highway

LOCATION:
Kentucky

EVENT TYPE:
Motor Vehicle Collision

SUMMARY

On Monday, August 21, 2017, a 54-year-old male truck driver (the victim) was delivering a load of gravel, when he rounded a curve and lost control, flipping the truck into a culvert, where the fuel tank struck exposed rebar and burst into flames... READ THE FULL REPORT> (p.5)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- Not wearing a seat belt
- Excessive speed
- No guardrail
- Exposed rebar
- Puncture of fuel tank

RECOMMENDATIONS

Face investigator concluded that, to help prevent similar occurrences:

- Commercial motor vehicle drivers should always wear seat belts.
- Commercial motor vehicle drivers should reduce speeds when entering a curve.
- State roadway maintenance branch should consider guardrail installation for drop-offs steeper than 3:1.
- Large truck manufacturers should consider re-design and placement of fuel tanks.
- The Kentucky Transportation Cabinet should consider a campaign to educate landowners on how to file a roadway maintenance repair request.
- The company should consider investing in new equipment that utilizes the concept of Prevention through Design (PtD)

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Fatality Assessment and Control Evaluation (FACE) Program

This case report was developed to draw the attention of employers and employees to a serious safety hazard and is based on preliminary data only. This publication does not represent final determinations regarding the nature of the incident, cause of the injury, or fault of employer, employee, or any party involved.

This Case report was developed by the Kentucky Fatality Assessment and Control Evaluation (FACE) Program. Kentucky FACE is a NIOSH-funded occupational fatality surveillance program with the goal of preventing fatal work injuries by studying the worker, the work environment, and the role of management, engineering, and behavioral changes in preventing future injuries. The FACE program is located in the Kentucky Injury Prevention and Research Center (KIPRC). KIPRC is a bona fide agent for the Kentucky Department for Public Health.

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INTRODUCTION

At 2:45 pm on Monday, August 21, 2017, a 54-year-old male truck driver (the victim) was operating a 1987 Western Star model #4964-2, four-axle dump truck on a two-lane state highway to deliver a load of white gravel. He rounded a left angle curve and lost control of the vehicle, flipping the dump truck off the road and into an unguarded culvert. The fuel tank struck exposed rebar that was protruding from a small, concrete embankment, ruptured, and burst into flames. Kentucky FACE was notified of the incident on August 23, 2017 by the Kentucky Labor Cabinet. On August 25, 2017, an investigation was conducted, photographs were taken of the incident site, and witnesses were interviewed.

EMPLOYER

The employer was a brick, stone, and related construction material merchant wholesaler. The company had been in business for 50 years and employed four individuals. The company was located in a neighboring state.

WRITTEN SAFETY PROGRAMS and TRAINING

At the time of the incident, the company stated they provided on-going safety training for their employees. The company reported providing all OSHA required training, but was not specific as to which training topics were covered. Annual driving evaluations were required. It is unknown when the victim had received his last driving evaluation.

WORKER INFORMATION

The victim was a 54-year-old married father. The decedent had received a high school education with no diploma. He had been employed with the company for 15 years.

INCIDENT SCENE

The incident took place on a rural two-lane state highway without guardrails. An eight-foot steep embankment dropped off from the right shoulder of the road. The Sheriff's department referred to this culvert as a cattle crossing, where rock and rebar protruded from concrete retaining walls. The state highway on which the truck travelled posted a 55 mph speed limit; however, prior to entering the curve, an advisory speed limit sign was posted, recommending 35 mph. Advisory speed placards are not regulatory signs; they are warning signs. The curve warning sign indicated that vehicles should slow down to navigate the curve safely.

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Photo 1: Embankment at the crash site. Barrels and cones added post-incident. (photo property of KY FACE)

Photo 2: Rebar that the fuel tank struck. (photo property of KY FACE)

Photo 3: Aerial view of crash site. Circled area shows final resting spot of the overturned truck. (photo courtesy of Google Maps)
Arrow shows direction of travel

WEATHER

The temperature was approximately 84°F at the time of the incident. The humidity was 56%, and the wind was 8.1 mph coming from the south. Weather was not considered a factor in this incident.[1]

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INVESTIGATION

On Monday, August 21, 2017, the Kentucky Fatality Assessment and Control Evaluation Program was informed by the Kentucky Labor Cabinet of a fatality involving a dump truck driver. A site visit and investigation were subsequently conducted.

On Monday afternoon at approximately 2:45 pm, a dump truck driver crossed into Kentucky from Ohio to pick up a load of #55 limestone gravel and deliver it to his assigned destination; this type of rock is very popular for use on driveways and walkways. The company stated the victim had driven this winding road many times over his 15-year tenure. As he traveled north, he approached a left angle curve.

Tire marks suggested the truck gradually drifted to the right, went off the road and into a small ditch area. The driver attempted to drive out of the ditch 224.10 feet from the final resting spot of the truck. The deputy sheriff stated the truck driver was traveling over the recommended speed limit of 35 mph. While the speed limit along the state road was posted at 55 mph, the curve was posted at 35 mph with an advisory speed sign prior to the curve. As the victim entered the curve, neighbors who lived in the vicinity stated they heard the driver trying to apply the truck's compression release engine brake – commonly referred to as a Jake brake - in an attempt to slow the truck. The deputy stated the Jake brake failed to slow the truck to a safe speed, causing the loaded truck's center of gravity to shift toward the passenger side, and the driver to lose control of the vehicle.

The truck left the roadway on the passenger side and flipped onto its right side into the culvert eight feet below the highway. As the truck flipped, the fuel tank struck a piece of rebar that was protruding from the concrete retaining wall leading to a water drainage tunnel under the highway. The fuel tank ruptured, causing a small fire in the engine that rapidly began to spread as fuel leaked from the tank.

Photo 4: 1987 Western Star 4900 series dump truck (Stock photo)

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Two neighbors, a husband and wife who heard the crash and saw the smoke from their residence, ran to assist the driver. When they arrived and noticed the fire, the husband desperately tried to pull the unconscious driver out of the burning truck through the front windshield that had become dislodged, while his wife called for emergency assistance and the fire department. The couple stated the driver was thrown and trapped along the passenger side of the truck where the flames were hottest, making it impossible to pull his unconscious body from the burning truck.

Photo 5: Crashed dump truck. (Photo courtesy of witness)

When the flames became too dangerous, the neighbors retreated to safety. Within four minutes, the cab became engulfed in flames. The local fire department arrived at the scene within five minutes of receiving the call and put out the flames. The truck driver was pronounced dead at the scene by the coroner.

CAUSE OF DEATH

The cause of death was complications from a motor vehicle collision with post-crash fire.

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. Investigation identified the following unrecognized hazards as key contributing factors in this incident:

- *Not wearing a seat belt*
- *Excessive speed*
- *No guardrail*
- *Exposed rebar*
- *Puncture of fuel tank*

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RECOMMENDATIONS/DISCUSSION

Recommendation #1: Commercial motor vehicle drivers should always wear seat belts.

Discussion: The truck driver was not wearing his seat belt, and as the truck flipped onto its side, he was thrown to the passenger side of the cab. The resulting force knocked the driver unconscious, and he became trapped. By wearing his seat belt, it is possible he would have been conscious and not trapped in the passenger side of the cab, allowing for an attempted self-rescue or better positioning for rescuers to extract him from the burning truck.

A 2013 study released by the Federal Motor Carrier Safety Administration (FMCSA) reported that dump truck drivers have the lowest seat belt usage rate (70%) of all commercial motor vehicle (CMV) body types.[2] In combination with low seat belt usage rates, incidents involving dump trucks resulted in the fourth highest number of fatal crashes among all large commercial vehicles.[3] Companies who employ dump truck operators should be especially cognizant when it comes to their drivers wearing seat belts.

Recommendation #2: Commercial motor vehicle drivers should reduce speeds when entering a curve.

Discussion: The truck driver was traveling on a rural highway with several sharp, dangerous curves. Advisory speed signs and curve warnings were posted prior to the curve. Information on the speed of the vehicle was unavailable at the time of this report; however, not following the suggested speed may have caused the driver to lose control. The company stated the driver had traveled this road many times, suggesting that he may have become complacent, and exceeded the recommended speed limit, resulting in the crash. The posted speed limit is intended for passenger vehicles, not large trucks.[4] Due to their high center of gravity, commercial motor vehicles should lower their speed before entering a curve in order to negotiate it safely.

Recommendation #3: **State roadway maintenance branch should consider guardrails for drop-offs steeper than 3:1.**

Discussion: Guardrails are safety barriers to protect motorists in the event of a crash. According to the Federal Highway Administration, "The guardrail can operate to deflect a vehicle back to the roadway, slow the vehicle down to a complete stop, or, in certain circumstances, slow the vehicle down and then let it proceed past the guardrail."[5] It is possible that guardrails might have prevented the dump truck from leaving the roadway, overturning, and the fuel tank rupturing.

Guardrail systems consist of the soil the posts are driven into, the guardrail itself, the end terminal, and the anchoring system located at the end terminal. For the guardrail system to adequately prevent injury, each of the system components must function properly during impact. The guardrail's purpose is to redirect the vehicle back to the roadway, and the purpose of the end treatment is to absorb the force of the impact of a head on collision. Crash tests are performed to test both the guardrail and the end treatment. These crash tests are performed on vehicles traveling 62 mph; this does not include the weight of any load the vehicle may be hauling. If speed exceeds 62 mph, the guardrail may not operate fully. The crash tests are performed on small sedans, midsize sedans, SUVs, and passenger vans. Most states use a Test Level 3 (TL3) guardrail system

on a majority of roadways. The TL3 system is designed for passenger vehicles with a weight of 2,420 lbs. and pickup trucks up to 5,000 lbs. travelling 62 mph with a 25-degree angle of impact. While a TL3 is not designed or tested for any vehicle that weighs in excess of 5,000 lbs., it is possible that a larger vehicle could be stopped.

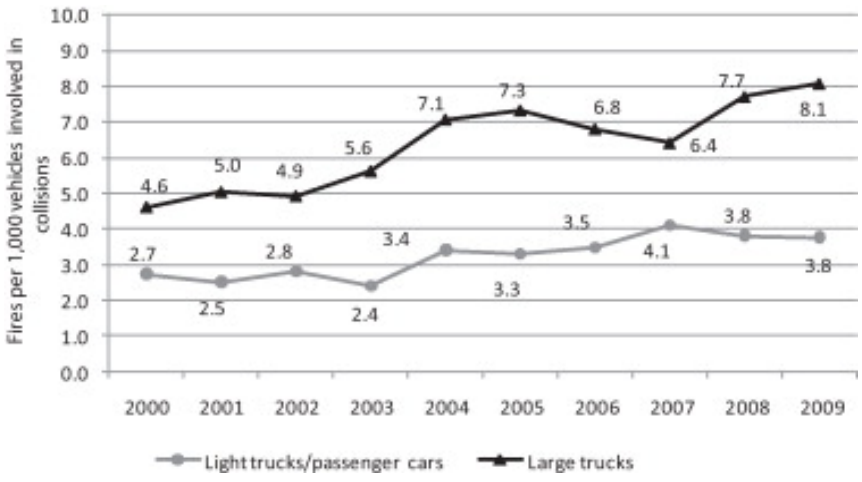
A guardrail system of a TL4, TL5, or TL6 would be best for protecting commercial vehicle drivers, but are cost prohibitive and only used in specialized situations. A TL4 can withstand a single unit truck weighing 22,000 lbs. with a speed of 56 mph and a 15-degree angle of impact. The TL5 and TL6 can withstand 79,300 lbs. with a speed of 50 mph and a 15-degree angle of impact.

According to the Kentucky Transportation Cabinet Division of Highway Design, a trained engineer uses American Association of State Highway and Transportation Officials (AASHTO) roadside design guide to determine if a guardrail is needed. A slope steeper than a 3:1 warrants the consideration of guardrail.

Recommendation #4: Large truck manufacturers should consider re-design and placement of fuel tanks.

Discussion: Large truck manufacturers should consider an engineering redesign and new placement of fuel tanks within all trucks. With the high number of truck crashes that result in fire, this redesign could save lives as well as equipment. According to the Bunn et al. (2012), large truck vehicle fire rates in Kentucky were significantly increased when compared to light trucks and passenger cars.[6] The study recommended the fuel tanks would be better protected within the truck body and not exposed.

Fig. 1. Vehicle fire rates due to motor vehicle collisions, 2000–2009.



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The article states, *"There could be many reasons for large trucks being more likely to catch fire in a motor vehicle collision. The average large truck weight (typically up to 80,000 pounds) can result in a greater impact force in collisions with a fixed object. There are fuel tank placement differences between large trucks, and light trucks, and passenger cars, which could account for fire likelihood differences between vehicle types in head-on and single vehicle collisions. Increased exposure occurs in large trucks because the two fuel tanks on the semi-tractor are exposed under the cab and are located directly behind the front axle."*

For the purpose of this study, 'large trucks' include semi-trucks and single unit trucks. According to the FMCSA, single unit trucks "are vehicle configurations designed to transport property, where the cargo carrying capability of the vehicle is integral to the body of the vehicle (i.e. - it does not carry its cargo in an attached trailer)" [7]. Dump trucks, including the one featured in this investigation, should be considered for fuel tank redesign.

Recommendation #5: The Kentucky Transportation Cabinet should consider a campaign to educate landowners on how to file a roadway maintenance repair request.

Discussion: According to the Kentucky Transportation Cabinet's (KYTC) website page concerning roadway maintenance, the roadway maintenance branch is responsible for several programs, including "Contract maintenance activities such as upgrading existing roadside guardrail, drainage structure maintenance and replacement, concrete pavement repair, slide repair, asphalt patching and other miscellaneous maintenance contracts as required"[8]. Generally speaking, culverts are hydraulic conduits used to convey water from one side of a highway entrance to the other for the purpose of drainage, making their repairs the responsibility of the KYTC. In this incident, a single piece of rebar measuring approximately 16 inches was protruding from what is referred to as a 'box culvert' - a rectangular four-sided concrete structure used in managing and storing storm water. According to the Kentucky Division of the Federal Highway Administration, in instances when small culverts run on a private landowner's property, it is the responsibility of the landowner to inform the KYTC of structural deficiencies. The KYTC would then travel to the site and make repairs. An open records request filed by the KY FACE team revealed that no repair request for this particular culvert was submitted. In order to prevent similar incidents from occurring in the future, the KYTC should consider a campaign to educate landowners on how to file maintenance requests via the KYTC website when a road, bridge, or culvert that runs on the owner's property is in obvious disrepair. Had the landowner informed the KYTC of the protruding rebar, it is possible the repair would have been made prior to the incident and subsequent fire.

Recommendation #6 The company should consider investing in new equipment that utilizes the concept of Prevention through Design (PtD).

Discussion: Prevention through design emphasizes anticipating possible hazards to workers who will use the system and "designing out" those hazards in the design and engineering phase. In this case, the company could invest in electronic stability devices or electronic logging device that attached to the engine and allows the company to view the driver' speed and location. Although it is hard to project a return on investment for

these products, the financial savings come via crash prevention through reduced speeds and decreased likelihood of rollovers.

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PROGRAM FUNDING

The Kentucky Fatality Assessment & Control Evaluation Program (FACE) is funded by grant 5U60OH008483-13 from the National Institute for Occupational Safety and Health (NIOSH).

SURVEY

Please take the time to complete our brief survey regarding this report:

https://uky.az1.qualtrics.com/jfe/form/SV_eVXdbBwylEwlyLP

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INVESTIGATOR INFORMATION

This investigation was conducted by DeAnna McIntosh, Safety Specialist, Fatality Assessment and Control Evaluation, Kentucky Injury Prevention and Research Center, University of Kentucky, College of Public Health.

ACKNOWLEDGEMENT

The Kentucky FACE program would like to thank Kentucky OSHA, the county coroner, the Sheriff's department, the company, and the U.S. Department of Transportation and the FHWA KY Division with their assistance with this report.