
TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE

Case No. 2010IA017

Report Date: 22 June 2011

SUBJECT: Fatal burn injury while bulldozing and burning brush

SUMMARY

A 74-year-old man died in May 2010 from severe burns to his upper body. The victim had been bulldozing trees and brush into a fire when his bulldozer caught fire. He was able to drive to a field next door to the property owner's house. The property owner's son called 911, but the dispatcher could not locate the address, so the property owner drove the injured man to a local hospital. The victim was airlifted to a Level I Trauma Center Burn unit where he was taken off life support and declared dead within one hour of arriving.

RECOMMENDATIONS

1. *Open fires should always be attended and supervised. Machinery should not be operated near open flames.*
2. *Always have ABC fire extinguishers in the cab of farming equipment.*
3. *Individuals should be aware of state safety policies for open burning and permit requirements for burns.*
4. *When burning trash or outdoor debris, contact the local fire department and advise them of your plans and location.*
5. *Plan for accessing emergency services. Individuals should contact local dispatchers to make sure adequate information is available to locate the residence or burn area.*
6. *Individuals should not work alone in risky conditions, such as when working with an open fire. When working alone in isolated areas, individuals should have plans to summon emergency assistance.*
7. *Machinery should be maintained in good condition and inspected before use, with specific attention to fuel lines and possible leaks.*

INTRODUCTION

Evidence for this report includes the State Medical Examiner's report, sheriff's investigation, and interviews with the victim's son, a representative from the bulldozer manufacturer, and a fire investigator.

A 74-year-old, self-employed male construction worker was helping burn trees and brush on a friend's property in the spring of 2010. The victim was bulldozing brush into the burn pile. A fire of

unknown origin started and led to a 65% full thickness circumferential burn to the victim's upper body, arms, and head. Burns on the knees were also present. He managed to drive his truck to a field where he knew the property owner's son was working. The property owner's son called 911, but the dispatcher could not find the address. The property owner drove the victim to a local hospital, where he was airlifted to and pronounced dead at a Level I Trauma hospital. The property owner's son went to the scene to find the bulldozer and extinguish the fire.

INVESTIGATION

The victim was a 74-year-old self-employed construction worker with more than 20 years of experience in the field and 16 years of professional experience driving a bulldozer. The victim was helping a friend clear trees and brush from a field, and he was using a bulldozer to push trees, brush, and debris into a burn pile. The victim was driving a 1978 bulldozer that he owned and maintained. The burn pile was located 50 yards from the road and encompassed approximately 20 yards. The victim was pushing brush northwards into the pile, with wind blowing from the north/north-east. Data from the regional weather station approximately 23 miles away, winds were blowing from 10 to 14 mph with gusts up to 18.4 mph. Based on a burn area on the ground, the bulldozer caught fire approximately 20 yards from the burn pile.



Exhibit 1: Burn pile and burn area on ground where bulldozer is believed to have caught fire

Although the victim was severely burned, he managed to put the bulldozer in reverse and exit the bulldozer. The bulldozer proceeded backwards approximately $\frac{1}{4}$ mile until it ran into some trees. It remained in that position until the property owner's checked on the site, approximately 30 minutes after the event. The bulldozer was still running, in reverse gear, and burning. The Sheriff's office investigated the next day and found that the seat and battery compartment under the seat were

severely burned. There was a slight burn on the console, but no other burned areas on the bulldozer. When the bulldozer was turned on, there was no evidence of any hydraulic leaks running under the seat console.



Exhibit 2: Location where bulldozer came to rest



Exhibits 3A and B: Burned areas of the seat and battery compartment under the seat.

The victim was able to drive himself to a nearby field, where he knew the property owner's son was working. The property owner's son called 911. Meanwhile, the property owner had seen the victim drive up and went to join them. The property owner reported that the victim said there was a "big ball of fire" and that he needed to go to the hospital. The victim was not able to provide any further information about the event because he was in critical condition.

The 911 dispatcher could not find the address in her system, so the property owner drove the victim to a local hospital. The victim was sedated and intubated, and transferred by helicopter to the closest Level I Trauma Center with a certified burn unit. Once the victim's family arrived, the treating doctor informed them that the victim's burns were too severe for him to survive. Life support was removed and the victim was pronounced dead soon after.

The exact cause of the fire has not been determined, and it is not known if the fire started on the bulldozer or the driver. However, evidence suggests that the victim somehow got an accelerant or burn source on his clothing, which is consistent with the severity of the burns and the location primarily on the upper body. Because the burns were primarily on the upper body, it is presumed that the fire did not start in the under-battery compartment. Since the damage to the bulldozer was concentrated on the seat, with non-concurrent burns to the victim's buttocks and lower legs, it is most likely that the burns to the seat compartment occurred after the victim exited the bulldozer. Since the bulldozer continued to operate for at least 30 minutes after the fire started, the fuel source is not likely to be a fuel or fluid leak, which would have been exhausted from the fire.

Several fire sources are possible:

- An ember from the burn pile caught the driver or bulldozer on fire. Consultation with John Walker, a fire investigation expert, indicated that such a severe fire would only occur from a floating ember if there was some sort of fuel. A nurse reported smelling gas or diesel on the victim, but the victim's shirt was completely burned and determining if it was soaked with a fuel source is not possible.
- Another fuel source could have been a leak of hydraulic fuel from the bulldozer. When the bulldozer was turned on after the event, there was no indication of a leak. However, the victim's son reported on interview that the victim had recently been working on the bulldozer. Phone calls to a supply company could not confirm exactly which parts had been purchased or what had been fixed.
- The debris in the burn pile caused a fireball, igniting the bulldozer or driver. According to John Walker (Fire Forensic Engineer), a "fire ball" from the burn pile would only be possible if there were a fuel source in the burn pile.

CAUSE OF DEATH

An autopsy was not conducted. The Medical Examiner's examination reported the cause of death as 64% full thickness circumferential burns.

RECOMMENDATIONS AND DISCUSSION

Recommendation 1: *Open fires should always be attended and supervised. Machinery should not be operated near open flames.*

Discussion: Fire investigation expert John Walker described open burn piles as "treacherous" and cautioned that work should not be done near open burns. The Massachusetts State Fire Marshall recommends that an adult attend open fires at all times when they are burning. Machinery should not be operated near an open burn.

Recommendation 2: *Always have ABC fire extinguishers in the cab of farming equipment.*

Discussion: At a minimum, a 10-pound ABC fire extinguisher should be mounted inside the cab of mobile farming equipment. Ideally, a second extinguisher should be mounted outside the cab to be accessible from the ground. There was no extinguisher on the bulldozer.

Recommendation 3: *Individuals should be aware of state safety policies for open burning and permit requirements for burns.*

Discussion: State Fire Marshall offices often have policies that require permits for open burns (which will inform authorities of when and where open fires will be ignited) with guidelines for appropriate materials, ignition practices, and conditions. For example, the Massachusetts Fire Marshall recommends that open fires not be set with even minimal wind conditions. In this event, winds throughout the day had increased, with wind speeds estimated at 10 – 14 mph with gusts up to 18.4 mph.

Recommendation 4: *When burning trash or outdoor debris, contact the local fire department and advise them of the plans and location.*

Discussion: Contacting a local fire department will ensure compliance with local permits or ordinances. They may also advise a worker regarding hazardous fire conditions and recommend a safer time to burn outdoors. More importantly, the fire department will be aware of the actual work location if an emergency call is necessary.

Recommendation 5: *Plan for accessing emergency services. Individuals should contact local dispatchers to make sure adequate information is available to locate the residence or burn area.*

Discussion: Persons residing in areas without expanded 911 coverage should contact their police dispatchers to determine whether their address is included in the dispatch database. Rural residents should post clear, concise directions to their location at each telephone in the event of an emergency; it is also recommended that neighbors exchange addresses so as to be able to direct responders to other nearby residences. In the absence of information about the location, the Sheriff investigating this event recommended that the dispatcher send an ambulance anyway and stay on the line to direct the ambulance to the location.

Recommendation 6: *Individuals should not work alone in risky conditions, such as when working with an open fire. When working alone in isolated areas, individuals should have plans to summon emergency assistance.*

Discussion: In risky situations such as open fires and/or use of heavy machinery, it is highly preferable not to work alone. When working alone, plans to facilitate calls for help and a quick response should be in place. For example, a cell phone with tested access to service or walky-talky should be available to the isolated worker. Individuals should ensure that regular checks on their welfare will be conducted.

Recommendation 7: *Machinery should be maintained in good condition and inspected before use, with specific attention to fuel lines and possible leaks.*

Discussion: Machinery should be in good condition to ensure safe operation. Check for hydraulic leaks at fittings and by looking for drips onto cardboard or other surfaces placed below the machine prior to using it in the field. Special attention should be paid to fuel lines and other sources of flammable liquids, especially if the machinery will be near open flames.

References

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John Walker, Fire Forensic Engineer, Walker Fire Forensic Analysis, Spencerville, Indiana, personal communication.

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Fatality Assessment and Control Evaluation FACE

Fatality Assessment and Control Evaluation, FACE, is a program of the *National Institute for Occupational Safety and Health* (NIOSH), which is part of the *Centers for Disease Control and Prevention* of the *U.S. Department of Health and Human Services*. Nationally, the FACE program identifies traumatic deaths at work, conducts in-depth studies of select work deaths, makes recommendations for prevention, and publishes reports and alerts. The goal is to prevent occupational fatalities across the nation.

The NIOSH head office in Morgantown, West Virginia, carries out an intramural FACE case surveillance and evaluation program and also funds state-based programs in several cooperating states. In Iowa, *The University of Iowa* through its *Injury Prevention Research Center* works in conjunction with the *Iowa Department of Public Health* and its *Office of the State Medical Examiner* to conduct the Iowa FACE program.

Nationally, NIOSH combines its internal information with that from cooperating states to provide information in a variety of forms which is disseminated widely among the industries involved. NIOSH publications are available on the web at <http://www.cdc.gov/NIOSH/FACE/> and from the NIOSH Distribution Center (1-800-35NIOSH).

Iowa FACE also publishes its case studies, issues precautionary messages, and prepares articles for trade and professional publication. In addition to postings on the national NIOSH website, this information is posted on the Iowa FACE site, <http://www.public-health.uiowa.edu/FACE/>. Copies of FACE case studies and other publications are available by contacting Iowa FACE, too.

The Iowa FACE team at the University of Iowa includes Marizen Ramirez, PhD, Principal Investigator; Corinne Peek-Asa, PhD, MPH, Co-Principal Investigator; John Lundell, MA, Co-Investigator; Renee Anthony, PhD, Co-Investigator; Stephanie Leonard, MS, Field Investigator; and Adele Bonney, editor. Additional expertise is provided from the Iowa Department of Public Health, including Rita Gergely, Principal Investigator; Kathy Leinenkugel, Surveillance Specialist; and John Kraemer from the Office of the State Medical Examiner.

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