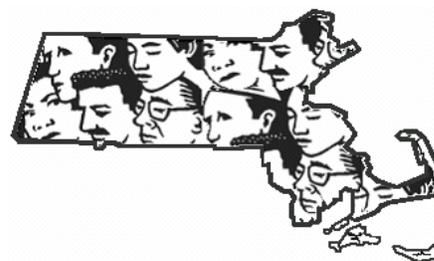


Massachusetts FACE Occupational Fatality Report

Massachusetts Department of Public Health
Occupational Health Surveillance Program
Fatality Assessment and Control Evaluation Project



Laborer Struck by Skid-steer Loader While Exiting from a Tarp-enclosed Area on a Construction Site - Massachusetts

Investigation: # 07-MA-019-01

Release Date: July 28, 2008

SUMMARY

On April 9, 2007, a 30-year-old male construction laborer (the victim) was fatally injured when a skid-steer loader struck him. The victim had been using a wheelbarrow to move mortar from the mixer to the staging area. The staging area was underneath a section of scaffold that was surrounded by a tarp. At the time of the incident, the victim was in a crouched position moving backwards pulling the wheelbarrow. He was exiting from underneath the staging area's tarp when he was struck by a skid-steer loader. Co-workers placed a call for emergency medical services (EMS) and within minutes personnel from the fire and police departments arrived at the site to attend to the victim. The victim was transported to a local hospital where he was pronounced dead. The Massachusetts FACE Program concluded that to prevent similar occurrences in the future, employers should:

- Ensure that tarp-enclosed areas have designated entrance/exit openings for workers;
- Place warning devices at designated entrance and exit locations where workers on foot are entering into work areas occupied by mobile equipment;
- Develop, implement, and enforce an internal traffic control plan (ITCP) specific to each construction site to help protect workers on foot;
- Supply and ensure that employees wear appropriate personal protective equipment, such as the American National Standard Institute (ANSI) compliant high visibility safety apparel;
- Ensure that employees operating skid-steer loaders have the required state-issued hoisting license;
- Provide employees training on the operation of skid-steer loaders and other equipment;
- Ensure employee trainings are in a language which is comprehensible and at appropriate literacy levels; and
- Develop, implement, and enforce a comprehensive written safety program, which includes hazard recognition and avoidance of unsafe conditions.



INTRODUCTION

On April 9, 2007, the Massachusetts Department of Public Health FACE Program was notified by the Occupational Safety and Health Administration (OSHA) through the 24-hour Occupational Fatality Hotline that a male laborer was fatally injured when he was struck by a skid-steer loader. An investigation was immediately initiated. On April 27, 2007, the Massachusetts FACE Program Director traveled to the incident location where the company had an office/storage unit and met with two company representatives to discuss the incident. The police report, death certificate, company information, and the OSHA fatality and catastrophe report were reviewed during the course of the investigation. Photographs of the incident location were taken.

The employer is a full service masonry company with 38 employees. Half of the 38 employees hold the same job title as the victim, laborer. The company has been in business for 15 years. During the first few years of business, the majority of the company's jobs were small jobs, such as building and repairing chimneys and fireplaces. Over the years, the company has grown and the typical job now consists of brick and concrete block work on both residential and commercial projects. These projects include work on both the exterior and the interior of buildings, as well as landscaping. The victim, an immigrant from Brazil, had been an employee of the company for two weeks at the time of the incident. The company reported that the victim had worked in the construction/landscaping industry in another state prior to the incident. The victim's first language was Portuguese and he spoke little English. The operator of the skid-steer loader had been an employee of the company for eight years, and English was not his first language.

The company had an employee handbook that included some health and safety information. The company also reported that they employed an individual who devoted half of his time to health and safety and the other half to office work. The company provided some safety training in the form of weekly on-site toolbox talks and a biannual half day safety meeting. All new hires were given the company handbook available in English, Spanish, and Portuguese, as well as personal protective equipment, which consisted of safety glasses, hardhats, and goggles. There was no formal training on skid-steer loaders for employees. The company is a member of the National Safety Council, Associated Builders and Contractors, and the Masonry Contractors Association of America. Employees are not part of a collective bargaining unit.

INVESTIGATION

The masonry company was hired as a subcontractor by a general contractor to provide brick and block work for a residential construction project. When completed, the project will consist of 2,800 condominiums and apartments. Due to the large size of the construction project, different areas of the site were in various phases of development at the time of the incident. Some of the sections of the development were occupied by residents, some sections contained buildings that

were close to being complete, and other sections were in the beginning stages of excavation prior to building construction.

At the time of the incident, the company had approximately 14 people on-site and was performing brickwork on the exterior facade of a building (Figure 1). The victim's main job was to mix and supply mortar to the masons. These tasks involved the use of a large mechanical mixer to mix the mortar and the use of a wheelbarrow to transport the mortar to the masons' location.

The masonry company reported that they had two large pieces of equipment on-site at the time of the incident, a lull and a skid-steer. The lull was a rented piece of equipment, and the skid-steer loader, the equipment that was involved in the incident, was owned by the masonry company. The skid-steer loader, manufactured in 2004, is powered by a diesel engine and has rubber tires (Figure 2). Without attachments, the skid-steer loader is approximately ten feet long, six feet wide and over six feet high (to the top of the cab). The cab of the skid-steer loader completely encloses the seated operator. At the time of the incident, the fork attachment was being used on the skid-steer loader to transport bricks and blocks on pallets to the different areas of the construction site.

The incident occurred a few minutes after 8:00 a.m. on a Monday morning. The weather conditions at the time of the incident consisted of temperatures around 40°F with an average wind speed of 16 miles per hour and no precipitation. The incident location was next to a building that was nearing completion. One section of tubular welded scaffolding was set up against the building and was enclosed by two blue tarps. The scaffold was being used as a supporting structure for the tarps that were set up to protect the work area and the workers from the environmental elements (Figure 1). There was no designated entrance or exit location to the tarp-enclosed area. Entering or exiting this area required the lifting of the bottom of the tarp and crouching down to get underneath the tarp.

Prior to the incident, the victim was inside the tarp-enclosed area and a co-worker was operating the company's skid-steer loader in the forward direction. The co-worker was driving the skid-steer loader parallel to the tarp-enclosed area to load a pallet of bricks onto the skid-steer loader's forks. The pallet of bricks was located approximately 50 feet north of where the incident occurred. The skid-steer loader's forks were in a lowered position and did not have a load on them at the time of the incident.

At the time of the incident, the victim was exiting the tarp-enclosed area with the wheelbarrow to fill the wheelbarrow with mortar. The mortar mixing machine was located approximately 20 feet to the west of the tarp-enclosed area. The victim was crouched down close to the ground lifting up the bottom of the tarp while backing out from underneath the tarp-enclosed area and pulling the wheelbarrow with him at the same time. The victim, in the crouched position, was struck and run over by the skid-steer loader as it passed parallel to the tarp-enclosed area.

Immediately after the skid-steer loader struck and ran over the victim, co-workers who were on foot in the area of the incident started to bang on the cab of the skid-steer loader to get the operator to stop. The skid-steer loader's operator stopped the skid-steer loader and then placed it into reverse and struck the victim again.

Co-workers placed a call to emergency medical services (EMS) and within minutes, personnel from the fire and police departments arrived at the site to attend to the victim. The victim was transported to a local hospital where the victim was pronounced dead. After the incident, the skid-steer loader was inspected and was found to have nothing wrong with it.

CAUSE OF DEATH

The medical examiner listed the causes of death for the victim as blunt trauma with head, torso, and extremity injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that tarp-enclosed areas have designated entrance/exit openings for workers.

Discussion: In this case, the victim and other co-workers would enter and exit the tarp-enclosed area multiple times during the day. This entailed the workers crouching down to lift up the bottom of the tarp and then crawling out. Inexpensive entrance/exit openings that still provide protection from the environment can easily be installed in tarps. One type of opening is the chamber type design. This typically consists of a vertical slit in the tarp with three foot wide strips of tarp material attached to the top of either side of the tarp covering the slit. Another option that could be used is a heavy duty tarp zipper. These zippers are self adhesive and can be installed vertically.

Recommendation #2: Employers should place warning devices at designated entrance and exit locations where workers on foot are entering into work areas occupied by mobile equipment.

Discussion: Warning devices, such as traffic control devices (orange cones, signs and barrels) placed at locations where workers on foot will be entering areas where mobile equipment might be present will serve as a reminder for both the worker on foot and the operator of the mobile equipment of the potential collision hazards. These locations would include, but not be limited to, entrance and exit locations of scaffolds, building corners and doorways, and where portable toilets are located.

Recommendation #3: Employers should develop, implement, and enforce an internal traffic control plan (ITCP) specific to each construction site to help protect workers on foot.

Discussion: In work environments where mobile equipment is being operated, workers on foot are exposed to potential run-over hazards. An internal traffic control plans (ITCP) is a tool used during roadway/highway construction projects where project managers coordinate the flow of construction vehicles, equipment, and workers on foot moving in close proximity to each other on a construction site¹. ITCPs help ensure the safety of workers on foot in close proximity to moving vehicles and equipment by preplanning where workers on foot and vehicles will be located.

An ITCP can be also be useful on a large construction project, such as the one involved in this incident. An ITCP can be accomplished by taking into consideration the tasks to be performed and how the workers on foot and the vehicles can safely navigate through the construction site to complete these tasks. Some areas within a construction site might have to be defined as designated walkways for workers on foot. When possible, all mobile vehicle and equipment roadways should be kept a distance away from building entrances and exits and other objects such as scaffolding and portable toilets.

In this incident, the skid-steer loader was being driven in close proximity to a tarp-enclosed area to access a pallet of bricks and the company did not have an ITCP in place. In addition to designated walkways for workers on foot and roadways for vehicles and equipment, the storage location of routinely accessed items, such as pallets of bricks, should also be taken into consideration.

Recommendation #4: Employers should supply and ensure that employees wear appropriate personal protective equipment, such as the American National Standard Institute (ANSI) compliant high visibility safety apparel.

Discussion: When appropriate high visibility clothing is provided and used, it is more likely that mobile equipment operators will be able to distinguish workers from the environment surrounding them. Although in this incident it is difficult to determine if the operator of the skid-steer loader would have noticed the victim in the crouched position even if he was wearing high visibility clothing.

The American National Standards Institute (ANSI) has developed voluntary guidelines for the selection of high visibility garments that employers can use as a guide². The ANSI standard for High-Visibility Safety Apparel (ANSI/ISEA 107-2004) is published by the International Safety Equipment Association (ISEA), and recommends specific types of reflective equipment while

working near moving vehicles. This standard specifies three classes of garments based on the workers' activities. These classes are:

- Class 3 garments provide the highest level of visibility for workers who face serious hazards with high task loads that require attention away from their work where traffic exceeds 50 miles per hour (mph).
- Class 2 garments are intended for use where greater visibility is necessary during inclement weather conditions and when activities occur near roadways where traffic speeds exceed 25 mph.
- Class 1 garments (not for use along highways and streets) are intended for use in activities that permit the wearer's full and undivided attention to approaching traffic. There should be ample separation of the worker from traffic, which should be traveling no faster than 25 miles per hour.

The ANSI standard also states that a competent person designated by the employer should be responsible for selecting the appropriate class of garment for the workers. A competent person, as defined by the Occupational Safety and Health Administration (OSHA), is a person who, through training or knowledge, is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Recommendation #5: Employers should ensure that employees operating skid-steer loaders have the required state-issued hoisting license.

Discussion: The company owner reported that the employee operating the skid-steer loader at the time of the incident did not have a Massachusetts Department of Public Safety (DPS) issued 2A Hoisting license that is required in Massachusetts to operate skid-steer loaders. In order to obtain a hoisting license, operators must be 18 years of age, complete an application, and successfully pass an examination covering all working parts of the hoisting machinery, safe operating practices, hand signals, and inspection procedures³. Information about the hoisting license can be found on the DPS Web site at www.mass.gov/dps.

Recommendation #6: Employers should provide employees training on the operation of skid-steer loaders and other equipment.

Discussion: As stated in the OSHA standard interpretation dated 11/05/2004 - *Powered Industrial Truck 1910.178(l) training requirements applicable to construction; training for skid-steer loader operators*, employers are required to train the skid-steer operators so that they can recognize and avoid unsafe conditions. As a practical matter, such training needs to be comprehensive enough to ensure that the operator is fully capable of safely handling the equipment in the type of conditions he/she will encounter at the site. The amount of training necessary to fulfill the requirement may be reduced based on the extent to which the operator has acquired the necessary knowledge and skill from prior experience^{4,5,6}.

Additional machine specific information that should be included in the training can be found in the equipment manufacturers' owners/operators manual. In addition, an assessment of the employees' knowledge of the material in the training must be performed. Trainings must be documented and the documentation should include who provided the training and their qualifications, the content of the training, workers who were trained, and the assessments of workers' comprehension of the training.

Recommendation #7: Employers should ensure employee trainings are in a language which is comprehensible and at appropriate literacy levels.

Discussion: When hired, employers should provide employees training that, at a minimum, includes both hands-on and classroom style training and in a language which is comprehensible and at appropriate literacy level⁷. The training should include, but not be limited to, providing information on all known hazards, as well as how to:

- operate equipment properly (Recommendation #6);
- complete tasks safely;
- recognize hazards;
- abate identified hazards; and
- avoid unsafe conditions.

Employers should also provide procedures to follow when safety and health issues arise and specify that employees should never risk physical harm to accomplish tasks.

Overcoming language and literacy barriers is crucial to providing a safe work environment and effective training for a multilingual workforce. Companies that employ workers who have limited English proficiency should identify the languages spoken by their employees and provide and implement multilingual training. If trainings are not conducted in languages comprehensible of all employees, a competent interpreter should be present at the trainings. To the extent feasible, the training should be at a literacy level that corresponds with the literacy level of the company's workforce. This also applies to any training documents that require a worker's signature. Companies may need to consider providing special safety training for workers with low literacy levels to meet their safety responsibilities.

Recommendation #8: Employers should develop, implement, and enforce a comprehensive written safety program, which includes hazard recognition and avoidance of unsafe conditions.

Discussion: A comprehensive written safety program that includes training on hazard recognition and the avoidance of unsafe conditions should be developed, implemented, and

enforced by employers. During the development of a comprehensive safety program, employers should evaluate all tasks performed by employees for potential hazards, such as the hazard of workers on foot being struck by mobile equipment. Information about the hazards of workers on foot being struck by mobile equipment and controls for these hazards should be incorporated into the comprehensive safety program, the ITCP (Recommendation #3) and health and safety training (Recommendations # 6 and 7).

In addition, masonry companies that work with stone materials should ensure that their comprehensive health and safety program addresses respiratory hazards, such as silica. Although not a factor in this incident, when cutting and mixing stone-based products employees could be exposed to respirable silica if proper controls are not in place. Employers should train employees on the proper controls for any respiratory hazards and other health hazards to which employees are exposed. Exposure to silica can cause the lung disease silicosis. Silicosis is preventable, but once you have silicosis it is incurable, debilitating and often fatal.

REFERENCES

1. NIOSH 2001. *Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment*, Department of Health and Human Services, Center for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 2001-128.
2. ANSI/ISEA [1999]. American National Standard for high-visibility safety apparel. New York, NY: American National Standards Institute, ANSI/ISEA 107 -1999.
3. Code of Massachusetts Regulations [1999]. 520 CMR 6.00. *Hoisting Machinery*.
4. DOL. OSHA. Standard interpretations: *Powered Industrial Truck 1910.178(l) training requirements applicable to construction; training for skid-steer loader operators*. [www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=24959]. Date accessed: January 30, 2008.
5. Code of Federal Regulations. 29 CFR 1910.178. *Powered industrial trucks*. Washington DC. U.S. Government Printing Office, Office of the Federal Register.
6. Code of Federal Regulations. 29 CFR 1926.21. *Safety training and education*. Washington DC. U.S. Government Printing Office, Office of the Federal Register.
7. DOL. OSHA. Standard interpretations: *The employer must provide the 1910.1200 verbal training in a language that is comprehensible*. [www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=19651]. Date accessed: January 30, 2008.

**Figure 1 – Similar location of the incident.
The tarp attached to the building without the scaffolding support.**



Figure 2 – Skid-steer loader similar to the one involved in the incident.

