Journal of the National Academy of Forensic Engineers®

http://www.nafe.org
ISSN: 2379-3252

Vol. XXXI No. 2 December 2014

Forensic Engineering Analysis of a Mobile Refuse Collection Vehicle Accident

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Abstract

As shown in this case, lack of attention to engineering, administrative, and management controls can lead to serious injury or death. Engineering controls include design or redesign of equipment, tools, or the workplace to reduce workers' exposure to hazards. Administrative controls are perhaps better characterized as workplace controls, which include changing work procedures, written safety policies and rules, supervision or schedules, and training, in order to reduce the duration, frequency, or severity of exposure. Management controls are a systematic effort by management to compare performance to predetermined standards, plans, or objectives, to determine if performance meets expectations and to take remedial action as indicated to reduce worker exposure to hazards. Because engineering, administrative, or management controls were not used in this case, a community service worker fell from a mobile refuse collection vehicle and suffered serious injury when his head struck the pavement.

Keywords

Forensic engineering, safety engineering, engineering control, administrative control, management control, gross negligence

Introduction

This case involves a county government that operates a public park. Trash trams, such as the one shown in **Figure 1**, were pulled through the park by a pickup truck, and trash cans would be emptied into the container at each picnic area and campsite. A park employee, who was responsible for safe equipment operation, drove the truck while community service workers rode on the tram.

Figure 1
Trash tram showing close-up of broken handle (in inset photo).

On Nov. 10, 2009, the plaintiff was riding on the back end of a tram — the cover of which had been left open. He

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was not made aware that there were gloves in the cap of the truck available for his use (gloves may have mitigated the impact enough to allow him to hold onto the rim). The hinge of the cover was in front. When the wind caught the lid, it closed. Because the handhold was broken (see inset of **Figure 1**), the plaintiff was holding onto the top of the container. When the lid slammed onto his hand, he fell off, suffering a left front temporal acute subdural hematoma with impending cerebral herniation.

As is often the case, several factors combined and contributed to the cause and seriousness of this event. Specifically, training was inadequate, the design was lacking key safety features, maintenance and repair were not performed, and the equipment was not operated in a safe manner.

Legal Standard

This is an engineering discussion, not a legal treatise. However, the standard of proof offers important context in this case. Georgia law says that when a local government purchases liability insurance, which, in this case, covered the motor vehicle and trailer in question:

> "….Neither the municipal corporation, county, or political subdivision of this state nor the insuring company shall plead governmental immunity as a defense; and the municipal corporation, county, or political subdivision of this state or the insuring company may make only those defenses which could be made if the insured were a private person (O.C.G.A. § 33-24-51)."

The defendant then pled immunity under the Community Service Act (O.C.G.A. § 42-8-71). Case law expanded such that, when applicable, a plaintiff must establish gross negligence, recklessness, or willful misconduct (Helton v. Glenn County et al. 2010).

Training

The county had an Employee Safety and Loss Control Manual (Adams 2008) that had been revised by Risk Management and the Safety Management Committee and approved by the County Board of Commissioners. Although employee training was addressed in the manual, it fell short of the requirements for operators of mobile waste and recyclable collection equipment (WASTEC 2008). These ANSI training requirements are basic initial training with periodic refresher regarding;

- The hazards assessment identifying type of hazard and who may encounter those risks;
- Required OSHA and DOT training;
- Operating instructions for each type of equipment;
- Equipment safeguards and features; and,
- Minimum requirements for each position.

Park Employee A testified that there was no policy or manual regarding training for those who ride the trash tram, nor was there a hazard assessment performed or available to the workers.

Community service workers rode the trash tram and emptied the trash cans. These workers satisfied their probation for relatively minor violations by working at the park. The plaintiff was performing community service because he had been driving with a suspended driver's license. From the park's perspective, these were transient workers. At each stop, the workers would empty trash cans into the tram, and then ride to the next stop standing on the step and holding onto the handhold. These workers were not trained; they were not forewarned of the hazards that may be encountered, they had no information on the equipment safeguards and features, and they were not given any information on the operating instructions for the equipment. They had a reasonable presumption that the equipment was safe and operated in a safe manner.

Design

In general, counties have small engineering staffs and limited budgets available to hire engineering support. Trash trams are not generally available in retail outlets. They are not easy to find through waste equipment suppliers. Over time, park employees had acquired several trash trams of unknown origin. It seemed reasonable (to park management) to sketch what was in use and engage a machine shop to manufacture more of the same. The trash tram requisition sketch is illustrated in **Figure 2**. There was no information regarding its origin.

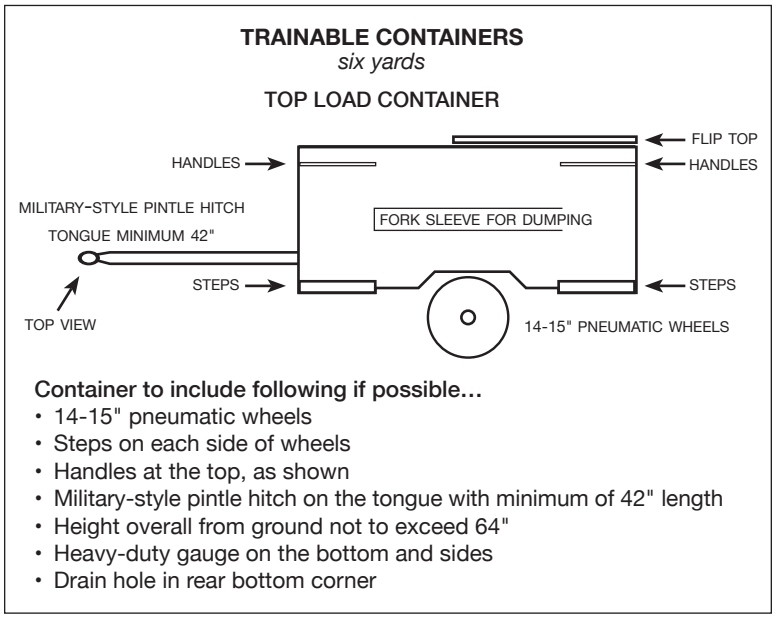

Figure 2
Trash tram requisition sketch.

A local machine shop received a contract to build trash trams based on the sketch. Some important details were left to the discretion of the machine shop. Had the county referred to *Mobile Wastes and Recycling Materials Collection Transportation and Compacting Equipment – Safety Requirements* (WASTEC 2008), it might have offered more detail. This ANSI standard called for a riding step at least 8 inches wide that provides a minimum surface of 220 square inches. As manufactured, the riding step was 10 inches wide and 14 inches long, providing a 140 in^2 step. The standard also called for handholds placed so that a rider can attain a four-point contact with the vehicle, using both hands and both feet approximately shoulder width. While it is not specified in the standard, these safety features need to be usable. The county safety and loss control manual required the County Safety Coordinator to:

"Recommend for incorporation in the program current practices, philosophies, and standards adopted by the safety profession, and its regulatory bodies, concerning injury prevention, occupational disease, vehicle accidents, liabilities or damage and loss to equipment and vehicles to the Safety Management Committee" (Adams 2008).

Maintenance

Broken handholds were a common and perennial issue. A park employee testified that the waste hauler damaged the handles with the forks of the container lifting devices — and that she had notified the waste hauler "years ago" about the problem. Another park employee testified that the handle on the side where the plaintiff was riding had broken off. Notifying the waste hauler once was insufficient management control.

Safety Program and Training

The minimum safety program includes (WASTEC 2008):

- A hazard assessment in which the employer conducts a review of the collection equipment used and the hazards associated with them, including the persons who may potentially encounter these hazards. *(This was not conducted.)*
- An evaluation of the means and methods of controlling the hazards identified in the hazard assessment, including information such as industry and regulatory requirements; operating, inspection, and maintenance of equipment. *(This was not performed.)*
- A written program, based on the hazard assessment and evaluation, including procedures for the operation, inspection, and maintenance of equipment, prohibited practices, recordkeeping, and training requirements. *(Equipment-specific assessment and evaluation were not performed.)*
- A training program that incorporates the above as initial and refresher training. *(There was not training available for community service workers.)*

Training was prescribed for county employees, and park employees participated in their own training. However, the training program did not include community service workers. Park Employee B testified that there was no policy or manual regarding training those who ride the trash tram. The ANSI Z245.1 standard specifies that contract labor must be trained as well.

Operation

A *NIOSH Alert* (NIOSH 1997) was published that offered safe riding instructions:

- Ride in the cab or a separate vehicle when not on the collection route;
- Use riding steps only when the vehicle is moving forward for short distances (0.2 mile or less) at slow speeds (10 miles/hour or less);

- After the vehicle has stopped, step — do not jump — on or off riding steps;
- Wear slip-resistant footwear, and avoid narrow cleats or spikes; and,
- Be extremely observant of the driver's blind spot behind the vehicle.

According to the vehicle driver, Park Employee C, the route was completed — and they were headed back to the staging area about 0.5 miles away at a speed of about 20 mph when the accident occurred.

Park Employee A had previously experienced wind blowing the lid of the trash tram closed while she was riding the tram. While the lid closing startled her, it did not cause her to let go. As a county employee, she had been trained and equipped with safety equipment (gloves). Gloves were available in the cab of the truck for the community service workers. However, testimony does not reflect that these workers were aware of this availability.

Conclusion

The plaintiff argued gross negligence applied. Georgia law defines gross negligence at O.C.G.A. § 42-8-71(d) as:

> "In general, slight diligence is that degree of care which every man of common sense, however inattentive he may be, exercises under the same or similar circumstances. As applied to the preservation of property, the term "slight diligence" means that care which every man of common sense, however inattentive he may be, takes of his own property. The absence of such care is termed gross negligence."

From an engineering perspective;

1. Good engineering practices were not used in equipment design, as indicated by deviations from the accepted standard (WASTEC 2008);
2. Management was aware of damaged safety features, and did not take effective and timely action to remedy broken hand grips;
3. Equipment was not operated safely. Specifically, riders did not stay in the truck cab when traveling to and from the park and the recommended speed was exceeded, contrary to the NIOSH recommendations; and
4. Community service workers were not trained as required by Glenn County Procedures, and were not made aware of safety equipment (gloves) that was available.

Management controls could have prevented this injury at several points. The requisition process did not include engineering review or any search of standards for refuse collection vehicles. Proper and routine inspection and maintenance would have assured handholds were available. A safety and training

program may have alerted management to the hazards and identified preventive action. In addition, operating as directed by NIOSH and the ANSI standard would have the plaintiff in the truck cab instead of hanging on the side of the tram while returning to the staging area.

In summary, the following engineering controls were not used to protect the worker:

- The riding step was under-designed such that riders could not stand with both feet shoulder width apart, in order to have the necessary stability. In addition, the handles were not designed for foreseeable use and abuse.

The following administrative controls were not used:

- Training was not extended to community service workers;
- Supervision was ineffective for both the park employee driving the truck and the plaintiff; and
- There was no written hazard assessment for the trash tram.

Management controls were not used effectively:

- Supervisors were aware of damaged handles and did not repair them or take action to prevent recurring damage.
- Supervisors were aware community service workers were not wearing the gloves, and did not take action to advise the workers.

While it is the jury's decision whether gross negligence applied, this engineering analysis offered useful clarification of the safety issues involved.

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