Shotcrete Truck Safety

By Mason Guarino

SEATBELTS, SEATBELTS, SEATBELTS! There, now that this is out of the way we can start. The key to making safety work is education, practice, and repetition. None of this is ever too much when it comes to ensuring everyone goes home safely every day. Truck safety is often overlooked, as the majority of the shotcrete crew does not have to interact with trucks on site. There are some general truck rules that can be followed to keep drivers and crews safe and there are some truck-specific safety items as well. The shotcrete crews typically interact with three types of trucks, including concrete, mobile volumetric mixer, and crew trucks. Most truck safety should be common sense; however, some things can be overlooked by even the most experienced crew members.

GENERAL TRUCK SAFETY

General truck safety is the easiest; some of it also applies to small personal vehicles that most workers are familiar with already. One of the easiest things to do is spend some time driving without any radio or music and learn what noises are normal and which ones are a cause for alarm. Some drivers do this religiously and never listen to the radio. All drivers should make it a regular practice to listen to your truck periodically.

Driver awareness and alertness is one of the most important safety factors. Driver fatigue can easily cause accidents on and off the jobsite. Not having enough rest to be alert as needed for safe operation of a vehicle can be disastrous, especially with the larger trucks that handle poorly and stop slowly when loaded. All drivers need to ensure they have enough rest to be safe.

Fig. 1: A news helicopter picture of the incident where a car came in contact with the passenger front corner of our truck and was turned in front of the truck and pushed a mile down a main highway

Drivers need to know their trucks and perform daily vehicle inspection reports. If something prohibits safe operation of the vehicle, immediately take the vehicle out of service until it can be repaired. On-road driver safety and responsibility should be a normal practice; follow the rules of the road, keep your truck maintained, and keep good records of maintenance or of any problems.

CAMERA SYSTEMS

With the price of technology decreasing, it is becoming much easier to install a truck camera system to help protect the company and the driver from injury and lawsuits. Backup cameras can be helpful, but having a camera on the driver, the front, back, and each side of the vehicle can easily alleviate a potential lawsuit from a mischievous individual or show the police that the truck driver did everything right when a car got too close. We had an incident a few years ago where, according to the driver, people were suddenly beeping and pointing at him and he pulled over to find a small car turned sideways in front of his 77,000 lb (35,000 kg) truck that he had pushed for a mile (1.6 km) down the highway at highway speeds (Fig. 1). Luckily no one was hurt, and no lawsuits were brought; however, a camera system that recorded all the movements would have shown who was at fault. GPS systems in the truck that monitor speed are recognized by the DOT and can help prove drivers are obeying the laws as well.

JOBSITE SAFETY

The jobsite is where more experience is needed. Many drivers are only experienced with on-road driving and do not encounter off-road driving. A lot of driving for shotcrete work requires off-road driving. Some off-highway driving is easier than others, such as mines and large-scale construction sites where roads are built within the sites to keep everyone safe. Many project sites such as retaining walls, soil-nail walls, and especially residential swimming pool work have less-than-desirable off-road driving conditions. These sites can be sloped in many ways, requiring the driver confirm they can even take their truck where it needs to go safely. Typically, the concrete truck—whether ready mixed or mobile volumetric mixer—is the heaviest vehicle with the highest center of gravity of any vehicles on

site. Just because a dump truck made it through upright does not mean it is safe for the concrete truck. These trucks can and do tip over. Drivers should evaluate where they are going whether on- or off-road before driving down to the discharge location. This is true whether it is the crew truck, the dump truck, or the concrete truck. Check for stable ground conditions and ensure nobody is ever beside a truck when driving into a jobsite. A truck that commonly weighs close to 80,000 lb (36,000 kg) can easily run over a soft spot with one wheel, which could cause the truck to tip (Fig. 2). Check for problematic areas, such as septic tanks, leach fields, weakened manholes, recently backfilled soils, or other potential soft spots. Truck drivers should ALWAYS have someone helping them back up into tight sites with slopes and drop-offs on the side of the road. In tight situations, some drivers may need help even when driving forward.

DRIVER TRAINING

Driver training is crucial to achieving many years of safety. Just because a driver has a commercial driver's license (CDL) that allows them to drive a large vehicle does not mean they have the correct experience to get into a truck and be a successful driver of that vehicle. Their experience could be limited to straight trucks over the road with no off-road experience. Or maybe they just graduated from CDL driving school, and while driving schools teach how to drive the school's lightly loaded trucks they will not have the experience necessary to safely drive a top-heavy truck weighing 70,000 to 80,000 lb (32,000 to 36,000 kg). These "new" drivers need to spend time riding with an experienced driver who can speak their language fluently and can demonstrate the correct skill set to drive that vehicle. Teaching a new driver how to be safe is more than just telling them to go slow on sharp corners, obey laws, and be careful. New drivers need to be educated on the weight their truck carries, how it carries it, and how that affects the acceleration and more importantly the stopping of the loaded truck. They need to be shown and taught why they need to drive a certain way and understand that it is very easy to roll over a large, heavy truck.

Fig. 2: An example of why vehicle inspections and knowing your truck are so important. This body broke loose from the frame of the truck and tipped over

Once a truck arrives on site, there is a different aspect of safety. Because the majority of readers here do not drive or operate concrete trucks, this article will not go in too much detail about them. Concrete trucks are operationally much simpler than volumetric mixer trucks. While there are lots of potential safety hazards with concrete trucks, the driver should be well-trained by the concrete batch plant company and understand their specific truck, so the shotcrete crews do not need to get involved in operating it safely on site. For the members of the shotcrete crew, the best thing to do around a concrete truck is to keep your distance and allow the operator to do their job.

VOLUMETRIC MIXER TRUCK SAFETY

Many shotcrete companies own and run volumetric mixer trucks. These are more common with the dry-mix shotcrete process; however, wet-mix batching trucks are becoming more popular. The volumetric mixer trucks have a slew of moving parts, including augers, conveyors, chains, gears, hydraulic booms, pumps, and hoppers. Drivers need to be thoroughly trained on how to load their trucks properly.

If you own volumetric mixers, testing should be conducted and pictures should be taken of what a full load entails. In Massachusetts, where South Shore Gunite Pools & Spas is based, our trucks are allowed to have a gross vehicle weight (GVW) of 77,000 lb. When the truck was purchased, it had mounts for side boards to protect the body from loading accidents, so we installed 2 x 12 in. (50 x 300 mm) lumber like we had on the dump trucks for years. Many drivers assume that we could fill the truck to the level of the boards and no sand would fall out on the highway… so that must be a full load. After initial testing we realized that if we loaded the truck to that level, it would still be safe to travel without anything spilling, but the truck could easily weigh up to 90,000 lb (41,000 kg) or more if the sand was wet. While the truck engine, axles, and suspension may all individually be able to handle this weight, it adds significant liability, such as breaking laws (that can incur fines), and simply is just a bad idea. The cement bins are also a fixed size, so if your truck is carrying around 90,000 lb that means there is probably 12,000 lb (5400 kg) too much sand in the truck. If your volumetric mixer is poorly calibrated, the concrete mixture will have far too much aggregate, and if calibrated properly your truck will be heading back to reload with an extra 12,000 lb on it. This would certainly use more fuel than necessary and is simply never cost-justified. With volumetric mixer trucks, there are a lot of moving parts in a dirty environment, and small and large breakdowns happen regularly. Experienced shotcrete contractors with a fleet of these trucks know that if you want to have three trucks ready to go you will need to own four, as something is always wrong with at least one of them.

AUGER SAFETY

Normal operation of volumetric mixer trucks is typically very safe because the manufacturers include safety equipment, such as guards, covers, shrouds, and latches to prevent injuries. It is when something goes wrong or breaks that things can become dangerous. With all these moving parts small problems are common and can usually be repaired in the field with basic crew truck tools. Common problem areas are in the augers, where materials such as rocks, hardened cement powder chunks, street cones, balls, and tree limbs can end up in the sand from many different sources. Experienced volumetric mixer crews can tell of many more strange objects that made their way into the aggregate bin and jammed up the mixer.

When things like this happen, DO NOT stick your hand in and free it. Steps need to be taken to ensure any work directly around augers is safe. Initially reversing the auger should be attempted to try to use the auger to free itself from what was causing a jam. If reverse does not work, the operator should do their best to relieve auger pressure by moving it into forward and reverse very lightly to find the middle of that optimal spot where the auger is not jammed under compression and could jump when the object is freed. Once it is certain that the auger is free, the truck should be shut down. This prevents any oil pressure from getting to something if a lever is bumped or a remote control falls. While it is possible to turn some valves and maybe isolate what is being worked on, why not just kill the power to everything to ensure nothing bad can happen? Once it is certain that all or as much pressure as possible is relieved from the auger and the truck is shut down, the operator should still not stick their hand into the auger to remove the jammed object. A lot of these augers will turn freely with a large tool when the truck is off, allowing the operator to slowly and carefully advance and auger with lots of control to work something out and then test if it is clear when it seems to be. Use an appropriate tool—preferably one with a longer handle that allows two hands to be on it for more control. Typically at this point the jam can be cleared relatively easily.

CONVEYOR BELT SAFETY

Conveyor belts pose a different and more complex jamming issue. The belts are typically attached to a chain that is difficult to see along its full length. These belts need to be extremely well maintained and always have the chains properly lubricated. These chains are frequently exposed to sand and dusty conditions—the opposite environment a chain wants to live in. With proper maintenance, cleaning, and lubrication, conveyor belts can last a long time. However, if the chains are not well maintained, the links will wear excessively and can start to come apart. When that happens, they always seem to jam themselves up in areas that are very difficult to repair. As any experienced volumetric truck operator knows, these material-conveying parts will never fail with only a little concrete material left—they will instead fail when the truck is full, thus making it even more difficult to diagnose and fix a problem. Again, when trying to repair these items, shut the truck off.

Most of these trucks have some type of chain drive. These chain drives are extremely easy to maintain as long as they are lubricated and checked regularly. If they are not checked, the chains can start to stretch a little or chain tensioners can come loose. When this happens, the chain starts to break teeth on the sprockets and once some teeth are missing they will try to jam up. When these jams occur, approach them in a similar way as the auger; try to relieve pressure by moving the mechanism in forward and reverse and then shutting the truck off. These chains are also heavy and even with the truck off and no tension, the chains can move a little, and a finger caught between a chain and a gear does not feel good.

ON-SITE REPAIRS

When these problems occur on-site, it is not uncommon for half of the crew to turn into professional mechanics who want to join in on fixing the problem. This is where the crew leader needs to step in and assign the correct people

Fig. 3(a) and 3(b): A driver mentally unfit to operate a truck took a turn too quickly and rolled our fully loaded mobile mixer. The body was able to be repaired but the truck was totaled

to complete the repair. Those people are usually the truck operator and ONE other person to assist. Keeping the repair process to two people allows clear information to be passed between the two and no one will hand-advance something when the other person is not ready. If for some reason there is no line of sight or it is noisy, a third person to ONLY convey information between the two can be added. Be clear, concise, and take a deep breath. These problems can be extremely frustrating, especially if you are sitting on a prevailing wage job with eight or more shotcrete crew members waiting to do their job. Stay calm, think clearly, and fix the problem safely. If there is a hot head on the crew, keep them away. If there is a hot head running the repair, let them take care of it. Would you risk your finger, hand, limb, or life over someone else's frustration?

MENTAL FITNESS

Truck drivers need to be mentally fit to be able to handle an 80,000 lb vehicle safely. Unfortunately, we found out about the mental unfitness of one of our drivers when they were driving a mobile volumetric mixer to a jobsite. The driver was familiar with the jobsite and knew where the turn was, but personal issues created a distraction for him. As a result, the driver was not paying attention and saw the left-hand turn he was supposed to make when he should have already been slowing down. He still tried to make the left-hand turn, although his speed was obviously too fast, and ended up rolling the truck over off a 6 ft (1.8 m) embankment (Fig. 3(a) and (b)). The driver suffered a broken arm and the truck was totaled. The driver did not return to work, as he could not focus on what he needed to focus on to safely do his job.

CONCLUSIONS

For those of you who do not have experience with volumetric mixer trucks, a little guidance: Yes, they break down; Yes, they break with full loads of sand and cement with broken augers and conveyor belts; and Yes, everyone that uses volumetric mixer trucks has been in the back of them hand-shoveling 30,000 to 40,000 lb (14,000 to 18,000 kg) of sand out of the truck to begin the repair, or even worse hand-shoveling over 8000 lb (3600 kg) of cement powder out of the cement bin. But here is a special message to those company owners and managers out there who think all that expensive sand around their sand barns needs to be cleaned up and used: if the sand barn has a dirt floor, that sand is a buffer from those auger busters—just let it be.

In summary, truck safety is all about education, practice, and repetition for all those associated with operating the vehicles. Drivers should get to know their vehicles and not assume every vehicle will act the same on or off the road. There are many aspects of truck safety that all need to be taught, monitored, and maintained to keep everyone returning home safely every day. Stay focused—not distracted—and ultimately make the commitment to stay safe.

Mason Guarino *started in the pool industry when he was 14, learning how to install reinforcing bars. Since then, he has worked on all phases of swimming pool construction. Guarino has been with South Shore Gunite Pools & Spas, Inc., full-time since graduating from the Wentworth Institute of Technology with his BS in construction management in 2009. Guarino currently serves on ASA's Board of Direction and is an ACI Certified Nozzleman.*