

28 BACKING UP



Reversing vehicles and equipment on construction projects pose a serious problem for personnel on foot. Fatal accidents resulting from workers being backed over by dump trucks and other equipment occur all too frequently.

Anyone on foot in the vicinity of reversing vehicles and equipment is at risk. A 2012 report on fatalities in Ontario's construction industry showed that between 1997 and 2011, 28 workers were killed when they were struck by moving vehicles or equipment. In 17 of these 28 cases, the equipment or vehicles were backing up.

Blind Spots

The main problem with reversing vehicles and equipment is the driver or operator's restricted view.

Around dump trucks and heavy equipment such as bulldozers and graders there are blind spots where the operator has no view or only a very limited view.

The operator may not see someone standing in these blind spots. Anyone kneeling or bending over in these areas would be even harder to see.

Consequently the driver or operator must rely on mirrors or signallers to back up without running over someone or into something. Figure 28-1 shows the blind spots for common types of construction equipment.

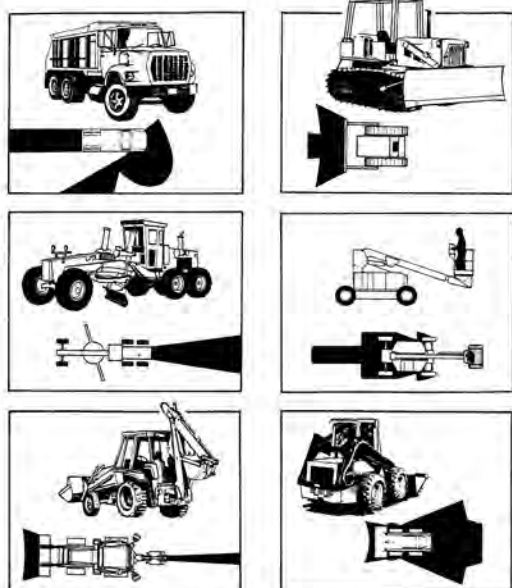


Figure 28-1: Operator Blind Spots (Dark Areas)

Dump trucks and cranes are the kinds of equipment that hit overhead powerlines most often. Beware of powerline contact whenever a crane, dump truck, or other vehicle is going to be operated near an overhead electrical conductor. If equipment operates within reach of (and could therefore encroach on) the minimum permitted distance from an overhead powerline (see Chapter 26: Electrical Hazards in this manual), the constructor is required to have written procedures in place to prevent the equipment from encroaching on the minimum distance.

Accident Prevention

To prevent injuries and deaths caused by vehicles and equipment backing up, there are four basic approaches:

- 1) Site planning
- 2) Signallers
- 3) Training
- 4) Signs and Warning Devices

Site Planning

Wherever possible, site planners should arrange for drive-through operations to reduce the need for vehicles to back up (Figure 28-2). Section 104 of the Construction Projects regulations (O. Reg. 213/91) states:

104. (1) Every project shall be planned and organized so that vehicles, machines and equipment are not operated in reverse or are operated in reverse as little as possible.
- (2) Vehicles, machines and equipment at a project shall not be operated in reverse unless there is no practical alternative to doing so.

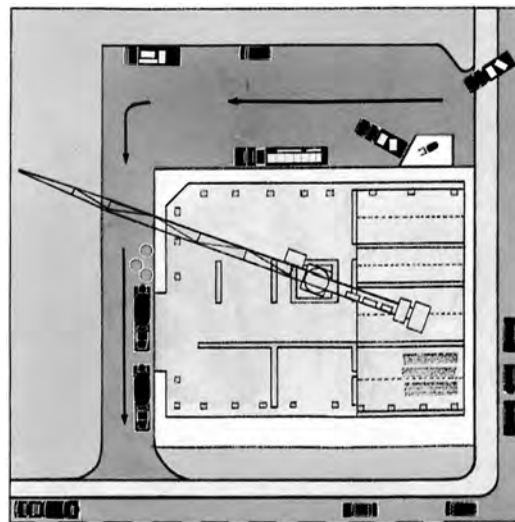


Figure 28-2: Plan for Drive-through Operations

Foot traffic should be minimized where trucks and equipment operate in congested areas such as excavations. Where feasible, a barricade can help to protect workers: (e.g., by keeping excavation work separate from forming operations as in Figure 28-3.)



Figure 28-3: Use Barricades to Protect Workers

The hazards of reversing vehicles can also be reduced through separate access for workers on foot. Where possible, for instance, a scaffold stair system should be provided for worker access to deep excavations.

Near loading and unloading areas, pedestrian walkways can be roped off or barricaded.

Signallers

On some projects, you cannot avoid having reversing vehicles or equipment on site. Often, they must share an area with other vehicles and operating equipment—as well as workers on foot.

You must have a signaller or spotter when

- a) A vehicle or equipment operator's view of the intended path of travel is obstructed
- b) A person could be endangered by the operation of the vehicle or equipment, or by its load
- c) Any part of the equipment could encroach on the minimum distance to an overhead powerline (see Chapter 26: Electrical Hazards in this manual for minimum distances).

A signaller must be a competent worker and must not have any other duties to fulfill while acting as a signaller.

Before a worker can act as a signaller, the employer must ensure that the worker has been given adequate oral and written instructions in a language that he or she understands. The employer must keep on site a copy of the written instructions and a record of the worker's training.

A signaller must wear a garment—usually a nylon vest—that covers the upper body and provides a high level of visibility. The vest must have an adjustable fit and have a front and side tear-away feature.

According to section 69.1 of the Construction Projects regulation (213/91), the main material of the garment must be fluorescent blaze or international orange in colour. However, other colours will be accepted by the MOL if they are listed in the CSA standard Z96-15: *High-Visibility Safety Apparel*.

The regulation also requires the vest to have two yellow stripes on the front and back that are retroreflective and fluorescent. The stripes must be at least 5 cm wide. The yellow area must be at least 500 cm² on the front and 570 cm² on the back. On the front, the two stripes must be vertical, centred, and approximately 225 mm apart (as measured from the centre of each stripe). On the back, they must be arranged in a diagonal "X" pattern.

For nighttime work, signallers must wear retroreflective silver stripes around each arm and leg.

The signaller must maintain clear view of the path that the vehicle, machine, or load will be travelling and must be able to watch those parts of the vehicle, equipment, or load that the operator cannot see.

The signaller must maintain clear and continuous visual contact with the operator at all times while the vehicle or equipment is moving (Figure 28-4), and must be able to communicate with the operator using clearly understood, standard hand signals (Figure 28-5).

The signaller must warn other workers on foot of the approaching vehicle or equipment, and must alert the operator to any hazards along the route.

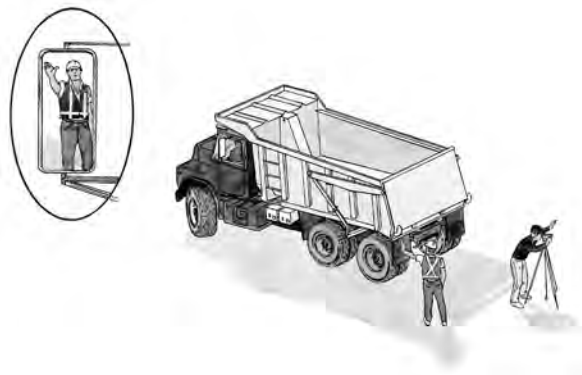


Figure 28-4: Use a Signaller

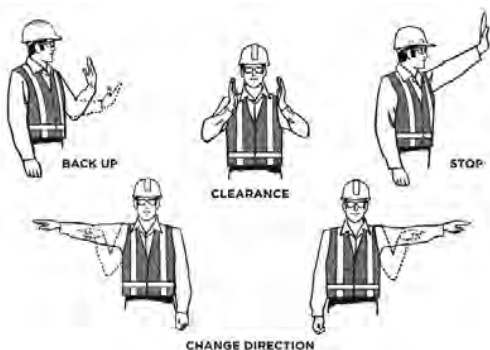


Figure 28-5: Traffic Control Hand Signals

Training

Instruction for drivers, operators, signallers, and workers on foot is essential to reduce the hazards created by reversing vehicles and equipment.

For example, all construction personnel must be made familiar with blind spots—the areas around every vehicle that are partly or completely invisible to the operator or driver, even with the help of mirrors. Figure 28-6 shows how some personnel on foot are visible to the driver while others are not. The driver cannot see the dark figures because they are passing through blind spots at the front and rear of the truck.



Figure 28-6: Workers in Blind Spots

Specific training can then focus on the following points.

Workers on Foot

- Know how to work safely around trucks and operating equipment.
- Understand the effect of blind spots.
- Avoid entering or standing in blind spots.
- **Make eye contact with the driver or operator before approaching equipment.**
- Signal intentions to the driver or operator.
- When possible, use separate access rather than vehicle ramps to enter and exit the site.
- Avoid standing and talking near vehicle paths, grading operations, and other activities where heavy equipment is moving back and forth.

Drivers and Operators

- Always obey the signaller or spotter. If more than one person is signalling, stop your vehicle and determine which one to obey.
- If possible, remain in the cab in areas where other equipment is likely to be backing up.

- Make sure that all mirrors are intact, functional, and properly adjusted for the best view.
- Blow the horn twice before backing up.
- Stop the vehicle when a spotter, worker, or anyone else disappears from view.

Signallers

- Stay alert to recognize and deal with dangerous situations.
- Know and use the standard signals for on-site traffic (Figure 28-5).
- Wear a reflective fluorescent or bright orange vest and a bright hard hat for high visibility.
- Use a signalling device such as a bullhorn in congested excavation areas.
- Understand the maneuvering limitations of vehicles and equipment.
- Know driver and operator blind spots.
- Stand where you can see and be seen by the driver or operator.
- Make eye contact with driver or operator before signalling or changing location.

Signs and Warning Devices

The Construction Projects regulation requires signs to be posted in conspicuous areas to warn workers of reversing vehicles and equipment (O. Reg., s.104 (6)). There is also a requirement for dump trucks to be equipped with an audible alarm that signals when the vehicle is being operated in reverse (O. Reg., s.105).

Back-up alarms offer the greatest benefit when traffic is limited to only one or two vehicles. The warning effect of the alarm is greatly reduced, however, when it simply becomes part of the background noise on-site.

This is a common shortcoming with devices that sound continuously when the transmission is put in reverse, especially in areas where several vehicles are operating at once.

Although the legislation only speaks to the audible alarm back-up technology, many other technologies have been developed to help decrease the number of struck-by incidents and protect workers from all kinds of reversing vehicles. It is believed that these technologies, when used in conjunction with signallers as required under section 104, have the potential to considerably reduce reversing vehicle incidents.

Rear-view camera and monitor systems use cameras that are mounted on the rear of the vehicle with a monitor in the cab. When the operator reverses the vehicle, the camera provides the operator with a clear view of the blind area behind the vehicle by displaying it on the monitor. In combination with the vehicle's mirrors, the system gives the operator a clear view of objects and personnel behind the vehicle.

Although these types of systems are good, one of their limitations is that the camera must be clean. In inclement weather, it's not always practical to keep the camera clean. Another limitation is that the system relies on the operator to look at the monitor.

Radar systems are designed to monitor the rear blind spots behind the vehicle. They are activated when the vehicle is in reverse by sending out electronic pulses that detect objects behind the vehicle in the vicinity of the radar beam. These systems generally consist of a radar antenna mounted on the rear of the vehicle and an alarm unit in the cab. Some of these systems have a feature where the frequency of the audible alarm increases as the object behind the vehicle gets closer.

These types of systems can be effective. However, the system will detect anything behind the vehicle, even if it's not a hazard. These "false positives" may cause the operator to ignore the alarm if it goes off too many times.

Radio frequency detection systems send out a signal from an antenna mounted on the back of the equipment. The signal from the antenna detects personnel wearing safety vests and hard hats that have been equipped with radio frequency identification (RFID) tags.

When a worker wearing an RFID-tagged vest or hard hat enters the transmitting area of the antenna, the tagged vest and hard hat sends a signal to a display unit installed in the cab and an alarm sounds to warn the operator that there is a worker behind the vehicle or equipment.

While there are obvious benefits to this type of automated system, one limitation is that the operator

may not be able to react in time to stop the vehicle once the alarm sounds. Another limitation is that the system only works if people on the jobsite wear RFID-tagged vests or hard hats.

These systems are intended to increase safety. They can help vehicle operators prevent struck-by incidents by letting them know that something or someone is behind the vehicle. **Remember: a signal person is required under section 104(3) of the construction regulations.** However, these technologies can provide additional protection for workers, including the signaller.