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OCCUPATIONAL HEALTH AND SAFETY CODE 2009

Part 19 Powered Mobile Equipment Highlights

- Section 256 summarizes all major operator responsibilities.
- Section 263 presents requirements for leaving equipment unattended or suspended.
- Section 267 permits employers to use various approaches to warn workers of the presence and movement of powered mobile equipment.
- Section 269 recognizes the need for employers to protect equipment operators from intruding or airborne objects.
- Section 270 requires employers to equip ride-on lawnmowers weighing more than 700 kilograms with a rollover protective structure (ROPS). Where the hazard assessment indicates that powered mobile equipment (not otherwise required to be equipped with a ROPS) might roll during use, the employer must provide the equipment with a ROPS or must introduce safe-work procedures to eliminate the possibility of rollover. (Section 8 of the *OHS Regulation* requires that the procedures be in writing and available to workers.)
- Section 272 requires employers to ensure that equipment is equipped with a falling object protective structure (FOPS) if the equipment operator is exposed to the hazard of falling objects.
- Section 276 prohibits anyone from riding on a load while it is being moved.
- Sections 280 through 282 present requirements applicable to all-terrain vehicles and snow vehicles.
- Sections 285 through 290 present requirements specific to pile driving equipment and practices, including crane-boom inspection and certification intervals.
- Section 290.1 presents licensing and mechanical inspection requirements applicable to personal vehicles used for work purposes.
- Section 290.2 introduces requirements specific to concrete pump trucks.

Requirements

Section 256 Operator responsibilities

Subsection 256(1)

This subsection describes a worker's responsibilities prior to actually operating powered mobile equipment. Emphasis is placed on the worker being trained and competent to operate the equipment safely. Competency can be demonstrated by operating the equipment to a level considered satisfactory by another worker who is competent in the operation of that same or similar equipment and who has been designated by the employer to assess this competency. Section 15 of the *OHS Regulation* specifies what, at a minimum, must be covered in the worker's training.

To operate the equipment safely, the worker must understand the equipment's operating instructions. Only workers authorized by the employer may operate powered mobile equipment. How a worker becomes "authorized" depends on the employer. Some employers may provide verbal authorization while others may do so in writing following an evaluation of the worker's operating skills.

Subsection 256(2)

This subsection allows a worker in training to operate powered mobile equipment as long as the worker does so under the direct supervision of a competent worker designated by the employer.

The term "direct supervision" is defined in the OHS Code and has special meaning. In particular,

- (a) direct supervision means that the worker who is not competent must be under the personal and continuous visual supervision of a competent worker — the two workers must be capable of interacting with one another on a one-on-one basis and must maintain visual contact with one another throughout the performance of the work for which direct supervision is required; and
- (b) the two workers must be able to readily and clearly communicate with each other — in noisy or distracting circumstances, hand signals may be appropriate. These signals must be clearly understood by both workers. If communication devices such as portable two-way radio headsets are used within protective headwear for example, transmissions must be clear and reliable for the duration of the work.

Subsection 256(3)

The operator is the worker most familiar with the performance of the powered mobile equipment. As such, the operator is responsible for reporting to the employer any condition that may affect the safe operation of that equipment. Serious problems should be reported immediately. Problems that do not present an immediate danger can be recorded and reported by any designated method appropriate to the particular situation. Systems such as a vehicle log book, maintenance work order, or central dispatching system can be used to record problems requiring future attention. The problems must, however, be reported in a way that ensures they are addressed in an appropriate timeframe.

Operators are responsible for ensuring that they operate powered mobile equipment safely. In particular, full control of the equipment must be maintained at all times to prevent near misses and accidents.

An operator must use the equipment's seat belt and all other safety equipment provided e.g. restraining devices, guardrails, operator protective structures, etc. The operator is also responsible for making sure that passengers use their seat belts and any other safety equipment provided.

Since poor housekeeping can affect worker safety, the operator must maintain the equipment in a reasonable condition. The cab, floor and deck must be kept free of material, tools or other objects, including spills of lubricant or fuel, that could create a safety hazard to the operator or other occupant(s). Objects such as lunch boxes, flashlights, tools, first aid kits, etc. can get jammed under control pedals or become airborne during an accident. Such objects must be appropriately stored and secured.

Section 257 Visual inspection

Subsection 257(1)

The operator of powered mobile equipment must perform a visual inspection of the equipment before starting it up. It is critical that a walk-around be done to check for obvious mechanical problems, equipment clearances, closeness to other equipment or structures, and other workers who may be at risk when the equipment is moved. Typically this can be done at the start of the operator's work shift.

Subsection 257(2)

In addition to a start-up inspection, the operator must perform periodic inspections as required by the manufacturer's specifications or the employer's operating procedures. The focus of these inspections is equipment safety. Since the number of items to be checked can be considerable, it is suggested that a checklist be developed. Items that can be included on the checklist include tires, wheel lugs, suspension, engine/hydraulic system/fuel levels, fluid leaks, operating and marking lights, cleanliness of windshield and cab windows, condition of installed safety devices such as back-up alarms, flashers, turn signals, seat belts, parking brake etc., and any other item that can affect operating safety.

Subsection 257(3)

Situations may arise in which an operator cannot perform a pre start-up inspection e.g. equipment operated on a continuous 24-hour basis or is not shut down at the end of a shift. This subsection allows an operator to perform the required visual inspection at some time during the shift or work period other than at its start. As described in the employer's operating procedures, an alternate time for the visual inspection could be during a period of production delay or a defined equipment fuelling period. The time and date of all inspections should be recorded.

Subsection 257(4)

No one is allowed to start the powered mobile equipment until a complete visual inspection as required by subsection (1) is done.

Section 258 Dangerous movement

Subsections 258(1) and 258(2)

The movement of powered mobile equipment can present a danger to workers located within range of moving loads or moving parts. These subsections require that:

- (a) the employer not permit any worker to remain within range of a moving load or part,
- (b) the operator, who has control over the equipment, must not move the load or equipment when any worker is in range of the moving load or equipment part, and
- (c) workers are responsible for moving themselves out of range of a moving load or part.

Subsection 258(3)

Being crushed between a stationary object or obstacle and moving equipment is a frequent cause of worker injury and death. This subsection requires the employer to identify such hazards. The employer must then prevent workers from entering the pinch point or provide a minimum clearance distance of 600 mm between the obstacle and the powered equipment. Guarding or the placement of barricades to prevent access to identified pinch points are approaches that are often used. Where machines swivel in the middle as part of their steering mechanism and operators need to grease the centre pin, shutting down the machine and applying the brakes may be the best way to prevent potential operator injury.

Section 259 Pedestrian traffic

Subsection 259(1)

At many worksites pedestrians can move about in close proximity to operating powered mobile equipment. To prevent accidents involving pedestrians, the employer must, if reasonably practicable, designate walkways that separate pedestrians from areas in which powered mobile equipment is operated. The employer must ensure that workers use the designated walkways.

Subsection 259(2)

Recognizing that it may not always be practicable to provide pedestrians with designated walkways, alternative safe work procedures may be used. Example include:

- (a) the use of a traffic control system,
- (b) the enforcement of speed limits for powered mobile equipment,
- (c) a requirement for the powered mobile equipment operator to acknowledge the pedestrian's presence before the pedestrian proceeds through the hazardous area,
- (d) high visibility vests, and
- (e) other equally effective means.

Section 260 Inspection and maintenance

Subsections 260 (1) and 260(2)

Powered mobile equipment must be inspected according to the manufacturer's specifications. Inspection intervals and what should be inspected are usually described in the specifications. Only competent persons are allowed to perform the inspection activities.

Subsection 260(3)

If an inspection reveals a defect or unsafe condition that could create a hazard to a worker(s), the powered mobile equipment should be immediately removed from service and, if appropriate, measures put in place to protect worker(s). Once this has been done, and if appropriate, the equipment can continue to be operated until the problem is corrected. For example, if the back-up alarm of a dump truck stops working, the truck can continue to be operated if another worker acts as a look-out during all backing-up activities.

Section 260(4)

If the powered mobile equipment is potentially hazardous but can be operated safely, the employer must make sure that the operator is aware of the potential hazard. The employer must also ensure that the defect or condition is repaired as soon as reasonably practicable. The defect or condition may worsen over time, posing an increased danger of injury to workers.

Subsection 260(5)

Records of the inspections and maintenance performed on powered mobile equipment must be kept at the work site. These records must be available to the equipment operator so that the operator is aware of the equipment's condition.

Section 261 Maintenance on elevated parts

Elevated parts of powered mobile equipment can pose a serious hazard to workers performing maintenance and repairs. Elevated parts must be securely blocked to prevent their movement. In some cases, the equipment may also need to be locked out to ensure that it will not move and endanger workers. As an example, numerous workers have been killed or seriously injured while repairing or maintaining forklift

trucks. Elevated forks can drop if they are not properly blocked to prevent unintended downward motion.

Section 262 Starting engines

Subsections 262(1) and 262(2)

Powered mobile equipment can move unexpectedly if a worker tries to start the equipment while any drive mechanism or clutch is engaged. Training, worker competency and following the manufacturer's specifications are key to preventing the equipment from moving unexpectedly.

Subsection 262(3)

It may not be possible to disengage the drive mechanism or clutch before starting up some types of powered mobile equipment. In such cases, the employer should identify the related startup hazards and ensure that workers are protected from injury. Restricting worker access or blocking and safeguarding the immediate area during startup may be one approach.

Section 263 Unattended equipment

Subsection 263(1)

Powered mobile equipment can pose a serious risk of injury to workers and damage to property if it is not properly secured against unexpected movement. Unexpected movement could be caused by any number of factors such as sloping ground, changes in air or hydraulic pressure, slippery ground conditions, equipment parked incorrectly, etc.

The operator must ensure that powered mobile equipment is prevented from moving unintentionally. Examples of how to do this include engaging any movement safety device and placing the transmission in the manufacturer's "park" position. Where necessary, the wheels of the equipment should be blocked with wheel chocks. On equipment like graders and dozers, ground-engaging implements provide additional braking and help to prevent unexpected movement.

Subsection 263(2)

Air and hydraulic pressures can bleed off over time. Suspended machinery or ground engaging implements such as rippers, blades, buckets, etc. must therefore be lowered to the ground or otherwise secured in a safe position before the equipment controls are left unattended.

Elevated manlift booms are often seen at worksites and especially rental yards stored in an elevated position. A recent (June 2009) review by Workplace Health and Safety of written instructions from all of the major manlift manufacturers has confirmed that this is an acceptable practice from the manufacturer's perspective. Manufacturers regard booms in this position as having been "secured in a safe position", thereby complying with this subsection. Manufacturers further agree that the equipment is safest when the boom is in its retracted position. An employer is considered to be in compliance with this subsection if

- (a) a manlift boom stored in an elevated position is fully retracted, and
- (b) the employer meets all of the manufacturer's other conditions for storage.

Section 264 Lights

If earthmoving construction machinery is operated during "hours of darkness" as defined in the OHS Code and described in this section, it must be equipped with lights that comply with SAE Standard J1029 (2007), *Lighting and Marking of Construction, Earthmoving Machinery*. The lights must illuminate the direction of travel, the working area around the equipment, and control panel instruments.

SAE Standard J1029 (2007) specifies requirements for lighting and marking earthmoving construction machinery. At least two headlamps are required for lighting the area directly ahead of the machine when operated in its normal direction of travel. Minimum lighting levels are specified for these headlamps.

For rear lighting, machines must have two tail lamps and two stop lamps. The performance of these lamps is specified through other referenced SAE standards. The Standard requires two red reflectors on the back of the machine, as low in height as practical and spaced as far apart from the centerline of the machine as practical. Rubber tired machines more than 6 m long require yellow reflectors on each side of the machine. These reflectors must be placed as low as practical and as far forward and rearward as practical.

The Standard also recommends flood lamps for general illumination of the work tool area of a machine. General service lamps are recommended for general illumination of areas a short distance from the machine.

Section 265 Windows and windshields

Subsections 265(1) and 265(2)

The glazing of powered mobile equipment must be approved to ANSI Standard Z26.1. Alternatively, non-shattering materials that provide at least equivalent protection can also be used.

ANSI Standard ANSI/SAE Z26.1 (1996), *Safety Glazing Materials for Glazing Motor Vehicles and Motor Vehicle Equipment Operating on Land Highways – Safety Standard*, specifies performance criteria and the methods for testing safety glazing material used for windshields, windows, and partitions of land and marine vehicles and aircraft. Compared to ordinary sheet glass, plate glass, or float glass, safety glazing materials complying with the Standard reduce the likelihood of injury or the severity of injury should the materials break.

Six types of glazing are described in the Standard: laminated glass, tempered glass, wire glass, plastic, multiple glazed units, and bullet-resisting glazing. Glazing materials complying with the Standard are marked with the words “American National Standard” or the characters “AS”, a model number identifying the type of construction of the glazing material, and the manufacturer’s distinctive designation or trademark.

Subsection 265(3)

Cracked or broken glazing that obstructs or impairs an operator’s view creates a safety hazard and must be replaced as soon as practicable.

If cracks are present but do not obstruct the operator’s view, they may become a safety hazard over time and the employer should take this into consideration. Changing weather conditions, vibration, and flexing of the cab structure can cause a crack to spread or cause the entire glazing to shatter unexpectedly. These factors should be considered when deciding if cracked glazing that does not obstruct an operator’s view should be replaced.

Subsection 265(4)

Proper windshield wipers are mandatory on all powered mobile equipment equipped with a windshield. The wipers must be of sufficient size and the drive-motor strong enough to remove debris from the windshield under expected operating and weather conditions. For Alberta weather conditions, a properly operating cab / windshield heater can maintain wiper effectiveness and the operator's view.

Section 266 Other safety equipment

Section 266(a)

Situations may arise in which the best way to prevent worker injury or damage to equipment and property is to shut down equipment quickly. This subsection requires that the equipment be equipped with a control device that permits the operator to do so. The device must be able to stop the unit of powered mobile equipment or any ancillary (accessory) equipment driven from the powered mobile equipment. The control device must be within easy reach of the operator and might take the form of a red-coloured emergency off button, a pull cord, or other similar device.

Section 266(b)

The presence, general dimensions or movement of powered mobile equipment may present a danger to workers. Where this is the case, the employer must ensure that the equipment is equipped with effective means of warning workers of the danger.

Examples of effective means include

- (a) audible warning systems,
- (b) clearance or marker lights that outline the width, length, and height of the equipment, and
- (c) flashing lights under some circumstances.

Section 266(c)

Powered mobile equipment must be equipped with seats or other installations sufficient to ensure that all workers authorized by the employer to be on the equipment are safe while the equipment is in motion. Equipment equipped with ROPS must also be fitted with seat belts, or another equally acceptable restraining device. Examples of common practices in violation of this requirement are workers riding in the boxes of trucks and on the forks of forklift trucks.

Section 266(d)

For powered mobile equipment equipped with a trailer hitch, the employer must ensure that safety clips are installed on the connecting pins. The safety clips prevent unintended disconnection of the trailer from the powered mobile equipment.

Section 267 Warning signal

Subsection 267(1)

The large size of some powered mobile equipment makes it impossible for the operator to have a clear view around the equipment. This view can be directly with the eyes or indirectly with a mirror, closed circuit television, or other effective means. A serious hazard can result if the equipment is moved in a direction that the operator cannot see clearly.

If the operator cannot see what is in the direction of travel, the powered mobile equipment must be equipped with one or more of three acceptable alternatives:

- (a) an automatic audible warning device – the audible warning must be loud enough to be heard above other noise in the immediate area. For most equipment this is the familiar “back-up alarm”;
- (b) an alternate warning device or method appropriate to the hazards of the work site – this may include flashing/rotating lights, strobe lights, or other effective means; or
- (c) an automatic stopping system – this system may use motion, thermal or other detectors to sense the presence of a worker or obstruction in the path of travel and automatically stop the equipment.

This subsection is not intended to have employers install warning devices or automatic systems on all powered mobile equipment. The requirement applies only if an equipment operator’s view of the equipment’s path of travel is obstructed or cannot be seen directly or indirectly in a direction. Putting audible warning devices on all powered mobile equipment at a work site, for example, could create a greater hazard due to confusion resulting from multiple alarms going off simultaneously.

Subsection 267(2)

Where it is impracticable to install a warning device or automatic stopping system (perhaps due to noise by-laws that restrict the operation of audible warning devices), the operator is not allowed to move the equipment until precautions are taken to prevent operator and worker injury. Examples of acceptable precautions include

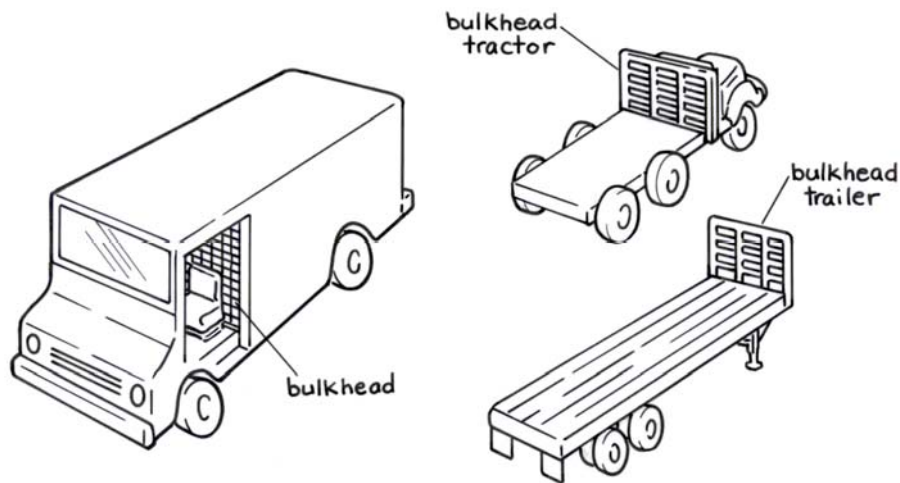
- (a) a detailed inspection of the travel path by the equipment operator,
- (b) direction by a designated signaller or other worker who is in continuous view of the operator and has a complete view of the area into which the equipment will move,
- (c) direction by a traffic control or warning system, or
- (d) ensuring that all other workers are removed from the area into which the equipment will move.

In all cases the control must be appropriate for the conditions at the work site.

Section 268 Bulkheads

Material or equipment can shift during a sudden or emergency stop, presenting a significant hazard to a powered mobile equipment operator. The employer must install a physical barrier such as a bulkhead (see Figure 19.1) or other protective device such as a cargo net to protect the operator. Because the bulkhead or protective device can be subjected to significant dynamic forces during an emergency stop, it must be properly designed and installed.

Figure 19.1 Examples of bulkheads



The reader is also referred to the Alberta Cargo Securement Regulation (AR 1/2005) under the *Traffic Safety Act*. This Regulation establishes a standard for properly securing a load on a commercial vehicle.

Section 269 Guards and screens

Activities such as brush clearing or the collection of golf balls at a driving range may expose powered mobile equipment operators to injury as intruding or flying objects e.g. branches, rocks, etc. may enter the operator cab. Where there is a significant potential for operator injury i.e. the nature of the work or work area make it highly likely that such objects will enter the cab, the employer must ensure that the operator is protected. The section lists several methods of protecting the operator.

Section 270 Rollover protective structures

Subsection 270(1)

Rollover protective structures (ROPS) are strong cages, frames, roll bars, or other structures attached to certain types of powered mobile equipment. ROPS systems are designed and built to provide crush protection for an operator during a rollover or accidental upset. Figures 19.2 through 19.10 show examples of the powered mobile equipment listed.

This section includes industrial ride-on lawnmowers weighing 700 kilograms or more. Rollovers involving industrial ride-on lawnmowers are most often the result of the lawnmowers hitting bumps, wheels dropping into holes, ditches, or structures such as swimming pools, wheels dropping off terraces, embankments, or retaining walls, and operating at full speed on steep slopes or during tight cornering. Rollovers have also occurred when machines have slid down slippery slopes.

Figure 19.2 Examples of a tracked dozer and tracked loader

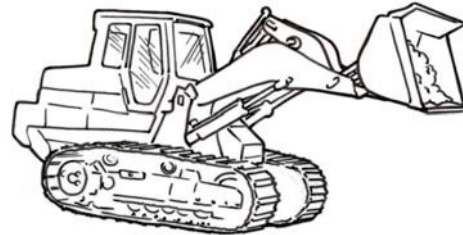


Figure 19.3 Examples of wheeled dozer and wheeled loader



Figure 19.4 Example of a skidder



Figure 19.5 Example of a backhoe with limited horizontal swing

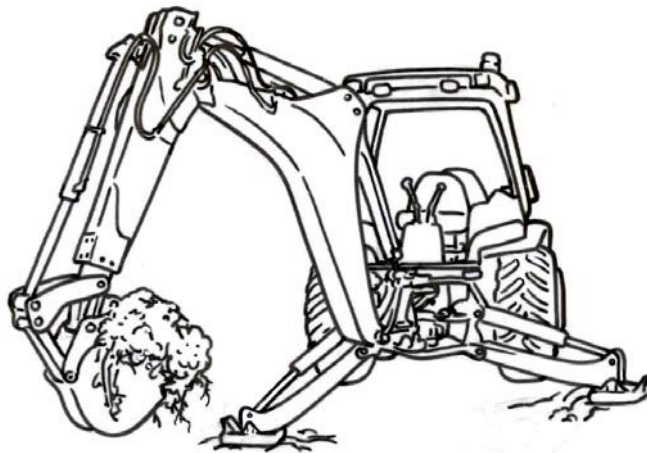


Figure 19.6 Example of a motor grader

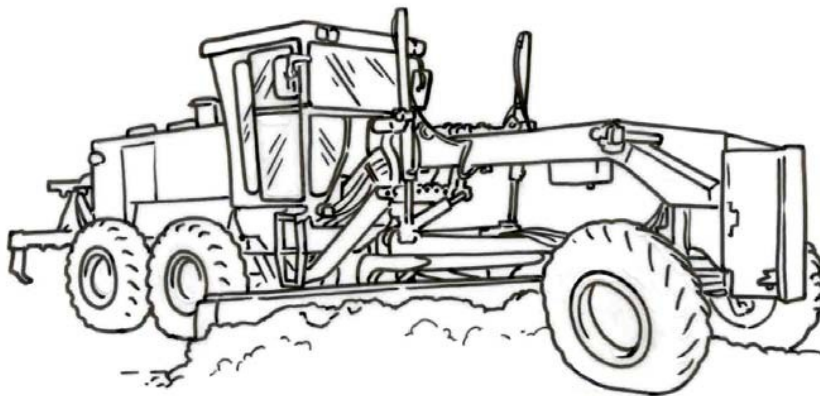


Figure 19.7 Example of a self-propelled wheeled scraper



Figure 19.8 Examples of agricultural tractors

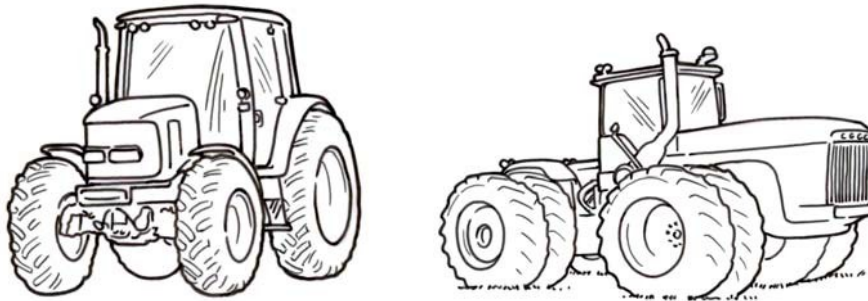


Figure 19.9 Examples of industrial tractors

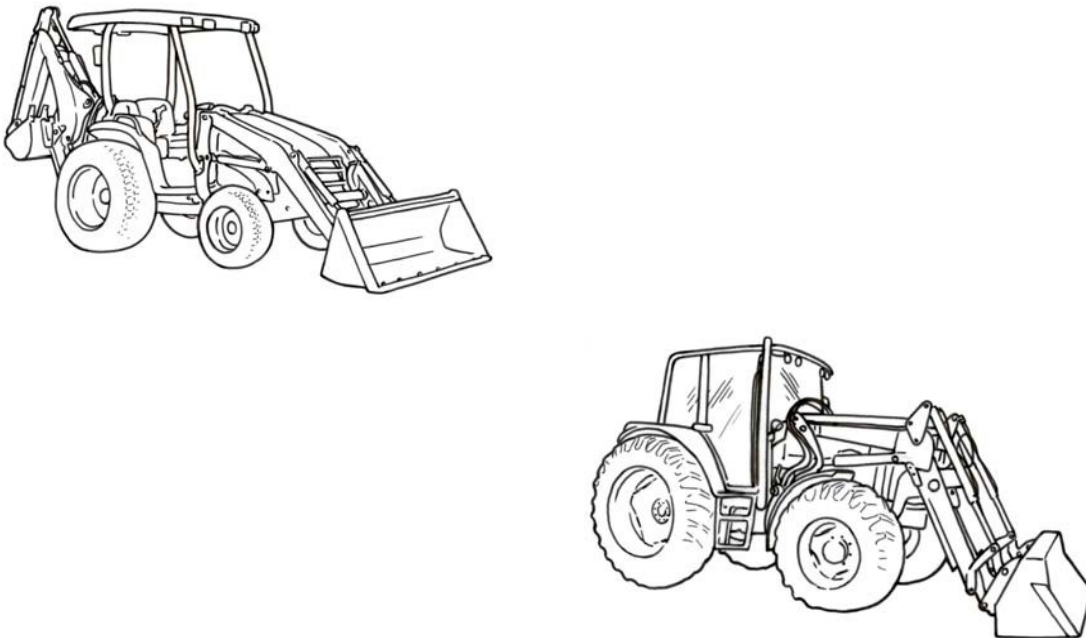
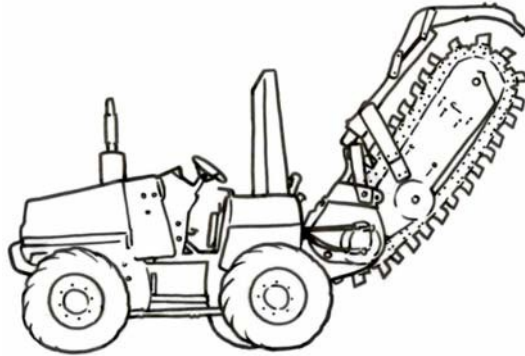


Figure 19.10 Examples of wheeled trenchers



Subsection 270(2)(a)

CSA Standards B352.0-95 (R2006), B352.1-95 (R2006), and B352.2-95 (R2006) detail the design, testing, performance and safety requirements for rollover protective structures (ROPS) for certain types of self-propelled machines for agricultural, construction, earthmoving, forestry, industrial, and mining operations.

CSA Standard B352.1 covers the performance requirements, based on destructive testing, for ROPS on wheeled agricultural tractors with a mass greater than 800 kilograms. It may also be used to evaluate general-purpose industrial tractors.

CSA Standard B352.2 covers the performance requirements, based on destructive testing, for ROPS on industrial tractors, motor graders, prime movers, skidders, tracked dozers, tracked loaders, wheeled dozers, wheeled loaders, backhoe loaders, rigid-frame dumpers, compactors, or rollers, with machine mass greater than 700 kilograms.

A ROPS complying with the referenced CSA standards will have a permanently attached label that includes the following information:

- (a) name of the ROPS manufacturer;
- (b) ROPS identification number;
- (c) the Canadian standard to which the ROPS was certified; and
- (d) machine make and models for which the ROPS is designed.

Subsection 270(2)(b)

SAE Standard J1042 (2003), *Operator Protection for General-Purpose Industrial Machines*, establishes performance requirements for protective systems that provide operator protection from hazards of machine rollover and/or falling objects. The Standard does so by recommending certain design features that reduce the likelihood of operator injury e.g. construction and location of batteries, fuel tanks, oil reservoirs, etc. and eliminating edges, corners and sharp projections that an operator might contact. The Standard also makes direct reference to other SAE Standards that present specific construction and performance criteria for ROPS and falling object protective structures (FOPS).

Checking the manufacturer's specifications and/or checking to see if the ROPS bears a label referring to the Standard can verify compliance with the Standard.

Subsection 270(2)(c)

SAE Standard J1194 (1999), *Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors*, establishes the test and performance requirements of a rollover protective structure (ROPS) designed for wheel-type agricultural tractors to minimize the frequency and severity of operator injury resulting from accidental upsets.

Checking the manufacturer's specifications and/or checking to see if the ROPS bears a label referring to the Standard can verify compliance with the Standard.

Subsection 270(2)(d)

ISO Standard 3471: 2000, *Earth-moving machinery – Roll-over protective structures – Laboratory tests and performance requirements*, establishes consistent and reproducible means of evaluating the load-carrying characteristics of roll-over protective structures under static loading conditions. The Standard applies to the following seated design operator-controlled machines:

- (a) crawler tractors and loaders;
- (b) graders;
- (c) wheeled loaders and wheeled tractors;
- (d) wheeled industrial tractors;
- (e) prime movers;
- (f) rollers and compactors; and
- (g) rigid frame dumpers.

Subsection 270(2)(e)

OSHA Standard 1928.52, *Protective Frames for Wheel-type Agricultural Tractors – Tests, Procedures and Performance Requirements*, applies primarily to tractors used as ride-on lawnmowers. A protective frame is a structure comprised of uprights mounted to the tractor, extending above the operator's seat to form what looks like a rollbar.

Checking the manufacturer's specifications and/or checking to see if the ROPS bears a label referring to the Standard can verify compliance with the Standard.

Subsection 270(2)(f)

This subsection recognizes that some equipment remains in service for many years, sometimes well beyond the lifetime of the referenced standards. Equipment having a ROPS designed or manufactured to comply with a previous edition of one of the referenced standards continues to be acceptable for use.

Subsection 270(3)

The powered mobile equipment listed in subsection (1) must be ROPS equipped. However, other equipment may also be subject to rollover because of how or where it is used. Section 7 of the OHS Code requires that the employer assess the work site for hazards. In the case of equipment that may roll over because of how or where it is used, the employer's hazard assessment should consider the manufacturer's specifications, stability data for the equipment, hazards presented during loading and unloading of the equipment, the type of work being performed with the equipment, and the conditions under which the equipment is being operated.

In cases where the possibility of rollover is present, the employer must either equip the equipment with an appropriate ROPS or implement safe work procedures that eliminate the possibility (Section 8 of the *OHS Regulation* requires that the procedures be in writing and available to workers). The ROPS must either be supplied by the manufacturer (the ROPS can meet any standard the manufacturer specifies and need not be limited to one of those listed in subsection (1)), or be certified by a professional engineer as being suited to that equipment.

Safe work procedures are a set of rules that must be followed. Using these procedures eliminates the need to equip the equipment with a ROPS by eliminating any possibility of the equipment rolling over during operation. The procedures may limit or restrict where the equipment can be used. For example, restrictions may include:

- (a) the slope on which equipment can be operated e.g. the equipment cannot be operated across a slope or up and down a slope exceeding so many degrees of incline;
- (b) the terrain over which the equipment is operated e.g. the equipment cannot be operated in areas where it is possible for it to rollover because a wheel or wheels can drop into a hole, ditch, etc. or drop off an edge such as an embankment, retaining wall, etc.;
- (c) maximum operating speed while cornering; and
- (d) marking off areas where slopes exceed the maximum slope angle, where terrain features are capable of causing a rollover, and where other hazards are present that could cause a rollover. Barricades, flagging, or similar means of warning may be needed to alert the operator of the hazard.

Section 271 Equipment with rollover protection

If powered mobile equipment is equipped with a rollover protective structure (ROPS), it must be equipped with some way of keeping the operator and passengers inside the ROPS in case of equipment upset. Restraining devices are designed to prevent occupants from being thrown outside of the ROPS and crushed or otherwise injured. Two approaches are acceptable:

- (1) seat belts that comply with the requirements of one of the listed standards; or
- (2) where the work process makes wearing seat belts impracticable, alternate restraining devices may be used. To be acceptable, the alternate restraining device(s) must prevent the operator and any passengers from being thrown outside the ROPS. Shoulder belts, bars, grates, screens or other restraining devices are considered acceptable.

SAE Standard J386 (2006), *Operator Restraint System for Off-Road Work Machines*, provides performance and test requirements for pelvic restraint systems (seat belt assembly, seat system, anchorages) provided for off-road self-propelled work machines fitted with ROPS. Such machines are commonly used in construction, earthmoving, forestry, mining, and other industrial applications. A seat belt assembly complying with the standard will be permanently and legibly labelled with a statement that it complies with SAE Standard J386.

SAE Standard J2292 (2006), *Combination Pelvic/Upper Torso (Type 2) Operator Restraint Systems for Off-Road Work Machines*, provides performance and test requirements for combination pelvic/upper torso (3-point and 4-point) operator restraint systems for off-road, self-propelled work machines fitted with ROPS. A seat belt assembly complying with the standard will be permanently and legibly labelled with a statement that it complies with SAE Standard J386/J2292.

Section 272 Falling objects protective structures

Subsection 272(1)

Operators of powered mobile equipment may be exposed to falling objects under some working situations. Examples include warehouse operations where items are stacked on high shelves, where a shaft or tunnel is being excavated, and where building demolition is taking place. Where a falling object hazard is present, the powered mobile equipment must be equipped with a falling object protective structure (FOPS).

Subsection 272(2) and 272(3)

To comply with this section, the FOPS must meet the requirements of the appropriate referenced standard or be certified by a professional engineer as providing equivalent or better protection. Readers are also referred to section 3.1 for additional information.

SAE Standard J167 (2002), *Overhead Protection for Agricultural Tractors – Test Procedures and Performance Requirements*, establishes test and performance requirements for overhead protection to minimize the frequency and severity of operator injury due to falling objects encountered during normal operation of a wheeled agricultural tractor. The cover mounted over the operator's seat may be solid, or a grid or mesh meeting the criteria for openings listed in the Standard. The overhead cover is expected to provide reasonable protection from such objects as bricks, concrete blocks, and small hand tools that may fall from heights of up to 9 metres (30 feet).

SAE Standard J/ISO 3449 (2005), *Earthmoving Machinery – Falling-Object Protective Structures – Laboratory Tests and Performance Requirements*, provides performance criteria for falling object protective structures (FOPS) installed on the types of earthmoving machinery specified in the Standard. A FOPS meeting the requirements of the Standard will have a label attached to it indicating the standard number and the performance level that the structure meets.

The Standard recognizes two levels of FOPS protection. Level I is intended to provide protection from falling bricks, small concrete blocks and hand tools encountered in operations such as highway maintenance, landscaping, and other construction site services. Level II is intended to provide protection from falling trees or rocks for machines involved in site clearing, overhead demolition, or forestry.

SAE Standard J1042 (2003), *Operator Protection for General-Purpose Industrial Machines*, establishes performance requirements for protective systems that provide operator protection from hazards of machine rollover and/or falling objects. The Standard does so by referencing other SAE Standards that present specific construction and performance requirements for falling object protective structures. The required overhead protective structures are expected to provide reasonable protection from such objects as bricks, concrete blocks, and small hand tools that may fall from heights of up to 9 metres (30 feet).

Section 273 Recertification after modification

Modifications or repairs to a rollover protective structure or a falling objects protective structure must be performed according to instructions provided by the manufacturer or a professional engineer. Since it is critical that the structure be restored to its original design strength, the structures must be re-certified by the equipment manufacturer or a professional engineer once repaired or modified.

Section 274 Fuel tank in cab

Vapours from powered mobile equipment fuel are a hazard having the potential to cause serious harm if not properly controlled. Vapours could overcome an operator, causing the operator to lose control of the equipment. A fire or explosion could result from vapour build-up if an ignition source is present. For these reasons, filler spouts and vents must extend outside the cab and must be sealed or covered to prevent vapours from entering the enclosed cab area.

Section 275 Worker transportation

Subsection 275 (1)

While operating or being transported, no part of a worker's body can protrude beyond the side of the vehicle. Protruding body parts can be injured if they strike stationary or other moving objects or equipment.

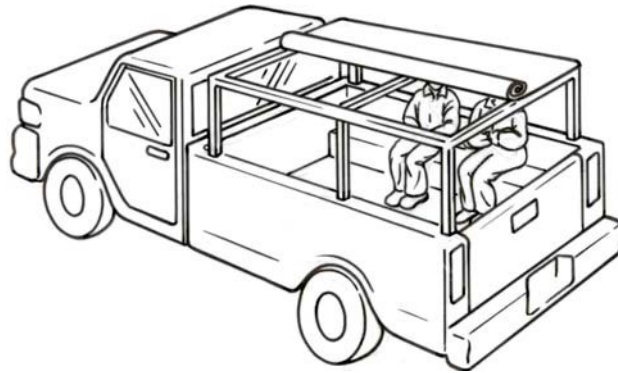
Subsection 275(2)

Unsecured equipment or materials can become dangerous projectiles or airborne objects during quick operating maneuvers or sudden stops. All equipment or materials must be positioned or secured to prevent injury to the operator or any other worker being transported.

Subsection 275(3)

Inclement weather can create uncomfortable and unsafe operating conditions due to reduced visibility or exposure to extremes of temperature. Workers being transported must be provided with sufficient protection against inclement weather. This does not mean that all powered mobile equipment must be equipped with a cab. Figure 19.11 shows a vehicle designed to transport workers and that provides protection against inclement weather.

Figure 19.11 Example of protection against inclement weather



Subsection 275(4)

Engine exhaust contains carbon monoxide gas that can build up in an enclosed body and be dangerous to workers. The powered mobile equipment's exhaust outlet must be located to prevent exhaust gases from entering the enclosed body.

Section 276 Riding on loads

A person attempting to ride on a moving load is at considerable risk of injury, including the hazard resulting from the load shifting. No person is allowed to ride on top of a load that is being moved. The prohibition also includes riding on the sides of a load.

Section 277 Hazardous loads

To prevent a fire or explosion, workers are restricted to performing only basic vehicle service and maintenance activities while flammable, combustible or explosive materials are

- (a) being loaded or unloaded, or
- (b) while such materials are in or on the vehicle and are not in a ULC-approved storage tank.

Section 278 Tank trucks

Section 277 does not apply to commercial tank trucks designed to transport flammable, combustible or explosive materials. To eliminate static discharge as a potential source of ignition, a commercial tank truck must be bonded and grounded during connection and disconnection of its loading lines and while its contents are being transferred.

Section 279 Refuelling

Subsections 279(1) and 279(2)

Fuel vapours can create an explosion hazard if a source of ignition is present. While being refuelled, no worker is permitted to smoke within 7.5 metres of a vehicle. The definition of “vehicle” includes powered mobile equipment. Similarly, no worker can refuel a vehicle if the vehicle is within 7.5 metres of any source of ignition.

A motor vehicle or watercraft cannot be refuelled while its engine is running unless, as permitted by subsection 279(4), a manufacturer designs, or a professional engineer certifies a fuelling system and safe work practices that allow the engine to be left running during refuelling.

Subsection 279(3)

Properly dispensing flammable fuel can significantly reduce the hazard to which workers might otherwise be exposed. This subsection specifies precautions that must be taken to minimize the potential for fuel spillage and/or inadvertent overfilling of fuel tanks. In general, the employer must ensure that workers maintain direct control when fuelling and do not use an object or device that is not an integral part of the

hose nozzle valve assembly to block flow control devices in the “open” position.

Subsection 279(4)

As mentioned in subsection 279(1), a vehicle’s engine can be left running during refuelling if the fuelling system and related safe work practices have been designed by the manufacturer or certified by a professional engineer.

All-Terrain Vehicles and Snow Vehicles

Section 280 Three-wheeled all-terrain cycles

Three-wheeled all-terrain cycles present a recognized rollover hazard and cannot be used at any work site.

Section 281 Operator’s manual

Improper operation of an all-terrain vehicle or snow vehicle can be dangerous – the vehicle must be operated according to the manufacturer’s instructions. Such instructions are found in the operator’s manual. For this reason, the manual must be kept in a secure location on the vehicle or at another location that makes the manual readily accessible to the operator.

Section 282 Load and slope limitations

Subsection 282(1)

As with all powered mobile equipment, all-terrain vehicles or snow vehicles must be operated according to the manufacturer’s specifications. If attempting to carry an excessive load, the entire balance and centre of gravity of the machine can be affected. Top-heavy loads can cause the unit to over-balance or rollover when operated on uneven or sloping ground. Similarly, overloading, combined with a sudden change of direction, could cause the unit to roll over.

Subsection 282(2)

The employer is ultimately responsible for ensuring that powered mobile equipment is operated safely. In cases where the manufacturer has not specified the operational limitations for an all-terrain vehicle or snow vehicle on sloping ground, the employer must develop and implement safe work procedures. Section 8 of the *OHS Regulation* requires that the procedures be in writing and available to workers. Those procedures must address the hazards to which workers will be exposed during machine operation.

Forklift Trucks

Section 283 Load chart

A load rating chart is essential for operators. The chart specifies the maximum load that can be lifted and carried under different operating conditions. Preventing excessive loading of the forklift truck limits the possibility of rollover or upset. The load chart must be readily available to the operator e.g. fixed to the machine, in a compartment or location on the machine itself, or at a nearby location where it can be quickly accessed when needed.

Section 284 Seat belt

Seat belts are an important piece of safety equipment. If a forklift truck is equipped with a seat belt by the original equipment manufacturer or a seat belt is added to the equipment at some later date, an employer must ensure that the seat belt is present on the forklift truck and in useable condition. Subsection 256(3)(d) required that the seat belt be used.

Pile Driving Equipment and Practices

Section 285 Chocking

To protect workers from the hazard created by a falling pile hammer, the operator must ensure that the hammer is securely chocked while suspended and not in use.

Section 286 Pile hoisting

To prevent worker injury, the operator must ensure that pilings are not hoisted in the leads when

- (a) workers not directly involved in the piling hoisting operation are on the superstructure, or
- (b) within range of a falling pile.

Because of the potential for injury, workers must not remain on or ride on any load while it is being moved, raised, or lowered. Unless a worker is directly involved in the piling hoisting operation, the worker must not be on the superstructure or within range of a falling pile.

Section 287 Restraining hoses and connections

If a pressure hose connection fails, the hose can flail wildly and seriously injure workers. To minimize the potential for such an incident, the employer must ensure that hoses on the pressure side of a connection are secured with safety chains or safety ropes.

Section 288 Brake bands and clutches

The failure of a brake or clutch mechanism can result in uncontrolled movement of pile driving equipment. The employer must therefore ensure that such components are inspected at the start of each work shift. A competent worker designated by the employer must perform the inspection.

Brake bands and clutches contaminated with oil or grease can cause these components to operate ineffectively or fail completely. The employer must ensure that contaminated units are dismantled and cleaned or, if necessary, replaced before further use.

Section 289 Using timber piles

Wood fragments from a shattered pile, as well as debris, bark and splintered wood on a timber pile about to be driven, can create hazards to workers. If airborne, these materials and debris can strike workers and injure them. Workers can be protected from dangers resulting from a pile shattering by maintaining a safe distance from the pile, being inside or behind a protective structure (including the cab of machinery), having the pile capped, or other equally effective means.

Section 290 Crane boom inspection

Driving piles with a vibratory hammer can be very hard on a crane boom. So can using the crane boom with a vibratory pile extractor or for dynamic compaction.

Given the critical nature of the boom, it must be

- (a) inspected
 - (i) at intervals specified in the manufacturer's specifications or specifications certified by a professional engineer;
 - (ii) annually or every 600 operating hours while being used for driving piles with a vibratory hammer; or
 - (iii) annually or every 200 operating hours if used with a vibratory pile extractor or for dynamic compaction, and
- (b) certified by a professional engineer as safe for continued used.

The inspection must be a structural examination, including non-destructive testing if necessary, of the boom and boom suspension system i.e. any part of the boom and its supporting structures that are subjected to the vibration and shock of driving piles, extracting piles, and compacting. A professional engineer must certify the inspection.

Section 290.1 Licensing and mechanical inspection

Some workers use a personal vehicle for work purposes. This section introduces licensing and mechanical inspection requirements that apply to workers who use a personal vehicle for work purposes.

Subsection 256(1) states that a worker must not operate powered mobile equipment, which includes vehicles, unless the worker

- (a) is trained to safely operate the equipment,
- (b) has demonstrated competency in operating the equipment to a competent worker designated by the employer,
- (c) is familiar with the equipment's operating instructions, and
- (d) is authorized by the employer to operate the equipment.

These requirements are considered to have been met once an employer ensures that the worker has met the appropriate licensed driver requirements of provincial legislation applicable to the type of personal vehicle being used.

To make sure that the personal vehicle is mechanically sound and therefore safe to use for work purposes, the worker must ensure that the vehicle is maintained in sound mechanical condition. This requirement can be met by the worker following the maintenance requirements specified by the vehicle manufacturer.

Concrete Pump Trucks

Section 290.2 Safety requirements

The 2009 edition of the OHS Code marks the first time that requirements specific to concrete pump trucks have been included. Their inclusion reflects ongoing safety issues with these relatively new pieces of equipment. In Alberta and British Columbia for the period 2001 to 2004, 20 incidents involving truck-mounted concrete pumping units happened, including one fatality in Alberta (see Safety Bulletin below).

Seventeen of the reported incidents involved equipment failures and three incidents involved power line contacts. The equipment failure incidents were further classified as follows:

- 14 failures resulted from design or manufacturing deficiencies;
- two failures were due to inadequate inspection and maintenance; and
- one failure was reported to be the result of unsafe operating practices.

The failures occurred in rotation drive components, an outrigger, a boom linkage, elbows, boom rods, cylinders, welded connection points, a pedestal and a king post tube failure. Most of the equipment failures were on machines that were less than one year old with many only a few months old. The incidents reported were not limited to one manufacturer.

In addition, a survey of recently reported incidents elsewhere in Canada and the United States shows that concrete pumping trucks are involved in overhead power line contacts and loss of stability due to improper placement of outriggers on unstable soil.

As a result,

- (a) all load bearing components must undergo non-destructive testing at 12-month intervals,
- (b) operators must visually inspect all load bearing components and safety and control devices before each use,
- (c) outriggers must be extended according to the manufacturer's instructions,
- (d) no worker or other person can be positioned under a distribution boom or mast. The person handling the concrete delivery hose must therefore stand beside it or change the work process so that the worker pushes the hose as the operator booms in (rather than the common practice of pushing the hose as the operator booms out). This requirement also refers to other workers at the work site. No worker or other person can be allowed to be under the boom or mast, and
- (e) the concrete pump truck cannot be moved when the distribution boom or mast is partially or fully extended, unless the truck has been designed to allow this.

For more information

http://employment.alberta.ca/documents/WHS/WHS-PUB_al031.pdf

Concrete Pumping Truck – Boom Failure

http://www.employment.alberta.ca/documents/WHS/WHS-PUB_FR-2004-02-26.pdf

Fatality Report – Concrete Pump Boom Failure