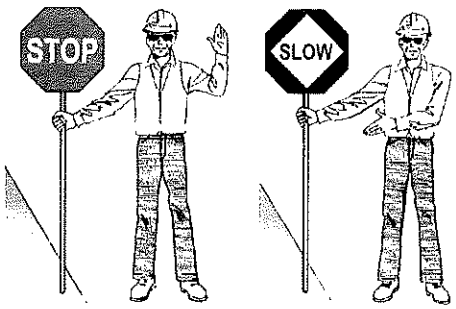


Figure 29-4: Proper Arm Placement

How to Improve Safety

- Don't be distracted by talking to fellow workers or passing pedestrians. If you must talk to motorists, stay at your post and keep the conversation brief.
- When using two-way radios to communicate with another traffic control person, take the following precautions:
  - Establish clear voice signals for each situation and stick to them.
  - Be crisp and positive in your speech.
  - Test the units before starting your shift and carry spare batteries.
  - Avoid unnecessary chit-chat.
  - Don't use two-way radios in blasting zones.
- When two traffic control persons are working together, you should always be able to see each other in order to coordinate your STOP-SLOW signs. Signals between you should be understood. If you change your sign from STOP to SLOW or vice-versa, you must signal the other person by moving the sign up and down or sideways. This will ensure that traffic control is coordinated. Two-way radios are the best way of communicating.
- When you can't see the other traffic control person, a third should be assigned to keep you both in view.

Legal Rights

Refer to the Traffic Control section of the Construction Projects regulation (O213/91, s.67 to 69.1) under the *Occupational Health and Safety Act* (OHSA) for legislation relevant to TCPs. OHSA Regulations are enforced by the Ministry of Labour.

Additional guidelines for traffic control are spelled out in the ***Ontario Traffic Manual, Book 7: Temporary Conditions***, available through Service Ontario Publications. The information applies to traffic control by any persons or agencies performing construction, maintenance, or utility work on roadways in Ontario.

Under section 146.1 of Ontario's *Highway Traffic Act*, all drivers are required to stop when a TCP displays a STOP sign and are not allowed to proceed until the sign is no longer displayed. In addition, all drivers must slow down when a TCP displays a SLOW sign. However, TCPs are not law enforcement officers. If problems arise, follow these steps.

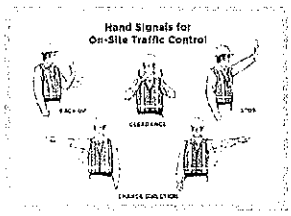
- Report dangerous motorists to your supervisor.
- Keep a pad and pencil to jot down violators' licence plates.
- Ask your supervisor for assistance from police in difficult or unusual traffic situations.
- Never restrain a motorist forcibly or take out your anger on any vehicle.
- Always be alert to emergency services. Ambulance, police, and fire vehicles have priority over all other traffic.

Remember

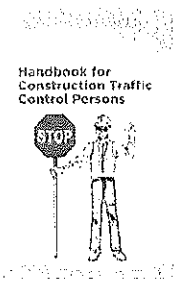
- Always face traffic.
- Plan an escape route.
- Wear personal protective clothing.
- Maintain proper communication with other traffic control persons.
- Stay alert at all times.
- Be courteous.

Traffic control is a demanding job—often a thankless job—but always an important job. How well you succeed will depend largely on your attitude.

To help TCPs communicate, employers or supervisors can give them IHSA's pocket-sized *Traffic Control Hand Signals Card* (V006) to ensure that everyone is using and understands the same signals on the jobsite.



Most of the information in this chapter is also available in a pocket-sized booklet. The *Handbook for Traffic Control Persons* (B016) is available in both English and French (B016F) and can be ordered or downloaded by visiting the **Products** section of **ihsa.ca**.



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.

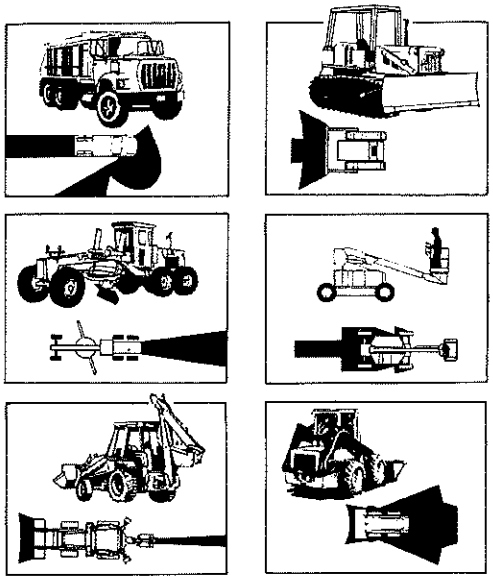


Figure 28-1: Operator Blind Spots (Dark Areas)

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.

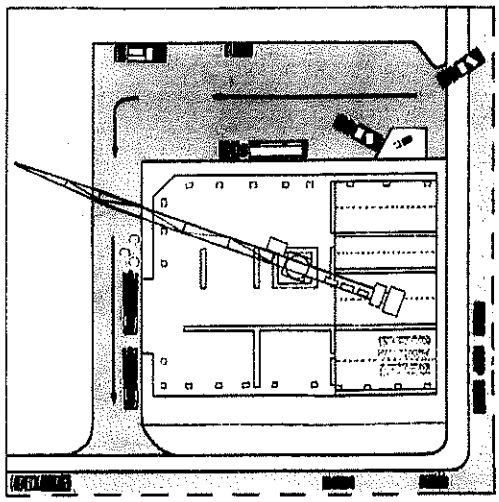


Figure 28-2: Plan for Drive-through Operations

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.)

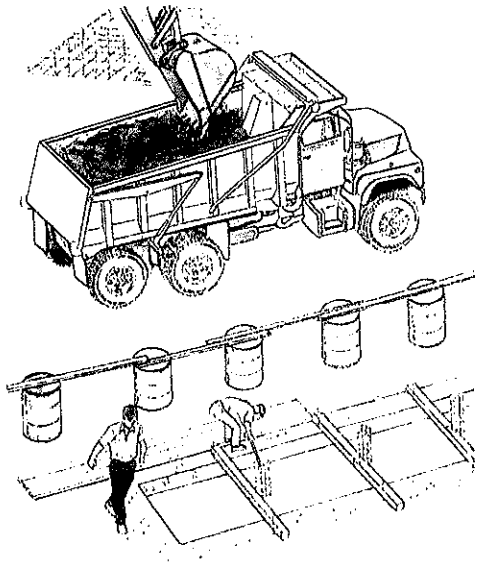


Figure 28-3: Use Barricades to Protect Workers

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 cm^2 on the front and 570 cm^2 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.

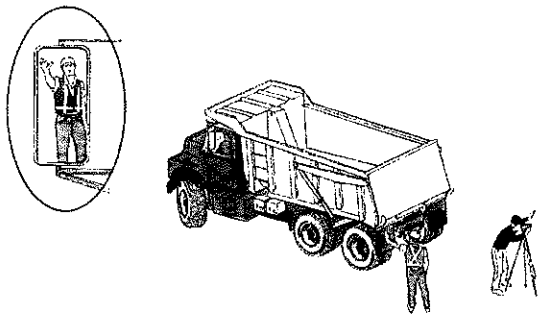


Figure 28-4: Use a Signaller

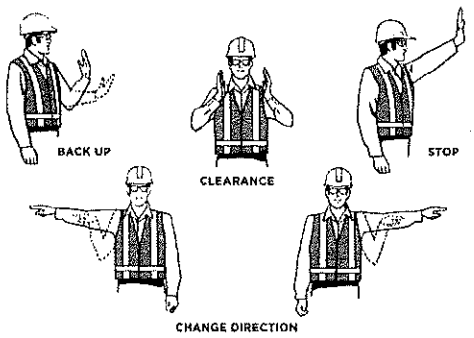


Figure 28-5: Traffic Control Hand Signals

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.

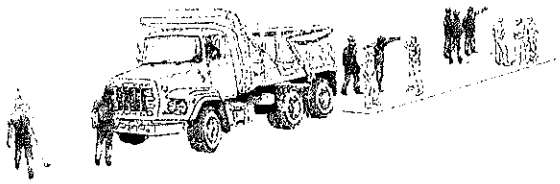


Figure 28-6: Workers in Blind Spots

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.213/91, 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.213/91, 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 (Figure 28-7).

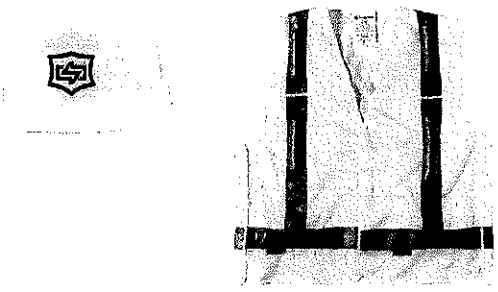


Figure 28-7: Hard Hat and Vest with RFID Tags

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 (Figure 28-8).

Figure 28-8: RFID Display Unit and Antenna

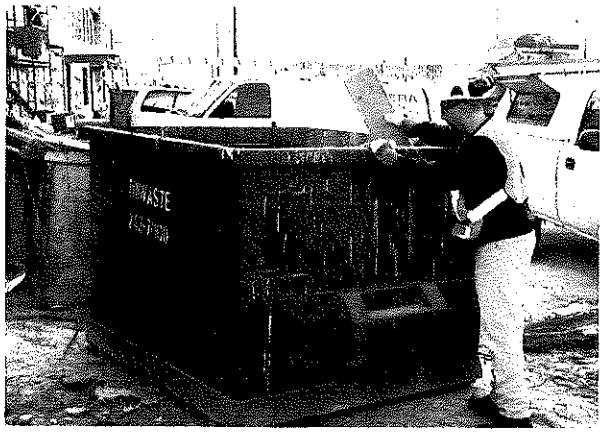
While there are obvious benefits to this type of automated system, one limitation is that the operator may not be able to react in time to stop the vehicle once the alarm sounds. Another limitation is that the system only works if people on the jobsite wear RFID-tagged vests or hard hats.

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 always required under section 104(3) of the construction regulations. However, these technologies can provide additional protection for workers, including the signaller.

FIRE SAFETY

25 HOUSEKEEPING AND FIRE SAFETY



Many injuries result from poor housekeeping, improper storage of materials, and cluttered work areas. To maintain a clean, hazard-free workplace, all groups—management, supervision, and workers—must cooperate.

Regulations

Legal requirements related to housekeeping practices include the following.

- Daily jobsite cleanup program (or as often as is necessary)
- Disposal of rubbish
- Individual cleanup duties for all workers
- Materials piled, stacked, or otherwise stored to prevent tipping and collapsing
- Materials stored away from overhead powerlines
- Work and travel areas kept tidy, well-lit, and ventilated (Figure 25-1)
- Signs posted to warn workers of hazardous areas.

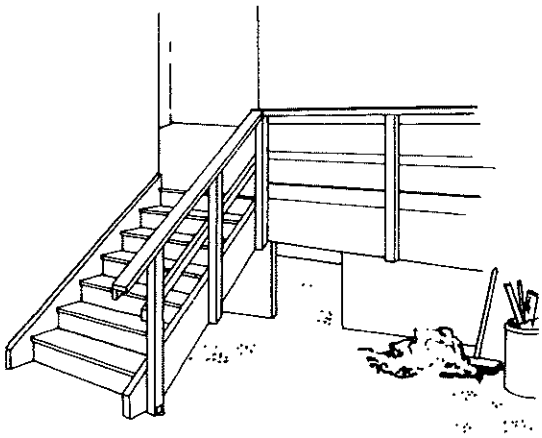


Figure 25-1: Keep Stairs and Landings Clear and Well-Lit

Housekeeping Basics

The basics of good housekeeping are shown in Figure 25-2. Good housekeeping means clear traffic and work areas, out-of-the-way storage, adequate illumination, and cleanup of debris.

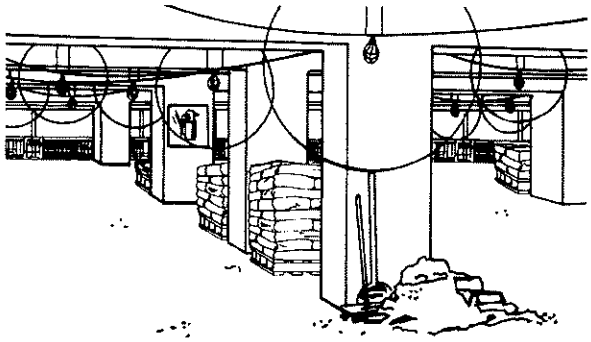


Figure 25-2: Good Housekeeping Basics

Follow the safe work practices listed below.

- Gather up and remove debris as often as required to keep work and travel areas orderly.
- Keep equipment and the areas around equipment clear of scrap and waste.
- Keep stairways, passageways, and gangways free of material, supplies, and obstructions at all times.
- Secure loose or light materials stored on roof or on open floors to prevent them being blown by the wind.
- Pick up, store, or dispose of tools, material, or debris that may cause tripping or other hazards.
- Before handling used lumber, remove or bend over protruding nails and chip away hardened concrete.
- Wear eye protection when there is any risk of eye injury.
- Do not permit rubbish to fall freely from any level of the project. Lower it by means of a chute or other approved device (Figure 25-3).
- Do not throw materials or tools from one level to another.
- Do not lower or raise any tool or equipment by its own cord or supply hose.
- When guardrails must be removed to land, unload, or handle material, wear fall arrest equipment (Figure 25-4). The area must also be roped off with warning signs posted.

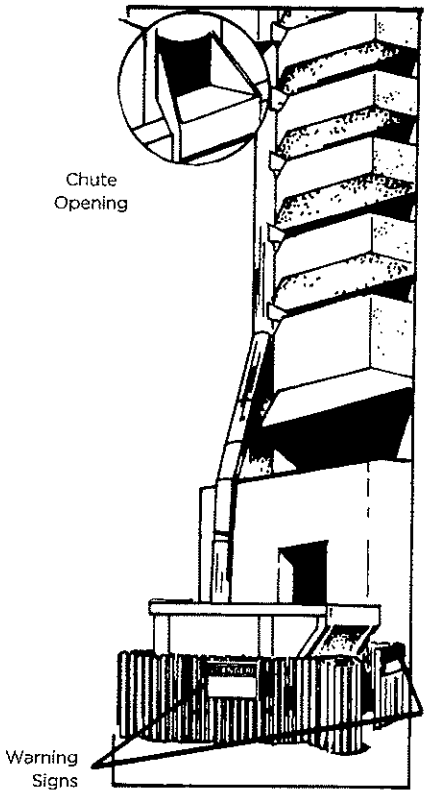


Figure 25-3: Use a Chute to Lower Rubbish

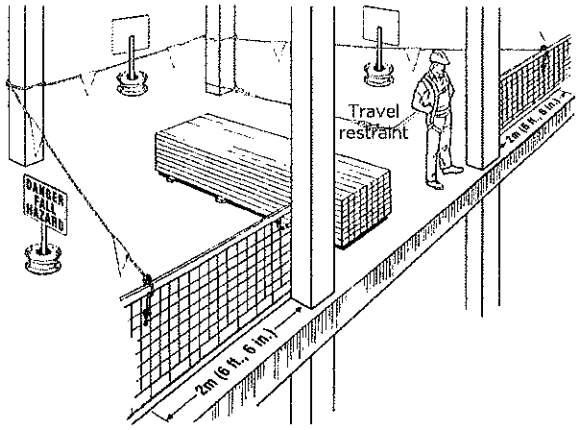


Figure 25-4: Wear Personal Fall Protection When Removing Guardrails

In shops, it is relatively easy to maintain a clean work area. Barriers and warning lines can also be set up to isolate table saws and other equipment.

On construction sites, arrangements are more difficult. Equipment often sits in basements, on decks, or in corners with insufficient working space. Sometimes it's in areas that are open to the effects of weather and the footing may simply consist of a piece of plywood.

Around table saws and similar equipment, keep the immediate area clear of scrap to avoid tripping hazards and provide sound footing.

Airborne wood dust can be a respiratory hazard, causing problems ranging from simple irritation of the eyes, nose, and throat to more serious health effects. Dust collectors should be installed in shops to remove sawdust from air and equipment. Wood dust is also very flammable.

In construction, saws and other tools are often operated in the open air where dust presents no hazard. However, dust masks or respirators should be worn whenever ventilation is inadequate.

Storage

Storage areas should be at least 1.8 m (6 ft) away from roof or floor openings, excavations, or any open edges where material may fall off. Near openings, arrange material so that it cannot roll or slide in the direction of the opening.

Secure loose material such as insulation and sheets of plywood to prevent them from blowing away in the strong wind (Figure 25-5). After removing material, resecure pile.

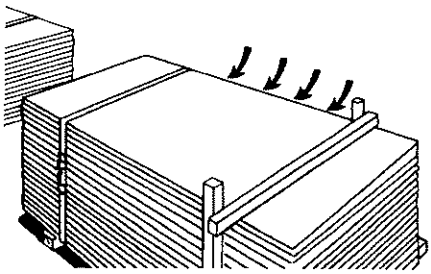


Figure 25-5: Secure Loose Material Against the Wind

Flammable Materials

- Use copper grounding straps to keep static electricity from building up in containers, racks, flooring, and other surfaces (Figure 25-6).
- Store fuel only in containers approved by the Canadian Standards Association (CSA) or Underwriters' Laboratories of Canada (ULC).
- Ensure that electric fixtures and switches are explosion-proof where flammable materials are stored.
- See Figure 25-7 for pointers on safe storage of flammable liquids.

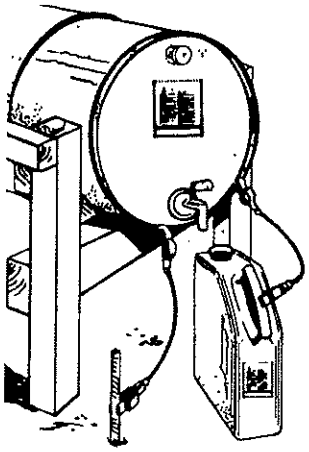


Figure 25-6: Ground Containers to Prevent Static Electricity Buildup

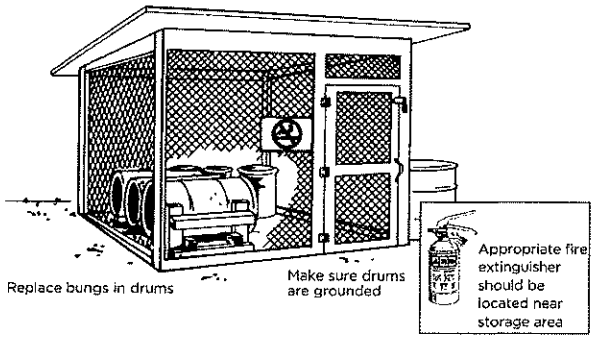


Figure 25-7: Storage of Flammable Liquids

Hazardous Chemicals

- Refer to the safety data sheet (SDS) for specific information on each product.
- Follow the manufacturer's recommendations for storage.
- Observe all restrictions concerning heat, moisture, vibration, impact, sparks, and safe working distance.
- Post warning signs where required.
- Have equipment ready to clean up spills quickly.
- Store empty chemical containers in secure area away from full containers. This will keep them separate for special handling and disposal later.

Bags and Sacks

- Do not pile bagged material more than 10 bags high unless the face of the pile is supported by the walls of a storage bin or enclosure.
- Do not move piles more than 10 bags high unless fully banded or wrapped.
- Cross-pile bags and sacks for added stability. Pile only to a safe and convenient height for loading and unloading.

Compressed Gas Cylinders

- When storing and moving cylinders, keep them in the upright position. Secure cylinders upright with chains or rope.
- Lock up cylinders to prevent vandalism and theft.
- Wherever possible, store cylinders in a secure area outdoors.
- Keep full cylinders apart from empty cylinders.
- Store cylinders of different gases separately.
- Keep cylinders away from heat sources.
- When heating with propane, keep 45-kg (100-lb) cylinders at least 3 m (10 ft) away from heaters; keep larger tanks at least 7.6 m (25 ft) away.

Lumber

- Stack on level sills.
- Stack reusable lumber according to size and length. Remove nails during stacking.
- Support lumber at every 1.2-m (4-ft) span.
- Cross-pile or cross-strip when the pile will be more than 1.2 m (4 ft) high.

Fire Protection

Good housekeeping is essential for the prevention of fires. However, if a fire does break out in the workplace, it is important to know what kind of fire extinguisher to use and how to use it.

Section 52 of the Regulation for Construction Projects (213/91) outlines specific locations and circumstances where fire extinguishers must be provided.

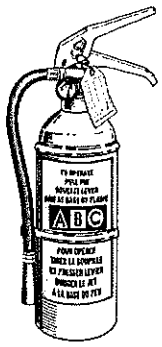
- Where flammable materials are stored, handled, or used
- Where temporary oil- or gas-fired equipment is being used
- Where welding or open-flame cutting is being done
- On each storey of an enclosed building being constructed or renovated
- In workshops, for at least every 300 square metres (3,230 square feet) of floor area.

Fire extinguishers must always be

- Visible
- Marked
- Easily accessible
- Well-maintained
- Refilled or replaced immediately after use.

They must be inspected for defects or deterioration once a month by a competent worker who records the date on the tag.

Fire extinguishers are classified according to their capacity to fight specific types of fires. Every fire extinguisher on a construction project must have an Underwriters' Laboratories of Canada 4A40BC rating. This type of extinguisher can be used on Class A, B, and C fires, which are the types of fires commonly encountered in construction.



Class A—For fires involving ordinary combustible materials (e.g., wood, paper, plastics, textiles) and where a quenching, cooling effect is required.

Class B—For fires involving flammable liquid or gas (e.g., oil, gasoline, propane, solvents) and where flame interruption by oxygen depletion is required.

Class C—For fires involving energized electrical sources (e.g., wires, electrical panels) and where the extinguishing agent cannot be a conductor of electricity.

Class D—For fires involving combustible metals (e.g., magnesium, titanium, sodium, potassium) that can react violently with water, air, or other chemicals.

Extinguishers have a very short duration of discharge—usually less than 60 seconds. Be sure to aim at the base of the fire.

Know the law

Every worker who may need to use a fire extinguisher must be trained in its use. (O. Reg. 213/91, s. 52)