Safe Work Practices for the Aggregates Industry
The contents of this publication are for general information only. This publication should not be regarded or relied upon as a definitive guide to government regulations or to safety practices and procedures. The contents of this publication were, to the best of our knowledge, current at the time of printing. However, no representations of any kind are made with regard to the accuracy, completeness, or sufficiency of the contents. The appropriate regulations and statutes should be consulted. In case of any inconsistency between this document and the Occupational Health and Safety Act or associated regulations, the legislation will always prevail. Readers should not act on the information contained herein without seeking specific independent legal advice on their specific circumstance. The Infrastructure Health & Safety Association is pleased to answer individual requests for counselling and advice.

The basis for this document is the former Mines and Aggregates Safety and Health Association’s Mining & Aggregates Safe Work Practices. The content has been used with permission from Workplace Safety North (WSN).

This manual was revised and endorsed by the Mining and Aggregates Sector Working Group in association with the Infrastructure Health and Safety Association. IHSA would like to thank the working group members for contributing their knowledge, experience, and time to produce a health and safety manual that will benefit both labour and management in the Aggregates sector.

The purpose of this booklet is to provide aggregate workers with guidelines for performing their work safely. All personnel should read, understand, and use these rules in their everyday work practices. While no list of rules is able to cover every circumstance, those listed here apply to most work situations that workers will encounter.

Every task can be performed safely; refer to specific written procedures and consult your supervisor if any doubt exists before starting a job.

Remember: No job is so important that we cannot take the time to do it safely.
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Each workplace party has certain responsibilities that contribute to a safe and healthy workplace. Before beginning work, it is important for everyone to know and understand their rights and responsibilities.

The *Occupational Health and Safety Act* (OHSA) and the Mines and Mining Plants Regulation (O. Reg. 854) govern the safe operation of pits and quarries. Copies of the Act and Regulations must be posted in the workplace where they are accessible to all workers (Figure 1).

**Figure 1**

![OHSA poster](image)

**Employer’s Responsibilities**

The duties of an employer are specified in sections 25 and 26 of the OHSA. Some of the basic duties of an employer are:

- to make sure that the OHSA and all regulations are complied with.
- to provide and maintain all prescribed equipment, materials, and protective devices.
- to make sure that prescribed measures and procedures are carried out.
- to take every precaution reasonable in the circumstances for the protection of workers.
- to provide workers with information, instruction, and supervision.
- to appoint a “competent person” as a supervisor.

As defined by the OHSA: “competent person” means a person who,

a) is qualified because of knowledge, training and experience to organize the work and its performance,

b) is familiar with this Act and the regulations that apply to the work, and

c) has knowledge of any potential or actual danger to health or safety in the workplace.

**Supervisor’s Responsibilities**

The duties of a supervisor are specified in section 27 of the OHSA. Some of the basic duties of a supervisor are:

- to ensure that workers comply with the OHSA and all regulations.
- to ensure workers use or wear the equipment, protective devices, or clothing that is required by the employer.
- to take every precaution reasonable in the circumstances for the protection of workers.
- to advise workers of actual or potential health and safety hazards of which the supervisor is aware.
- in some cases, to provide workers with written instructions as to the measures and procedures to protect themselves from health and safety hazards.
Worker’s Responsibilities

The duties of a worker are specified in section 28 of the OHSA. Some of the basic duties of a worker are:

- to work in compliance with the OHSA and all regulations
- to wear or use the equipment, protective devices, or clothing required by the employer and not to remove or make ineffective any protective device
- to report any violations of the OHSA, any defective equipment, or any workplace hazard to the employer or supervisor
- not to operate any equipment in a way that may injure themselves or any other worker
- not to engage in any pranks, contests, or boisterous conduct.

Responsibilities for Training

The Mines and Mining Plants Regulation (O. Reg. 854) requires that all employers engaged in surface mining establish and maintain a training program for workers. Supervisors and production workers must complete three Common Core modules, plus specialty modules that apply to the particular work they do. Common Core training must be completed within 12 months of when the worker is hired. For more information on the Surface Miner Program #7700210, contact IHSA and the MTCU local office.

Worker’s Rights

Workers in Ontario have three basic rights:

1. **The right to know** what hazards are in the workplace
2. **The right to participate** in keeping the workplace healthy and safe by joining a Health and Safety Committee or becoming a Health and Safety Representative
3. **The right to refuse unsafe work** that they believe endangers their health or safety or the health or safety of others.

Right to Refuse Unsafe Work

Section 43 of the OHSA provides workers with the right to refuse to work if they have reason to believe that one or more of the following is true:

43. (3) (a) any equipment, machine, device or thing the worker is to use or operate is likely to endanger himself, herself or another worker;

(b) the physical condition of the workplace or the part thereof in which he or she works or is to work is likely to endanger himself or herself;

(b.1) workplace violence is likely to endanger himself or herself; or

(c) any equipment, machine, device or thing he or she is to use or operate or the physical condition of the workplace or the part thereof in which he or she works or is to work is in contravention of this Act or the regulations and such contravention is likely to endanger himself, herself or another worker.

All workers should be aware and knowledgeable of the local/on-site procedure for refusing unsafe work.

Talk to your supervisor first. Try to resolve the problem before initiating the work refusal process.

**Remember:** You have a duty to report all potential hazards and unsafe conditions to your employer.
CHAPTER 2—EMERGENCY PROCEDURES

An emergency is any situation that has the potential to harm the life, health, or safety of a person, public property, or the environment. It is an unplanned event. In order for everyone to be prepared for emergencies, every project needs an emergency response plan before work begins.

Emergency Response Plan and Procedures

The purpose of an emergency response plan is to ensure that emergency procedures are in place and every worker is prepared to respond to any emergency in a correct, timely, consistent, and dependable manner.

An effective plan must include the following:

1. **Hazard Identification/Assessment**
   Identify hazards and assess potential risk by answering the questions: What can go wrong? What are the consequences?

2. **Emergency Resources**
   Determine the resources available for the hazards identified and assessed. Verify that 911 operates in the area. If not, make alternate arrangements. Maintain on-site resources such as fire extinguishers, spills containment equipment, and first aid kits. Outside help may be so far away that on-site resources are necessary, such as fire protection or ambulance/medical resources in remote areas.

3. **Communication Systems**
   To relay accurate information quickly, reliable communications equipment must be used, procedures developed, and personnel trained. A backup system is a good idea in case the emergency destroys phone lines, for instance. The type and location of emergency communication systems must be posted on the project. Emergency phone numbers and the site address/location should be posted beside all site phones (See Emergency Phone Numbers on page 5).

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**Figure 2**

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4. Administration of the Plan
   The person in charge of administering and organizing the plan must ensure that
   • everyone clearly understands their roles and responsibilities within the plan
   • adequate emergency resources are kept in step with the progress of the project
   • the plan is reviewed regularly and always after an emergency to correct any shortcomings.

5. Emergency Response Procedure
   The Emergency Procedures chart outlines standard emergency response procedures (Figure 2). STOP and ASSESS the situation before performing any of the tasks. Stay calm to provide an example to others.

6. Communication of the Procedure
   • Review the procedure with subcontractors, workers, and suppliers to ensure that it covers their activities.
   • Review it with owner/client in operating plants to ensure that hazards are identified and covered.
   • Review it with the JHSC or health and safety rep on a regular basis to address new hazards or significant changes in site conditions.
   • Post the procedure in a conspicuous location.

When developing your plan, make sure it always reflects current conditions on the jobsite. For more detailed information on developing emergency response plans, refer to the Emergency Response Planning (B030) booklet available from IHSA.

Personal Injury
1. Report any injury, no matter how slight, to your supervisor immediately.
2. If required, arrangements for medical aid and transportation will be provided.

Be prepared: Take a first aid course to become qualified to handle injuries and illnesses on and off the job. Any response to an emergency situation should be clearly defined and communicated.

Fire Emergencies
Fires and explosions occur all too frequently in the aggregates industry. The key is to prevent a fire from starting or to minimize the damage if one does start.

Fire Prevention
1. Always keep fire extinguishers accessible. (use the appropriate type of fire extinguisher as per Regulation 854)
2. Know the location of the fire extinguishers in your work area and what type (class) of fire they can be used on. Read the instructions and be properly trained in how to use extinguishers in fire-fighting situations.
3. Fire extinguishers must be inspected by a competent person on monthly basis (O. Reg. 854, s. 41(5)) and be replaced or refilled when necessary.
4. Escape routes should be kept clear and free of any obstructions.
5. Store flammable materials in special storage areas that are posted with proper signs (“No Smoking”, “Flammable”, etc.)
6. Fuel vehicles or equipment only at designated fuelling areas with the vehicle or equipment properly parked and the engine shut off.
7. Do not smoke or have any open flame at fuelling areas.

Fall Arrest Rescue Plan
If a worker is involved in a fall arrest, it is important that the worker be brought to a safe place as quickly as possible without causing further injury or putting the rescuers at risk.

The Construction Regulation (O. Reg. 213/91, s.26.1(4)) requires that before workers use any fall-arrest system or safety net on a project, the employer must develop written rescue procedures. (See Chapter 7: Fall Protection for more information.)
Fire Control

The first five minutes of a fire are considered the most crucial. If you are unable to control or extinguish the fire within that time, then you must call the fire department. Do not risk any lives to save equipment. Many materials produce hazardous fumes when they burn. Take care of your own safety and that of your fellow workers. Sound an alarm and call for help. Only trained and properly equipped personnel should fight major fires.

Emergency Phone Numbers

Emergency instructions and phone numbers must be prominently posted near all telephone locations. These should include the phone numbers for:

- Fire Department
- Police
- Ambulance
- Nearest Hospital
- Company Official

The site address or location should also be included. The Emergency Response Poster (P103), available from IHSA, can be used to record this and other information (Figure 3).
Safe Work Practices for the Aggregates Industry
CHAPTER 3—PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment (PPE) is designed to safeguard a worker’s personal health and physical welfare. Hard hats, safety glasses, and safety boots, for instance, can prevent an injury or reduce the severity of an injury. However, PPE only reduces the risk—it does not remove the hazard.

The kind of PPE that is required depends on the worker, the job, and the site conditions. As best practice, it is recommended that all forms of PPE be certified to CSA Standards or equivalent. Required PPE will be identified by the employer and the Joint Health and Safety Committee. Any worker who fails to use the required protective equipment is in contravention of the OHSA and regulations.

Head Protection
In designated areas, workers must wear a CSA-certified hard hat at all times. A CSA-certified hard hat will have a CSA label or the CSA classification stamped into the shell of the hat under the brim (Figure 4).

Always consult the manufacturer’s guide for use and care instructions of your hard hat. Never alter your hard hat by painting it or drilling holes in it. You should inspect your hard hat every day before you use it and replace any damaged or worn hats and liners immediately.

Foot Protection
Protective footwear must be CSA-approved with puncture-proof soles and protective toecaps.

In operational areas, heavy-duty, construction-type workboots are the only type permitted. These boots are identified by a green triangular patch imprinted with the CSA logo on the outside of the boot and green label indicating protection on the inside of the boot (Figure 5).

Workboots should be fully laced and replaced when badly worn or deteriorated.

Eye Protection
Proper eye protection (safety glasses, goggles, side shields, face shields, etc.) can greatly reduce your risk of an eye injury. Wear appropriate eye protection in designated areas and while performing activities that could expose you to the risk of an eye or face injury. Prescription safety glasses can be used if they meet the requirements of CSA Standard Z94.3-2007 Class 1.
Hearing Protection
If you are working in noisy places or with noisy equipment, you must wear approved hearing protection such as earplugs or ear muffs. When choosing hearing protection, consider the following points:

- **Noise exposure**—Protect against the loudest noise possible with the equipment you operate or in the place where you work.
- **Comfort**—If the type you choose isn’t comfortable, you won’t wear it.
- **Appearance**—If you don’t like how you look with the protection, you may not use it.
- **Communication**—Some hearing protectors actually make it easier to hear other people speaking in noisy places.
- **Safety**—You may feel isolated and unsafe if the protection is so high that you can’t hear anything, including speech or warning sounds.

Respiratory Protection
Proper approved respiratory protection should be worn when working in an environment that has potentially hazardous dusts, gases, vapours and fumes. Respiratory protection can include the following.

- N95 Filtering facepiece
- Half facepiece
- Full facepiece
- Powered air-purifying respirator
- Supplied-air respirator.

Any respiratory equipment that can be reused should be well-maintained, cleaned, and returned to storage after use. Additionally methods should be implemented to keep the dust from entering the air. These can include adequate ventilation, wetting down, or enclosing the process.

Other Personal Protective Measures
For your personal protection on the job, do not wear:

- loose clothing or cuffs
- greasy or oily clothing, gloves, or boots
- finger rings, neck chains or other loose jewelry.

High visibility (retroreflective) clothing is required in all areas of operations. Shirts and long pants should be worn at all times. Pant cuffs should be worn outside the boot to prevent material from getting inside the boot. Specialized equipment or practices and training may be required on some jobs. Check with your supervisor if in doubt.
Follow the general safe work practices listed below:

- Know the proper way to do your job. Don’t guess—ask your supervisor.
- Follow the proper work procedures. Discuss any concerns or ideas with your supervisor.
- Be aware of your surroundings.
- Be visible and stay out of blind spots. When working around operating equipment, make sure the operators are aware of your presence. Wear high-visibility garments that comply with CSA Standard Z96-02, *High Visibility Safety Apparel*, in particular a Class 2 garment that provides full coverage of the upper torso with Level 2 fluorescent retroreflective stripes.
- When working around heavy machinery, you must have some means of communication with the operator before approaching the machine (e.g., eye contact, verbal signals, or hand signals). The means of communication must be clear, concise, and understood by both parties.
- When performing high-risk activities, it may be appropriate to advise your supervisor if you are taking any medication that may affect your abilities.
- Think before you act.
- Inspect and test tools and equipment before use.
- Clean up before you leave a job.
- Always use stairways or ladders when going from one plant level to another.
- Always use the handrails on stairs and make sure you have proper footing.
- Report to your supervisor any defect or damage to tools and equipment.
- Do not work alone under conditions that are known to be hazardous.
- Report any unsafe condition you are unable to correct to your supervisor.
- When climbing ladders or climbing onto equipment:
  - Always face the ladder and use the three-point contact method of climbing (two hands and one foot or one hand and two feet).
  - Use a tool belt or secure bulky tools or equipment with a rope to raise or lower them.
  - Do not toss tools or objects up or down.
  - Make sure your footwear, climbing surface, and hands or gloves are free from oil, grease, mud, or other slipping hazards before you climb.
Housekeeping is fundamental to a good safety program. Keeping your work area and travel ways clean and orderly is a basic responsibility of every worker and supervisor.

- Store materials, tools, and equipment in their proper place.
- Keep aisles, travel ways, and work areas clean and orderly.
- Avoid tripping hazards by properly using and storing hoses, slings, extension cords, welding cables, etc.
- Discard waste materials and recyclables in their proper containers.
- Clean up spills from oil, grease, or other hazardous liquids immediately or cover it with a non-slip, absorbing material.
- Keep equipment and machinery as clean as possible at all times.

- Store materials in their proper place. Make sure they do not block access to equipment or safety equipment or do not obstruct exits and escape routes.
- Stack all stored materials neatly and carefully so they cannot endanger anyone.
- Empty garbage receptacles regularly, not only for sanitary reasons but also to prevent spontaneous combustion.
- Maintain adequate lighting by replacing burnt-out or defective light bulbs.
- Do not operate or store combustible equipment in areas that have chemical or flammable materials.

Remember: Everything has a proper place and everything should be stored in its proper place.
CHAPTER 6—TOOLS

Hand Tools
Many accidents with hand tools can be prevented by following these basic safe work practices:

• Choose the right tool for the work.
• Always use the right size tool for the job.
• Make sure you are familiar with the tool before using it.
• Take proper care of your tools.
• Never use tools or equipment with defective or worn parts. Tools with “mushroomed” heads are dangerous and must be replaced immediately.
• Do not carry sharp-edged or pointed tools in your pockets. Use a protective case or tool box.
• Never place a tool or other loose object on stairways, catwalks, or tops of stepladders, or in any location where it can fall and injure someone below or cause someone to trip.
• When using wrenches, ensure they fit the bolt head or nut snugly and always pull toward yourself.
• When using a knife, always cut away from yourself.

• Wear appropriate eye and/or face protection while operating a power tool. A dust mask must be worn in dusty conditions.
• Whenever possible use a ground fault circuit interrupter (GFCI), especially in damp conditions.
• Ensure power tools or equipment are switched off before connecting tools to a power source. Unplug and de-energize tools before changing attachments. Turn off tools before walking around with them.
• Keep extension cords away from water and make sure that they do not create a tripping hazard.
• Reported any defective wall receptacle and tag it out of service.
• Never yank or pull sharply on a power cord. Pull on the plug only.
• Make sure all portable power tools are equipped with a three-wire cable and are double-insulated or properly grounded with a three-pronged plug.
• Use only qualified personnel to make repairs to electrical tools and equipment.

Electrical Power Tools

• Inspect tools before use. The casing must be free of any defects such as cracks or sharp edges. Ensure that safety guards and devices are operating and in place before beginning work. The cord must not be frayed, broken, or have the ground pin broken off.
• Do not carry electric tools by the cord.
• Protect electrical cords from materials or equipment that may damage them such as sharp edges, corrosive liquids, or extreme heat.

Pneumatic Power Tools
Pneumatic tools powered by compressed air are fast, powerful, and ideal for repetitive tasks. A compressor, powered by a combustion or electric motor, supplies the air for the tools.

Hazards include:

Air embolism – If compressed air from a hose or nozzle enters even a tiny cut on the skin, it can form a bubble in the bloodstream—with possibly fatal results.

Flying particles – Compressed air at only 40 pounds per square inch can accelerate debris to well over 70 miles per hour, which is enough to penetrate the skin.
CHAPTER 6  TOOLS

Physical damage – Compressed air directed at the body can easily cause injuries—including damage to eyes and eardrums.

- Wear eye and face protection, as well as body protection if required, when working with air-powered tools.
- Wear hearing protection as these tools are generally very noisy.
- Wear gloves to prevent blisters or oil contact with the skin.
- Test-run an air-powered tool before using it to make sure its in good operating condition.
- Ensure the air supply is equipped with a lubricator and that it is filled with the proper lubricant.
- Run combustion engines outside or in a well-ventilated area to prevent the buildup of carbon monoxide gas. Always keep a fire extinguisher near flammable liquids.
- Make sure that air pressure is set at a suitable level for the tool or equipment being used.

Powder-Actuated or Explosive-Actuated Tools

Used improperly, powder- or explosive-actuated tools pose the following hazards:

- Flying particles and ricochets – On impact, materials may break up, blow apart, or spall off. Operators should wear eye protection and a face shield. A heavy shirt and pants can also provide some protection against ricochets and flying fragments of material.

- Noise – These tools create an extreme pulse of sound when fired. Operators and others in the area should wear hearing protection—especially when the tool is operated in a confined space.

- Sprains and strains – These injuries usually result from using the tool repeatedly in awkward, cramped, or unbalanced positions. Operators should try to work from a balanced position on a solid surface.

- Explosions – There is always the risk of explosion or fire when these tools are used in atmospheres contaminated by flammable vapour, mist, or dust. The work area must be ventilated—mechanically if necessary.

- Blow-through – When the base material does not offer enough resistance, the projectile may pass completely through and fly out the other side. Areas behind, around, and under material should be kept clear of people.

Powder- or explosive-actuated tools should be treated with the same respect as a firearm. Most jurisdictions—including Ontario—require that operators be trained before using the tools and carry proof of training on the job.
Fall protection is required when a worker is exposed to any of the following hazards:

- Falling more than 3 metres (10 feet)
- Falling more than 1.2 metres (4 feet), if the work area is used as a path for a wheelbarrow or similar equipment
- Falling into operating machinery
- Falling into water or another liquid
- Falling into or onto a hazardous substance or object
- Falling through an opening on a work surface (O. Reg. 213/91, s. 26).

Eliminating a Fall Hazard
The best option for protecting workers from a fall hazard is to eliminate the hazard altogether. This could involve:

- relocating the work to a place where the fall hazard does not exist
- erecting a guardrail system, which prevents workers from falling off an open edge
- covering floor or roof openings so that workers cannot fall through them
- using a travel restraint system.

You can move the job task to an area where the fall hazard no longer exists by, for example, building a roof on the ground and hoisting it into place or moving materials and equipment at least 2 metres from an unprotected edge. Install warning barriers at least 2 m from the edge of a fall hazard (unless a berm is required). These barriers should be at least 1.1 m in height and have signs warning of the fall hazard. The signs should also say “Fall Protection required beyond this point”.

If you build guardrails around the fall hazard, make sure:

- they have a top rail, a mid-rail and a toeboard. The top rail must be between 0.9 metres (3 feet) and 1.1 metres (3 feet 7 inches) in height.
- they are adequately secured and in good condition
- safety chains are in place and connected to guard every opening
- chains are left open when leaving the platform.

Guardrails must be provided around work platforms on all scaffolds, floor openings, ramps, and open areas where a worker can fall from one level to another. Whenever guardrails are temporarily removed, workers must be protected by a fall protection system that meets the requirements of section 26 of the Construction Regulation (213/91).

Covers over floor or roof openings must:

- cover the opening completely
- be fastened securely
- be clearly marked as an opening cover
- be made from material that can support all loads that may be placed on it
- be able to support at least 2.4 kilonewtons per square metre (50 lb per sq ft).
A travel restraint system allows a worker to get to the edge of an opening or fall hazard but restrains them from falling into or onto the hazard. It consists of the following CSA-approved equipment:

- A full-body harness, lanyard, rope grab, and lifeline
- Adequate anchorage that must be able to support a static load of 4 kilonewtons (900 pounds)

Controlling a Fall Hazard

If it’s not possible to eliminate the hazard or protect workers using a guardrail system, the next best option is to control the hazard using one of the methods of fall protection listed below.

- A fall restricting system
- A fall arrest system
- A safety net (O. Reg. 213/91, s. 26.1 (2)).

These systems do not prevent a fall but reduce the severity of injury from a fall.

A fall restricting system generally fastens to a sternal connection on the harness, then to a wire rope grab or fixed ridged rail system used for climbing ladders. This system must be able to limit a workers free-fall distance to 0.6 metres (2 feet).

A fall arrest system must include:

- a CSA-approved full-body harness
- a lanyard equipped with an energy absorber unless the energy absorber could cause a falling worker to hit the ground or an object or a level below the work
- an adequate fixed support capable of supporting a static load of 8 kilonewtons (1,800 lbs). The fixed support must be free of sharp edges and the harness must be connected to it via a lanyard and a lifeline.

A fall arrest system must prevent a falling worker from hitting the ground or any object or level below the work and must not allow a worker to free-fall more than 1 metre.

Fall Arrest Planning

Before deciding to use a fall arrest system, assess the hazards a worker may be exposed to in case of a fall. Fall arrest planning must take these and other concerns into account:

- Will the worker “bottom out”, that is, hit the ground or any material, equipment, or a lower level of the structure before the fall is arrested?
- Will the pendulum effect cause the worker to swing from side to side, possibly striking some equipment, material, or the structure?
- In the event of fall arrest, how will the suspended worker be rescued?

The Total Fall Distance is the distance required to fully arrest a fall. It consists of the Free-fall Distance, which should be kept to 1 metres (3 feet) or less, plus the Fall Stopping Distance, which includes the stretch in the lanyard (minimal) and lifeline, slack.
in the harness (maximum of 30 cm or 1 foot due to allowable adjustments for users’ comfort), and deployment of the energy absorber (maximum 1.1 metres or 42 inches).

**Figure 10: Calculating the Total Fall Distance**

Free-fall distance is measured from the D-ring of a worker standing on the work surface down to the point where either the lanyard or the energy absorber begins to arrest the fall. It is strongly recommended that this distance be kept as short as possible.

Where a worker is connected to a vertical lifeline by a rope grab, the rope grab should be positioned as high above the D-ring as the work will allow. By doing this, the worker minimizes not only the free-fall distance but also the fall stopping distance required to completely arrest a fall.

**Fall Protection Systems**

The components of fall protection systems, which include safety harnesses and lanyards, must be CSA certified and carry a CSA label. Safety harnesses must fit snugly to all parts of the body. All hardware and straps must be intact and properly fastened. The D-ring must be positioned in the centre of the back between the shoulder blades.

Lanyards must be 16 mm (5/8 in) in diameter and made of nylon rope or equivalent. The lanyard should be secured to an anchor point, rope grabbing device, or lifeline with an attachment point preferably higher than waist level. It should be kept as short as possible to reduce fall distance.

All fall protection equipment must be inspected for damage, wear, and obvious defects by a competent worker before each use. Any worker required to use fall protection must be trained in its safe use and proper maintenance. For any worker receiving instruction in fall protection, the manufacturers’ instructions for each piece of equipment should be carefully reviewed, with particular attention to warnings and limitations.

**Lifelines**

There are three basic types of lifelines:

1. vertical
2. horizontal
3. retractable.

All lifelines must be inspected before each use to ensure that they are

- free of cuts, burns, frayed strands, abrasions, and other defects or signs of damage
- free of discolouration and brittleness indicating heat or chemical exposure.

**CAUTION:** a horizontal or vertical lifeline shall be kept free from splices or knots, except knots used to connect it to a fixed support. Knots along the length of either a horizontal or vertical lifeline can reduce its strength by as much as 40 per cent.

**Vertical Lifelines**

Vertical lifelines are typically 16-millimetre (5/8-inch) synthetic rope (polypropylene blends). They must comply with the current edition of the applicable CSA standard and the following minimum requirements:

- Only one person at a time may use a vertical lifeline.
- A vertical lifeline must reach the ground or a level above ground where the worker can safely exit.
- A vertical lifeline must have a positive stop to prevent the rope grab from running off the end of the lifeline.
Horizontal Lifelines

Horizontal lifelines must be designed by a professional engineer according to good engineering practice. The design can be a standard design or specifically engineered for the site. The design for a horizontal lifeline system must:

- clearly indicate how the system is to be arranged, including how and where it is to be anchored
- list and specify all required components
- clearly state the number of workers that can safely be attached to the lifeline at one time
- spell out instructions for installation, inspection, and maintenance
- specify all of the design loads used to design the system.

The system must be installed, inspected, and maintained in accordance with the professional engineer’s design. Before each use, the system must be inspected by a professional engineer or competent worker designated by a supervisor. A complete and current copy of the design must be kept on site as long as the system is in use.

Retractable Lifelines

Retractable lifelines consist of a lifeline spooled on a retracting device attached to adequate anchorage. In general, retractable lifelines:

- are usually designed to be anchored above the worker
- employ a locking mechanism that lets line unwind off the drum under the slight tension caused by user’s normal movements
- automatically retract when tension is removed, thereby preventing slack in the line
- lock up when a quick movement, such as a fall, is applied
- are designed to minimize fall distance and the forces exerted on a worker’s body by fall arrest.

Always refer to the manufacturers’ instructions regarding use, including whether an energy absorber is recommended with the system and whether the device can be used in the horizontal position.

Any retractable lifeline involved in a fall arrest must be removed from service until the manufacturer or a qualified testing company has certified it for reuse.

Inspection

Always inspect every part of a fall arrest system before each use. Consult the manufacturer’s instructions for the inspection requirements of your equipment.

- Examine the fabric for cuts, cracks, tears, enlarged eyeholes, and signs of wear that might affect its strength.
- Inspect the stitches for breaks, ragged strands, or other signs of weakening.
- Check the metal hardware for loose anchorage, breaks, cracks, or signs of wear that will affect its strength or action of the fastening devices.
- Ensure a proper fit by checking that the “D” ring is located in the centre of the back.
- Replace or repair defective equipment or parts before use.
- Never alter safety belts, lanyards, and harnesses in any way.
- Lanyards or ropes must also be inspected prior to use.
- Check hooks or metal hardware for proper safety catches, enlarged openings, and distorted or broken eyelets.
- If any component is defective, remove it from service immediately and replace it with a new one.
- Never tie a knot in a rope or lanyard that is used as a lifeline.
Fall Protection Training
As of April 1, 2015, workers will need to complete a working at heights training program that has been approved by the Chief Prevention Officer before they can work at heights. An approved training program must meet the Working at Heights Training Program Standard and the training provider must meet the Working at Heights Training Provider Standard.

Fall Arrest Rescue Plan
When workers are required to work in fall arrest, the employer must develop a Fall Arrest Rescue Plan. This rescue plan will ensure a fallen worker is rescued as soon as possible without causing injury or putting rescuers at risk.

The rescue plan has to be developed for each work location and communicated to all staff as to what resources and equipment are available. Designated rescuers must be adequately trained. Workers must receive training from their employer regarding the specific fall protection equipment and procedures they will use. Products differ not only between manufacturers but also between product lines in a single company. Training must therefore cover the exact harness, lanyard, energy absorber, rope grab, lifeline, and anchorage each worker will rely on, as well as the applications to be encountered.

Sample Fall Rescue Procedures
Here are some examples of general fall rescue procedures to give you an idea of what your plan should include.

A. If an elevating work platform (EWP) is available on site:
   1. Take it to where the suspended worker is.
   2. Make sure that rescue workers using the EWP are protected against falling.
   3. Be sure the EWP has the load capacity for both the rescuer(s) and the victim.

B. If an elevating work platform is not available:
   1. Where possible, use a ladder (or ladders) to reach the suspended worker.
   2. If the suspended worker is not in an area that rescuers can reach by ladders, move the suspended worker by his or her lifeline to an area that can be safely reached by ladder (if possible).
   3. Rig a separate lifeline for each rescuer to use while carrying out the rescue.
   4. Position the ladder(s) so that the rescuers can get beneath the suspended worker.
   5. Securely attach a separate lowering line to the suspended worker’s harness.
   6. Rescuers on the ground lower the worker while the rescuers on the ladder(s) guide the worker. If the suspended worker is unconscious or can't help with his or her own rescue, two rescuers may be needed to handle the worker.
   7. Once the worker has been taken to a safe location, administer first aid for suspension trauma and any other injuries.
   8. Arrange to take the worker to the nearest hospital.
C. If the injured person is suspended near the work area and can be reached safely from the floor below or from the place from which the worker fell:

1. Make sure that all rescuers are protected against falling (such as by travel restraint or fall arrest).
2. If possible, attach a second line securely to the worker’s harness to help pull him or her to a safe place. At least two strong workers will probably be needed to pull someone up.
3. Eliminate slack in the retrieving line to avoid slippage.
4. Once the worker has been taken to a safe place, administer first aid for suspension trauma and any other injuries.
5. Arrange to take the worker to the nearest hospital.

D. If a person has fallen and is suspended in an inaccessible place (e.g. on a tower, against a building, or in a structure that has no openings), you may need trained personnel and specialized rescue techniques to rescue the worker. For example, the rescuer may have to lower himself down to the suspended worker or use a lifeline to retrieve him or her.

Because of the inherent risk in this type of rescue, only people with specialized training should do it.
Ladders can be dangerous if not used properly. Under the Construction Regulation (O. Reg. 213/91), a ladder is not a work platform. It is a means of access. When a conventional scaffold or work platform can be used, it should always be the first choice instead of a ladder.

For more information, refer to the “Ladder Use In Construction Guideline” developed by the Construction Provincial Labour-Management Health & Safety (Section 21) Committee in conjunction with the Ontario Ministry of Labour (www.ihsa.ca/pdfs/topics/ladders.pdf).

Ladders

- Inspect ladders for defects and damage before use. Defective ladders must not be used and should be tagged and removed from service. Do not paint ladders. Paint can hide cracks and defects and also causes slippery conditions.
- Ladders should be set up on a firm, level surface. If the base is to rest on soft un-compacted or rough soil, a mud sill should be used.
- All straight and extension ladders must be equipped with non-slip feet. Stepladders may not be used as straight ladders.
- Face the ladder and grasp the rungs when climbing up or down. Use the three-point contact method of climbing. (Use two hands and one foot, or two feet and one hand, to maintain contact with the ladder at all times.)
- Do not carry tools, equipment, or material in your hands while climbing. Use a tool belt to carry tools and a hoist line for lifting and lowering.
- Ladders should not be erected on boxes, carts, tables, scaffold platforms, man lift platforms, vehicles, or other unstable objects.

- Always place the ladder at a safe angle. For straight and extension ladders, the base of the ladder should be placed 1 foot out for every 3 or 4 feet up, depending on the length.
- When using a stepladder, ensure braces are fully open and spreaders are locked. Do not stand any higher than the third step from the top. Do not stand on the pail shelf of a stepladder.
- Do not use metal ladders for work on or near any electrical power source or electrically-powered equipment.
Ladders and Scaffolds

- When a ladder is to be left in place and used to gain access to another level, it must be secured and extend at least 90 centimeters (three feet) above the level.
- Keep the area around the base of the ladder clear of tools and other material.
- Erect a barricade or station a fellow worker at the base of the ladder to prevent it from being bumped in areas of vehicle traffic.
- Only one person is allowed on a ladder at a time.
- Use two workers to carry ladders longer than 3.5 metres (12 feet).
- Ensure ladders are properly designed for the task for which it will be used.

Scaffolds

- The erection and dismantling of scaffolds must be performed by someone who is competent, has the knowledge, and has experience in the task. Never assume that rental equipment meets regulated specifications.
- Scaffolds must be erected with all braces, pins, screwjacks, baseplates, and other fittings installed as required by the manufacturer. Inspect each scaffold component before using it to make certain there are no bent parts, bad welds, or rust that might compromise its strength.
- Securely fasten all cross braces to the scaffold frames. Do not use the braces as a ladder.
- Place the scaffold legs on a firm foundation. If necessary, provide sills to distribute the load over a larger area.
- Scaffolds must be equipped with guardrails consisting of a top rail, mid rail and toeboard.
- Scaffolding platforms must be at least 46 centimeters (18 inches) wide. If they are over 2.5 meters (8 feet) high, they must be planked across their full width.
- Scaffolds with a height to base width ratio of three to one (3:1) (including outrigger supports if used) must be tied to a building or structure to prevent tipping. Where scaffolds cannot be tied in to a building, guy lines adequately secured should be used to provide stability. Guys, ties, and braces must be installed according to the scaffold manufacturer’s recommendations.
- Scaffold planks should extend at least 15 cm (6 inches) beyond the centre of support and must be securely fastened to prevent them from sliding.
- Scaffold planks must be of good quality, free of defects such as loose knots, splits or rot. They should be made of No.1 spruce or better, when new, and should measure 51 mm x 25.4 cm (2 inches x 10 inches).
- Scaffolds must be erected, used, and maintained in an upright and plumb condition.
- Scaffolds must be equipped with a proper ladder for access. Vertical ladders must be equipped with 15 centimetres (6 inches) stand-off brackets and a ladder climbing fall device or safety cage when they are more than five metres (15 feet) high.
- Scaffolds over 15 metres (50 feet) in height must be designed by a professional engineer and constructed in accordance with the design.
- Remove ice, snow, oil, grease, and other slippery material from the platform and sand the surface.
- Wheels or casters on rolling scaffold must be equipped with braking devices securely pinned to the scaffold frame.
- When overhead work is being performed, the danger area below should be roped off or barricaded and signs clearly posted indicating “Danger – Workers Overhead.”
It is important to understand the hazards that increase our risk of developing a musculoskeletal disorder (MSD). MSDs are often associated with manual material handling tasks (lifting, pushing, pulling, carrying, etc.). However, it’s not enough just to understand the hazards of such activities. You must also learn and apply the principles of MSD prevention at your workplace.

- When lifting, keep your back reasonably straight, bend your knees, and grasp the load firmly. Raise (and lower) the load by using your legs, not your back. Avoid twisting your body while lifting, moving, or setting down a load (turn with your feet). Moves should be slow and steady—not jerky.
- Check the route of travel before carrying any load. Check walking surfaces, obstacles, lighting conditions, traffic, etc.
- Get help with heavy loads or objects or use mechanical handling equipment if possible.
- When two or more persons are involved in carrying a load, the method of handling the object should planned and discussed before lifting.
- Do not carry a load you cannot see over.
- Beware of pinch points when handling or moving material.
- Wear gloves when lifting or moving sharp edged or rough materials, such as steel plate, lumbar, pipe, cable, or chain.
- Know your limitations.
There are many hazards associated with operating machines and equipment. Companies should develop safe operating procedures for each machine and piece of equipment that workers will be required to operate. They can include things like:

- Never start any machine or equipment of any kind unless you are trained and authorized to do so. No unauthorized riders should be permitted on any mobile equipment.
- A circle check (pre-op inspection) must be conducted on all equipment including operational checks (e.g., testing of brakes, steering, lighting, and other safety components) before use. Use and fill out the operator checklist and immediately report any defects.
- Be sure that all guards are securely in place and properly adjusted before starting or operating any machinery or equipment. Replace any missing guards or notify your supervisor immediately.
- Never block, leave open, or otherwise render inoperative any protective guard or safety device from functioning as it was intended.
- Before servicing, cleaning, oiling, repairing, or adjusting any machinery or equipment, make sure it has stopped, been de-energized, and been properly locked and tagged.
- Ensure the start-up alarm is operable (where necessary).
If work is to be done on or near machinery with moving parts, the machinery should be shut down and the power turned off. This prevents it from accidentally starting up.

Develop a lockout/tagout procedure. Post it and make sure workers follow it. It can include instructions such as the following.

1. Turn off the power to the machine with the operator’s controls and deal with all other energy sources (pneumatic, hydraulic, kinetic, etc.) residual or stored energy.
2. Wait for the motor and free-wheeling machine parts and belts to come to a complete stop (apply brake if so equipped).
3. Pull the main disconnect switch or control to the open or off position. Use the left hand rule and face away from the switch when activating or deactivating the power.
4. Each worker working on the equipment must install their own personal lock and tag on the disconnect switch (multiple lock adapters are available).
5. Control all other stored energy sources (close and lock valves, bleed off pressure, block potential moving parts, etc.)
6. Apply a tag with information about the time, date, and reason, and about the person who is responsible for lockout.
7. Double-check to ensure that the machinery is out-of-service by pressing the start control.
8. After work is completed, ensure all personnel are clear, then remove locks and tags before start-up.

**Compressed Air, Water, and Steam**

1. When applicable, use the lockout/tagout procedure when working on air, water, and steam lines. Dissipate all stored energies if there is work to be done on the supply lines.
2. Check all air hose splices and connections and report any defects to your supervisor at once.
3. When using compressed air, adequate eye, face, hearing, and respiratory protection must be worn.
4. Compressed air must not be used to clean clothing or skin and must not be directed at other persons. The results can be fatal.
Entry into confined spaces is covered under Ontario Regulation 632/05 - Confined Spaces.

A “confined space” must meet the following criteria:

- a fully or partially enclosed space
- not designed and constructed for continuous human occupancy
- atmospheric hazards may occur because of its construction, location, or contents or because of work that is done in it;

The following is a summary of the basic confined space requirements.

No person shall enter a confined space unless:

- a confined space program has been developed by the employer (see sec. 5 of the confined space regulation).
- a hazard assessment is conducted before entry by a person with adequate training, knowledge, and experience (sec. 6)
- A plan to control hazards for the specific confined space has been developed (sec. 7) the Regulation
- Workers involved in the entry receive appropriate training (sec. 9)
- A valid entry permit is issued for the specific confined space before each entry (sec. 10)
- Emergency rescue procedures for the specific confined space are in place (sec. 11 & 12)
- A confined space attendant is assigned (sec. 15), and
- Appropriate records are retained (sec. 21)

Confined spaces that cannot be purged or ventilated, that may contain or are suspected of containing a flammable or explosive gas or vapour require special equipment and procedures developed for the specific application.
Maintenance Shops
Good housekeeping is required to maintain a clean and safe workshop. Essential materials and equipment should be properly stored so that they do not block walkways or create hazards for other workers. Replaced parts that are no longer required should be removed and properly discarded. All mobile equipment in a shop must have wheels chocked and the master switch locked out with the appropriate tag attached.

Lubricants
To prevent spills, care should be taken when handling oil and grease. All spills should be cleaned up immediately. Appropriate spill cleanup kits should be located in potential areas.

Bench Grinders
When using a bench grinder, ensure that all legislated requirements are followed including:

- The space between the tool rest and the grinding wheel does not exceed 3 mm (1/8 inch). (Backgrounder as per Regulation 854, section 193)
- The tool rest is located just above the centre line of the wheel.
- Proper guards are in place.
- The grinder is stopped when any adjustments are to be made to the tool rest or the grinder itself.
- The grinding wheel is not operated in excess of the manufacturer's recommended maximum speed.
- Eye/face protection is available and being used properly.

Welding and Cutting
(A good guide to use is Regulation 854, section 36 on hot work.)

1. Only qualified, authorized personnel shall use welding and cutting equipment. All required personal protective equipment and clothing shall be used.
2. Only approved equipment in good condition shall be used. Any defect must be reported immediately. Inspect equipment frequently.
3. Adequate ventilation must be provided.
4. Equipment for cutting, burning, and welding shall be protected against physical damage and from damage by heat, fire, and sparks. To protect hoses and cables, it may be necessary to suspend them.
5. Special precautions must be taken prior to welding or cutting in dusty or gaseous locations.
6. The area in which welding is being done should be clear of combustibles, screened off with proper screens, and provided with suitable fire extinguishers.
7. Cylinders should be handled with care and secured in an upright position. When not in use, cylinders should be capped to protect the valve. They should be stored neatly with empty cylinders stored separately and clearly marked.
8. Special care must be used when working in confined spaces. Confined space entry procedures must be followed.
9. Welding or cutting must not be done near containers that have held flammable or poisonous substances until they have been thoroughly cleaned and safeguarded.
10. Never allow oil or grease to come in contact with oxygen or oxyacetylene equipment or hoses.
11. The valves of oxygen and acetylene cylinders shall be closed when a job is completed and when they are being transported. Allow for fire watch after the welding cutting work is finished.
General Maintenance

1. Only authorized personnel are allowed to carry out any maintenance work.

2. Before doing any repair or maintenance work on any machine, de-energize the equipment—follow the lockout/tagout procedure. In cases where equipment must be running for adjustments, etc., effective precautions and procedures to protect the worker are required.

3. Never undertake any cleaning or adjustments while a conveyor belt is running unless special procedures are in place.

4. Pipe extensions should not be used on wrenches to loosen tight nuts or pipe fittings—use the proper size wrench or socket. If the larger wrench is not effective, consult your supervisor.

5. To avoid injuries, be sure everyone in the area is clear and in a safe place before starting any equipment or motor.

6. Do not make repairs to any machinery until all moving, elevated parts or suspended loads are blocked and any stored energy or pressure is released so that there is no possibility of workers getting caught or injured.

7. Before placing the repaired equipment in service, ensure that all guards are in place, everything is in order, and the area is cleaned up.

Vehicle Maintenance

1. The machine should be on level ground for maintenance. Make sure the wheels are chocked and the brakes are set.

2. Lower the bucket, blade, or other attachments “flat” on the ground. If the bucket, blade, or other attachments must be raised for maintenance, block securely using adequate blocking such as load-rated devices and use the manufacturer’s lift arm safety bar/cylinder locking device.

3. Relieve all pressure systems.

4. Disconnect battery to prevent accidental start and to protect the vehicle’s computer.

5. Attach necessary locks and warning tags according to manufacturers’ specifications, company procedures, and Regulation 185.

6. Attach steering lock on articulated machines.

7. Machines should not be serviced with anyone in the operator’s seat unless they are assisting in the service and are qualified to operate the machine.

8. If you have to crawl under a machine, be sure you are out of traffic, the wheels are blocked, and the controls are tagged and/or locked.

9. Exhaust fumes are deadly. If it is necessary to start an engine inside a building, make sure there is adequate ventilation and get the machine outside as soon as possible. Periodically check exhaust system for leakage.

10. Before you remove inspection covers, stop the engine. Don’t let tools or loose objects from your pockets fall in the opening. Any work on mobile equipment brakes shall be done by a competent person.
CHAPTER 14—ELECTRICAL PRECAUTIONS

1. Report all electrical problems to a supervisor or electrician.
2. Never touch loose or fallen electric wires. They may be charged and result in electrical shock. Advise supervisor immediately.
3. Electrical switch rooms should be designated as hazard areas and only authorized personnel be allowed in them.
4. Never touch any electrical equipment, electrical switches, or starter buttons unless authorized to do so.
5. Always pull the safety disconnect switch on the line side of any electrical box before opening to remove exposed fuses not mounted on a safety block. If this switch is not an integral part of the box or located within arm's reach of the box, then the switch must be locked in the off position.
6. When placing light bulbs in live sockets, turn your face away—the bulb may explode. If possible, switch off the lighting circuit before changing bulbs.
7. Never leave a light socket empty. Replace the bulb at once.
8. Extension cords with worn insulation are dangerous and must be repaired or replaced.
9. To prevent fires in electrical panels, qualified personnel must remove dust accumulation periodically.
10. Never store any material in front of or on top of electrical panels and equipment. Maintain clear access by keeping the floor free of obstacles. Never store any other material in switch rooms.
11. Always pull control switch before opening knife switch in fuse panel for any reason.
12. Before opening any switch box be sure the motor is stopped, then press top button, move disconnect switch to off position, and lock.
13. Make a habit of operating starting compensators and switches with your left hand and turn your face to the right. The handles of enclosed switches and compensators are invariably on the right side and when operated with the left hand, your body will be out of the direct line with a flash, should one occur.
14. A lockout station should be located in electrical switch rooms with a lockout procedure posted nearby.
15. Rubber mats should be placed on the floors of electrical rooms.
16. All disconnected electrical cables and gear should be removed.
17. Metal ladders should not be used in electrical switch rooms.
18. Single line diagram of overload protection circuits should be posted in electrical rooms.
CHAPTER 15—EXPLOSIVES AND BLASTING

Only experienced and trained authorized personnel shall handle and use explosives.

When handling, transporting, storing, or using explosives, obey all provincial, federal, and local laws and regulations. Refer to Part IV of the Regulation for Mines and Mining Plants (O. Reg. 854), Sections 121-154. Also see regulations for Transportation of Dangerous Goods, and the Explosives Handling and Storage Act.

Do not smoke near explosives.

**Transport of Explosives**
(backgrounder Reg. 854, sections 131-132)

1. Obey all laws and regulations.
2. Load and unload carefully.
3. Make sure that the vehicle used conforms to the Regulation under the Explosives Act and is in perfect working order and safe condition.
4. If the vehicle transporting electric blasting caps to or from the job is equipped with a radio transmitter, the caps should be carried in a closed metal box and the transmitter turned off and not used.
5. Do not allow riders.

**Storage of Explosives**

1. Store clean and dry licenced magazines in a well-ventilated area that is properly located away from working areas, bulletproof, and securely locked.
2. Do not store blasting caps or any primer in the same container with explosives.
3. Only explosives are stored in the magazine. (O. Reg. 854, section 128 (6))
   a. Powder is stored in the powder magazine.

b. Detonators and caps are stored in a separate magazine.
4. Report any leaking explosives to your supplier.
5. Do not store fuses or explosives in a wet or damp place, or near oil, gasoline, or any flammable material or source of heat (stove, steam pipe, etc.).
6. Never attempt to make primers in a magazine.

**Use of Explosives**
(backgrounder Reg. 854, sections 140-147)

1. Keep all unauthorized persons away from your working area.
2. Keep away from the explosives during the approach or progress of an electrical storm.
3. Do not use any damaged or wet explosives, fuses, or other equipment.
4. Do not use a metal tool to open or close a box or case containing explosives.
5. Do not strike, or tamper with blasting caps and do not try to pull wires out.
6. Do not carry explosives in pockets, pouches, or any part of your clothing. Follow proper handling procedures.
7. Do not bring or prepare more explosives than you need.

**Drilling and Loading**

1. Inspect drilling equipment at the beginning of each shift and report any unsafe condition at once.
2. Be sure of firm footing before starting to drill and ensure a properly secured or guarded face edge.
3. Check for the presence of unfired explosives before drilling. Never drill into explosives, old holes, or within 8 metres (26 feet) of a missed shot.

4. Ensure proper body position while drilling. Drill steel may break suddenly. Be in the clear if this happens, so that your machine will not fall on you or throw you off balance. Do not bear down on the drill set. Handle steel with care.

5. Check the condition of the bore hole before loading.

6. Do not force explosives into a bore hole. Use fall arrest loading holes when close (within 6 feet) to the edge of the quarry face.

7. Do not force caps into explosives.

8. Use only wooden or plastic tamping tools. Tamp gently without kinking any wire or damaging fuses or caps. Stem the hole properly.

### Before Firing

1. Make sure that all surplus explosives and caps are returned to the storage magazine.

2. Where safety fuse is used, no fuse shorter than one metre may be used.

3. Make sure that all persons, vehicles, and equipment are at a safe distance or under cover. Calculate a safety facture in the standoff distance for fly rock.

4. Give an adequate warning signal before the blast.

5. Check weather conditions. A low ceiling and high humidity may produce a louder explosion and generate complaints from local residents.

### Electrical Firing

1. Do not try to blast during an electrical storm or when large charges of static electricity (dust storms) are present. Discontinue the handling of explosives and leave the vicinity.

2. Test balanced circuits with a blasting galvanometer or other suitable device.

3. Make sure that you have sufficient current to fire the charge.

4. Make sure that the circuit is well-insulated and away from other conductors.

5. Keep the lead wire short-circuited until ready to fire.

6. Electrical blasting shots shall be connected and fired only by the blaster. Use a proper blasting machine and follow manufacturer’s procedures.

### After Firing

1. Keep away from the blast area until smoke dust, and gases have cleared.

2. In case of a misfire, the muckpile should be inspected for undetonated explosives. Keep workers away and handle only with an experienced person, under the direction of the supervisor, and follow prescribed procedures.

3. Dispose of explosives in accordance with approved methods.

4. Make sure that all unused blasting material and equipment has been returned to the magazine and secured.

5. Burn all material used in packaging explosives in an open area, 90 metres (300 feet) away from buildings or equipment. Inspect material to ensure no explosives remain hidden in the packaging. (Permits may be required.)

6. Working face should be inspected from below before anyone checks the top of the bench.

7. Make sure that loose or overhanging rock at the top of the face is removed immediately. Ensure fall arrest protection is used when inspecting or scaling face and/or walls.

8. Do not hesitate to consult your explosive suppliers. They are experts, and the company is paying for their services.
CHAPTER 16—CRUSHING, SCREENING, AND WASHING OPERATIONS

General
1. When moving any portable plant section, brakes and tires should be inspected, brake drums cleaned, and air lines checked before venturing onto public roads.
2. When blocking a portable crusher, make sure the ground is firm and level and blocking if required is in good condition.
3. When assembling and disassembling a plant, only one worker should signal the crane operator and another should do the rigging. All other workers should be kept clear of the work area.
4. When a worker is exposed to the hazard of falling more than three metres, a fall arrest system must be used. (See Chapter 7 on Fall Protection.)
5. Impact or jaw crushers must have chains or cavity guards in place.
6. Control dust with water as much as possible.
7. Make sure there is adequate lighting.
8. Prior to plant startup, ensure that all guards are in place, personnel are clear of moving parts, and start-up alarms are in good working order where needed.
9. During plant operation, walk-through inspections should be conducted several times during the operating shift to ensure equipment is operating properly and guards, safety devices, etc., are in the proper working positions and in good working order.

Bins and Hoppers
1. Entry into all bins and hoppers shall be carried out in conformance with legal requirements. (See O. Reg. 632/05: Confined Spaces for more info on confined space entry.)
2. Bins must not be entered without the authorization of a supervisor.
3. Materials must be checked to ensure that there is no possibility of a cave-in. A pole or a rod is to be used from the top to poke such material down.
4. Never enter rock bins on the grizzly unless a worker on top or the bin is otherwise guarded to prevent rock from being dumped into the bin.
5. A fall arrest system must be used when entering or working over a bin or hopper under the following situations:
   a. when there is danger of being buried by movement of material
   b. when there is possibility of being overcome by toxic gases or lack of oxygen
   c. when there is a possibility of falling more than three metres.

Conveyors
Conveyors are one of the most frequent sources of injuries and safety violations in the aggregate industry. It is crucial that everyone be aware of the potential hazards associated with conveyor belts and take the necessary precautions to avoid injury.
1. When operating or working around conveyors, follow proven safety practices by obeying all company rules and the provincial (legislated requirements) regulations. Refer to Section 196 and 185 of the Regulation for Mines and Mining Plants (O. Reg. 854).
2. Never attempt to clean or repair a moving conveyor. Use the lockout/tagout procedure. Be aware of interlocking equipment and lock out any other parts that may affect your safety. If in doubt, check with the supervisor.
3. Follow the safe procedures developed for lubricating conveyors and applying belt dressing.

4. Ensure guards are in place at all identified pinch points (pulleys, accessible return rollers, drive belts, chains, shafts, etc.). Do not remove guards unless the conveyor is stopped, de-energized and locked out.

5. Do not use a tool to free lodged material while a conveyor is moving.


7. Ensure safety pull cords are accessible and in good operating condition. Do not use pull cords for normal shutdowns—use the stop-start switch.

8. Never ride or walk on conveyor belts.

9. Never step through, crawl on, stand under, or step over moving conveyors.

10. Loose clothing and long hair must be suitably confined to prevent entanglement when working around moving conveyors or any other equipment.

11. Never operate a screw conveyor unless it has a proper cover, or is otherwise protected.

12. Do not step on screw conveyor covers. Keep these covers tight and secured.

13. All personnel working around conveyors must be familiar with start-up warning devices and procedures.

14. Never uses D-handled shovels or any other D-handled tool around conveyors.
Hoisting and Rigging

Section 201 of Regulation 854 states that “An operator of mobile cranes, shovels and boom trucks, or similar equipment, whereby rope is wound onto a drum driven by an engine for the purpose of raising, lowering or swinging materials, shall, hold a certificate of qualification issued under the Ontario College of Trades and Apprenticeship Act, 2009, that is not suspended, or, if the worker is an apprentice, be working pursuant to a training agreement registered under that Act”

Only qualified, authorized, and competent personnel shall operate shovels, cranes and draglines. (O. Reg. 854, s. 201)

1. Operators shall test all controls, brakes, and hoisting ropes prior to machine operation.
2. Do not use a defective machine. Report the condition to your supervisor immediately.
3. While operating, avoid distractions and refrain from talking with others. Concentrate on the job.
4. Never move a load over the heads of workers.
5. Always work clear of overhead wires. Refer to Section 159 (2) of the Regulation for Mines and Mining Plants (O. Reg. 854).
6. Protect electric training cables and handle them with proper insulated gloves or insulated pullers.
7. Do not overload trucks or haul units.
8. Unless it is stopped and de-energized and attachments are properly supported, no one shall go under the machine, bucket, or boom at any time.
9. Lower the bucket to the ground before leaving the operator seat. Stop equipment when oiling or repairing.
10. Only the operator is allowed on a machine while in operation. If the presence of an oiler, trainee, maintenance person, etc., is required, know their location at all times.
11. Keep a clean and tidy machine that is free of grease, oil, and trash.
12. When mounting and dismounting the machine, do not rush. Use the three-point contact method.
13. Place shovel in a position that allows a view of all the loading operation and know the exact location of drillers and others working in the area.
14. All workers, before attempting to climb on or off any equipment, must signal the operator to stop and place the machine in the most advantageous position.
15. Do not swing the bucket over a truck cab while the driver is in the vehicle.
16. Maintain proper face heights and do not create hazardous “undercuts.” Refer to Section 88 and 89 of the Regulation for Mines and Mining Plants (O. Reg. 854).
17. There have been a number of accidents where dragline equipment, while removing material from below the waterline, has plunged into the water. To avoid this type of accident, special procedures must be followed to ensure proper machine setback, operator safety, etc.
18. Proper hand signals must be used when hoisting materials with a crane.
19. Roll-over protective structures and fall-on protective structures should be used as required.
Hoisting Engineer Training Requirements

Section 150 (1) of the Construction Regulation (213/91) stipulates that no worker shall operate a crane or similar hoisting device unless the worker holds a certificate of qualification issued under the Ontario College of Trades and Apprenticeship Act, 2009, that is not suspended, or the worker is an apprentice and is working pursuant to a training agreement registered under that Act, that is not suspended, in the trade of, hoisting engineer.

1. Inspect any hoisting device prior to making a lift and report all defects to your supervisor.

2. When moving material by means of a hoisting device, ensure that the material is secured and balanced. This will prevent material from shifting, falling, or sliding and striking bystanders.

3. When a hoisting device is used to move an object, always follow proper procedures.
   a. Inspect hooks, cables, ropes, slings, or chains for defects before making a lift. If defects are found, these items must be discarded.
   b. Hooks on hoisting equipment must be equipped with a safety latch. This will prevent the sling, etc., from slipping off the hook.
   c. Only one person gives signals to the operator. Standard hand signals should be used when using lifting devices.
   d. When lowering a load, make sure the ground or floor is clear of obstructions.
   e. Never operate a lifting device at excessive speed. Maintain control at all times.
   f. The operator of any hoisting device or qualified rigger acting under their supervision is responsible to see that the load is secure.
   g. Never permit anyone to stand close to or walk under a suspended load—you included.
   h. Hoisting devices are not designed to pull sideways. Avoid side pulls—they are dangerous and will cause unnecessary damage to equipment.
   i. Do not exceed the maximum load limit of the device. The lifting capacity of the equipment should be posted on the unit.
   j. Do not leave suspended loads unattended. Always ground the load before leaving.
   k. Wait until a load being received is lower than shoulder level before guiding it. Ensure hands and feet are clear of the load’s path. Take a safe position.
   l. Guard the area around the lift with barriers, signs, and/or personnel, especially where the operator cannot see the load.
   m. Proper regular inspection by qualified people should be done.
   n. Proper documentation for inspecting hoisting devices should be maintained.
   o. Be aware of overhead wires or other obstructions when operating any hoisting device.

Figure 12: Hand Signals for Hoisting Operations
CHAPTER 18—WATER SAFETY

This chapter deals with safety procedures when working in and around open water and slurry ponds.

Objective
To provide employees with the knowledge required to work in and around water by:
- ensuring sound machine footing
- placing banks and berms
- following rescue procedures
- ensuring rescue equipment such as boats and floatation devices are in place and in good condition
- repairing and/or reporting deficiencies according to safety legislation, company standards, and manufacturer specifications.

Introduction
By their very nature, surface mining operations can create large, artificial bodies of water caused by natural runoff, rainfall, and underground water tables. Working in and around water is very hazardous and all possible measures must be taken to guard against the danger of drowning. As with most worksite hazards, accidents associated with working around water can happen very unexpectedly and quickly. Taking steps to guard against this hazard is only one part of properly addressing the danger.

Legislation
There is no specific legislation regarding working around water in Regulation 854: Mines and Mining Plants. However, it is employer’s duty to take every precaution necessary for the protection of the worker. Section 86 of Reg. 851: Industrial Establishments specifically states that where there is danger of a worker falling into a liquid that is of sufficient depth to cause drowning, the worker must wear a personal floatation device (PFD). In addition, an alarm system and rescue equipment must be available to make sure the worker can be rescued from the liquid.

Section 27 of Reg. 213: Construction Projects legislates the requirements for worker protection from drowning. While the procedures and equipment may vary slightly from site to site, approved practices require the following:
- At least two workers trained to perform rescue operations should be available on site to perform the rescue activities.
- All workers on the project shall be advised of the rescue procedures to be followed and their role, if any, in carrying out a rescue.
- Rescue equipment shall be provided in a suitable location on or near the water.
- The rescue equipment shall include:
  1. A seaworthy boat equipped with a lifebuoy attached to a buoyant heaving line not less than 15 metres in length
  2. A boat hook
  3. An alarm system capable of warning a worker of the necessity of carrying out a rescue operation.
- The boat must be power-driven if the water is likely to be rough or swift.
- The alarm system must be activated when a rescue operation is necessary.
- When no boat is necessary, appropriate equipment should be stored nearby and readily accessible, which may include:
  - Lifeline rope and rescue buoy
  - Extra PFDs for other personnel
  - Phone or other emergency communication equipment
- Personnel trained in the use of this equipment should be standing by to assist.
PROCEDURES

General Precautions

(If applicable)

1. Where there is a danger of a worker falling into a liquid that is of sufficient depth to cause drowning, the worker must wear a PFD.

2. All banks and berms constructed around the perimeter of the body of water must properly contain the water and be placed and built according to approved company standards and safety legislation.

3. When operating machinery around water, sound footing and stable placement of the machine must be ensured to prevent upset. Machinery should be equipped with emergency escape hatches and PFDs should be worn.

4. If work is to be performed at night, abundant lighting must be provided at all points where there is a risk of workers falling into water.

5. If work is to be performed at certain distances above the water level, all precautions such as guardrails, safety nets, and appropriate fall arrest systems must be used.

6. While guardrails or nets are being installed, or when they can’t be used, self-inflating PFDs should be worn.

7. Guardrails and/or berms should be installed where traffic is regularly moving by the water hazard or when equipment is parked nearby.

8. No one should work alone when performing activities in or around water. Always use the buddy system.

9. Floating barges and/or platforms containing pumps or other types of equipment should be equipped with walkways and suitable railing to protect workers from accidentally falling off.

10. Workers should wear PFDs when working on floating platforms and life rings should be available for emergency rescue.

Rescue Equipment and Procedures

(If applicable)

1. Where there is a danger of a worker falling into a liquid that is of sufficient depth to cause drowning, the worker must wear a PFD.

2. At least two workers trained to perform rescue operations should be available on-site to perform the rescue activities.

3. All workers on the project shall be advised of the rescue procedures to be followed and their role, if any, in carrying out a rescue.

4. Rescue equipment shall be provided in a suitable location on or near the water.

5. The rescue equipment shall include:
   - A seaworthy boat equipped with a lifebuoy attached to a buoyant heaving line not less than 15 metres in length.
   - A boat hook
   - A personal floatation device (PFD) for each person using the boat.

6. The boat must be power-driven if the water is likely to be rough or swift.

7. The alarm system must be activated when a rescue operation is necessary.

8. When no boat is necessary, appropriate equipment should be stored nearby and readily accessible, which may include:
   - Lifeline rope and rescue buoy.
   - Extra PFDs for other personnel.
   - Phone or other emergency communication equipment.

9. Personnel trained in the use of this equipment should be standing by to assist.
Front-end loaders are used to move, load, or stockpile large quantities of aggregate material. Because of their size and the nature of the work, they can cause serious injury and even death if not operated properly. Here are some hazards to be aware of when using front-end loaders and safe practices that will help prevent those hazards.

**Common Hazards**

- flying debris
- noise
- roll-over
- traffic
- other equipment
- powerlines
- protruding objects caught in tracks.

**Safe Practices**

1. Only qualified, fully trained, and authorized personnel shall operate front-end loaders.
2. A circle check (pre-op inspection) must be conducted on all equipment including operational checks—testing of brakes, steering, lighting and other safety componentry prior to initial use of the motor vehicle for the shift.
3. Use and fill out the operator checklist and immediately report any defects.
4. No loader should be operated in an unsafe condition. Lock and tag it out-of-service.
5. Take extra care climbing on or off the machine. Use the three-point contact method. Ensure all PPE is worn when leaving the operator’s cab.
7. Unless for the purposes of training, allow no one to ride outside the cab. No one should ride with operator unless safe seating facilities are provided.
8. Never attempt to operate or start a loader from any position except the operator seat.
9. Always use the seatbelt.
11. Check for fuel leaks. Know the location, condition, and operation of the fire extinguisher (required).
12. Before you back up, be sure the area is clear. Sound horn or other warning device before starting engine or moving. Ensure backup alarm is working.
13. Maintain control at all times. When descending ramps, etc., slow or stop at the top and select the proper gear. Never coast downhill in neutral.
14. When leaving a loader unattended, park in a safe, level area; lower bucket flat on the ground; shut off engine and engage parking brakes. Shut off master switch!

15. If it is necessary to park on a slope, park with the wheels safely blocked or turned into a bank.


17. Before fuelling loaders, ensure the engine is shut off and that there is adequate ventilation. Do not smoke in the fuelling area. Avoid spills that can damage the environment.

18. Maintain proper face heights in the bank or pile and do not create hazardous “undercuts”. Refer to sections 88 and 89 of the Regulation for Mines and Mining Plants (O. Reg. 854).

19. Check brakes, tires, and rim assemblies frequently.

20. Always operate front-end loaders in accordance with company policies and procedures and manufacturer’s recommendations.

21. Roll-over protection structures must be in place on all equipment where required by Regulation 856.

22. Protection from falling material must be installed on all equipment as required by section 117 (2) of Regulation 854.
CHAPTER 20—BULLDOZERS

Bulldozers are used to extract or push large quantities of aggregate material very quickly. Because of their size and the kind of work they do, they can cause serious injury and even death if not operated properly. Here are some hazards to be aware of when using bulldozers and safe practices that will help prevent those hazards.

Figure 13: Bulldozer

Common Hazards
• flying debris
• noise
• roll-over
• traffic
• collision with other heavy equipment
• blind spots—hitting other workers
• protruding objects caught in tracks.

Safe Practices
1. A circle check (pre-op inspection) must be conducted on all equipment including operational checks—testing of brakes, steering, lighting and other safety componentry prior to initial use of the motor vehicle for the shift. Use and fill out the operator checklist and immediately report any defects.
2. Only qualified, fully trained, and authorized personnel shall operate bulldozers.
3. Take extra care climbing on or off the machine. Use the three-point contact method. Ensure all PPE is worn when leaving the operator’s cab.
4. No bulldozers shall be allowed to operate in an unsafe condition.
5. Do not attempt to start or operate the machine from any position other than in the seat provided.
6. To leave a bulldozer unattended:
   • Find a level, safe parking place.
   • Lower attachments to the ground.
   • Place transmission controls in neutral and engage transmission control lock.
   • Set parking brake.
   • Shut down engine.
   • Position a bulldozer at right angles to a slope if it is necessary to park on a grade.
   • Never leave a machine unattended with the engine running.

7. Never allow anyone to ride on the machine.

8. Operate at speeds slow enough to ensure complete control at all times.

9. Always inspect the workplace for hazards and potential hazards. Make sure that:
   • The site is safe.
   • There is adequate clearance for equipment and attachments.
   • There are no buried wires or cables in the area.

10. Travel to jobsites using designated travel routes. Observe speed limits and signals. Travel upgrade and downgrade in an efficient manner. Stay clear of pedestrian and vehicular traffic and other obstacles.

11. Before fuelling bulldozers, ensure the engine is shut down and that there is adequate ventilation. Do not smoke in the fueling area. Avoid spills that can damage the environment.

12. Do not create hazardous “undercuts” in the stockpile or bank.

13. Always operate bulldozers in accordance with company policies and procedures and manufacturer’s recommendations.

14. Roll-over protective structures and fall-on protective structures should be used as required.
Safe Practices

1. A circle check (pre-op inspection) must be conducted on all equipment including operational checks—testing of brakes, steering, lighting, and other safety componentry prior to initial use of the motor vehicle for the shift. Use and fill out the operator checklist and immediately report any defects.

2. Only fully trained and authorized drivers are to operate trucks.

3. Use the three-point contact method when climbing on and off vehicles. Ensure all PPE is worn when leaving the operator’s cab.

4. Travel to worksites following designated travel routes, adjusting speed to road conditions and observing speed limits and traffic signals.

5. Know the braking capabilities of equipment re: stopping distance, maximum grade and gear/speed/grade information. Test brakes before going down on a grade.

6. Always wear your seatbelt.

7. Keep windshield and door windows clean at all times.

8. Keep a safe following distance.

9. Follow safe parking procedures. When parked on a grade, the wheels should be adequately chocked and turned toward the bank.

10. Before fuelling haulage trucks, ensure the engine is shut down and that there is adequate ventilation. Do not smoke in the fuelling area. Avoid spills that can damage the environment.

11. Always operate trucks in accordance with company policies and procedures and manufacturer’s recommendations.

12. If unsure of any procedure, such as a traffic pattern or dumping procedure, stop and ask.

13. All accidents and damage are to be reported immediately to supervision.

14. Be certain that there is adequate clearance before driving a truck through any opening or near buildings.

15. Be aware of the blind spots for the vehicle and take them into account at all times. Don’t park in another vehicle’s blind spot.

16. Communicate, for example by sounding your horn, before passing or when visibility is obstructed. Be sure the backup alarm is working.
17. During loading, drivers must remain in the cab. Do not leave the operator’s cab while the loader is loading the unit so the loader operator knows where you are.

18. Before dumping:
   • Ensure people are clear of the area.
   • Check overhead clearances such as wires, building projections, etc.
   • Look for signs of unstable or uneven ground.
   • If operating a trailer unit, keep the trailer and tractor in line while dumping.

19. After dumping, make certain the box is completely lowered before moving the truck.
Haulage road conditions can play a big part in the safety of a pit or quarry operation. Poor road conditions can make it much more difficult to operate equipment safely.

Vehicle operators should be alert to and anticipate changes in road conditions, especially with changes in weather.

Operators should promptly inform supervisors of any unusual or potential dangerous road conditions. Examples would be:

- Poorly drained areas
- Soft shoulders
- Washed out areas, ruts, and gullies
- Boulders or debris on the roadway
- Ice and snow drifts
- Cracks or unstable slopes above or below the roadway
- Excessive dust
- Safety berms missing or inadequate.

Operators should always be aware of other traffic and pedestrians using the haulage roads and follow posted speed limits and traffic signs.

Haulage roads should be provided with suitable berms. The general rule of thumb is that the berm should be at least half the height of the tire of the largest vehicle that travels on the roadway. This will prevent rollover.
Safe work practices for the Aggregates Industry

Safe stockpiling and dumping techniques vary depending on the type of material handled and the type of equipment available.

**Safe Dumping Methods**

- Materials must be dumped back from the crest of the pile, as the edge may not support a loaded haul truck. Materials should be pushed over the edge by a bulldozer or front-end loader using a “bumper” of other material to keep the equipment a safe distance from the edge.
- Loaders and bulldozers should always operate perpendicular (at 90 degrees) to the top edge of the stockpile or dump.
- Well-maintained berms should be placed along the edges of the stockpiles and dumps. The presence of a berm does not necessarily signify the edge is stable—material may have been removed from the base of the pile, etc.
- Dumpsites should be inspected frequently for signs of slope instability (cracks, slumping on the slope, bulging at the toe, etc.). Supervisory inspection on foot should supplement the equipment operator’s constant vigilance.
- Dump only in designated areas. If in doubt, drivers should contact their supervisor before dumping.
- Trucks must not dump at the top of a pile where the toe has been removed.

**Safe Stockpiling Techniques**

- Loader operators must be alert to material sliding down the pile while they are digging and be constantly vigilant for frozen or consolidated chunks that could roll down the face.
- Loaders should always be operated facing the base of the pile to place the operator cab as far from the face as possible.
- After blasting quarry face, ensure face is properly inspected and scaled before mucking below with equipment.
- Loaders should never excavate from the bottom of a stockpile while other machinery is working directly above on the top of the stockpile.
Surge Piles

Stockpiles and surge piles that have material being removed by underground feeders can be particularly dangerous. Two major hazards exist: the unstable material around the draw hole and the possibility of hidden voids (bridged material).

- Never operate equipment directly over a feeder.
- Operators should never push material directly into the draw hole. Bump it with other material, keeping the bulldozer or loader a safe distance away from the edge.
- Operators should never get off their machine and walk to the edge of the draw hole. They could easily be drawn into the material flowing to the feeder.

- Always operate equipment with it facing the feeder.
- Operate with the draw hole or hopper kept nearly full to avoid having equipment drawn into it.
- Open holes should be guarded when not in use and have appropriate signs warning of the possible dangers.
CHAPTER 24—WINTER HAZARDS

Winter weather can slow or completely stop pit and quarry operations. Winter weather can increase injury rates and maintenance costs. Workers should anticipate and control the following conditions during the winter alert period and throughout the year as necessary.

**Pitwall Hazards**

Weathering creates pitwall hazards. Weathering occurs when air, water, and mechanical action resulting from temperature changes causes rocks to decay and crumble.

Freezing and thawing is a kind of weathering. Water in the pitwall can freeze and turn into ice, which expands and exerts pressure on the surrounding surfaces. This pressure separates the material in the pitwall. Ice can bind loose material together. But when the temperature rises, the ice melts and the pitwall becomes unstable. An unstable pitwall is an accident waiting to happen.

Workers and supervisors should pay special attention to the condition of pitwalls during the winter when freezing and thawing is more likely to occur.

**Icy Surfaces**

Slips and falls are the most frequent causes of non-fatal accidents in aggregate operations. Workers face the same hazards as anyone who walks on ice, snow, or mud-covered surfaces.

Ice and snow on ladders, stairways, and steps presents special hazards. A thin film of ice may cover ladders or walkways. A person may not become aware of the ice until it is too late or until they have climbed a few rungs, or walked a few steps, lost their footing, and fallen.

Workers should be careful when walking or climbing on icy or wet surfaces surfaces. Also avoid slipping/tripping hazards due to muddy boots and dozer/shovel tracks.

- Keep walkways and travel ways free of ice and snow.
- Wear proper boots and walk slowly and carefully.
- Use handrails or handholds to maintain balance.

**Frost Overhangs**

Frost overhangs can occur in either pit or stockpile faces. There is a tendency to undercut further into the pile or face, thus creating the following hazards.

**Hazards From Above**

Equipment operators and personnel working on upper surfaces have a false sense of security that they are on solid footing (unable to accurately determine where the true face is).

**Hazards From Below**

- Danger of large chunks breaking off and striking the equipment, causing injury to the operator.
- Chunks can also bounce into the cab and strike the equipment operator.
- Accidents have occurred where a large frost chunk has crushed the operator cab.
**Haulage Road and Equipment Hazards**

Operation of large off-road haulage trucks can be particularly dangerous on icy and wet roads. Safe driving is something over which the driver has control. Driving must be adjusted to the existing conditions even in the face of such hazards.

Pit and quarry operators generally use road graders to keep haulage roads in good shape. Graders can also be used to break up ice that has formed on the road.

Limited visibility contributes to accidents. Limited visibility may be caused by:

- Poor eyesight
- Fog
- Heavy rains
- Blowing snow
- Dusty roads
- Glare from sunset and sunrise.

**Cold Exposure**

Exposure to cold can damage your skin (frostbite, etc.) and cause general body cooling (hypothermia). Contributing factors include:

- Temperature
- Wind speed
- Worker’s age and physical condition
- Degree of protection from outer clothing or covering
- Exposure to cold or icy water

Know the safety and first aid procedures to prevent and treat cold injuries. If exposed skin comes into contact with extremely cold metal, it can cause frostbite.
Propane or liquefied petroleum gas (LPG) is a by-product of petroleum or natural gas refining and it is packaged under pressure in cylinders. In its stored state it is a liquid but is released from the cylinder or tank in a gaseous form.

Propane tanks or cylinders are available in different sizes with different methods of fuel withdrawal (liquid or vapour). The pressure within the container varies depending on the temperature. The pressure increases as the temperature rises, causing expansion of the liquid.

For this reason, containers are never fully charged with liquid, but have a vapour space at the top of the tank to allow for normal expansion (Figure 14). If the temperature rises above safe limits, a relief valve will open to allow release of some of the gas. The valve then reseals and remains closed until the pressure builds up again.

Figure 14: Cutaway view of vapour-withdrawal propane cylinder

Propane Safety

- Propane is heavier than air and will settle to the lowest area possible. For this reason, propane must not be released over a pit or depression where it may collect and create a fire/explosive hazard.
- When propane liquid is released, it produces 270 times as much vapour by volume creating an extremely hazardous situation.
- Propane tanks not in use, whether full or empty, must be stored outdoors in a secure area in an upright position with the valves tightly closed. Note: There are limits to the amount of propane which can be stored at an industrial site. Check with the supplier.
- If stored indoors, propane tanks must be stored in an approved vented, explosive safe room.
- Ideally, propane tanks should be exchanged outdoors. To comply with the Ontario Fire Code, cylinders may be exchanged indoors as long as they are 25 feet from all ignition sources, open pits, and underground entrances.

All personnel handling propane must receive specific training from a certified trainer as required by legislation. (O. Reg. 211/01)
Propane Safety Rules

- Never attempt to refuel any propane vehicle unless you have received the appropriate training and instruction.
- Liquid propane vaporizes quickly and will cause extreme frostbite if it touches skin. Wear protective gloves while making or breaking connections. Also turn your face away from the filler overflow valve when refueling equipment. Be sure the valve is closed before breaking any connections and that there is sufficient ventilation present.
- Observe the “No Smoking” rules.
- Some propane vehicles are equipped with “stop fuel” protection while others are not. Take every precaution not to overfill a vehicle.
- Any repairs to the fuel supply system of a propane-powered vehicle must be done by a qualified propane service technician.
- Following tank exchanges, check fittings and connections for leaks with a soap solution. Never check for propane leaks with an open flame.
- Unless designed for a horizontal use, propane cylinders must be kept in an upright position.
- Only hoses and fittings approved for propane must be used to connect a cylinder to devices and equipment.
- Protect hoses from heat or damage.
- Whenever possible, safety relief valves should be positioned so they face away from likely sources of heat or ignition.
- When not in use, propane cylinders and hose-connected devices should not be left in trenches or other low-lying areas as propane is heavier than air.
- Propane cylinders shall not be transported in the passenger compartment of a vehicle.
Worker Requirements

All workers shall be trained in basic surface miner common core. As well, all operators shall complete their specific specialty skills.

- Participate in WHMIS training sessions.
- Recognize the different hazard symbols and their meaning.
- Read labels and Material Safety Data Sheets (MSDSs) for all hazardous materials in the workplace.
- Follow the recommended use, handling, and storage procedures for hazardous materials.
- Practice good housekeeping and personal cleanliness.
- Wear the required personal protective equipment.
- Know what to do in the case of emergency involving a hazardous material.
- Follow all health and safety rules for worker protection.
- Report missing or unreadable labels on containers of hazardous materials to your supervisor.
- Workers have a “right to know” but also a responsibility to apply what they know.

Figure 15: Hazard Symbols (WHMIS)