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Work Safe for Life

SAFETY TALKS

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When you register a new business with the WSIB, you automatically become a member of the Infrastructure Health and Safety Association

Who we are

IHSA is part of Ontario's health and safety system, which includes the Ministry of Labour (MOL), the Workplace Safety and Insurance Board (WSIB), and six health and safety associations. **As a member of IHSA, you get access to our health and safety training, products, and services at no charge or at a reduced price.**

What we do

IHSA is a leader in health and safety education. Through skills-based training, auditing, and evaluation, we provide safety solutions to those who perform high-risk activities such as working at heights, working with energized high-voltage power systems, driving motor vehicles, transporting dangerous goods, working on suspended access equipment, and utility line clearing.

Ministry of Labour

Develops legislation and regulations and is responsible for enforcement and prevention.

Workplace Safety and Insurance Board

Provides compensation and return-to-work supports for injured workers. Funds the health and safety system through employer premiums.

Health and safety associations

Six designated health and safety associations provide training, education, and services related to occupational health and safety.

Infrastructure Health and Safety Association

Serves the construction, electrical, utilities, aggregates, natural gas, ready-mix concrete and transportation sectors.

Workers Health and Safety Centre

Provides training for workers, Joint Health and Safety Committee members, supervisors, and employers in every sector.

Occupational Health Clinics for Ontario Workers

Provides medical diagnostics, information, and services to prevent work-related health conditions.

Public Services Health and Safety Association

Serves the public service sector including health and community care, education and culture, municipal and provincial government, and public safety.

Workplace Safety North

Serves the forestry, mining, pulp and paper, and printing sectors.

Workplace Safety and Prevention Services

Serves the agricultural, industrial, manufacturing, and service sectors.

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Safety Talks

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IHSA has additional information on these and other topics.

Visit **ihsa.ca** or call Customer Service at **1-800-263-5024**

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Table of Contents

Table of Contents *continued*

Safety talks and JSAs

What is a safety talk?

A safety talk is a hands-on way to remind your workers that health and safety are important on the job. Each safety talk provides specific information on hazards for a particular topic. It also outlines things workers can do to prevent injuries and illness. Safety talks are ideal for daily or weekly safety meetings. But on their own, they aren't enough to keep your workers safe.

What is a JSA?

A job safety analysis (JSA), sometimes called a job hazard analysis (JHA), is an organized analysis of a specific job in a specific location. By completing a JSA, you ensure that you have properly planned the work and that workers can do it safely. As a written document, it can serve as evidence of due diligence.

Before giving safety talks, create JSAs

Before workers begin a job, management must ensure that all the work has been planned so that workers can do it safely. Management must set up an effective method or system to identify and control or eliminate hazards in the workplace. One way to do this is to develop a job safety analysis (JSA) for tasks that your workers will complete as part of their work on the jobsite.

Use the safety talks in this book along with the JSAs you have created for each job.

Why develop a JSA?

JSAs are excellent tools for identifying

- the steps involved in the job
- the potential hazards associated with the job
- the protective measures you will use to protect workers who will complete the job.

Who develops the JSA?

A competent person should develop the JSA because, according the *Occupational Health and Safety Act*, he or she has knowledge of the hazards that are present on the jobsite. Usually, the competent person who writes JSA is the foreperson or supervisor.

How to develop a JSA

1. **Identify the Job**
   The first thing you do when developing a JSA is identify the main jobs or tasks that your workers will do as part of the job on site. These are the jobs that you will analyze to ensure that everyone can do them safely. List these jobs in order of priority.

2. **Break down each job into steps**
   Once you have identified a job for analysis, the next step is to break down the job into steps. Each step is a segment of the operation that is necessary to advance the work. Make sure you keep the jobs steps in sequential order. Get the crew and the health and safety representative to help with this part.

   These steps are not only specific to the job, but also specific to the work area. If the work area changes, the steps may need to change as well. If the steps are too detailed, the JSA will be burdensome and difficult to follow. However, if they are not detailed enough, you may miss some hazards.

3. **Identify the hazards associated with each job step**
   This is the most challenging part of the JSA. Take each step and list the hazards associated with it. Think about what could go wrong from a health and safety perspective. Think about how people, equipment, materials, processes, and the surrounding environment may contribute to a hazard.

   Here are some things you can do to help you identify potential hazards.
   - Ask workers who are familiar with the job.
   - Review causes of past injuries or illnesses.
   - Consider other work going on near the work area.
   - Understand the legislation or regulatory requirements associated with the work.
   - Review the manufacturer's instructions for the equipment you are using.
   - Consider your own personal experience with the job.

4. **Determine controls for each hazard**
   Each hazard that you identified in the previous step needs a control. The control explains how you will eliminate the hazard or how you will significantly reduce the risk of injury or illness. Below are some ways to control hazards.

Eliminate the Hazard	• Modify the process or choose a safer process. • Improve the work environment (e.g., ventilation). • Modify or change equipment or tools.
Contain the Hazard	• Install barriers, such as guardrails or machine guards. • Enclose the hazard so workers aren't exposed to it. • Install a booth for workers.
Revise the Work Procedure	• Modify the part of the procedure that is hazardous. • Change the sequence of steps. • Add additional steps (such as locking out energy sources).
Reduce the Exposure	• Reduce the number of times workers will encounter the hazard. • Reduce the number of workers exposed to the hazard. • Use personal protective equipment. • Rotate jobs to reduce the length of time each workers is exposed to the hazard.

5. **Discuss the completed JSA with workers**
   Once you have completed the first four steps for every job that you identified in step one, you will have well-developed JSAs. Now, it's time to share them with your workers. The JSAs won't be effective if the workers don't know about them or don't understand them.

   Before starting work, review the relevant JSAs with your crew and make sure everyone knows how they are supposed to do the job. If you're dealing with a job or task that will last more than one day, it's a good idea to review the relevant JSAs each morning before work starts.

Updating JSAs

We know how often work plans change. When things change, the supervisor or foreperson must update the relevant JSAs to reflect any new hazard that results from the change. Then, the supervisor or foreperson must review the revised JSAs with all workers. Keep in mind that if workers perform the same job in two different locations, you will probably need two JSAs because the surrounding environment is different.

Sample JSA

Company: ABC
BIG PROJECT

JOB SAFETY ANALYSIS

JSA No._____

TASK: Work Description: Geotechnical Soils Investigation
Work Location: Area outside north and south of contractor parking
Estimated Start Date/Duration: November 19, 2012 for approximately 2 weeks
Trade Groups (Including sub-contractors): Geotechnical Technicians, Labourers, Operating Engineers
Major Equipment: Drill Rig
Reference Material: Soils Investigation Specification, Bore Hole Location Sketch

Job:		**To Begin (Date):**
Department:	**Supervisor in Charge:**	
Prepared By:	**Approved By:**	**Date Approved:**

JOB-STEPS	HAZARDS	BARRIERS or CONTROL
1. Establish general locations for boreholes during initial site walk-about	Spray paint or other chemical marking products	• MSDS sheet or consumer product labels
	Electrical environment	• Have owner/authorized personnel accompany • Approved electrically resistant footwear
	Personnel contacting live electrical apparatus	• Safe limits of approach
	Moving vehicles in vicinity	• Reflective safety vest or other clothing • Stay within visible barriers when required
2. Take samples for contaminants at six proposed borehole locations	Electrical environment	• Have owner/authorized personnel accompany • Approved electrically resistant footwear
	Personnel or equipment contacting live electrical apparatus	• Safe limits of approach
	Moving vehicles in vicinity	• Reflective safety vest or other clothing • Stay within visible barriers when required
	Contact of underground electrical apparatus	• Excavate by hand only
	Pinches, cuts, strains	• Personnel wear hard hats and gloves • Safe lifting practices
	Possible contaminated fill soils	• Approved sampling and handling practices
3. Locate underground utilities	Electrical environment	• Approved electrically resistant footwear
	False or missing locates due to static or induction electric fields	• Plans showing underground utility location • Appropriate locate instrumentation • Documentation of locates
	Personnel or equipment contacting live electrical apparatus	• Safe limits of approach
	Moving vehicles in vicinity	• Reflective safety vest or other clothing • Stay within visible barriers when required
4. Set up drill rig at borehole locations	Electrical environment	• Approved electrically resistant footwear
	Moving vehicles in vicinity	• Reflective safety vest or other clothing • All work to be carried out within visible barriers • Lane closure and/or door closure permits at boreholes 3,5,6,7 and 8
	Pipe rack overhead at borehole 3	• Use half-tower on drill rig
	Personnel or equipment contacting live electrical apparatus	• Safe limits of approach
	Ground potential rise, induction	• Ground drill rig using two 4/0 portable grounds due to non-availability of station grounds (see step 3)
	Proximity of borehole to buried services/utilities	• Hand excavate to expose services
5. Drill boreholes to required depth	Electrical environment	• Approved electrically resistant footwear
	Moving vehicles in vicinity	• Reflective safety vest or other clothing • All work to be carried out within visible barriers
	High-speed rotating augers	• Maintain safe distance away from augers • Wear close-fitting clothing • Recognized drilling practices
	High decibel levels during drilling	• Hearing protection
	Flying particles/debris	• Approved eye protection
	Contact of underground electrical apparatus by augers or samplers	• Plans showing underground utility location • Locate done using appropriate equipment • Drill within defined area • Excavation permits
	Personnel or equipment contacting live electrical apparatus	• Safe limits of approach
	Ground potential rise, induction	• Ground drill rig using two 4/0 portable ground rods
	Proximity of borehole to buried services/utilities	• Hand excavate to expose services
	Possible contaminated fills/soils	• Personnel wear gloves, eye protection • Approved practices per results of chemical analysis • If unknown contaminants encountered, stop work in that area and notify the owner. Do not resume work until conditions are identified and appropriate protective measures are taken
	Possible contaminated soil cuttings or slurry resulting from drilling activities	• Approved handling practices per chemical test results • Soils to be contained in drums, if contaminated, for disposal at licensed facility
	Bentonite, cement, and other drilling agents	• MSDS sheet or consumer product labels • Approved personal protective equipment
	Pinches, cuts, strains	• Personnel wear hard hats and gloves • Safe lifting practices
6. Move drill rig off of and between borehole locations	Electrical environment	• Have owner/authorized personnel accompany • Approved electrically resistant footwear
	Moving vehicles in vicinity	• Reflective safety vest or other clothing
	Personnel or equipment contacting live electrical apparatus	• Safe limits of approach

NOTES: **1. Borehole locations shown on attached plan:**

Instructions:
1. To be prepared by the supervisor most directly involved in the work.
2. Must be approved by preparer's management supervisor.
3. Must be reviewd by all workers involved in the work.
4. Emergency plan must be considered.
5. If the work plan changes and the JSA is amended, changes must be reviewed by all workers involved in the work.

JSA No. _____

Job Safety Analysis

Company _____ Project _____

Contractor _____ Supervisor in charge _____

Work location _____ Estimated start date/duration _____

Work description _____

Trade groups (including sub-contractors) _____

Major equipment _____

Reference material _____

Job Steps	Hazards	Barriers or Controls

Prepared by _____

Approved by _____ Date approved _____

Instructions:

1. To be prepared by the supervisor most directly involved in the work.
2. Must be approved by preparer's management supervisor.
3. Must be reviewed by all workers involved in the work.
4. Emergency plan must be considered.
5. If the work plan changes and the JSA is amended, changes must be reviewed by all workers involved in the work.

How to use safety talks

Once you have completed the necessary job safety analysis (JSA) for each particular job or workplace, you will have identified the hazards and planned to eliminate or contain them. When the hazard cannot be eliminated or contained, controls need to be put in place to reduce the risk of injuries or illnesses for workers. A safety talk is a hands-on way to remind workers of these controls, how they work, and that health and safety are important on the job.

Safety talks deal with specific problems in the workplace. They do not replace formal training. Each safety talk addresses a specific hazard. You can use them to remind workers about the health and safety requirements for the tools, equipment, materials, and procedures they use every day or for particular parts of the job.

Each safety talk in this book will take about five minutes to present.

Why give a safety talk?

Your objective is to help workers **RECOGNIZE** and **CONTROL** hazards on the project. You may be a supervisor, a health and safety representative, a member of the Joint Health and Safety Committee (JHSC), a safety officer, or someone with similar duties.

You give safety talks because you are responsible for advising workers about the existing or potential dangers to their health and safety. Using safety talks demonstrates both the employer's and workers' commitment to health and safety.

What makes a safety talk work?

- Choose a talk suited to your site and work conditions.
- Deliver the talk where it will be most appropriate. That could be in the job office, out on the site, or near the tools and equipment you are talking about.
- Introduce the subject clearly. Let workers know exactly what you are going to talk about and why it's important to them.
- Refer to the safety talk for information, but wherever possible use your own words.
- Connect key points to things your crew is familiar with on the project.
- Pinpoint hazards. Talk about what could happen.
- Use information from the safety talk to explain how to control or prevent these hazards.
- Wherever possible, use real tools, equipment, material, and jobsite situations to demonstrate key points.
- Ask for questions. Answer them to the best of your knowledge. Get more information when necessary.
- Ask workers to demonstrate what they have learned.

Keep a record of each talk that you deliver. Include the date, topic, and names of attendees. Photocopy the Report Form at the back of this manual and use it to keep a record of each session.

Remember: A safety talk may be the only information workers receive about a particular tool, piece of equipment, type of material, or work procedure on the project. When choosing and presenting your talk, do everything you can to help workers remember and act on the message you deliver.

Responsibilities

Explain dangers

Construction can be dangerous business if people don't fulfill their responsibilities for on-site health and safety.

Learning your responsibilities is the first step. You should also be aware of other people's responsibilities so you know who to talk to if you see a hazard.

Identify controls

Health and safety hazards could be controlled if everyone knew their own responsibilities and acted on them.

The *Occupational Health and Safety Act and Regulations for Construction Projects* (O. Reg. 213/91) define the responsibilities of workplace parties such as constructor, employer, supervisor, and worker. You can get a copy of the *Act and Regs* from IHSA or by visiting **ihsa.ca**.

Here are some examples of responsibilities of workplace parties.

CONSTRUCTOR (See Section 23 of the *Act*)

- Ensure that everyone and all work processes comply with the law. This includes all employers (subcontractors) and their workers.
- Ensure that all workers' health and safety are protected.
- Provide notification of project to the Ministry of Labour.

EMPLOYER (See Section 25 of the *Act*)

- Provide equipment, materials, and protective devices, and maintain them.
- Ensure that everyone and all processes comply with the requirements of the law.
- Provide information and instruction to protect workers' health and safety.
- Provide competent supervision.
- Acquaint workers with hazards.
- Take every precaution reasonable to protect workers.
- Ensure that all workers are at least 16 years old.

SUPERVISOR (See Section 27 of the *Act*)

- Ensure that the health and safety of workers are never in danger.
- Ensure that workers work safely, according to the law.
- Ensure that workers use and wear any protective equipment or clothing required by the law or the employer.
- Advise workers of any possible danger to their health and safety on the job.

WORKER (See Section 28 of the *Act*)

- Work safely at all times.
- Wear any protective equipment or clothing that your employer requires you to wear.
- Never remove a safety guard or any protective equipment.
- Report to your employer or supervisor any protective device that is missing or not working properly.
- Report to your employer or supervisor any hazard in the workplace.
- Report any violations of the law.

Demonstrate

Hold up the "green book" (*Occupational Health and Safety Act and Regulations for Construction Projects*) and ask your crew what they know about it.

Ask your crew to name:

- two responsibilities of employers
- two responsibilities of supervisors.

Workers' rights

Explain dangers

Employers have the right to determine and control the work, as long as everything is legal. Workers, however, have the power to protect their health and safety.

Identify controls

Ontario law spells out the three rights that give workers this power: the right to know, the right to participate, and the right to refuse.

RIGHT TO KNOW

Workers have the right to know about workplace health and safety hazards.

According to the *Occupational Health and Safety Act,* employers must provide a wide range of information about workplace hazards to workers and Joint Health and Safety Committees (JHSCs). JHSCs have a duty to communicate with workers.

WHMIS, the Workplace Hazardous Materials Information System, is one example of the right to know. WHMIS is a Canada-wide system designed to protect workers by providing information about hazardous materials on the job.

WHMIS has three main parts:

- labels
- safety data sheets (SDSs)
- worker education and training.

RIGHT TO PARTICIPATE

Workers have the right to make recommendations about health and safety.

Employers must recognize this right to participate. They must consult with JHSCs about methods of testing equipment, substances, or other workplace factors, and about health and safety training programs.

A worker on the JHSC has the right to be present at the beginning of testing, to participate in Ministry of Labour inspections and investigations, to investigate serious accidents, and to inspect the jobsite regularly.

JHSCs have the right to make recommendations to employers about health and safety improvements. Employers must reply in writing within 21 days. Certified worker members have the right to investigate complaints dealing with dangerous circumstances.

RIGHT TO REFUSE

Workers have the right to refuse work if they believe it endangers their health and safety.

The *Occupational Health and Safety Act* sets out specific procedures. It's a two-stage process.

You can refuse based on your subjective belief that the work is dangerous. You must inform the supervisor or employer.

Once a supervisor has investigated, you may still have reasonable grounds for believing that the work is dangerous. In this case, you may continue to refuse work. A Ministry of Labour inspector must be called to investigate.

Demonstrate

Ask your crew the following questions:

- What rights do construction workers have on the job?
- Who are the members of the JHSC on this project?

Show workers the location of the MOL's mandatory *Health & Safety at Work* poster and the mandatory JHSC or H&S Rep poster on the site.

Eye protection

List eye hazards on site.

_____

_____

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Explain dangers

We do too many jobs without protecting our eyes.

Just think of the eye hazards in our work:

- flying dust and grit
- welding arcs
- sparks and slag from welding and cutting
- abrasives from sandblasting
- chemical splash
- pipe and wire sticking out of walls
- ties and wire hanging from ceilings
- sun and wind.

We've all had dust and dirt in our eyes. Some of us have been hit in the eye by chips of wood, concrete, and stone.

A little bigger, a little faster—these particles could leave us with limited sight or none at all.

Identify controls

You've only got one pair of eyes. Make them last a lifetime.

Wearing the right protection can prevent most eye injuries.

Basic protection is safety glasses with sideshields. Look for the CSA logo on the frames, whether the glasses are prescription or non-prescription. For welding, eye protection must also be marked with the shade number.

Follow the tips below:

- Don't wear contact lenses on site. Dust and other particles can get under the lens. If you must wear contact lenses for medical reasons, wear appropriate eye protection as well.
- Keep your safety glasses on when you wear other protection such as a welding helmet or faceshield. Why? Because when you lift up the visor or shield, you may still be exposed to flying chips, dust, or other hazards.
- Match your eye protection to the hazard. Goggles that protect you from dust may not protect you from splash or radiation.
- Make sure your eyewear fits snugly.
- Clean dirty lenses with water or a lens cleaning solution to float the dirt away instead of scratching it into the lenses.
- Get your eyes checked every couple of years to make sure that problems haven't developed or gotten worse.

Demonstrate

Take a look at eye protection used by your crew. Point out any cracked or broken frames and scratched or pitted lenses that should be replaced.

Review the company policy on providing and replacing eyewear.

Review any special requirements for welding helmets, sandblasting hoods, faceshields, etc.

Hearing protection

List noise hazards on site.

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Explain dangers

Many workers are overexposed to noise. In time, overexposure can damage your hearing.

Hearing loss prevents you from hearing other hazards on the job. It also causes problems in your personal life.

- It interferes with how you hear normal speech.
- It prevents you from socializing.
- It can cause high blood pressure.
- It is permanent.

Identify controls

Hearing loss is preventable. The best prevention is hearing protection.

Noise is any unwanted sound. There are two types—continuous noise (e.g., from a generator) and impulse noise (e.g., from a nail gun).

Noise is measured in decibels (dBA). For example, a quick-cut saw produces 115 dBA, a jackhammer 110 dBA, and a drill 100 dBA.

The noise level doubles every time it increases by 3 dBA. So when the level goes from 80 dBA to 83 dBA, the noise is twice as loud.

In the same way, the noise level drops 6 dBA when you double your distance away from it. This will make the noise level four times quieter.

As of July 1, 2016, Noise Regulation 381 will set a limit of 85 dBA of noise exposure over an 8-hour work shift. This is the loudness of a room full of people.

The new regulation will also require employers to control noise at the source or along the path before relying on hearing protection devices to control noise at the worker.

If hearing protectors such as earplugs and earmuffs are the only option, employers must train workers how to use them.

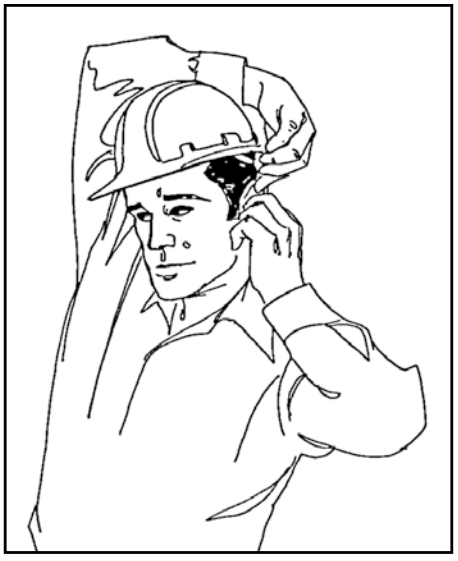
Demonstrate

Review company policy and procedures on hearing protection.

Show two types of hearing protectors:

- earplugs
- earmuffs.

Show how to insert earplugs:



Proper Technique for Inserting Earplugs

Reach one hand around back of head, pull ear upwards to straighten S-shaped ear canal, then insert plug with other hand according to the manufacturer's instructions.

Respirators—Types

List respiratory hazards on site.

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Explain dangers

Construction can involve airborne hazards—for instance, mist from spray-painting, fumes from welding, vapours from adhesives, and dust from concrete cutting.

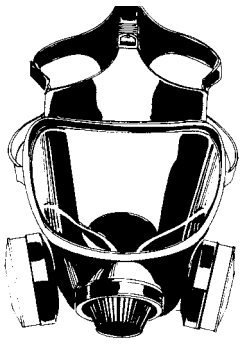
Airborne hazards can have short-term effects such as sneezing or long-term effects such as lung disease.

Identify controls

Respirators are the last line of defence against airborne hazards.

When we can't isolate the hazard or use a different product, we have to wear a respirator.

There are two basic types of respirator: air-purifying and supplied-air.



Air-Purifying Respirator

Supplied-Air Respirator

Respirators must be matched to particular hazards. There is no all-purpose respirator that can be used in every situation.

Air-purifying respirators

- Filter contaminants like dust and fibres out of the air.
- Do NOT supply air or oxygen.
- Must be matched to specific hazards such as solvent vapours or mist from sprayed form oil.
- Are specified in safety data sheets (SDSs) for controlled products.
- Have a limited lifespan based on contaminant levels and filter load. (Do NOT rely on the stated "expiry date".)

Supplied-air respirators

- Supply the wearer with breathable air from a compressor, cylinder, or tank.
- Offer the BEST protection against many hazards.
- Have limitations (for instance, air tanks are bulky and air lines can get tangled).
- Are the only respirators that can be used for confined space rescue or in dangerous atmospheres.

Demonstrate

- Show CSA and NIOSH labels and stress that only CSA- and NIOSH-approved respirators appropriate for the hazard should be used.
- Show examples of air-purifying and supplied-air respirators.
- Show how to replace filters.
- Show where information on respirators can be found on a safety data sheet (SDS).
- Review company rules and procedures on respirators.
- Stress that respirators only work when they are selected, maintained, and used properly.

Respirators—Fit

Explain dangers

With respirators, one size doesn't fit all.

Even with three different sizes of facepieces, for instance, no one size from one manufacturer may fit you. A different brand may be necessary.

If a respirator doesn't fit right, it can't protect you.

Even when a respirator fits properly, it may get nudged or bumped out of position while you're working, causing leaks that can be dangerous.

Respirators can also leak if you're not clean-shaven.

Respirators and cartridges must be appropriate for the hazardous substances in the air. Particulate respirators, for example, don't work for acids, solvents, ammonia, or other gaseous mixtures.

Identify controls

You should be clean-shaven to get the best possible seal with your respirator. Facial hair can cause leakage and reduce protection.

Test for fit every time you put the respirator on and throughout your shift.

Two easy tests can show whether most reusable respirators fit right and don't leak:

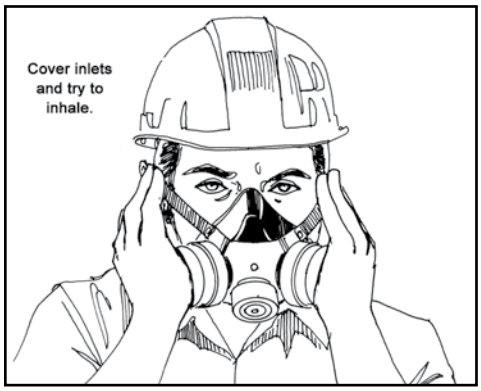
1) Negative-pressure seal check
2) Positive-pressure seal check.

Demonstrate

Demonstrate as you talk.

Negative-pressure seal check

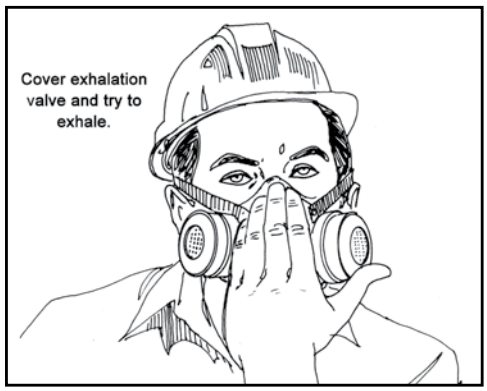
- Put on the facepiece and adjust it to fit comfortably—snug, not overly tight.
- Block the air inlets. These are usually the filter openings on the sides of the facepiece.
- Try to breathe in.
- If there are no leaks, the facepiece should collapse slightly and stay like that while you hold your breath for 10 seconds.



Negative-Pressure Seal Check

Positive-pressure seal check

- Put on the facepiece and adjust it to fit comfortably—snug, not overly tight.
- Block the exhalation valve. This is usually on the bottom of the respirator.
- Try to breathe out.
- The facepiece should puff slightly away from your face and stay like that while you hold your breath for 10 seconds.



Positive-Pressure Seal Check

If you find a leak, adjust the facepiece or straps and repeat the test until you get a good fit.

Peform seal checks periodically while you wear the respirator.

Respirators—Maintenance

List breathing hazards on site.

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_____

Explain dangers

To provide protection, respirators must be maintained. Dirty, missing, or damaged parts can prevent your respirator from working properly.

For instance, valves that are damaged, missing, or poorly seated can drastically reduce the protection provided by your respirator. There's also a danger in sharing respirators—it's not hygienic.

Identify controls

Particulate respirator filters are identified by a letter and a number. The letters are:

N – not resistant to oil

R – resistant to oil

P – oil-proof.

The numbers are 95, 99, and 100. These indicate efficiency: 95 (95%), 99 (99%), 100 (99.9%).

Filter cartridges for chemicals such as ammonia, organic vapours, solvents, or acid gases use different filter technology. Look at the cartridge before selecting a respirator.

With use, filters become harder to breathe through. You're breathing not only through the filter but also through the contaminants that build up on the outside of the filter.

Change filters whenever the filter

- is damaged
- becomes difficult to breathe through.

As gas and organic vapour filters are used, their ability to remove gases and vapours decreases. They must be replaced according to a schedule set by the manufacturer.

Leave a contaminated area and change filters right away if

- you can smell or taste the contaminant through the filter
- your throat or lungs feel irritated.

Demonstrate

Demonstrate what to look for when inspecting a respirator. Inspect two or three respirators in use. Make necessary adjustments and arrange repairs or replacements.

- Check the inhalation valves for damage, dust and dirt, and proper seating.
- Remove filters and make sure the flapper valve (usually a flexible disk) isn't missing or damaged.
- Make sure the flapper valve is seated properly in the valve assembly.
- Remove the cover at the bottom of the respirator to inspect the exhalation valve. Check the valve for damage, dirt, and proper seating.
- Make sure that straps and buckles are free of damage and working properly.
- Check the facepiece for holes, cracks, and splits.

Hand protection

List hazards to hands on site.

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Explain dangers

The best tools we have are our hands. We need to protect them on the job.

Manual work exposes our hands to many different hazards, from cuts to chemicals, from pinching to crushing, and from blisters to burns.

Identify controls

Leather gloves provide good protection against sharp edges, splinters, and heat. Cotton or other materials don't stand up well. You should wear them only for light-duty jobs.

Wearing anti-vibration gloves when using power tools and equipment can help prevent hand-arm vibration syndrome (HAVS).

HAVS causes the following changes in fingers and hands:

- circulation problems such as whitening or bluish discoloration, especially after exposure to cold
- sensory problems such as numbness and tingling
- musculoskeletal problems such as difficulty with fine motor movements—for instance, picking up small objects.

Our hands also need protection against chemicals. Check the label to see whether a product must be handled with gloves and what types of gloves are required.

If that information isn't on the label, check the safety data sheet (SDS). An SDS must be available on site for any controlled products that are being used.

Using the right gloves for the job is important. For instance, rubber gloves are no good with solvents and degreasers. The gloves will dissolve on contact.

Demonstrate

Talk about the specific chemicals used on your jobsite and the type of gloves recommended for each.

Use the SDS or refer to the Glove Selection Chart in Chapter 16: Hand/Skin Protection of the *Construction Health and Safety Manual* (M029).

Use the Right Gloves for the Job

Head protection

In January 2011, a 70-lb metal beam fell from the seventh storey of a condominium development and struck a worker on the head, face, and torso. The man was taken to hospital in serious condition but survived. Police credited the man's hard hat with saving his life.

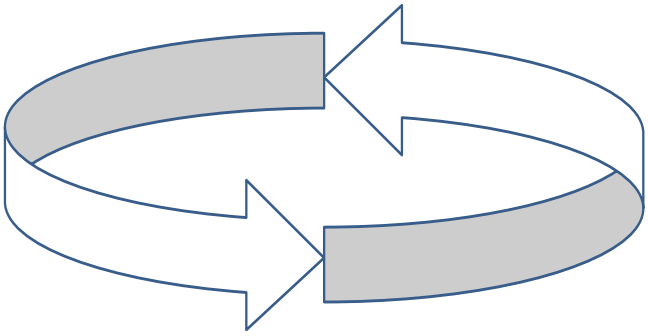
Explain dangers

A hard hat can protect you from cuts, scrapes, and bruises. It can protect you from falling objects, which can cause severe damage to the head and spine. It can prevent electric shock and limit your exposure to UV radiation from the sun.

Identify controls

Keep these points in mind to ensure you get the best use out of your hard hat.

- Hard hats that are poorly maintained or improperly used can fail. It is important that you follow the manufacturer's instructions.
- Use the correct type of hard hat for the job. The hard hat should be labeled with the CSA or ANSI **Type** and **Class** of protection.
- Approved hard hats protect against impact and penetration. **Type I** hard hats protect only the top of the head; **Type II** hard hats protect both the top and the sides of the head.
- A **Class E** hard hat is required for construction and utility projects. It provides electrical protection up to 20,000 volts.
- Inspect your hard hat every day before you use it.
- Clean your hard hat using soaps or cleaning agents as recommended by the manufacturer.
- Never wear a baseball cap under your hard hat.
- A hard hat should normally be worn facing forward. It may be worn backwards only if it has a reverse orientation mark (see below).



Reverse orientation mark

- Never paint a hard hat.
- Never make holes in a hard hat.
- Never store your hard hat in the rear window of your car—intense sunlight can make it age more quickly.
- Never spray your hard hat with insect repellant—it can damage the material.
- Hard hats are not made to last forever. Find out the useful life of your hard hat by contacting the manufacturer or reading the manufacturer's instructions.

Demonstrate

Together as a crew, inspect your hard hats.

- Check the shell for cracks, dents, deep cuts, or gouges. If the surface appears dull or chalky rather than shiny, the hard hat may have become brittle.
- Check the suspension for cracks or tears. Make sure straps are not twisted, cut, or frayed.
- If you find any signs of damage or degradation, remove the hard hat from service immediately.

Guardrails

List fall hazards on site.

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Explain dangers

Falls are the number one cause of serious injuries and death from injuries in construction.

Identify controls

Guardrails are often the best and most convenient means of fall protection.

Where possible, guardrails must be installed

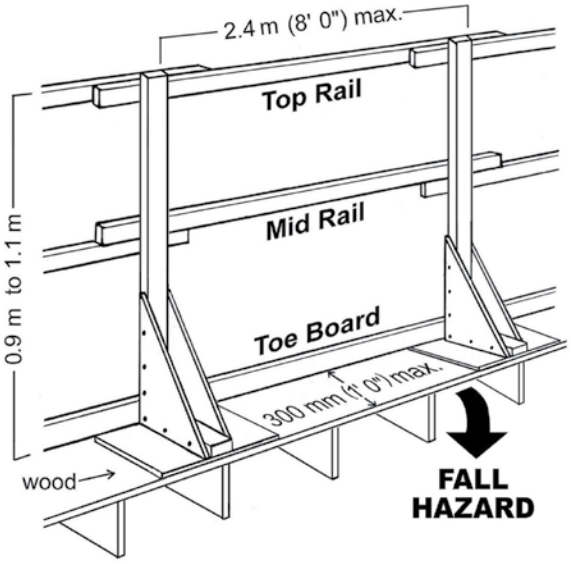
- along the open edges of roofs and floors
- on formwork, scaffolds, and other work surfaces
- around openings in floors, roofs, and around skylights
- wherever workers are exposed to the risk of falling.

Guardrails must be installed no more than 30 cm (1 foot) from the open edge. They must be able to withstand all loads specified in section 26.3(5) of the Regulation for Construction Projects (213/91).

Guardrails must have:

- a top rail, mid rail, and toeboard secured to vertical supports
- a top rail between 0.9 m (3 feet) and 1.1 m (3 feet 7 inches) high
- a toeboard at least 100 mm (4 inches) high—89 mm (3 1/2 inches) high if made of wood—and installed flush with the surface
- posts no more than 2.4 metres (8 feet) apart.

Guardrails can also be wire rope and manufactured systems of metal frames and wire mesh.



Well-anchored posts are essential. You can use vertical shoring jacks, screw-clamp posts, clamp binding posts, or posts that fit into sleeves cast right in the slab.

Sometimes guardrails have to be removed to land material or make installations along floor or roof edges. The open edge should be roped off and marked with warning signs. Workers inside that area must wear fall protection and be tied off.

All guardrails—especially wood guardrails—should be inspected regularly.

Guardrails are the best method of protecting workers around openings in floors and roofs, but sometimes they're not practical. You may have to use securely fastened covers made of planks, plywood, or steel plate. Covers must be strong enough to support any weight to be reasonably expected.

There's always the danger that someone will pick up the plywood to use somewhere else. Workers have even removed covers from openings and then fallen through.

That's why covers should be clearly marked in bright paint with warning signs. DANGER! DO NOT REMOVE! DO NOT LOAD!

Demonstrate

Review the types of guardrails used on site. Ask your workers where else guardrails should be installed.

Fall protection—Basic types

List fall hazards on site.

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Explain dangers

Falls are the number-one cause of accidental deaths in construction. And you don't have to fall far to be killed or injured.

Identify controls

On many sites, guardrails are the most common and convenient means of fall protection. Where guardrails cannot be installed or are impractical, the two basic types of fall protection are travel restraint and fall arrest. Both involve a full-body harness.

Travel restraint system

A travel restraint system keeps you from getting too close to an unprotected edge.

The lifeline and lanyard are adjusted to let you travel only so far. When you get to the open edge of a floor or roof, the system holds you back and prevents you from falling.

A full-body harness should be used with travel restraint systems. You can attach the harness with a lanyard that attaches to a rope grab on the lifeline. The lifeline must be securely anchored.

Fall arrest system

If no other fall protection is in place, you must use a fall arrest system if you are in danger of falling:

- more than 3 metres
- into operating machinery
- into water or another liquid
- into or onto a hazardous substance or object.

A fall arrest system consists of a full-body harness, a lanyard, and a shock absorber.

You can connect the lanyard directly to adequate support OR to a rope grab mounted on an adequately anchored lifeline.

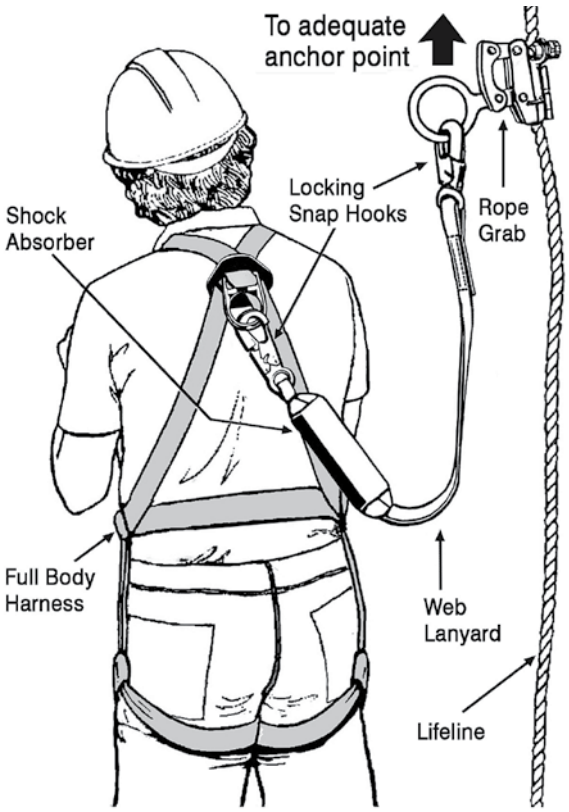
A full-body harness must also be worn and tied off when you are:

- on a rolling scaffold that is being moved
- getting on, working from, or getting off a suspended platform, suspended scaffold, or bosun's chair.

Lifelines must be adequately anchored. For fall arrest, that means able to support the weight of a small car (about 3,600 pounds).

Demonstrate

Show how to put on, adjust, and wear a full-body harness.



Full-Body Harness

Fall protection—Approvals and inspections

List fall hazards on site.

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Explain dangers

When you're using a travel restraint or fall arrest system, your life depends on your equipment. If it is not certified by a recognized authority or is not properly inspected and maintained, you risk injury and death.

Identify controls

Approvals

Safety harnesses must be approved by the Canadian Standards Association (CSA). Look for the CSA logo.

Also look for the CSA logo on lanyards, energy absorbers, and rope grabs. The label means the equipment has been manufactured to meet high standards.

Inspections

Inspect your fall protection equipment before each use and remove any components from service if their integrity is compromised. Store your fall protection equipment so that it's well protected.

A worker who is competent in inspection should perform an annual inspection of the fall protection equipment and document the results.

Any equipment involved in a fall arrest must be discarded or removed from service until the manufacturer certifies that all components are safe for reuse.

Demonstrate

Inspect the components of a fall arrest system used on your site.

Harness

Check the harness to make sure that:

- hardware and straps are intact and undamaged
- moving parts move freely through their full range of motion
- webbing is free of burns, cuts, loose or broken stitching, frayed material, and signs of heat or chemical damage
- the fall arrest indicator has not deployed.

Lanyard

- Make sure the lanyard fastens securely to the D-ring on the harness.
- Inspect the lanyard for fraying, kinking, and loose or broken stitching.
- Check for rust, cracks, and damage to the lanyard hardware.
- Check energy-absorbing lanyards regularly. Look for stress or tearing on the cover jacket of the energy absorber.

Lifeline

Inspect fibre rope lifelines for fraying, burns, kinking, cuts, and signs of wear and tear.

Check retractable block lifelines for smooth operation. Pull out line and jerk it suddenly. The braking action should be immediate and tight.

Fall protection—Rope grabs

List fall hazards on site.

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Explain dangers

With rope grabs, there are three basic hazards:

- attaching them the wrong way
- grabbing hold of them during a fall
- using them with the wrong size or type of rope.

A rope grab attached upside down to a lifeline can't work properly. Instead of locking on the line, it will simply slide down.

Don't grab the device if you fall. This can prevent some grabs from working properly. Instead of stopping, you'll slide to injury or death below.

Identify controls

Rope grabs are technically known as fall arresters and must meet CSA requirements.

Two common types of fall arresters are Class AD and Class ADP.

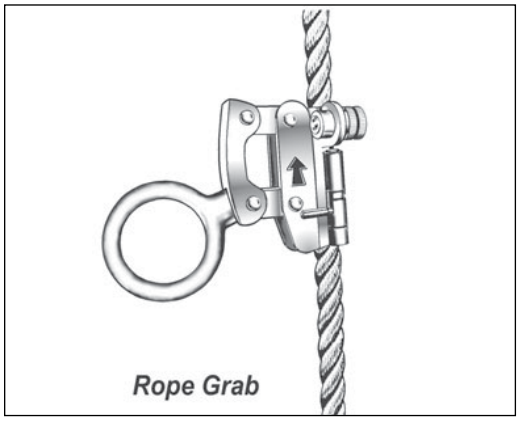
Class AD attaches to the D-ring on the back of your harness. So does Class ADP. But ADP also includes a panic feature. The "P" is for "panic." The panic feature keeps the arrester locked on the lifeline, even if you grab hold of it.

Class AD doesn't have this panic feature. But the CSA standard requires that AD arresters come with integral connectors that attach to the harness between 30 and 60 centimetres long (one and two feet). This makes it very difficult for a falling worker to reach around and grab the arrester.

Demonstrate

Demonstrate as you talk.

- When attaching a rope grab to a lifeline, always make sure the arrow on the grab points along the line to the anchor point.



- After putting the rope grab on the lifeline, give it a firm tug in the direction of a fall to make sure it engages.
- Ensure that lifeline and rope grab match. Rope grabs are designed to work with certain types and diameters of lifelines.
- Remember to tie a knot in your lifeline at the farthest point where you need to travel. The knot ensures that the rope grab will not run off the free end of your line.
- Some grabs have a "parking feature" that locks at a point on the lifeline that won't let you reach a fall hazard.
- On a vertical lifeline, always position the rope grab as high as possible above your D-ring to minimize free fall.
- Make sure you have clearance below. Fall arresters may slide down the lifeline as much as one metre before arresting your fall.
- Inspect rope grabs before use. Check for distortion, rust, sharp edges, and moving parts that don't move easily.
- A rope grab that arrests a fall should be taken out of service until it can be inspected and recertified for use.

Stepladders

List stepladder locations on site.

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Explain dangers

The stepladder is one of the most familiar things on a jobsite. Still, workers get hurt using them.

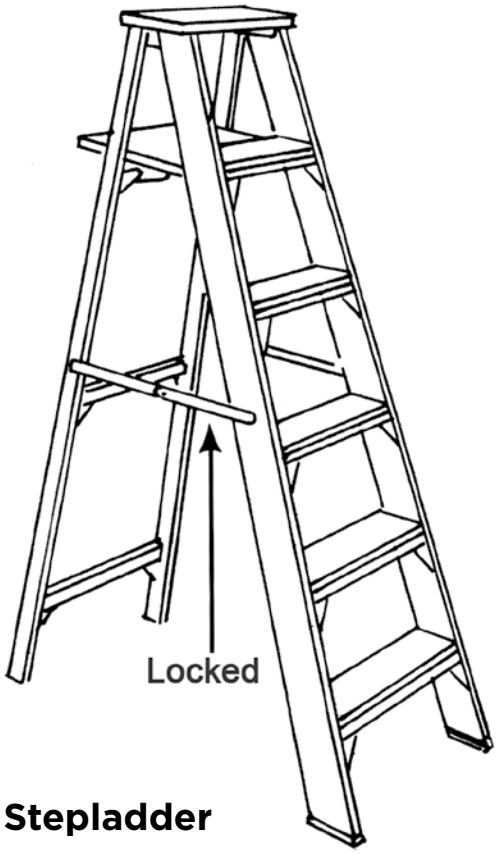
Falls are the biggest risk. Even though workers are not very high off the ground, some have died from falling a short distance and landing the wrong way. Even sprains or strains could mean pain and days off work.

Identify controls

[Use a stepladder to demonstrate as you talk.]

Here's how to use a stepladder the right way.

- Check the ladder for defects or damage
  - at the start of your shift
  - after it has been used somewhere else by other workers
  - after it has been left in one place for a long time.
- Keep the area at the base of the ladder clear.
- Make sure the spreader arms lock securely in the open position.
- Stand no higher than the second step from the top.
- Never straddle the space between a stepladder and another point.



Stepladder

- When standing on the ladder, avoid leaning forward, backward, or to either side.
- Always open the ladder fully before using it. Don't use an unopened stepladder as a straight or extension ladder. The feet are not designed for this use.
- Never stand on the top step, the top, or the pail shelf of a stepladder.
- When climbing up or down a stepladder, always face the ladder and maintain 3-point contact. That means two hands and one foot or two feet and one hand must be on the ladder at all times.

Demonstrate

Inspect stepladders in use on site. Determine whether other equipment would provide safer, more efficient access.

Extension ladders

Explain dangers

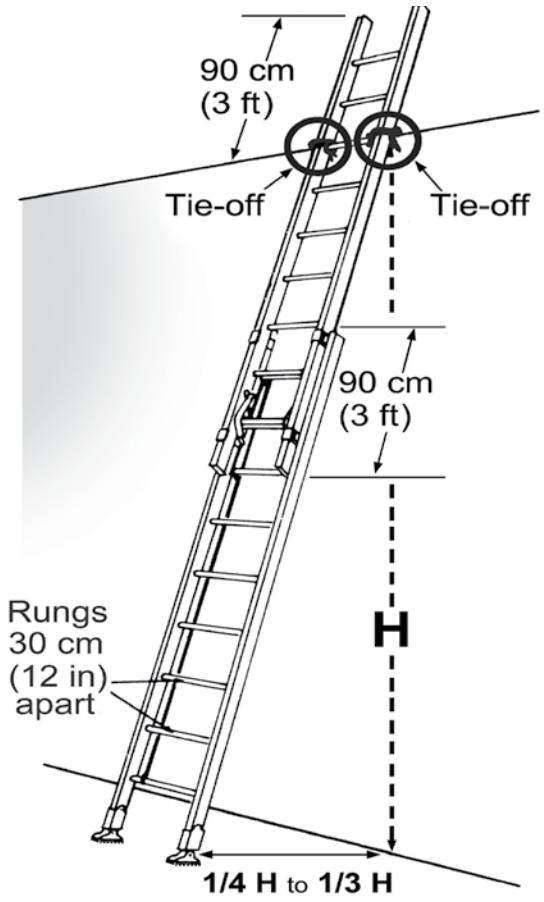
Extension ladders can be dangerous tools. Workers have been killed and injured from falls and powerline contact.

Identify controls

- Choose the right ladder for the job. It must be long enough to
  - be set up at a safe angle (see below)
  - extend 90 centimetres (3 feet) beyond the top landing.
- A two-section extension ladder should be no longer than 15 metres (50 feet); a three-section ladder no longer than 20 metres (66 feet).
- Check the ladder for damage or defects
  - before you set it up
  - after it has been used somewhere else by other workers
  - after it has been left somewhere for a long time.
- Set the ladder on a firm, level base. If the base is made of soft, loose, or wet material, clear it away or stand the ladder on a mud sill.
- Never erect extension ladders on boxes, carts, tables, or other unstable objects. Never stand them up against flexible or movable surfaces.
- Set the ladder up at a safe angle—one foot out for every three or four feet up, depending on length.
- When the ladder is set up, there should be a clear space of at least 15 centimetres or 6 inches behind each rung.
- When the ladder is fully extended, sections must overlap at least 90 centimetres (3 feet).
- Stand no higher than the fourth rung from the top.
- Tie off or otherwise secure the top and bottom of the ladder. Keep areas at the top and bottom clear of debris, scrap, material, and other obstructions.
- Clean mud, snow, and other slippery substances off your boots before climbing.
- When climbing up or down, always face the ladder and maintain 3-point contact.
- Don't carry tools, equipment, or material in your hands while climbing. Use a hoist line or gin wheel for lifting and lowering.
- Be very careful when erecting extension ladders near live overhead powerlines. Never use metal or metal-reinforced ladders near electrical wires or equipment.
- Wherever possible, use extension ladders only for access—not as work platforms.
- When you must work from a ladder more than 3 metres or 10 feet up, wear a safety harness and tie off to a well-anchored lifeline or other support—not to the ladder.

Demonstrate

Demonstrate as you talk.



3-point contact—Ladders

List ladder locations on site.

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Explain dangers

Climbing a ladder is not as easy as it sounds. Many workers have been injured getting on or off a ladder. Workers have died from falls after losing their balance.

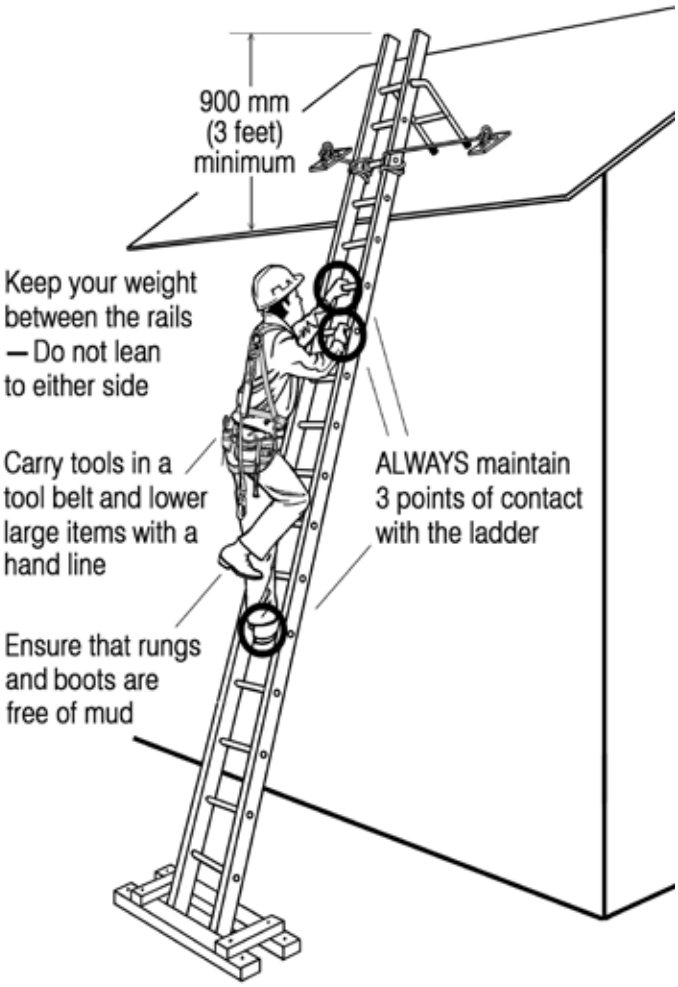
Identify controls

To use ladders safely, always maintain three points of contact. That means two hands and one foot or two feet and one hand on the ladder at all times.

- Put both hands firmly on the rungs before stepping onto a ladder.
- Break 3-point contact only when you reach the ground or a stable platform.
- Always face the ladder when you're climbing up and down.
- Keep your body between the side rails. Don't lean out on either side.
- Make sure that the ladder extends at least 900 millimetres (90 centimetres or 3 feet) above the top landing.
- There must be a clear space of at least 150 millimetres (6 inches) behind each rung.
- Moving quickly often results in only 2-point contact. You often have to make a conscious effort to maintain 3-point contact.
- Don't carry tools, equipment, or material in your hands while climbing. Use a tool belt for small tools and a hoist line or gin wheel for lifting and lowering larger items.
- Clean mud, snow, and other slippery substances off your boots before climbing.

Demonstrate

Demonstrate as you talk.



3-Point Contact for Ladders

3-point contact—Vehicles and equipment

List vehicles and equipment used on site.

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Explain dangers

Getting on and off equipment is not as easy as it sounds. More than one-quarter of all injuries to equipment operators and truck drivers occur during mounting and dismounting.

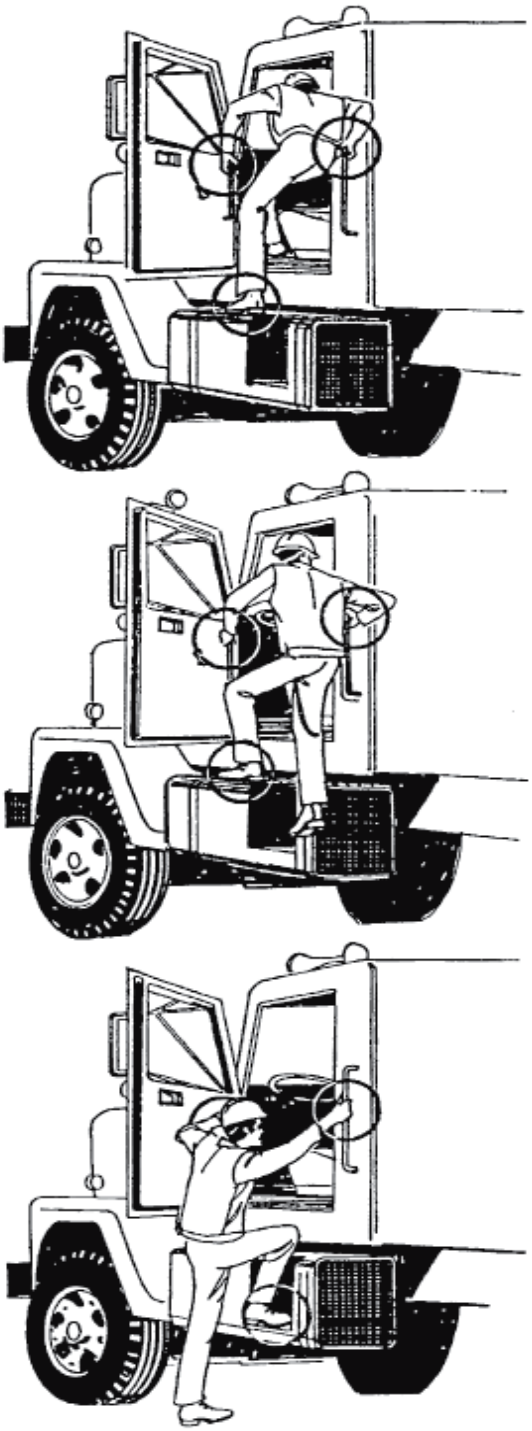
Identify controls

To climb on and off construction equipment safely, always maintain three points of contact. That means two hands and one foot or two feet and one hand on the equipment at all times.

- Break 3-point contact only when you reach the ground, the cab, or a stable platform.
- Mount and dismount facing the equipment.
- Climb on and off only when the equipment is stationary.
- Use the parts designed by the manufacturer for mounting and dismounting—steps, footholds, running boards, traction strips, handgrips, etc.
- Keep these parts clear of mud, snow, grease, and other hazards that can cause slips, trips, or falls.
- Don't use wheel hubs, machine tracks, or door handles for mounting and dismounting.

Demonstrate

Demonstrate 3-point contact by mounting and dismounting from a truck, bulldozer, or other piece of heavy equipment on site. Ask your crew to try out 3-point contact as well.



Scaffolds—Planks and decks

List scaffolds needing inspection on site.

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Explain dangers

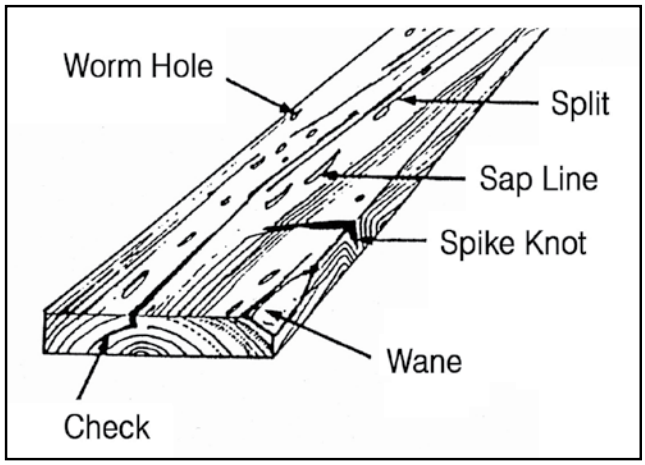
If scaffold planks and decks fail, you could be seriously injured or killed from a fall. You could also be thrown off balance and injure yourself with your tools or equipment.

Identify controls

Scaffold planks and deck material must be inspected regularly. Here's what to check for.

Wood planks

- Length—planks must overhang the frame no less than 6 and no more than 12 inches (150 – 300 mm).
- Cracks—often be detected at the end of the plank. Discard planks with long and deep cracks.
- Cuts—check plank edges for cuts from saws, tools, and sharp objects. Discard planks with many or deep cuts.
- Plank defects—worm holes, splits, knots that are knocked out along edges, and lots of nail holes. Discard planks when defects are serious.
- Light weight—this can indicate dry rot that can't be seen.
- Damaged cleats—they should be removed and replaced.



Plank defects

Laminated veneer lumber planks

- Separation of laminated layers—this is usually due to repeated changes in moisture levels as layers soak up rain and dry in sun.
- Cuts of any kind.
- Pressure cracks in the top or bottom layer.
- Warping from wear and weather.
- Damaged cleats.

Aluminum/plywood deck panels

- Cuts in aluminum frames.
- Deformed, cracked, or broken fastening hooks and hardware.
- Cracked or broken plywood.
- Bent, cracked, or broken rungs.
- Sliding or other locking devices in good condition.

As a general rule, you should plank or deck the working levels of a scaffold across their full width for maximum support and stability.

Demonstrate

Demonstrate methods of inspecting planks and panels. Ask crew to inspect sample materials on site.

Scaffolds—Structural components

List scaffold locations on site.

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Explain dangers

If scaffold components are damaged, defective, or installed incorrectly, it can lead to tip-over or collapse.

Demonstrate

Demonstrate as you talk.

Structural components of all frame scaffolds must be inspected regularly. Inspection should include frames, feet, connecting pins, braces, and guardrails.

Frames

- Uprights and cross-members should not be cracked, rusty, bent, or otherwise deformed.
- All connecting components should fit together square and true.

Feet

- Adjustable base plates should work properly.
- Plates should be securely attached to legs to resist uplift as well as compression.
- If mudsills are used, base plates must be nailed to them.

Connecting pins

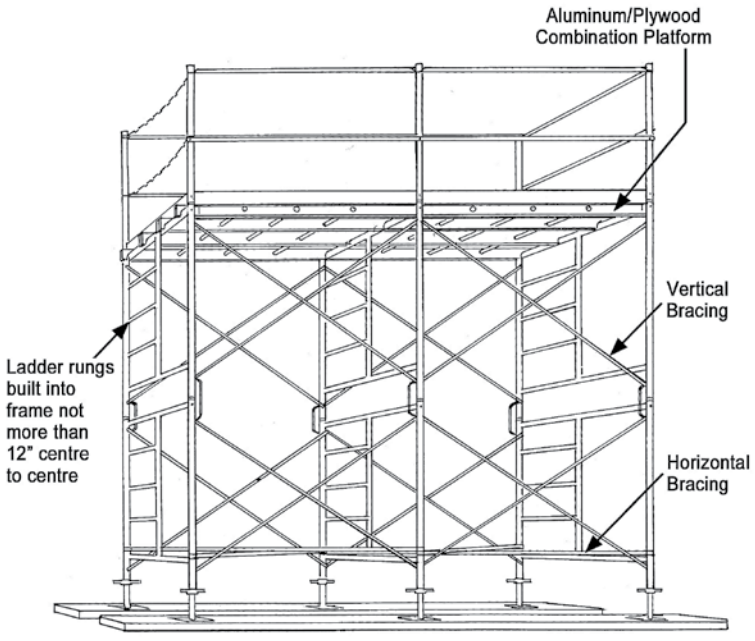
- Frames must be joined together vertically by connecting pins compatible with the frames.
- Connecting pins must be locked in place to prevent them from loosening and coming out.
- Pins must be free of bends and distortion. If they don't fit, get replacements that do.

Braces

- Cross and horizontal braces should not be cracked, rusty, bent, or otherwise deformed.
- Braces should be compatible with frames and free of distortion.
- Horizontal braces must be installed every third frame vertically and in each bay laterally.
- Scaffolds higher than three frames must be tied into the structure.

Guardrails

- The work platform must have guardrails.
- Guardrails must be compatible with frames.
- Guardrails can be made of tube-and-clamp components if they're assembled properly.



STANDARD FRAME SCAFFOLD

Suspended access equipment—Fall protection

Explain dangers

Suspension systems on swingstages, work cages, and bosun's chairs can fail. You can fall if you are not using a fall arrest system. This can result in serious injury or death.

Identify controls

The basic rule is simple: there must be **two independent means** of support for workers using suspended access equipment.

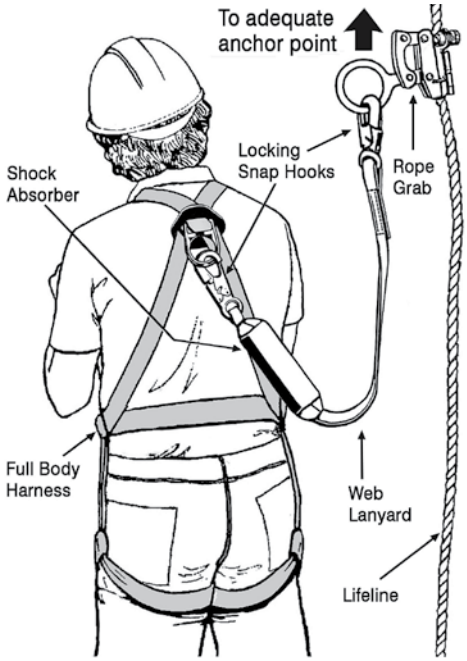
1. One independent means of support for each worker is the **suspension system** holding up the stage, cage, or chair.

2. The second independent means of support is the **fall arrest system.** This consists of a
   - full-body safety harness
   - lanyard
   - rope grab
   - lifeline
   - lifeline anchor.

If the suspension system fails, the worker will be saved by the fall arrest system.

In some cases, the second independent means of support can be another complete suspension system. On a swingstage, for instance, there would be four outrigger beams instead of two, four suspension lines instead of two, and so on. If one suspension system fails, the other will take over. This arrangement is used on a tiered stage.

But even with two complete suspension systems you must still wear a full-body harness and lanyard. In this case, you would tie off to a stirrup on the stage or to a line secured to both stirrups.



Fall Arrest System

Demonstrate

Do a hands-on inspection of fall arrest equipment while talking.

Fall arrest equipment is your last line of defence. Make sure it works. Your **harness** must have a label identifying the CSA standard to which it complies.

Check the harness for
- cuts, burns, and signs of chemical damage
- loose or broken stitching
- frayed web material
- D-ring and keeper pads showing signs of distortion, damage, or undue wear
- grommets and buckles showing damage, distortion, and sharp edges.

The lanyard must be securely attached to the harness D-ring by a locking snaphook or other approved means.

Your **lanyard** and **energy absorber** must be free of fraying, kinking, and loose or broken threads. The hardware should not be deformed, rusty, cracked, or unduly worn. All moving parts must move freely and easily through their full range of movement.

Make sure your **rope grab** is working, matches the type of lifeline you are using, and has no damaged parts or sharp edges that could cut the lifeline.

Your lanyard must be attached to the rope grab with a **locking snaphook** to keep it from accidentally coming out.

Your **lifeline** should be free of damage, wear, and decay. It must be protected from rubbing and scraping where it passes over corners or edges.

Suspended access equipment—Tiebacks

Explain dangers

Suspended access equipment can fail if you don't set up all the components properly, such as tiebacks. Improper setup can lead to injury or death from a fall.

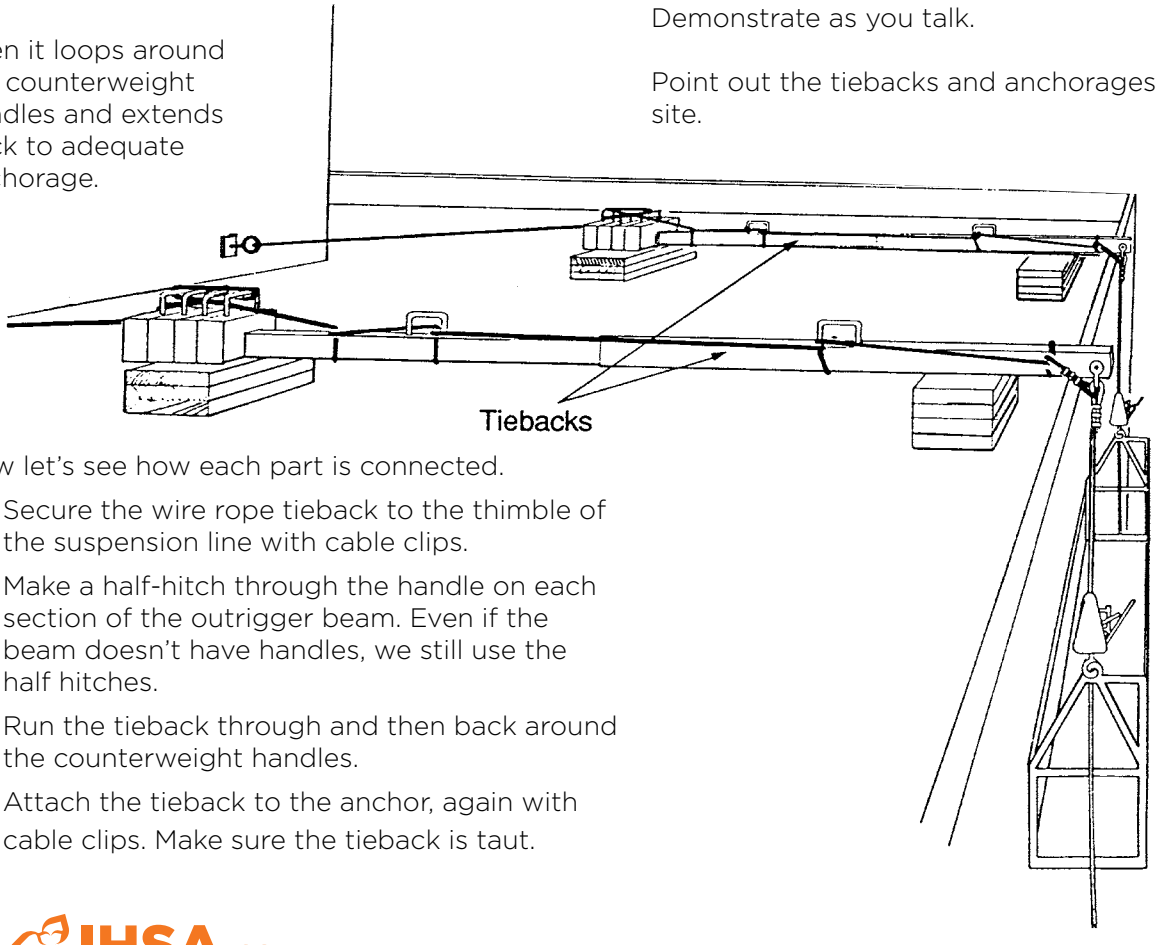
Identify controls

Tiebacks are used to secure the outriggers and counterweights of suspended access equipment. The tieback holds the major components of the suspension system together. It keeps them from being loosened or dislodged and secures them back to an adequate anchor point.

Let's follow a wire rope tieback from start to finish.

The tieback runs from the thimble of the suspension line back along the outrigger beam with at least one half-hitch on each section.

Then it loops around the counterweight handles and extends back to adequate anchorage.



Now let's see how each part is connected.

1. Secure the wire rope tieback to the thimble of the suspension line with cable clips.
2. Make a half-hitch through the handle on each section of the outrigger beam. Even if the beam doesn't have handles, we still use the half hitches.
3. Run the tieback through and then back around the counterweight handles.
4. Attach the tieback to the anchor, again with cable clips. Make sure the tieback is taut.

An adequate anchor can be

- engineered tieback systems such as eye bolts and rings as identified on an approved roof plan
- the base of large HVAC units
- columns on intermediate building floors or stub columns on roofs
- large pipe anchorage systems (12-inch diameter or bigger)
- roof structures such as mechanical rooms
- parapet clamps attached to reinforced concrete parapet walls on the other side of the building

If unsure, workers and supervisors must ask for assistance in finding an adequate anchor.

Demonstrate

Demonstrate as you talk.

Point out the tiebacks and anchorages used on site.

Suspended access equipment —Calculating counterweights

Explain dangers

Without the right number of counterweights, suspended access equipment can fail, leading to injury or death.

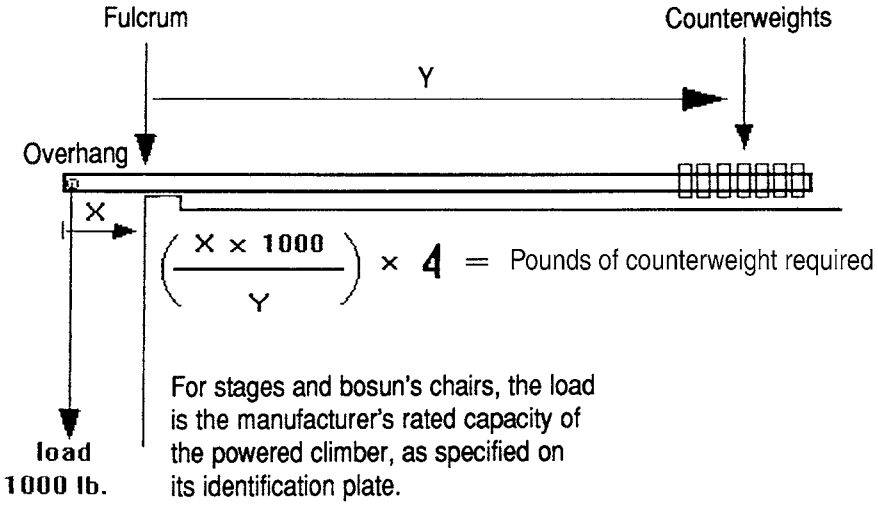
Identify controls

Here's how to calculate the number of counterweights you need.

Let's start with the design factor. For beams and weights, the design factor must be 4 to 1.
This means that the effect of the counterweights holding the equipment up must be at least 4 times greater than the load pulling the equipment down.

Another way of saying this is that...
- the distance of the outrigger beam from the fulcrum to the centre of the counterweights (Y)...
- multiplied by the load of the counterweights...
- must be at least 4 times greater than the distance of the outrigger beam from the fulcrum to the suspension line (X)...
- multiplied by the capacity of the climber.

Let's look at an example.



Demonstrate

Go over this example with your crew.

The beam is 18 ft long. The counterweights will require at least 2 ft of space at the end of the beam.

There is a 1 ft overhang and a supported load of 1,000 lb.

X = 1 ft Climber load = 1,000 lb

Therefore 1 ft x 1,000 lb = 1,000 ft lb pulling down.

The resisting force, including the design factor of 4 that must be provided by the counterweights = 4 x 1,000 ft lb = 4,000 ft lb.

Y = 18 ft – 1 ft (overhang) – 1 ft (centre of weights) = 16 ft.

The load required by the counterweights = $\frac{4{,}000 \text{ ft lb}}{16 \text{ ft}}$ = 250 lb.

Assuming counterweights are 55 lb each, number of weights required = $\frac{250 \text{ lb}}{55 \text{ lb}}$ = 5 counterweights.

If labels on an outrigger beam are missing or not readable, do not use the beam.

Remember—only use counterweights that have been specifically manufactured for the particular outrigger beam you are using.

Floor and roof openings

List floor or roof opening hazards on site.

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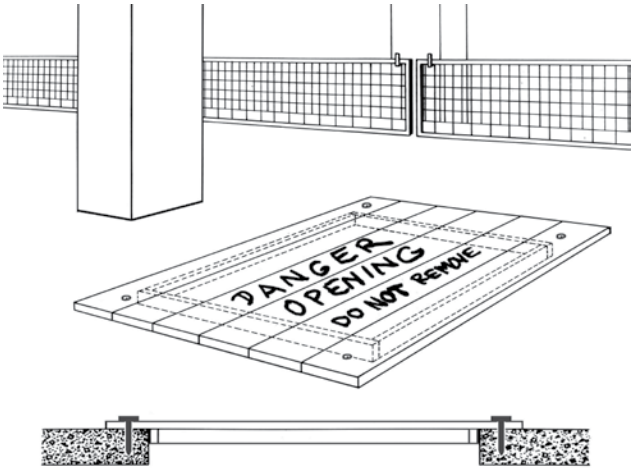


Pallet-Style Cover

Explain dangers

Without proper guarding, workers are exposed to falls when working around floor and roof openings. Avoiding such hazards may seem like common sense, but a moment of distraction around an uncovered opening can end in disaster.

- In March 2010, a worker was killed installing formwork for a concrete curb around an opening. The worker fell 32 feet through the floor.
- In May 2010, a worker was killed after falling about 17 feet through a roof opening.
- In June 2010, a worker was installing a drywall fire barrier in a back-split style duplex. The worker fell though an opening into the basement and died.

Identify controls

Installing guardrails is the best solution. In situations where guardrails can't be installed, covers are the next best option. According to the construction regulations, these covers must:

- completely cover the opening
- be securely fastened
- be labelled as a covering for an opening
- be made from material that can support any load that may be encountered on the worksite.

Always use another means of fall protection when installing, removing, or working near an unprotected opening.

The labels on opening covers need to stand out on a busy worksite. Use bright paint to create a warning sign on the cover that says something such as —DANGER! OPENING—DO NOT REMOVE! DO NOT LOAD!

Always fasten the cover securely to prevent workers from removing it and falling through the opening. Where permanent covers or hatches are installed, they should be kept closed at all times except when they are being used for access.

Demonstrate

After you talk about floor and roof openings, take a look around the jobsite. If there is an available roof or floor opening, install a cover and review how this complies with legislation.

If you can't install a floor or roof covering, then talk about what everyone has seen on jobsites in the past and what types of openings they've encountered.

Has anyone seen an incident involving an uncovered opening? How could it have been prevented?

Flying forms—Working at heights hazards

Explain dangers

Flying forms can save time and, in some cases, are safer than using built-in-place methods. However, flying forms have some significant hazards that can lead to serious injury if proper precautions aren't taken.

One of the main hazards associated with flying forms is when working at heights. The workers who receive the forms often work near the edge of the structure and are usually up high.

Normally, guardrails are in place when workers are working at heights, but they are often removed so that workers can receive the forms.

Working near the edge of a building without guardrails is very dangerous if a travel restraint or fall arrest system is not used.

Identify controls

- Put danger signs and barriers in place before moving any forms so that all workers are aware of what's happening. Dangerous areas include the work area below the flying form, the floor area from where the form is pushed out, and the top floor area where the form will be received.
- Each worker must have a fall protection system in place before anyone removes the guardrails.
- A travel restraint or fall arrest system must be used by any worker who
  - receives a panel from the slab edge
  - gets on or off the form
  - installs the panel
  - bolts or unbolts wall forms for exterior walls and elevator shafts
  - steps on a panel to attach slings to pick points
  - helps other workers attach rigging hardware, such as slings
  - pushes a panel out toward the slab edge.

- A travel restraint system is preferred over a fall arrest system because it keeps the worker from reaching the edge. If this is not practical however, then a fall arrest system must be used.
- If you use a fall arrest system, you must be attached to an individual anchor point—not to the flying form.
- Immediately replace guardrails and shoring after the form is flown out and while you are still using a fall protection system.

Demonstrate

- Demonstrate how to properly set up a travel restraint or fall arrest system.
- Review the procedure on how to safely install the flying form.

Formwork—Leading edge

In the high-rise formwork industry, nearly 23 per cent of all lost-time injuries are caused by falls. Most of these injuries result in sprains and tears, fractures, and concussions.

Explain dangers

- A leading edge is the unprotected side and edge of a floor, a roof, or formwork. It changes location as workers place new formwork in front or to the side of the piece they previously installed.
- High-rise formworkers will often be in situations where fall protection is required. However, when the edge is constantly moving, it's more difficult to apply standard fall protection controls.

Identify controls

Before using any of these control measures, workers must be trained in the use of fall protection and employers must have a fall rescue plan in place.

- Install guardrails along the edge of all completed decks, allowing enough room for installing bulkheads. Remember to install guardrails as the leading edge progresses.
- For work on the leading edge, use an active fall protection system consisting of a full-body harness with a lanyard combined with an energy absorber connected to a rope grab and a lifeline secured to an anchorage.
- If possible, arrange your fall protection system so that it is in travel restraint. If you can't reach the edge, you can't fall.
- Use appropriate anchor points. Wrap connectors or slings around concrete columns or several dowels of rebar or use embedded connection points that are specifically intended for anchorage. *NOTE: Wire or metal anchorage slings are more durable than webbing that can wear and tear over time.*
- Check with an engineer if you're unsure about proper anchor points (e.g., how many dowels of rebar are required). Affix the anchor securely so that the connector cannot slip or fall off.
- Mark the transition from completed or "safe" areas to unprotected leading edge areas with clear signs and barriers.
- Always keep barriers a minimum of 2 m from the leading edge operations. Use a sign to indicate that personal fall protection equipment is required in the work area.
- Instead of a lifeline and rope grab, use a self-retracting lifeline (SRL). SRLs work by allowing the lifeline to unspool under slight tension. Just be aware that when you use SRLs, you will probably be in fall arrest, not travel restraint. Check the manufacturer's instructions to ensure the SRL can be used horizontally.
- To minimize fall hazards, don't extend the deck out to the end of the bay. Work across the leading edge, advancing each bay one step at a time.
- To minimize the possibility of formwork and falsework collapse, always nail the formwork in as you progress.
- If you're supplying materials to workers using fall protection, make sure you're in a safe area or protected by using travel restraint or fall arrest.

Demonstrate

Due to the severity of the hazards involved in high-rise formwork, training is an essential first step. Train workers in the use of fall protection and make them aware of any site-specific fall hazards.

Demonstrate proper leading edge installation procedures such as setting up a fall protection system, installing guardrails, and erecting signs and barriers.

Gin wheels or pulley wheels

Explain dangers

Using a gin or pulley wheel is a low-cost and convenient way of raising or lowering a load (Figure 1).

However, there are some risks associated with using gin or pulley wheels.

- A hoisting rope that does not have a proper safety hook or knots at the end.
- A hoisting rope that is worn and needs to be removed from service.
- A load that exceeds the weight capacity of the components or the ability of workers to lift it.
- A load is not secured properly
- The bucket or load that strikes the scaffold or building, causing the load to tip and fall.

Identify controls

- Inspect the hoisting equipment and rope before each use. When not in use, store the rope so that it's protected from exposure to rain, snow, and UV radiation from the sun.
- Set up the gin wheel according to the manufacturer's instructions.
- Make sure the gin wheel and the rope are rated for the load you will be hoisting.
- When lifting liquid, cover the bucket so the contents don't spill.
- Always rope off the area below the gin wheel and never stand directly below the load (O.Reg. 213/91, s. 103).
- Whenever possible, workers at ground level should lift the load. When lifting, do not stand under the load.
- Always use gloves when working with a gin wheel to prevent rope burn.
- Make sure the rope is the correct diameter for the size of the gin wheel.
- Only use a gin wheel with a working safety catch on the mounting hook to prevent the wheel from detaching.
- Mount the gin wheel on a safe work platform that is above the standing arm's length of the worker who will be receiving the load. The load itself should be received no higher than the worker's shoulder height.
- If proper hooks are not available, use the appropriate knots.*
- Restrict loads to one-fifth of your body weight and watch for excessive side loading.
- Workers receiving the load (at heights) must use proper fall protection.
- If two or more workers are lifting the load, one worker should be giving instructions.

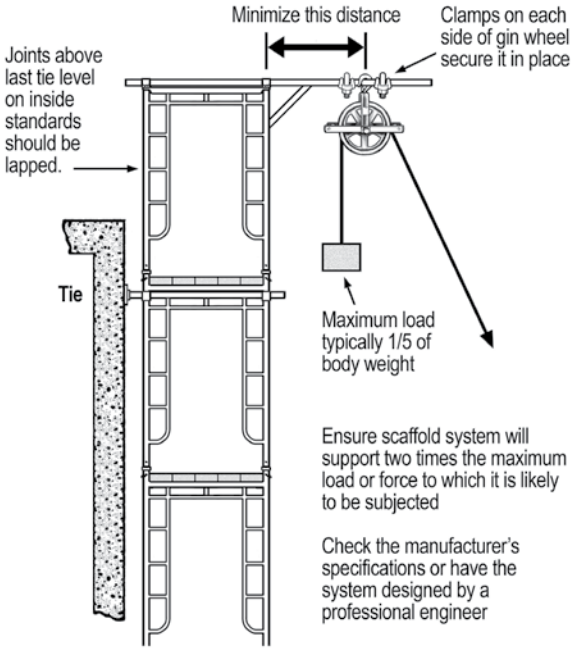


Figure 1: Proper Set-up of Gin Wheel

Demonstrate

Ask crew to describe any problems they have had with:

- handling a gin wheel
- making the appropriate knots
- using a gin wheel with missing or damaged parts.

*Refer to Chapter 24: Rigging in IHSA's *Construction Health and Safety Manual* (M029) for more information on knots and hitches.

Rigging hardware

List rigging on site.

Explain dangers

Rigging is only as strong as its weakest link. Workers' lives depend on the strength of that link.

It doesn't matter what safe working load is stamped on a hook if the hook is cracked and twisted or opening up at the throat. It can't deliver its full rated capacity.

Inspection is vital in rigging and hoisting.

Identify controls

Rigging hardware must have enough capacity for the job. Only load-rated hardware of forged alloy steel should be used for hoisting. Load-rated hardware is stamped with its working load limit or WLL.

Adequate capacity is the first thing to look for in rigging hardware. For hoisting, the design factor must be 5 to 1.

Once the right hardware has been chosen for a job, it has to be inspected regularly as long as it's in service.

There are warning signs that hardware has been weakened in use and should be replaced.

Cracks
Inspect closely—some cracks are very fine.

Missing parts
Make sure that parts such as catches on hooks, nuts on cable clips, and cotter pins in shackle pins are still in place.

Stretching
Check hooks, shackles, and chain links for signs of opening up, elongation, and distortion.

Stripped threads
Inspect turnbuckles, shackles, and cable clips.

Demonstrate

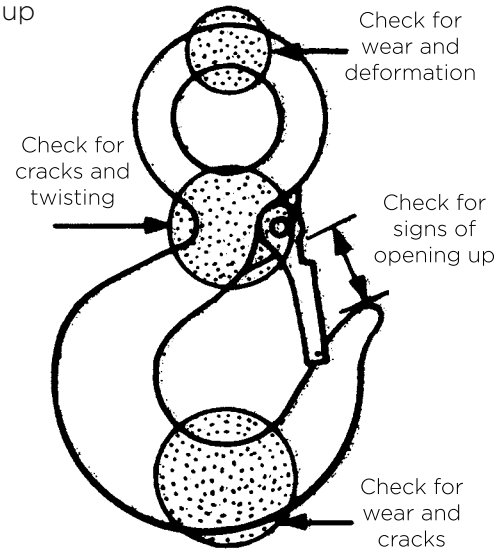
With your crew, inspect rigging hardware in use or stored on site. Repair or replace any damaged or defective items you find.

Cable Clips
- Check for wear on saddle.
- Check that original parts are in place and in good condition.
- Check for cracks.
- Check for proper size of the wire rope.

Shackles
- Check for wear and cracks on saddle and pin.
- Check that pin is straight and properly seated.
- Check that legs of s[illegible] are not opening up

Hooks
- Check for wear, twisting, and cracks.
- Make sure that hook is not opening up.

Turnbuckles
- Check for cracks and bends.
- Check rods for straightness and damage to threads.



Hook Inspection Areas

Wire rope—Inspection

List places wire rope is used on site.

Explain dangers

Damage from wear and tear can reduce rope strength and capacity, endangering workers who rely on the rope.

Identify controls

Wire rope in continuous service should be inspected during operation and at least once a week.

There are warning signs to look for during inspection. Most of these warning signs indicate that the rope should be replaced.

Broken wires
Replace rope if there are
- 6 or more broken wires in one lay
- 3 or more broken wires in one strand in one lay
- 3 or more broken wires in one lay in standing ropes.

Worn/abraded wires
Replace rope if outer wires
- become flat from friction
- become shiny from wear AND
- wear exceeds 1/3 of diameter.

Reduced diameter
Replace rope if wear on individual wires exceeds 1/3 of their diameter.

Stretch
Replace 6-strand rope if stretch reduces diameter by more than 1/16.

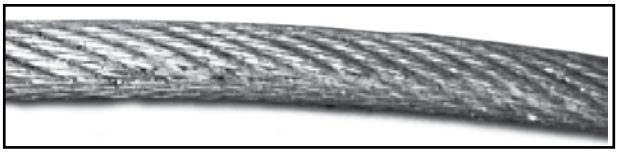
Corrosion
Difficult to detect because it's inside the rope. Look for rust, discolouration, and pitting outside.

Cuts/burns
Replace rope if any wires or strands are cut or burned. Damaged ends can be removed and seized. Otherwise rope must be replaced.

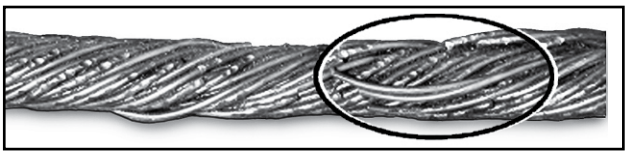
Birdcaging
Look for strands opening up in cage-like clusters. Rope must be replaced.

Core protrusion
Replace rope when inner core starts poking through strands.

Kinks
Kinks seriously reduce wire rope strength. Sections with kinks should be cut off. Otherwise rope must be discarded.



Outside of wire rope. It appears to be in good condition. See below.



Core of same wire rope. You can see many broken wires and notches. This rope should have been replaced long ago.

Demonstrate

Review wire rope in use on site. Ask your crew to inspect samples and arrange for repair or replacement as required.

Wire rope—Cable clips

Explain dangers

There's only one right way to install cable clips when you want to get the maximum efficiency—up to 85%—out of a prepared loop or thimble-eye termination. Otherwise the capacity of the termination can be severely reduced, risking the lives of workers and others nearby.

Identify controls

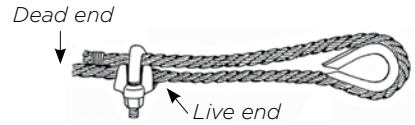
Demonstrate these points with rope and clips as you talk.

Here's how to install cable clips correctly.

- Most cable clips have two sections. There's a saddle part and a U-shaped part. You need the right-sized clip for the wire rope diameter.
- You need to know the number of clips required, the amount of rope to turn back from the thimble, and the torque needed to tighten the nuts. There are tables that spell out all of this information. (See sample below.)
- At least three clips should be used when making any prepared loop or thimble-eye termination for wire rope, especially for hoisting.
- All three clips must be installed with the saddle part on the live end of the rope. This lets the live end rest in the saddle so it's not crushed by the U part of the clip. A way to remember this is: **"Never saddle a dead horse."**
- The U goes on the dead end of the rope where crushing will not affect the breaking strength of the hoist line.

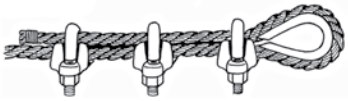
Demonstrate

Demonstrate proper installation step-by-step with your crew by following the diagram below.



STEP 1 - Apply first clip one base width from dead end of rope. U-bolt is placed over dead end and live end rests in clip saddle. Tighten nuts evenly to recommended torque.

STEP 2 - Apply second clip as close to loop as possible. U-bolt is over the dead end. Turn nuts firmly but do not tighten.



STEP 3 - Apply all other clips, spaced equally between the first two. They should be 6-7 rope diameters apart.

STEP 4 - Apply tension and tighten all nuts to recommended torque.

STEP 5 - Check nut torque after rope has been in operation.

Rope Diameter (inches)	Minimum Number of Clips	Amount of Rope Turn-back from Thimble (inches)	Torque for Unlubricated Bolts (Foot-Pounds)
5/16	2	5 1/2	30
3/8	2	6 1/2	45
7/16	2	7	65
1/2	3	11 1/2	65
9/16	3	12	95
5/8	3	12	95
3/4	4	18	130
7/8	4	19	225

Hoisting signals—Basic rules

List hoisting jobs on site.

Explain dangers

In hoisting operations, miscommunication between signaller and operator can lead to disaster for people or property.

Identify controls

If you're going to rig a load, you also need to know the signals for lifting, moving, and landing it. The operation may be a simple LIFT and LOWER. Or it may require more complicated signals.

On construction sites, signalling is required in the following situations.

1) When the operator cannot see the load.
2) When the operator cannot see the load landing area.
3) When the operator cannot see the path of travel of either the load or the crane.
4) When the operator is too far from the load to judge distance accurately.
5) When the crane or other hoisting device is working close to live powerlines or equipment.

In many cases, hand signals are the most efficient form of communication between riggers and crane operators. Over the years, a system of standard hand signals has evolved that is now international.

There is a signal for each action of the crane from BOOM UP to BOOM DOWN, from TRAVEL FORWARD to STOP.

By using the correct hand signals, you can get a crane to do almost anything you want. The operator only needs to clearly see and understand your signals.

In our next talk, we'll run through all the hand signals for hoisting. But first we have to know the ground rules for signalling.

- Only one person should signal the operator. But anyone can give the STOP signal and it must be obeyed immediately. [Demonstrate signal.]

- Signals should be clear and, wherever possible, barehanded.
- The load should be directed so that it never passes over anyone.
- Operators should not make a move until they receive and understand your signal. If contact between you and the operator is broken for any reason, the operation must stop.
- Some situations call for two signallers. For instance, during a concrete pour, one signaller may be needed to direct the lift while the other directs the drop.
- In cases where a difficult lift requires vocal communication, use two-way radios instead of hand signals.

Hand signals have their limitations. For example, they should never be used when distance, visibility, or noise prevents accurate communication with the operator.

Demonstrate

Demonstrate the hand signals on the next page.

Hoisting signals—Demonstration

Demonstrate

Demonstrate the hoisting signals below. Ask them to show you the signals for "Load Up," "Turn Right," and "Use Main Line."

Ask your crew to practise them so that they become natural. Hand out IHSA's ***Hand Signals for Hoisting Operations Card*** (V002).

Electrical safety

Explain dangers

Using electricity on site can be hazardous, especially in three areas:

- tools
- cords
- panels/generators.

Identify controls

Consider all electrical wires and equipment energized until they are tested and proven otherwise.

According to the Construction Regulations: "No worker shall connect, maintain or modify electrical equipment or installations unless,

(a) the worker holds a certificate of qualification issued under the *Ontario College of Trades and Apprenticeship Act*, *2009*, that is not suspended, in the trade of,
  (i) electrician—construction and maintenance, or
  (ii) electrician—domestic and rural, if the worker is performing work that is limited to the scope of practice for that trade; OR

(b) the worker is otherwise permitted to connect, maintain or modify electrical equipment or installations under the *Ontario College of Trades and Apprenticeship Act*, *2009,* or the *Technical Standards and Safety Act, 2000."* (O. Reg. 213/91, s. 182).

A worker who does not meet the requirements of (a) or (b) may only insert or remove an electrical attachment plug of electrical equipment to or from a power receptacle.

Tools

- Use only electric tools that have a CSA logo or equivalent.
- Make sure the casings of double-insulated tools are not cracked or broken.
- Always use a Class A ground fault circuit interrupter (GFCI) with portable electric tools operated outdoors or in damp or wet locations. GFCIs detect current leaking to ground from a tool or cord and shut off power before damage or injury can occur.
- Take defective tools out of service.
- Any shock or tingle, no matter how small, means that the tool or equipment needs to be checked and repaired.
- Before drilling, nailing, cutting, or sawing into walls, ceilings, and floors, check for electrical wires or equipment.

Cords

- Make sure that tool cords, extension cords, and plugs are in good condition.
- Use only 3-pronged extension cords.
- Make sure that extension cords are the right gauge for the job to prevent overheating, voltage drops, and tool burnout. A 12-gauge extension cord is ideal.
- Do not use cords that are defective or have been improperly repaired.
- Protect cords from traffic.
- When outdoors or in wet locations, plug into a GFCI-protected receptacle or use a portable in-line GFCI.

Panels/Generators

- Temporary panel boards must be securely mounted in a lockable enclosure protected from weather and water. The boards must be accessible to workers and kept clear of obstructions.
- Receptacles must be GFCI-protected.
- Panels must be installed in accordance with the Ontario Electrical Safety Code.
- Use only generators with a label identifying it as "neutral bonded to frame". Do not use generators with a "floating neutral".
- Use a portable generator with built-in GFCI receptacles or use a portable in-line GFCI at the generator receptacle.

Demonstrate

- Inspect sample tools and cords used on the job.
- Point out labels indicating double insulation.
- Show a portable in-line GFCI. It can be used on all grounded electrical receptacles.

Lockout and tagging

List hazardous energy sources on site.

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Explain dangers

Serious and fatal accidents have occurred when people assumed that electricity or machinery was turned off but it wasn't. Electric shock, sudden movement of sharp machine parts, release of pressure, falling counterweights—these are just some hazards that can result when energy is unexpectedly released.

Identify controls

Lockout and tagging ensures that hazardous energy sources are under the control of the workers needing protection.

Lockout often involves workers using a padlock to keep a switch in the "off " position, or to isolate the energy of moving parts.

Tagging is how you tell others that the device is locked out, who locked it out, and why.

There are four basic actions in any lockout.

1) Identify all energy sources connected with the work.
2) De-energize, disable, redirect, or stop all energy from doing what it normally does.
3) Apply restraint devices (e.g., lock, scissors, chain, or block) to keep the system from starting up while you work on it.
4) Confirm that you've reached a zero energy state.

Forms of energy that you must lock out include electrical, mechanical, potential (stored energy, such as in suspended loads), hydraulic, pneumatic, thermal, and chemical.

It's not always easy to identify every source of energy. Machines or systems usually contain several forms of energy. A press may be hydraulically powered, for instance, but electrically controlled.

Locking out the hydraulic power is not enough. Locking out the electricity is not enough. Gravity can still cause a raised ram to drop. There may also be potential energy stored in pistons or springs.

To identify energy sources, you may need to trace wiring, lines, and piping in and out of the equipment. Specifications, drawings, operating manuals, and similar information will also help.

A **lock** is your personal lock that can only be opened with your key.

Once you apply the lock or other restraint device, you have to **tag** it. The tag must indicate:

1) who you are
2) who you work for
3) why the machine or system is locked out
4) the date when the lock was applied.

Once each energy source has been locked out and tagged, you must test the equipment to verify a zero energy state.

Many plants or industrial establishments will have specific procedures for lockout and tagging.

Know the law
Section 190 of the Construction Regulations (O. Reg. 213/91) lists the requirements for lockout and tagging.

Demonstrate

Show sample lockout devices and tags. Explain your project's lockout procedures. Identify situations on site where lockout and tagging would be necessary. Review recent applications of lockout and tagging.

Powerline contact

List powerline hazards on site.

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Explain dangers

Powerline contact is a major cause of fatal accidents and critical injuries.

These types of incidents usually involve heavy equipment such as backhoes, dump trucks, boom trucks, cranes, and excavators.

Beware of contact when moving extension ladders, rolling scaffolds, long lengths of pipe, and siding.

Beware of the powerline moving (e.g. in the wind).

Identify controls

- The constructor must develop written procedures ahead of time if the equipment or its load can encroach on the the minimum permitted distance to a powerline.
- The minimum permitted distances are listed in the construction regulations and the table below.

Minimum Distances to Powerlines

Voltage Rating	Minimum Distance
750 to 150,000 volts	3 metres (10 feet)
150,001 to 250,000 volts	4.5 metres (15 feet)
More than 250,000 volts	6 metres (20 feet)

Source: O. Reg. 213/91, s. 188

- Don't store material and equipment below overhead powerlines.
- To determine powerline voltage, check markings on pole or call the utility.
- The written procedures must be communicated to every employer and worker on the project.
- The written procedures should include the use of warning devices and signs.
- Use a signaller to direct equipment operators and truck drivers.
- The signaller must be in full view of the operator and have a clear view of the powerline.
- The signaller must warn drivers and operators when any part of their equipment or load approaches the minimum distances set by law.
- When erecting or moving a ladder or scaffold, don't let it lean or drift toward overhead powerlines. Always maintain minimum allowable clearances.

Demonstrate

Review procedures with your crew in case of contact.

- If possible, break contact by driving the equipment clear of the powerline. Otherwise do not leave the equipment until the utility shuts down the power or fire forces you to jump clear.
- Keep everyone away from equipment in contact with powerline.
- Beware of time relays. Even after breakers are tripped by line damage, relays may be triggered to restore power.
- Never touch equipment and ground at the same time.
- Get someone to call the local utility to shut off power.

Temporary lighting

List temporary lighting locations on site.

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Explain dangers

Frequent relocation of circuits can loosen connections, break insulation, and create other shock or electrocution hazards.

Steel door frames can become electrified when doors close on wires.

Ladders, pipe, scaffold frames, and other objects can bump stringers, leading to electrical contact and shock.

Dead, missing, or low-watt bulbs, inadequate power, and blown fuses can leave stairwells, basements, and other areas poorly lit or with no lighting at all, increasing the risk of injury.

Identify controls

- Lighting levels should be at least 55 lux (5 foot candles). That means 150-watt bulbs:
  - suspended 2.4 metres or 8 feet high and
  - 7.5 metres or 25 feet apart

    OR
  - suspended 3 metres or 10 feet high and
  - 6 metres or 20 feet apart.
- Bulbs lower than 100 watts are not recommended.
- Bulbs should be installed to light as large an area as possible.
- Bulbs must be protected by cages against accidental damage.
- Keep branch lighting circuits that feed temporary lighting entirely separate from power circuits, except for a common supply.
- Protect branch lighting circuits by a breaker or fuse with a 15-amp rating. An electrician should connect the circuits directly into a distribution panel.
- Don't use temporary lighting circuits as extension cords. If a fuse blows, finding your way to the panel in the dark can be dangerous.
- Make sure that wires do not contact steel doors or steel door frames. Ensure that wires cannot be pinched or cut by doors.

Demonstrate

With your crew, review the following checklist.

- ❑ Are work areas well lit?
- ❑ Are burned-out bulbs promptly replaced?
- ❑ Are they replaced with new bulbs or bulbs taken from another location?
- ❑ Are stringers promptly relocated when bulbs are blocked by the installation of new ceilings, ducts, piping, and other features?
- ❑ Are lamp holders hard-usage type?
- ❑ Are electrical feed lines for sockets supported every 1.4 metres (4 feet, 6 inches)?

Underground utilities

List hazards with underground utilities on site.

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Explain dangers

Buried gas and electrical lines present a serious risk of injury and death.

Utility pipes, conduit, and cable may be damaged by:

- digging without locates or with inaccurate locates
- careless excavation once the utilities have been located and marked
- failure to support exposed utilities once they have been uncovered.

Breaks in buried services threaten not only workers but also the general public.

Identify controls

The basic idea is to CALL BEFORE YOU DIG.

Ask utilities to locate and mark their underground services. That includes gas, water, electrical, cable TV, telephone, and pipelines.

Utilities generally offer a free service for locating and marking buried services with stakes, flags, or paint.

These markers indicate the approximate centre line of the underground service. Utilities also provide a diagram of the locate information. Keep records of all your locates on the job.

Once the underground service is located, it's our job to uncover it.

This must be done by hand digging. Never use excavating equipment to find the service.

If we use a pressurized water/vacuum system to expose the buried service, we have to check with the utility first to make sure it's safe.

In some cases, the utility may supervise our digging and excavation. This is a requirement when working with fibreoptic cable.

Once the service has been uncovered and its location determined at several points along its length, then excavating equipment can be used.

Exposed utility pipes, conduit, and cable must be supported to keep them from falling or breaking. When construction contracts don't specify the method of support, ask the utility for its requirements.

For more information on utility damage prevention, go to **orcga.com** and download a free copy of ORCGA's *Best Practices.*

ONE CALL
Contact Ontario One Call (On1Call) to notify all utilities with underground services in the area where we want to dig.

e-Ticket Locate Requests
1-800-400-2255
www.on1call.com

According to the *Ontario Underground Infrastructure Notification System Act, 2012,* most underground services locates will be provided when you contact On1Call. There are some exceptions, however. Ask On1Call if any of these are in your area.

Demonstrate

Review information in a locate provided by a utility for an underground service on site.

Electrical contact—Roofing

Cutting into existing roofs and fastening insulation are common jobs for roofers. One of the hazards they face when doing these jobs is contact with electrical services.

Electrical services such as conduits or cable could be just beneath the membrane of the roof. Electrical services could also be mounted to the underside surface of the roof deck on the inside of the building.

Explain dangers

The most common danger for roofers when they encounter electrical services is electrocution. However, there are also dangers associated with cutting the deck, such as kickback and fire.

Identify controls

- Prior to cutting into the roof, contact the owner and request information on the location of conduits or cable.
- If possible, check the underside of the roof deck inside the building for conduits and cable in the spot where you plan to cut.
- If you are working on a concrete roof deck, x-ray the area before cutting.
- Always remove the membrane system before cutting holes in the roof deck.
- If an electrical service is located close to where you plan to cut, request that the power be shut off and locked out.
- If the power cannot be shut off and locked out, request that a new location be chosen for the hole.
- Contact with electricity can seriously injure or even kill you. Don't cut until you have received confirmation that the area is clear of all services.
- Don't forget that the same hazards exist when you are securing (mechanically fastening) insulation to the decking and when you are cutting. If possible, check the underside of the roof deck inside the building for services. You may need to have two-way communication with someone watching the progress from the inside of the building.

Radio Detection Device

Radio detection is another method of checking for electrical services that has become more reliable. Prior to fastening the insulation to the decking or cutting a hole, a worker can scan the area using a radio detection device and mark areas of concern. By doing this, the worker can lower the risk of contact.

NOTE: If you find electrical services and there is a risk of contacting them, investigate alternatives to mechanically fastening decking.

Demonstrate

Walk around the work area and, if possible, look for any services on the underside of the decking.

Radio detection companies often provide training on their products. Arrange for worker training if you plan to use this equipment.

Backing vehicles

Explain dangers

Every year, workers are killed and injured by backing vehicles and machinery. If you work in the homebuilding, ICI, heavy civil, or road building industry, you have an increased likelihood of getting struck by heavy equipment.

The main problem is blind spots around heavy equipment. If you're in a blind spot and the operator doesn't know you're there, you could be backed over.

The hazards increase in congested areas where vehicles and heavy equipment are backing up all the time. Noise distracts people and dust makes it difficult to see and be seen.

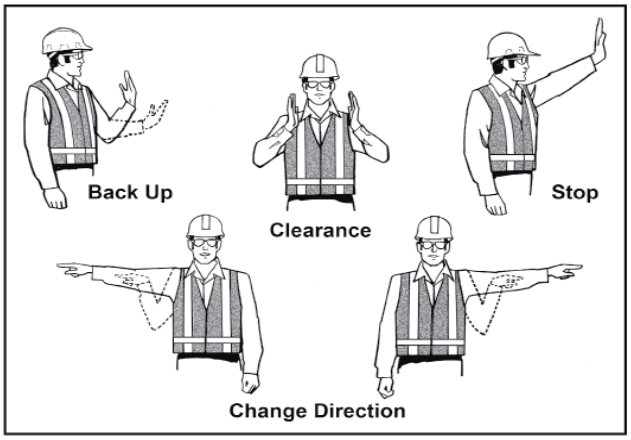
Identify controls

You can plan a drive-through site to limit the need for backing up. But on most projects, trucks and equipment have to operate in reverse at some point. That's when a signaller is necessary.

The **signaller** is another pair of eyes for the driver. If you're asked to work as a signaller, follow these tips.

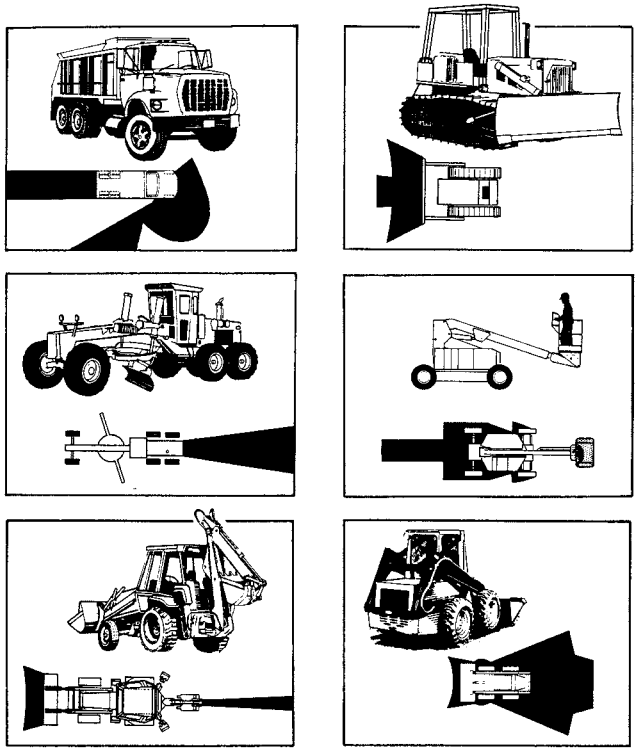
- Wear high-visibility clothing as required.
- Stand where the operator can see you at all times, and where you have a full view of the intended path of travel. You must, however, stay out of the vehicle's path.
- Use the hand signals demonstrated below.

Traffic Control Hand Signals



- Make eye contact with the driver or operator before you signal or change position.
- Do not perform any other duties. Signalling requires your full concentration.
- Know driver and operator blind spots.

[Show your crew these diagrams of blind spots.]



Make eye contact with the operator before approaching vehicles and equipment.

NOTE: You can use new technology such as a system that can read tags on worker's vests or hard hats and send a signal to warn the operator that someone is behind the vehicle. But systems like this may not be available on most projects.

Demonstrate

Show your crew where the blind spots are on a truck or piece of heavy equipment on site. Get them to see things from the operator's perspective.

Hand out IHSA's *Traffic Control Hand Signals Card* (V006).

Traffic control—Public roads 1

List traffic control needs on site.

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Explain dangers

When construction or utility work affects traffic on public roads, there's a risk both to workers and to ordinary drivers and passengers. The first priority of a traffic control person is to protect workers and the public from accident and injury.

Identify controls

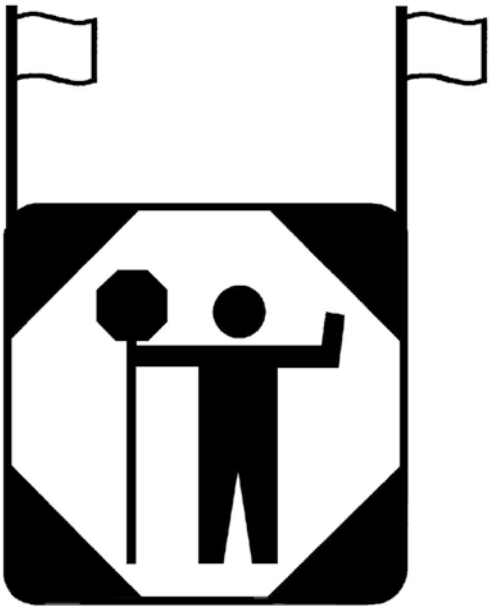
Traffic control persons protect workers and the public by regulating traffic flow. As long as you're working as a traffic control person, you can't do other work or have additional duties. Directing traffic is a full-time job.

Public traffic has priority over heavy equipment. But you'll have to stop traffic when the job requires it. Otherwise, keep traffic moving at a normal or reduced speed to avoid tie-ups.

With your help, work will go ahead safely and efficiently. I'm going to give you instructions in writing. But let me go over the main points now.

The most important point is simple: **Pay attention.**

- Don't be distracted by talking to anybody.
- Always face oncoming traffic.
- Stay alert to work nearby. Don't get backed over by your own equipment.



- Stand where you can see and be seen by approaching traffic for at least 150 metres (500 feet).
- Stand alone. Don't let a group gather around you.
- Stand at your post. Sitting is hazardous because you can't fully see or be seen by drivers.
- Always have a quick escape route ready in case a driver doesn't see you or disregards your signals.

NOTE: A traffic control person must never be used to direct traffic if more than one active lane of traffic is travelling in one direction, or if the posted speed limit is greater than 90 km/h.

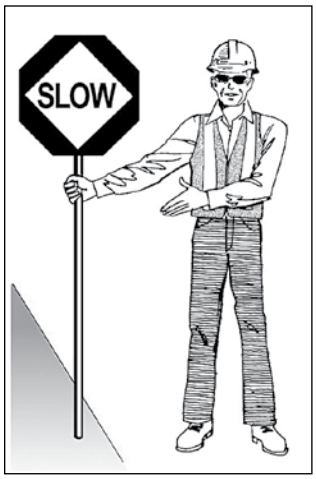
Demonstrate

Give the worker IHSA's *Handbook for Construction Traffic Control Persons* (B016).

Go over the requirements for a typical arrangement for a two-lane roadway on page 10 of the handbook.

Traffic control—Public roads 2

List traffic control equipment locations.



Identify controls

In addition to the hard hats and safety boots you're already wearing, you're going to need some equipment to do traffic control:

- Safety vest that meets requirements of the construction regulations (O. Reg. 213/91, s. 69.1)
- Eye protection—it's dusty and bright out there
- STOP/SLOW sign that meets requirements of the construction regulations (O. Reg. 213/91, s. 68).

Demonstrate

Demonstrate as you talk.

Let me show you how to use the STOP/SLOW sign.

- When you show the STOP side to approaching traffic, hold up your free hand like this.
- When you show the SLOW side, motion traffic to keep moving slowly.
- Hold the sign firmly in view of oncoming traffic.
- Give motorists plenty of warning. Don't suddenly flash STOP when a driver is too close.
- When you show STOP, clearly indicate where you want traffic to stop. When traffic has stopped, you may move to a point on the road where traffic in that lane can see you.
- When you show SLOW, don't bring traffic to a complete halt. When drivers slow down, use your free hand to signal them to keep moving slowly.
- If you're working along a two-lane road with traffic moving in both directions, you'll have to coordinate your signals with the traffic controller on the other side.
- Where two lanes are reduced to one, make sure you stop traffic in one direction before letting traffic through from the other direction.
- A traffic control person must never be used to direct traffic if more than one active lane of traffic is travelling in one direction or if the posted speed limit is greater than 90 km/h.
- Remove or cover any traffic control signs at quitting time or when traffic control is suspended. Drivers can be confused by signs still in place when no work is going on.

Dump truck tipovers—Drivers

List tipover hazards on site.

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Explain dangers

Dump trucks have tipped over when their boxes were lifted. The result has been death and injury to drivers and nearby workers.

Just consider some of the dimensions and forces involved.

A 46-foot trailer raised at 45 degrees is about 42 feet high. That's a lot of height and weight to keep balanced.

One small factor can make the truck tip over. All it takes is

- a slight variation in level
- a load that gets stuck
- soft ground under tires.

Identify controls

Let's take a few minutes to review basic operating procedures.

- At the loading point, make sure that the load is distributed evenly in the box. Don't overload.
- Remember that long boxes tip more easily than short boxes.
- Always make sure that trailer and tractor are aligned before dumping.
- Avoid dumping in high winds.
- Dump only on level ground. On slopes, dump downhill rather than up—the box doesn't have to be raised as high.
- Take extra care when dumping sticky material like clay and asphalt. It may stick to one side of the raised box and not to the other. Or it may stick in the upper portion, creating a top-heavy load. Either condition can lead to uneven weight, imbalance, and tipover.
- Don't leave a load in the truck overnight. It will stick to the box, especially in freezing temperatures.
- Keep your truck in good condition. Stability can be affected by poor suspension, uneven tire pressure, and worn or inadequate lifting systems.
- Ensure that the latch on the box works properly.
- Stay in the cab during dumping and keep your seatbelt on. You're less likely to be injured in a rollover. If the truck starts to tip **DON'T TRY TO JUMP OUT.**
- Always lower the box before moving the truck. This lowers the centre of gravity and prevents rocking, swaying, and instability. It also prevents contact with overhead obstructions.
- Keep lift axles down while dumping. Loads will be distributed over more bearing surfaces and the truck will not sink as easily in soft ground.

Demonstrate

Inspect boxes on one or two dump trucks. Check that latch works properly. Point out any defects or damage.

Dump truck tipovers—Workers in vicinity

List tipover hazards on site.

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Explain dangers

If possible, deliver this talk where truck operations are visible at a safe distance.

Dump trucks have tipped over when their boxes were lifted. The result has been death and injury to drivers and nearby workers.

Just consider some of the dimensions and forces involved.

A 46-foot trailer raised at 45 degrees is about 42 feet high. That's a lot of height and weight to keep balanced.

One small factor can make the truck tip over. All it takes is

- a slight variation in level
- a load that gets stuck
- soft ground under tires.

Identify controls

Workers around moving vehicles must wear high-visibility clothing. Make sure it's in good condition and can be seen from all sides.

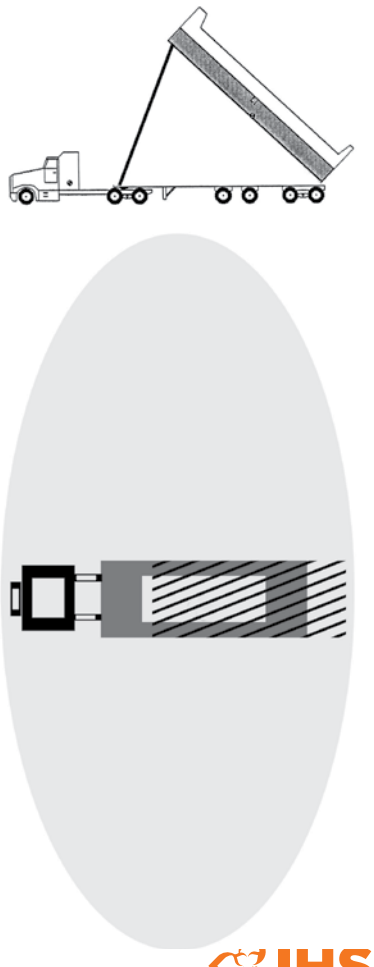
When approaching a truck, make eye contact with the driver so the driver is aware of your presence.

Demonstrate

Demonstrate as you talk.

When a truck is dumping, stay out of the danger area. *[Show your crew the shaded area in the drawing below.]*

- By staying out of this area you will be safe if anything goes wrong.
- The signaller should be close enough to give adequate directions to the driver, yet far enough away to avoid injury if the truck tips over.
- Watch for overhead wires. Raised boxes can contact and break wires.



Securing loads

Explain dangers

If a load isn't properly secured on your vehicle, it can severely injure you during loading and unloading.

Risk factors for operators when securing loads include

- overexertion injuries
- being struck by parts of the load
- slips and falls—either when working at heights or from the ground due to ice, snow, and rain.

Here are two examples of actual workplace incidents:

1. **Strapping loads** – A flatbed driver was strapping a load of steel from the side of a flat-bed truck. While pulling and turning the strap wheel, the driver felt a sudden pain in his right shoulder—a musculoskeletal injury. This injury required therapy and days off work.
2. **Unstrapping loads** – A worker was killed by a falling pipe when unloading a transport trailer. The worker was in the process of unstrapping the load when three high-density polyethylene pipes, weighing about 500 kg each, rolled off the top tier. Although the pipes were resting on dunnage, it failed to secure the load once the strap was removed.

If a load isn't properly secured, it can cause major problems during transportation. Studies have found that up to 25 per cent of unsafe highway incidents were attributed to cargo inadequately secured on trucks and vehicles.

Identify controls

There are many methods and materials available to secure loads and cargo on vehicles and inter-modal containers. These methods can include

- strapping (steel, polyester, nylon, and polypropylene)
- fasteners (nails and bolts)
- dunnage
- lashing (ropes, cables, wires, and chains).

To prevent injuries, follow proper work practices to secure loads.

- Workers and independent operators should be trained to recognize the danger to themselves and the public from materials becoming dislodged.
- All loads must be secured to comply with Ontario's *Highway Traffic Act* (s. 111) and the *National Safety Code* Cargo Securement Standard.
- Workers should wear comfortable boots with anti-slip resistance.
- When placing straps over loads, tie a rope with a ball to the end of the strap. Make sure that no one is near the other side of the trailer. If someone is helping you on the other side, tell them to stand far back. Then, throw the ball over the load and pull the strap over on the other side.
- Use telescoping tools to help you pull straps down from the top of the load.
- Use a power strap winder or drill-attached strap winder to save your wrist from repetitive strain and forceful exertion.
- Consider installing geared or powered winches.
- Use a properly designed winch bar. When tightening or loosening winches, always maintain a firm grip on the winch bar. Never release a winch bar without checking the pawl to ensure that it is fully engaged between the ratchet teeth. Releasing a winch bar without the pawl being properly engaged can cause serious injury to the user or bystanders. Never use cheater bars with the winch bars.
- Loading and unloading may also involve equipment such as lift trucks or cranes. Drivers should not operate this equipment unless they are competent to do so based on their training, experience, and knowledge of occupational health and safety legislation.

Demonstrate

Ask the crew to describe any problems they have had with securing loads.

Safe setup of heavy equipment

Explain dangers

The use of concrete pumps and boom trucks is common on most residential sites. In addition to increased productivity, there are ergonomic and safety-related benefits. However, if the site is not set up properly, concrete pumps and boom trucks can be dangerous for the equipment operator as well as for other workers nearby.

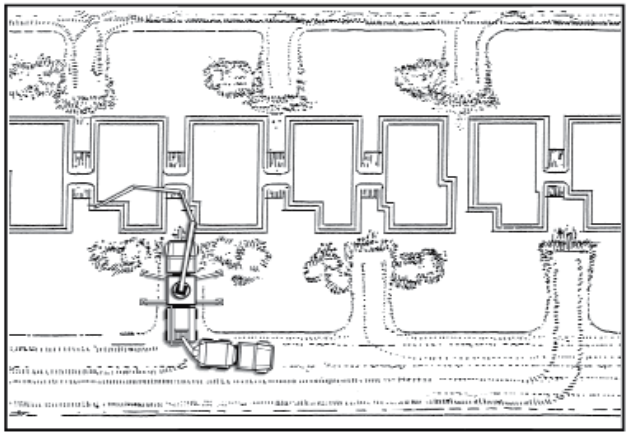
1. The concrete pump, concrete delivery truck, or boom truck may block the path of emergency vehicles.
2. The pump or truck may tip over.
3. The boom may come in contact with a powerline.
4. Workers may be injured by concrete delivery trucks that are backing up.

Identify controls

Proper site planning can prevent many of these problems.

1. The *Occupational Health and Safety Act* requires every project to have written procedures to follow in case of an emergency. If part of the site is blocked off, emergency vehicles and personnel may not be able to reach injured workers.

   Make a proper staging area by grading driveways or other areas off the road. That will give concrete pumps, boom trucks, and other heavy equipment enough space to set up properly off the road so they won't block traffic.



Example of Proper Site Setup

2. To ensure the stability of the concrete pump or boom truck, the ground where the equipment is set up has to be level and compacted. Refer to CSA Z151-09—*Concrete Pumps and Placing Booms* and the manufacturer's instructions.

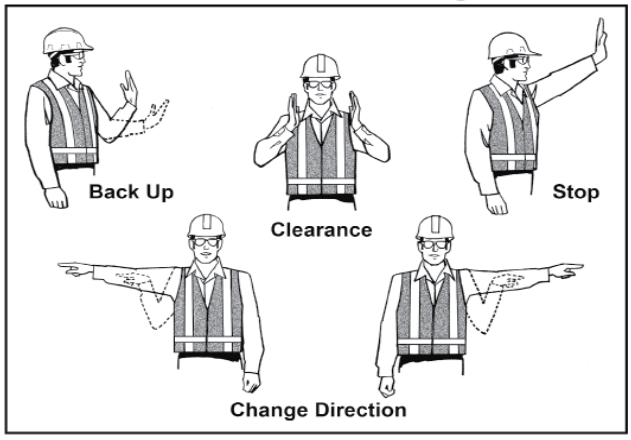
3. To prevent the boom from contacting overhead powerlines, follow the procedures below.

   - Establish written procedures to ensure that equipment or loads do not encroach on minimum distances to powerlines.
   - Provide adequate devices that are visible to the operator to warn of electrical hazards.
   - Station a signaller in full view of the operator to warn them each time the equipment may approach the minimum distance.

   NOTE: Refer to sections 188 and 189 of the Regulation for Construction Projects (213/91).

4. Concrete delivery trucks need to back up to fill the pump hopper. Always have a designated signaller in place to keep anyone from being hit by a reversing vehicle. Regulations require that a signaller wear high-visibility clothing and use pre-arranged hand signals to communicate with the operator (O. Reg. 213/91, s.104 and 106).

Traffic Control Hand Signals



Demonstrate

Review the site plan and staging areas with those involved. This will ensure that concrete pumps and boom trucks will be set up correctly.

Hand out IHSA's *Traffic Control Hand Signals* (V006) and *Ready-mix Driver and Concrete Pumping Hand Signals* (V007).

Lift trucks in the warehouse

Explain dangers

Many workers are injured by lift trucks in situations like the following.

- A lift truck is unintentionally driven off a loading dock.
- A lift truck falls between a dock and an unsecured trailer.
- A worker is struck by a lift truck when it is backing up or when the worker cannot be seen by the operator.
- A lift truck tips over and crushes the operator or a worker.
- The load on a lift truck falls off the forks because it was not loaded or secured properly.
- The operator did not keep his or her hands and feet inside the cab.
- The operator slips or falls when getting in or out of the cab.

Many incidents also involve property damage including damage to overhead sprinklers, racking, pipes, walls, and machinery.

Most injuries and property damage are caused by

- lack of safe operating procedures
- lack of safety rule enforcement
- insufficient or inadequate training.

Identify controls

- Always wear suitable clothing and safety shoes or boots when you are working in a warehouse.
- Always fasten your seatbelt when driving a lift truck.
- Always use 3-point contact when getting in and out of the cab.
- Take off any jewellery, and keep long hair tied back to prevent it from being caught in machinery or equipment.

- Watch out for other workers and vehicles, especially near doorways and ends of aisles.
- When backing up, always look in the direction that you are travelling. Watch for people, equipment, or anything else in your path of travel.
- Don't be afraid to use your horn. It's better to make too much noise than not enough.
- Secure the load properly to prevent it from falling onto equipment or pedestrians.
- When you are stacking something on high shelves, make sure the lift truck can stack at the proper heights and manoeuvre in aisles without becoming unstable.
- Review the manufacturer's instructions and keep the manual with the equipment for quick reference.

Demonstrate

- Ask the crew to show that they understand the load chart.
- Ask lift truck operators if they can remember the speed limits and warning signs at your facility.
- Ask the operators to show that they understand all the warnings and precautions for the type of lift truck they will be allowed to use.

Slip and fall hazards for truck drivers

Over a five-year period, slips and falls were the cause of nearly 50 per cent of all critical injuries in the trucking industry.

Explain dangers

Pay special attention when working on the following surfaces:

- ramps and gang planks without skid- or slip-resistant surfaces
- metal surfaces such as dock boards and dock plates, platforms, construction plates or covers on sidewalks, and roads
- metal rungs, steps, footholds, treads, running boards, and platforms on equipment and ladders.

Remember: metal is slippery because of its lower force of friction and traction. Metal surfaces such as running boards can become smooth and slippery with wear and extremely slick when wet, muddy, oily, dirty, or greasy.

Identify controls

When working around flatbed trucks:

- Clean footwear of mud, snow, ice, grease, or other slippery substances.
- Make sure running boards, treads, steps, footholds, and platforms are clean and dry.
- Always face equipment when mounting and dismounting.
- Have a secure grip on the handhold before stepping up.
- Place your foot firmly on the step or foothold so that it's in front of your heel, under the arc of your foot
- Always be aware of your surroundings and any obstacles around you.
- Don't climb down with something in your free hand. Put it on the floor of the vehicle and reach for it when you get down to the ground

The single biggest cause of falls from a vehicle is driver error and failure to follow the 3-point contact rule.

When mounting and dismounting:

- Maintain 3-point contact while getting onto or off of the equipment until you reach the ground, cab, or a stable platform. This means one hand and two feet or two hands and one foot must be on the equipment at all times.

- Do not jump down when getting off the bed of a truck or other part of the equipment. Step down carefully while facing the equipment.

To prevent slips and trips:

- Wear shoes with good support—not sandals, bare feet or high heels.
- Exit and enter facing the cab.
- Slow down and use extra caution in bad weather.
- Get a firm grip on rails and handles with your hands.
- Look for obstacles on the ground before exiting.
- Don't rush to climb out after a long run. Descend slowly to avoid pulling a muscle.
- Don't ever jump out. You may land off balance or on an uneven surface and fall.
- Don't use tires or wheel hubs as a step surface.
- Don't use unauthorized handholds such as door frames or door edges.

Demonstrate

Demonstrate 3-point contact to your workers by properly mounting and dismounting a vehicle.

Defensive driving—Highway traffic

Explain dangers

Not everyone drives well. Some people speed aggressively. Others wander into another lane because they aren't paying attention or they're multi-tasking (e.g., talking on the phone, texting, checking messages, or eating).

Aggressive drivers can cause road hazards to themselves and others sharing the roads. Drivers may follow too closely, make sudden turns without signalling, or weave in and out of traffic.

The length, width, and weight of large trucks can create hazards for drivers of both small and large vehicles. Many fatal collisions between cars and trucks are caused by the car driver's error.

Identify controls

Follow these tips to make the highways—and your next drive—a lot safer.

- **Consider stopping distances.** Trucks need a much longer braking distance than cars. Don't cut in front of a truck. If you do that, it reduces the truck's braking distance and limits the evasive action a truck driver can take.
- **Pass carefully.** When passing a truck, do not drive alongside it for too long. Pass as quickly and safely as possible, and don't cut too closely in front of a truck when re-entering the lane.
- **Be aware of your surroundings.** Check your mirrors frequently and scan conditions 20 to 30 seconds ahead of you. Keep an eye on pedestrians, bicyclists, and pets along the road.
- **Drive defensively.** Do not assume another driver is going to move out of the way or allow you to merge. Expect that drivers may run through red lights or stop signs and be prepared to react. Be considerate of others but look out for yourself. Have an escape route.
- **Maintain an optimal position.** In all driving situations, the best way to avoid potential danger is to position your vehicle where you have the best chance of seeing and being seen.
- **Follow the two-second rule.** Since the greatest chance of a collision is in front of you, use the two-second rule to help you establish and maintain a safe following distance that provides adequate time for you to brake to a stop if necessary.
- **Keep your speed down.** Posted speed limits are meant for ideal driving conditions. It's your responsibility to ensure that your speed matches the actual conditions.
- **Eliminate distractions.** A distraction is any activity that diverts your attention away from the task of driving. Driving deserves your full attention. Stay focused on the driving task.

Demonstrate

- Ask the crew to describe ways of keeping a two-second distance between two vehicles.
- Demonstrate stopping distances for small and large vehicles.
- Show the blind spots of any vehicles that workers are expected to drive.

Work-related driving

Motor vehicle incidents (MVIs) are the biggest cause of workplace fatalities for IHSA member firms. In 2014, 17 workers from the sectors served by IHSA lost their lives in motor vehicle-related incidents on the job.*

Explain dangers

Work-related driving is defined as "driving activities undertaken by staff in the course of their work." If workers drive as part of their work, employers have the same duty to protect them from this hazard as from any other workplace hazard. This applies even if workers are using their own vehicles.

In Ontario, MVIs are one of the leading causes of workplace injuries and fatalities. To protect workers from hazards related to MVIs, employers should have a safe-driving policy and program for their company and communicate it to all workers.

Identify controls

- Follow the health and safety procedures in your company's safe driving policy.
- Make sure you have a valid driver's licence that is appropriate for the class of vehicle you will drive.
- Check to make sure that any vehicle you drive is properly insured and in good working condition. All vehicles should be inspected, serviced, and maintained regularly.
- Seatbelts save lives. Buckle up any time you operate a vehicle or a piece of mobile equipment. If it has a seatbelt, you are legally required to use it.
- Check to see if there are other workers or equipment around the vehicle before starting the engine or putting the vehicle in motion. Use a signaller when your intended path of travel is not clear or when you have to back up at a busy worksite.
- Do not drive if you feel physically or mentally unable to do so. Take a rest break or tell your employer you can't drive safely.
- Follow safe storage practices. Documents, bags, tools, and other equipment or materials should be stored properly and restrained in case of sudden braking or a collision. Make sure there's enough trunk space to hold your material. Install storage equipment inside the vehicle if necessary.
- Try not to drive in bad weather or at night. If you must do so, adjust your driving to account for the weather (fog, rain, snow, etc.) or darkness.
- Adjust the seats, steering wheel, mirrors, etc. so that they fit your size and your driving needs.
- Turn the engine off and make sure the vehicle can't move before you get in or out.
- If your work vehicle is equipped with an emergency kit, check it regularly and make sure you know how to use it.
- Do not use a cell phone or start doing work activities until you have turned off the engine and parked the vehicle in a safe place where it can't move, and until all workers are either at a safe distance from the vehicle or inside it.
- Let your employer know if the work you're doing or your schedule prevents you from obeying the speed limit or the hours of service regulations.

Demonstrate

Ask workers if they have any concerns about driving as part of their job. Ask if they have received training in defensive driving. Discuss what they learned in the course.

All workers should know how to drive defensively. If they have not been trained, register them for IHSA's *Defensive Driving* course.

*Statistics were provided by the WSIB.

Tire explosions (Pyrolysis)

When a rubber tire becomes overheated, a chemical reaction in the rubber called pyrolysis can occur. Pyrolysis causes the rubber to deteriorate. At a certain point, this deterioration can create a very rapid pressure increase inside the tire that can lead to a sudden and unexpected explosion.

Explain dangers

Pyrolysis can occur when heat is applied to a tire, such as when heating lug nuts using a blow torch. Other heat sources include

- overheated brakes
- aerosol tire inflators
- welding on or near the tire
- contact with electricity (e.g., from overhead powerlines or lightning).

Once this chemical reaction starts, it can continue on its own even after the heat source is removed. Pyrolysis can last seconds or hours. There are no visible signs when it's taking place until the explosion occurs.

Pyrolysis can occur in temperatures as low as 185°C and does not require oxygen. Nitrogen-filled tires are also at risk.

The pressure inside the tire can increase to over 7,000 kPa (1,000 psi) before an explosion occurs. Anyone standing near the explosion is at risk of serious injury or even death.

A tire can explode even if it's not sealed on the rim. During the final seconds of the reaction, there is a rapid burst of energy that can even re-seal loose tires.

Extra caution is needed when working around heavy-duty truck tires. The pressure can build up to higher levels than in tires for passenger vehicles, resulting in a larger explosion.

Identify controls

- Avoid using a heat source on tires if possible. If a heat source must be used, deflate and unseat the tire from the rim or prop the tire seating open with a metal object such as a tire iron before doing the repair. Once completed, let the tire cool to normal temperatures and inspect the tire internally for deterioration before reseating.
- If a tire has been heated and there is concern pyrolysis could be occurring, it's safer to assume it's actually happening and take precautions. Isolate the tire for 24 hours and keep people 200 metres (650 feet) away from the potential explosion area. After the 24-hour isolation period has ended, remove the tire from the rim and inspect it for deterioration or physical damage.
- If you suspect pyrolysis may have started in a vehicle from overheated brakes, fire, or electrical contact, isolate the vehicle from passersby and emergency personnel. If practical, drive the vehicle to a remote area of a parking lot.
- Use tire inflation safety cages where practical. Note that some safety cages will not protect you from smaller projectiles.
- Re-inflate heavy truck tires remotely using a clip-on air chuck. Keep at least 3 metres (10 ft) away, even if the tires are in safety cages.
- When inflating a tire, it is safer to face the tread than the rim.

Demonstrate

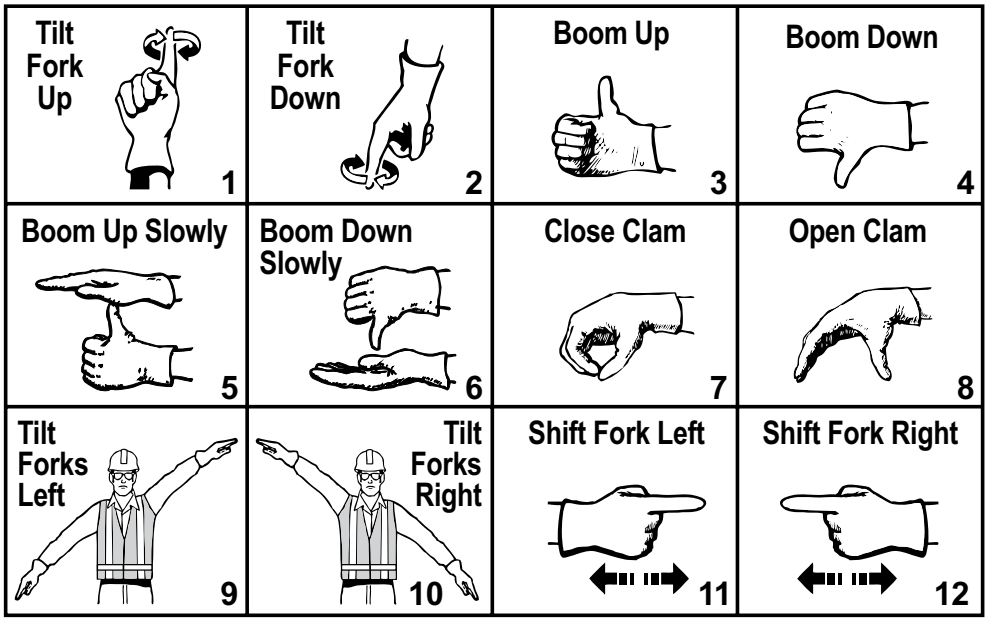
Ask workers if they have been in a situation where pyrolysis could have occurred. Identify any current work practices that could cause tire pyrolysis at your workplace and discuss ways to reduce this hazard.

Variable reach lift truck hand signals

Demonstrate

Demonstrate the hand signals below for variable reach lift trucks, which are also known as articulating or telescopic lift trucks, telehandlers, or zoom booms.

Ask your crew to practise them so that they become natural. Hand out IHSA's ***Variable Reach Lift Truck Hand Signals Card*** (V014).



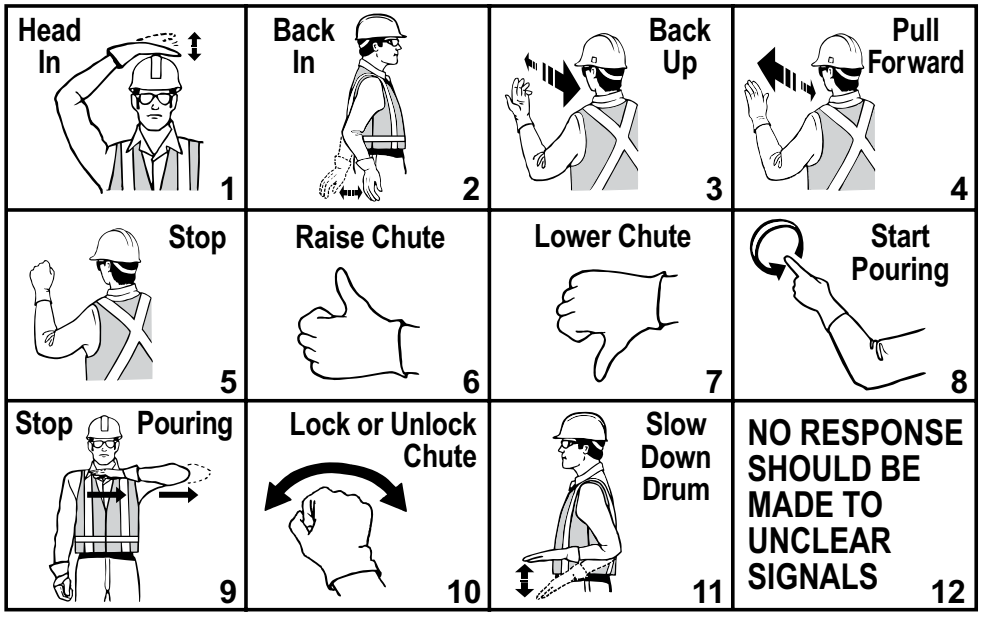
Ready-mix driver and concrete pumping hand signals

Demonstrate

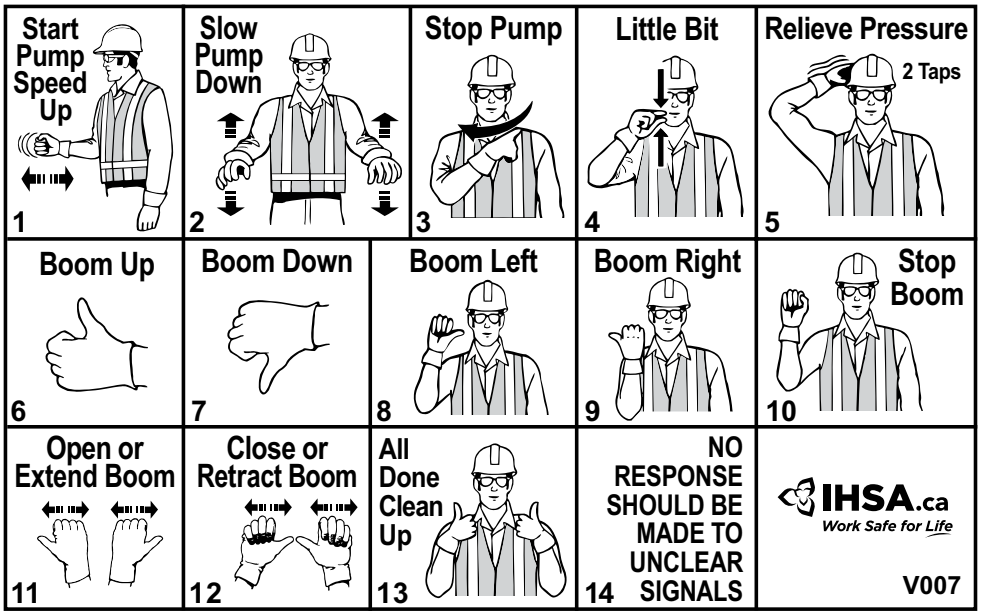
Demonstrate the hand signals below. Ask your crew to practise them so that they become natural.

Hand out IHSA's ***Ready-mix Driver and Concrete Pumping Hand Signals Card*** (V007).

READY-MIX DRIVER HAND SIGNALS



CONCRETE PUMPING HAND SIGNALS



Excavator hand signals

Demonstrate

Demonstrate the hand signals for excavating. Ask your crew to practise them so that they become natural.

Hand out IHSA's ***Excavator Hand Signals Card*** (V015).

No response should be made to unclear signals!

Trenching—Soil types

Explain dangers

An unstable trench can collapse, killing or injuring workers. Trench stability is affected by a number of factors such as weather, moisture, vibration, and previous excavation.

Time is also a critical factor. Some trenches will remain open for a long period, then suddenly collapse for no apparent reason.

Soil type is one of the most important factors affecting trench stability. In a single trench, soil properties can vary widely from top to bottom or along its length. Even hard soil may contain faults in seams or layers that make it unstable when excavated.

Identify controls

The foreperson or supervisor on a project must be knowledgeable about soil types and plan protection accordingly.

There are four general types of soil—from dry, dense, and hard (Type 1) to wet, muddy, and unable to support itself (Type 4).

TYPE 1

- Hard, very dense. You can only penetrate it with difficulty by using a small sharp object.
- Low natural moisture content, high degree of internal strength.
- No signs of water seepage.
- You need mechanical equipment to excavate it.

TYPE 2

- Very stiff, dense. You can penetrate it with moderate difficulty by using a small sharp object.
- Low to medium natural moisture content, medium degree of internal strength.
- Has a damp appearance after it's excavated.

TYPE 3

- Stiff to firm, compact to loose in consistency. May be previously excavated soil.
- Signs of surface cracking and water seepage.
- When dry, it may run easily into a well-defined conical pile.
- Low degree of internal strength.

TYPE 4

- Soft to very soft, very loose in consistency, very sensitive to vibration and motion.
- Any disturbance significantly reduces its natural strength.
- Runs easily or flows unless completely supported before excavation.
- Almost no internal strength.
- Wet or muddy.
- Exerts substantial fluid pressure on its supporting system.

Demonstrate

Demonstrate tests for different types of soil.

Examine soil samples on site.

Trenching—Protection

Explain dangers

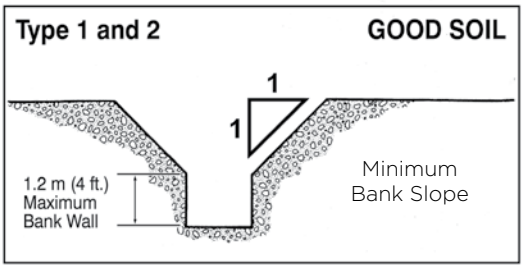
You risk injury or death if you enter a trench deeper than 4 feet (1.2 metres) that has not been sloped, shored, or protected by a trench box.

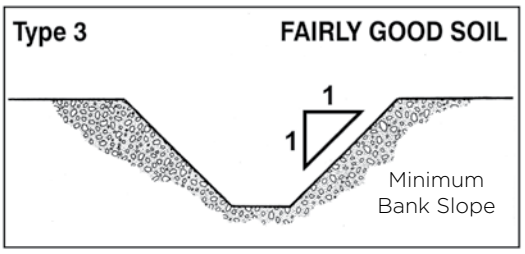
Identify controls

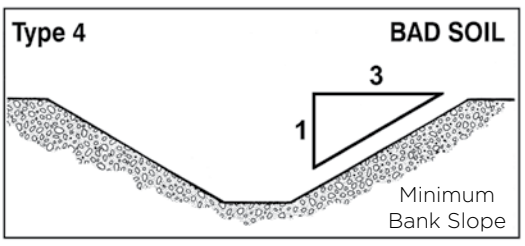
Sloping

Sloping the walls is one way to keep a trench from collapsing. The angle of the slope depends on soil conditions.

- Type 1 and 2 soils: Cut trench walls back at an angle of 1-to-1 or 45 degrees. That's one metre back for each metre up. Walls should be sloped starting at 1.2 metres or 4 feet up the wall.
- Type 3 soil: Cut walls back at an angle of 1-to-1, but from the bottom of the trench.
- Type 4 soil: Slope the walls at 1-to-3. That's 3 metres back for every 1 metre up from the trench bottom.







Shoring

Shoring is a system that supports walls to prevent soil movement. It also helps to support underground utilities, roadways, and foundations.

The two types of shoring used most commonly are timber and hydraulic. Both consist of posts, wales, struts, and sheathing. One major advantage of hydraulic shoring is that you don't have to enter the trench to install the system. Installation can be done from the top of the trench.

Whenever possible, shoring should be installed as excavation proceeds. If there's any delay between digging and shoring, no one should enter the unprotected trench.

Trench boxes

Trench boxes aren't meant to shore up or support trench walls. They're only meant to protect workers in case of a cave-in.

The space between the box and the trench wall should be backfilled. Otherwise a cave-in or collapse may cause the trench box to tilt or turn over. It's also easier to enter the box if soil comes right up next to it.

Trench boxes are commonly used in open areas away from utilities, roadways, and foundations. If you're in the trench, stay inside the box.

Ladders

Whether the trench is sloped, shored, or protected by a trench box, you need a way to climb in and out safely.

Trenches must have ladders in the areas protected by shoring or trench boxes. The ladder must be securely tied off at the top, extend above the shoring or box by at least 1 m (3 ft), and be inspected regularly for damage.

A ladder should be placed as close as possible to where you're working—and never more than 7.5 metres (25 feet) away.

Demonstrate

Review the protective systems used on site. Check condition of sloping, shoring, or trench box. Are ladders provided for getting in and out? Show participants the sloping diagrams.

Trenching—Inspection

List trench locations on site.

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Explain dangers

Without regular and frequent inspection, you have no assurance that your sloping, shoring, or trench boxes are effective in protecting workers from trench collapse.

Identify controls

Sloping, shoring, and trench boxes must be inspected regularly. Inspection is everyone's responsibility.

With hydraulic shoring, look for

- leaks in hoses and cylinders
- bent bases
- broken or cracked nipples
- cracked, split, or broken sheathing.

Report any of these conditions to your supervisor.

Check timber shoring before it's installed. Discard any damaged or defective lumber.

With timber shoring, check for

- cracked or bowed sheathing
- wales crushed where they join struts
- loose or missing cleats
- split or bowed wales
- struts off level.

If wales show signs of crushing, this indicates structural problems and the need for more struts.

Make sure that shoring members are the size required by regulation for the depth of your trench and the type of soil.

Always check areas near shoring where water may have seeped in. The combination of water and granular soil can lead to washout. This undermines the trench wall and has killed and injured workers several times in the past.

In trench boxes, look for

- damage and other defects
- deformed plates
- cracks in welds
- bent or distorted welds in sleeves and struts
- missing struts
- bent struts
- holes, bends, or other damage to plates.

During use, check the trench box regularly and often to make sure that it is not shifting or settling more on one side than the other. This can indicate movement of soil or water underneath. If the box is shifting or settling, get out and tell your supervisor about it.

Inspect the ground around trenches for tension cracks. These may develop parallel to the trench at a distance of about one-half to three-quarters of the trench depth. If you find cracks in the ground, alert the crew and double-check your shoring or trench box.

It's dangerous to overlook damage or defects in protective systems. Even if the job is short-term or almost finished, trenches can still cave in.

Demonstrate

Inspect sloping, shoring, and trench boxes on site. Check ground conditions nearby. Refer to the appropriate regulations.

Confined spaces—Definition

List confined spaces on site.

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Explain dangers

The hazards of working in confined spaces are often not recognized until it's too late. For example:

- Four workers died from hydrogen sulphide poisoning in a sewage holding tank.
- A worker was killed by carbon monoxide gas from a gasoline-powered pump used to drain a pit.
- A worker was caught in a mixing tank which was inadvertently started while he was inside.

Identify controls

In the Confined Spaces Regulation (O. Reg. 632/05), "confined space" means a fully or partially enclosed space,

- that is not both designed and constructed for continuous human occupancy, and
- in which atmospheric hazards may occur because of its construction, location, or contents, or because of work that is done in it.

In chemical and petrochemical plants, confined spaces include tanks, vessels, pipes, sumps, and pits.

Confined spaces in heavy industrial plants can be roasters, digesters, mixers, bins, and conveyors.

Sewage-handling and water-treatment plants include various kinds of confined spaces, from settling and holding tanks to maintenance holes and wells below floor level.

For utility workers, confined spaces include cable chambers, hydro vaults, sewer systems, water towers, excavations, trenches, and storage tanks.

In general construction, confined spaces include vaults, maintenance holes, tanks, and other spaces that meet the criteria of the definition.

Physical hazards such as live electrical conductors, operating equipment, stored energy, pressurized pipes, noise, and heat sources must be controlled in confined spaces through lockout and tagging.

You must also control other dangers, including those you may introduce into the space by the work being performed. Such hazards include hazardous dusts, chemical vapours, engine exhaust, and welding fumes.

Other spaces that don't fall under the definition of confined space but need to be assessed and controlled include

- trenches and excavations
- basements
- halls
- small rooms.

These spaces must be adequately ventilated to ensure hazardous materials and atmospheres are not present and do not accumulate from the work being performed. Workers have been overcome and killed by solvent and adhesive vapours in small, poorly ventilated rooms.

Demonstrate

Identify confined spaces on the project with the crew. Discuss potential dangers.

Confined spaces—Dangerous atmospheres

Explain dangers

Dangerous atmospheres have killed those working in confined spaces as well as those attempting rescue. Know the hazards.

Identify controls

Dangerous types of atmospheres are

- flammable and explosive
- toxic
- oxygen-deficient
- oxygen-enriched.

Flammable and explosive atmospheres include

- natural gas from leaking gas lines or natural sources
- methane from decaying sewage
- propane gas from leaking cylinders or equipment
- gasoline vapour from leaking tanks and spills
- vapour from solvents used for painting, cleaning, refinishing, etc.

Toxic atmospheres include

- vapour from solvents
- hydrogen sulfide from decaying sewage or raw petroleum
- carbon monoxide from engine exhaust.

Oxygen-deficient atmospheres contain less than 19.5% oxygen. Breathing oxygen-deficient air can make you lose judgment, coordination, and consciousness. In a confined space, oxygen can be displaced by other gases or used up by rusting metal, combustion, or bacteria digesting sewage.

Oxygen-enriched atmospheres contain more than 23% oxygen. They are rare and are usually caused by leaking oxygen hoses or cylinders.

Check for atmospheric hazards before entering any confined space. Use properly calibrated gas detection equipment. Many dangerous atmospheres cannot be detected by smell or taste.

Make sure the equipment is able to detect what you suspect. Some detectors have sensors that check for oxygen content, explosive gases or vapours, and a range of toxic gases. Some have only one or two sensors and may not detect certain types of hazards. You may need a selection of detectors—one detector can't test for everything.

Check all levels of the space. Some contaminants are lighter than air and accumulate near the top of the space. Others are heavier than air and settle at the bottom.

If you leave the space for a break or lunch, test before you go back in. Dangerous atmospheres can develop without warning.

If tests indicate a dangerous atmosphere, you must NOT enter the space until it is thoroughly ventilated and subsequent tests indicate the air is safe to breathe.

Ventilation and testing must be continued as long as you are in the space.

If the space can't be adequately ventilated, you can only enter if

- you wear suitable respiratory protection and a full-body harness attached to a rope anchored outside the space and held by a worker with an alarm
- you have a means of communication with the worker outside
- a person trained and equipped in artificial respiration and emergency rescue is available outside the space.

Never try to rescue a worker overcome in a confined space unless you are trained and equipped for it.

Many workers trying to save their buddies have become victims themselves. Get emergency help.

Demonstrate

Review the types of confined spaces and atmospheric hazards that your crew may encounter. Demonstrate how to use gas detection equipment.

Confined spaces—Physical hazards

List confined spaces on site.

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Explain dangers

In addition to dangerous atmospheres, confined spaces such as tanks, vats, vessels, hoppers, and bins can present physical hazards such as

- poor entry and exit
- cramped working conditions
- temperature extremes
- rotating or moving equipment
- reactive or corrosive residues
- electrical hazards
- uncontrolled movement of liquids or solids.

Some of these hazards involve greater risk inside a confined space than outside.

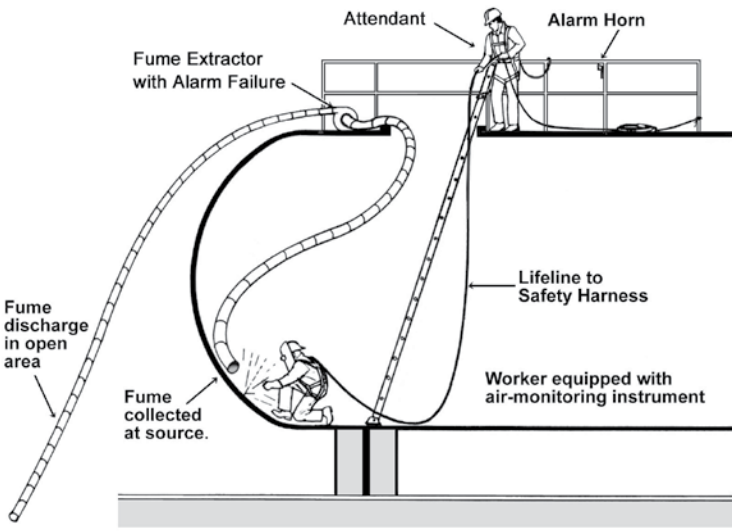
For example, electrical flashover can be more dangerous in a cramped maintenance hole where there's limited escape than in an electrical room with clear exits. And fire in a confined space can be far more dangerous than fire in an open work area.

Identify controls

- Isolate the space by disconnecting supply and drain lines. Lock out and tag the lines so they won't be reopened while you're working inside.
- Inspect the space for dangerous contents such as grain or sand that could slide, shift, and bury you inside.
- Lock out any electrical, hydraulic, or pneumatic equipment that could unexpectedly rotate, drop, roll, or snap shut in the space.
- Block and secure any equipment that could move because of gravity or stored momentum.
- Wear safety harnesses and lifelines to make rescue more efficient in case of an emergency.
- Develop a rescue plan for the space and practice to make sure that everyone knows what to do.
- Use an entry permit system. This helps identify hazards and controls, and keeps track of who is inside.

Demonstrate

Review procedures for lockout, tagging, and entry. Discuss some of the controls shown in the diagram.



Housekeeping

List housekeeping hazards on site.

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Explain dangers

Every year, poor housekeeping and storage cause many accidents and injuries.

We all know how fast rubbish accumulates on site—scrap lumber, broken bricks, pieces of drywall, strap-bands, and packaging.

How can you concentrate on your work when you're worried about slipping, falling, or tripping over garbage and debris?

Production and installation time go up while quality tails off.

Construction rubbish is often irregular in shape, hard to handle, and full of sharp objects.

One of the biggest problems is packaging. Too often it gets removed from material and left wherever it falls.

This creates tripping and slipping hazards. It also makes other hazards hard to see. Even worse, it invites more mess. When a site isn't cleaned up, no one cares about leaving garbage where it drops.

When that happens, you can't see faulty wiring, protruding nails, damaged flooring, and missing scaffold planks.

Mess also makes it difficult to use material-handling equipment. As a result, more material gets handled manually. This increases the risk of injury and damage.

Identify controls

Housekeeping means cleaning up scrap and debris, putting it in containers, and making sure the containers are emptied regularly. It also means proper storage of materials and equipment.

Effective housekeeping and storage prevents accidents and injuries.

- Clean up as work proceeds.
- Keep equipment and the areas around equipment free of scrap and debris.
- Keep stairways, ramps, and other travel areas clear.
- Secure loose or light material stored on roofs and open floors to keep it from blowing away in the wind.
- Never let material fall from any level of the project. Use an enclosed chute or lower the material in containers.
- Keep material at least 1.8 metres or 6 feet away from floor and roof openings, floor and roof edges, excavations, and trenches.
- Store material so that it won't roll or slide in the direction of the opening. Use blocking if necessary.
- Before handling used lumber, remove or bend over any protruding nails and chip away hardened concrete.
- Remove flammable rubbish and debris immediately from sources of ignition such as welding, flame cutting, and propane heating.

Demonstrate

Review housekeeping problems unique to your crew. Discuss housekeeping problems on other areas on site.

Hand tools—Pliers and wrenches

List tasks needing pliers and wrenches.

Explain dangers

Injuries with hand tools are not often serious, but they can be severe enough to send you to the hospital and make you lose time from work.

Common causes include using the wrong tool, using the right tool improperly, rushing, and lack of training or experience.

Identify controls

[Demonstrate these points as you talk.]

All tools

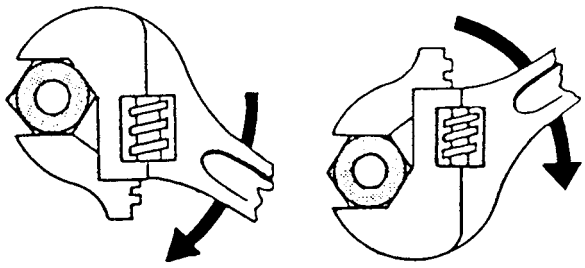
- Use tools for their intended purpose. Don't use pliers as wrenches. Don't use wrenches as hammers.
- Wherever possible, don't expose tools to extremes of heat and cold. Metal will lose its temper and get brittle.
- Don't extend the handles of tools with sleeves or cheater bars for more leverage and power.
- Don't confuse cushion grips with insulated handles. Cushion grips are for comfort only. Insulated handles are for electrical shock protection.
- Don't hammer on the handles of wrenches or pliers to gain more force. The tool could bend, break, or fly off and hit you or someone else.

Pliers

- Use pliers with enough space between the handles to keep palm and fingers from being pinched.
- Pull on pliers—don't push.
- Oil regularly. All it takes is a drop of oil on the hinge.
- Use pliers that are big enough to do the job with reasonable effort.
- Don't use pliers to turn nuts and bolts. The jaws can slip and damage corners and edges of nuts and bolt heads.

Wrenches

- Replace damaged wrenches. Straightening a bent wrench only weakens it.
- Pull on a wrench—don't push.
- Be prepared in case the wrench slips. Make sure your footing is solid, your stance is balanced, and your hands are clear.
- With adjustable wrenches, put pressure on the permanent jaw, not the movable jaw.
- Use the right wrench for the job. Don't use pipe wrenches on nuts or bolts. Don't use adjustable wrenches on pipe.
- On adjustable wrenches, inspect knurl, jaw, and pin for wear.



Demonstrate

Review types of pliers and wrenches used by your crew. Inspect a few for evidence of wear, damage, or misuse.

Hand tools—Screwdrivers

List tasks requiring screwdrivers.

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Explain dangers

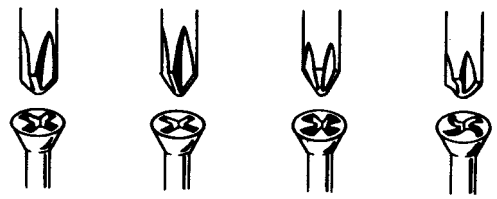
People use screwdrivers for chipping, chiselling, scraping, prying, digging, gouging, testing circuits, making holes, stirring paint, propping doors open, and taking the lids off cans.

Workers have suffered eye injuries from flying fragments of screwdrivers struck with a hammer.

Even then, the most common abuse of the screwdriver is using one that doesn't fit or match the screw. That means using a screwdriver too big or small for the screw or not matched to the screw head. The results are cuts and puncture wounds from slipping screwdrivers.

Identify controls

- Use the right screwdriver for the job. This means the right kind of tip—slot, Robertson, Phillips, whatever. It also means the right size. A screwdriver too big or small for the screw can only lead to trouble. You'll chew up the screw head, damage the screwdriver, gouge the material, or scrape your knuckles.



- Drill a pilot hole before driving a screw into wood.
- Make sure that the screwdriver handle is intact, free of splits or cracks, and clean of grease and oil.
- You should only need enough force to keep the screwdriver in contact with the screw. With a properly sized and drilled hole, the screw will draw itself into the material with minimum pressure and guidance.
- Don't hold the material in one hand and use the screwdriver with the other. The screwdriver can slip and cut your hand.
- Discard screwdrivers with chipped handles, bent shanks, and twisted or excessively rounded tips.
- Don't use bench grinders to restore tips. The excessive heat can destroy temper and reduce the hardness of shank and tip. Filing should be done by hand.
- Use screwdrivers with large handles for better grip.
- Don't use pliers on the handle of a screwdriver for more power. To remove stubborn screws, use a screwdriver with a square shank designed for use with a wrench.

Demonstrate

Review types of screwdrivers used by your crew. Inspect a few for evidence of wear, damage, or misuse.

Electric tools—Basic safety

List electrical hazards on site.

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Explain dangers

Using electricity on site can be hazardous, especially in these three areas:

1. Tools
2. Cords
3. Panels/generators.

Identify controls

The basic rule is simple: Consider all electrical wires and equipment live until they are tested and proven otherwise.

Tools

- Use only tools that are polarized or double-insulated.
- Make sure the casings of double-insulated tools are not cracked or broken.
- Always use a Type A ground fault circuit interrupter (GFCI) with portable electric tools operated outdoors or in damp or wet locations. GFCIs detect current leaking to ground from a tool or cord and shut off power before damage or injury can occur.
- Any shock or tingle, no matter how small, means that the tool or equipment needs to be checked.
- Take defective tools out of service.
- Before drilling, nailing, cutting, or sawing into walls, ceilings, and floors, check for electrical wires or equipment.

Cords

- Make sure that tool cords, extension cords, and plugs are in good condition.
- Use only 3-pronged extension cords.
- Make sure that extension cords are the right gauge for the job to prevent overheating, voltage drops, and tool burnout—12 gauge is ideal.
- Use cords fitted with dead-front plugs. These present less risk of shock and short-circuit than open-front plugs.
- Do not use cords that are defective or have been improperly repaired.
- Protect cords from traffic.

Panels/generators

- Temporary panel boards must be securely mounted in a lockable enclosure protected from weather and water. The boards must be accessible to workers and kept clear of obstructions.
- Receptacles must be GFCI-protected.
- Use only generators with neutral bonded to frame.

Demonstrate

With your crew,

- inspect sample tools and cords used on the job
- point out labels indicating double insulation
- show how a circuit tester and GFCI can be used to test cords, tools, and outlets.

Electric tools—Drills

Explain dangers

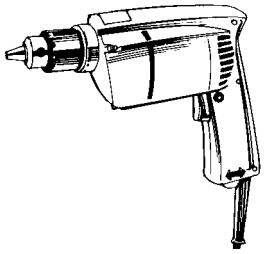
If you have to push a tool beyond its capacity, you can burn out the motor and injure yourself.

Leaning into a drill and pushing too hard is dangerous. If you lose balance or control, you can fall or strain your neck, arm, and shoulder muscles.

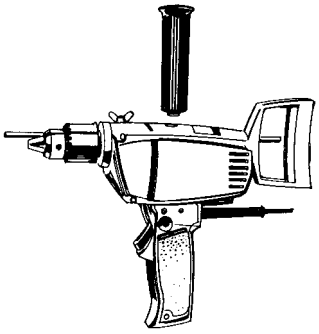
Identify controls

[Have sample drills available to demonstrate.]

You need a drill powerful enough for the job. And you need a bit that is both sharp and suited to the job.



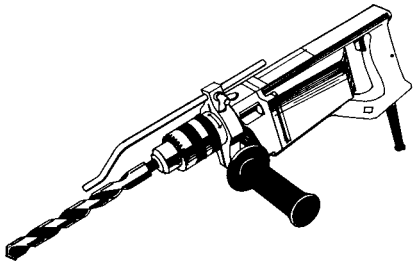
1/4-inch or 3/8-inch drills are ideal for light-duty tasks such as driving screws into wood or drilling small holes.



1/2-inch or 3/4-inch drills are heavy-duty and designed to be used with two hands. They have an auxiliary handle that you can screw into the top. This is what you want for drilling into concrete, steel, heavy timbers, etc.

A heavier drill is also useful for hole saw bits and spade bits where the blade of the bit is considerably wider than the shank. These attachments require the power and control you get with a two-handled drill.

An **impact or hammer drill** is what you need for work such as drilling large holes in concrete or rock with a carboloy bit.



Follow these safe work practices when using drills.

- Heavy-duty drills or hammer drills have a low rpm and high horsepower rating. Take a break when you have to, especially when you're up on a ladder or scaffold. You may even need help with some kinds of drilling.
- Check your balance and grip. Sudden torque can twist your arm and throw you off balance.
- When drilling deep holes, occasionally withdraw. This clears cuttings from the hole.
- When you're drilling on loose material, securing the work is half the battle.
- **HANDS OFF**. Don't hold the work in your hand, on your knee, or against your boot while you're drilling. Clamp small pieces in a vice.
- When you're drilling, don't push or lean too hard on the drill. You can damage the tool or the work, or be thrown off balance if the drill twists and grabs.
- Punching a layout hole or drilling a pilot hole can make your work more accurate, efficient, and safe.

Demonstrate

Review types of drilling done by your crew. Inspect sample drills and bits used on the job.

Electric tools—Sabre saws

List jobs requiring sabre saws.

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Explain dangers

[Have saws available to demonstrate.]

Sabre saws are used to cut holes in ceilings, floors, and walls and to make short, straight cuts. The sabre saw cuts on the upstroke only.

Don't use this saw for continuous or heavy cutting. Use a circular saw.

If you don't use a sabre saw correctly, it can kick back, injuring you and damaging materials. If you don't check out what's behind your work, you could also saw into wires, cables, or pipes.

Identify controls

There are some basic safeguards to follow when using a sabre saw.

- You need eye protection. You should wear safety glasses with side shields. Even better are goggles for dust or a face shield.
- You need two hands on the saw to maintain control, absorb vibration, and avoid accidental contact.
- Always make sure you know what's on the other side of the surface being cut. Beware of sawing into wires, cables, and pipes.
- Make sure that the saw will clear the bench, trestle, or other support.
- Clamping material is not only safe but also reduces vibration and makes cutting more accurate.
- Don't start cutting with the blade in contact with the work. Let the saw reach full power before it touches the work.
- Hold the base or shoe of the saw in firm contact with the work. This keeps the blade cutting straight up and down and prevents it from twisting or breaking.
- Keep your free hand away from the front of the saw.
- Never reach under, around, or behind the material being cut.
- Don't try to make inside or pocket cuts without first drilling a lead hole.
- When the motor is running, working a blade in or out of a cut or lead hole can cause kickback.
- Let the saw and the blade do most of the work. Don't force the saw. The machine should turn with ease. If you have to push the saw, the blade is too dull or the stock is too heavy for the saw.
- Never put the saw down until the blade and motor have stopped.

Demonstrate

Inspect sabre saws used on the job. Review situations in which the saws should or should not be used. Demonstrate external and inside cuts.

Electric tools—Circular saws

List jobs requiring circular saws.

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Explain dangers

[Have saws available to demonstrate.]

The circular saw is one of the most widely used portable power tools on construction sites. If not used correctly, it can cause serious injuries.

Kickback is the most common problem. It can happen to even the most careful users. You can minimize the chance of kickback by properly setting the blade depth, maintaining a sharp blade, standing in the right position, and ensuring that the material is held securely.

Identify controls

- Always wear the proper clothing and gear when operating the saw. This includes safety glasses, hearing protection, a dust mask, and appropriate footwear. Avoid wearing loose clothing and jewelry. If your hair is shoulder length or longer, tie it back so it doesn't get caught in the saw.

If you are cutting pressure-treated wood or cedar, we recommend that you use a NIOSH-approved N95 filtering face mask or a more protective respirator.

- Read all the safety materials included in the manufacturer's instructions before using your saw.
- Always unplug the saw when changing blades, cleaning the saw, or making adjustments.
- Never use the saw near water.
- Ensure the extension cord does not run across walkways where it can be a tripping hazard or get damaged.
- Ensure that the extension cord is in good condition, and that the plug has a ground pin.
- The blade should extend only 1/8 inch below the piece of material that you are cutting. The risk of kickback and injury increases as more blade is exposed below the material.
- Do not overextend your body when cutting. Position yourself so that you are in control of the saw and the material.
- Never use your knee or foot to support the material you're cutting.
- Never wedge, wire, or jam the guard to prevent it from working. This is a dangerous practice that could cause serious injury.
- Never fasten the trigger's safety lock in the "on" position. The purpose of this feature is to minimize accidental starts.
- Never pull the saw backward when cutting.
- Always use the proper blade for the type of material and the type of cut.
- Before setting the saw down, make sure the guard is in place. If you don't, the saw could run across your hand or foot.
- Never carry the saw by the cord or with your finger on the trigger.

Demonstrate

Inspect the saw. Identify all safety features and make sure they are working.

Demonstrate how to use the saw, as well as techniques for holding material, by making cuts in different positions and with different materials.

Nail guns

List jobs requiring nail guns.

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Explain dangers

There are two common types of nail guns used on construction sites: pneumatic (compressed air) and powder-actuated (explosive cartridge). They are both very powerful and very dangerous if not used properly.

Nail guns have the capacity to fire several nails per second. Puncture wounds are the most common type of injury, often caused because the bump or trigger safety was disabled.

While puncture wounds to the extremities such as hands and feet are the most common, puncture wounds to places like the head or neck can cause more severe injuries and result in death.

Identify controls

Nail gun safety can be increased if workers know the difference between a contact trigger and a sequential trigger.

Demonstrate with models you are currently using on site.

Contact triggers allow the gun to fire any time the trigger is held down and the nose is depressed against a surface.

Sequential triggers only fire when the nose is depressed against a surface before squeezing the trigger. To fire a second nail you must release and press the trigger and/or release and depress the nose.

Sequential-trip triggers are much safer than contact-trip triggers, which can fire accidentally if the nail gun recoils or the operator bumps against a surface or co-worker. Studies show that using sequential-trip triggers can cut injury rates in half without affecting productivity.

Nail guns speed up the work, but one careless motion is all it takes to lose an eye or put a nail through your hand.

The following are good work practices to help prevent injuries:

- Always wear the proper personal protective equipment—including eye protection—when you are using the nail gun.
- Always keep your hands and fingers off the trigger when you are not using the gun. Never carry the gun with your finger on the trigger.
- Before doing any sort of maintenance on your nail gun, whether reloading it or clearing a jam, disconnect it from its air source or remove the cartridge.
- Keep your hand and fingers well away from the nail's path. Use clamps if necessary.
- Never point the gun at another person or yourself.
- When you're not using the gun, engage the trigger safety device or disconnect the gun from its power source.
- Never modify safety features, such as tying or wiring the nose contact in the activated position.
- Never allow people who have not been trained to operate a nail gun.
- Always use the proper type of nails in the gun.
- Never overextend your reach when you are using the gun. Hold it firmly in your hand.
- Check the manufacturer's instructions.

Demonstrate

Inspect the nail gun to ensure that it is in proper working condition, and that all safety features are intact and working. Demonstrate proper work techniques.

Floor sealing

List hazards on site.

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Explain dangers

Workers have been killed and critically injured when they apply coatings to floors in basements and other enclosed areas. Hazards include flash fires, explosions, and asphyxiation.

Most coatings contain petroleum products that are extremely flammable. Applying these coatings with a spray or roller can create an explosive atmosphere.

Some coatings may contain isocyanates which can cause respiratory sensitization and asthma.

Many floor coatings, adhesives, and sealants are also toxic. They can cause asphyxiation. This means that your body can't get enough oxygen to survive. Asphyxiation can make you lose consciousness and die.

Two causes of asphyxiation are:

1. Oxygen in the air you breathe has been reduced by the products you're using.

2. The products have poisoned your blood so that it can't carry oxygen through your body.

Identify controls

WHMIS

The Workplace Hazardous Materials Information System (WHMIS) is your first line of defence.

Read the WHMIS label on the coating, sealant, or other products you're using. It will explain the steps you must follow to avoid trouble.

More information is available in the safety data sheet—the SDS—that comes along with floor-sealing products.

Fire

Because most of these products are flammable, make sure that any ignition sources in the work area are turned off.

Never smoke when applying floor coatings. Air contaminated by coatings can also be ignited by pilot lights on gas appliances or furnaces and sparks from electric switches.

Ventilation

When laying or finishing floors in residential basements:

- **Test**—make sure that the basement atmosphere is not toxic, oxygen-deficient, oxygen-enriched, or flammable. Testing should be done by someone competent to use appropriate testing equipment.
- **Ventilate**—open doors and windows and, if necessary, use fans to exhaust and clear the air.
- **Monitor**—Keep testing the atmosphere as long as people are working there.

Demonstrate

With your crew, review the information on the label and SDS for a coating or other product you typically use on the job.

Fire extinguishers

List fire extinguisher locations on site.

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Explain dangers

Fire is a threat on many worksites, especially where open flames, flammable products, and flammable materials are used.

Welding, flame cutting, and thermal roofing are obvious examples. But fire hazards are connected with many paints, solvents, and adhesives as well.

Identify controls

According to the construction regulations:

Every worker who may be required to use fire extinguishing equipment shall be trained in its use. (O.Reg. 213/91, s. 52(1.1))

Fire extinguishers on construction sites must be

- accessible
- inspected regularly
- promptly refilled after use.

Extinguishers should be located

- where flammable materials are stored, handled, or used
- where temporary oil-fired or gas-fired equipment is being used
- where welding or open-flame cutting is being done
- on each storey of an enclosed building being constructed or renovated
- in shops for at least every 300 square metres (approx. 3,000 square feet) of floor area.

Fire extinguishers are classified according to their capacity to fight specific kinds of fires.

Class A – for fires in ordinary combustible materials such as wood and paper where you need a quenching, cooling effect.

Class B – for flammable liquid and gas fires such as oil, gasoline, paint, and grease where you need oxygen exclusion or flame interruption.

Class C – for fires involving electrical wiring and equipment where you need a non-conductive extinguishing agent.

Class D – for fires in combustible metals such as sodium, magnesium, and potassium.

For most construction operations, a 4A40BC extinguisher will do the job.

Once you've discharged an extinguisher, report it immediately to your supervisor.

Extinguishers have a very short duration of discharge—usually less than 60 seconds. Within that limited duration, you've got to use the extinguisher effectively.

Demonstrate

On a 4A40BC extinguisher, explain the principal features—label, nozzle, gauge, pin, and handle.

Show how to hold the extinguisher properly.

The goal is to extinguish the flames at their source. Aim the nozzle at the base of the fire and direct the spray back and forth in a rapid sweeping motion until the fire is extinguished.

Heaters

List location of heaters on site.

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Explain dangers

Temporary heaters are dangerous if you don't control the risks of explosion, fire, carbon monoxide poisoning, and lack of fresh air.

Heater exhaust is a source of carbon monoxide (CO). Even in small doses, CO can kill you. It's a clear, colourless gas that you can't smell or taste.

The first signs of CO poisoning are headache and fatigue. More exposure can rapidly lead to loss of consciousness, arrested breathing, heart failure, and death. [See the safety talk on carbon monoxide.]

Identify controls

Temporary heaters can be fuelled by

- electricity
- liquids such as fuel oil or kerosene
- propane
- natural gas.

Choose an indirect-fired heater instead of a direct-fired heater when you want to heat an enclosed space. An indirect-fired heater vents combustion by-products outdoors while ducting heated air indoors. A direct-fired heater (such as an open-flame or closed-flame heater) releases combustion by-products into the heated area.

Electric

Electric heaters are not as common as fuel- or gas-fired heaters. They're used where heated air must be free of combustion by-products such as CO and carbon dioxide (CO^2). An electric heater is useful when working in a closed space with limited fresh air.

Liquid fuel

Liquid fuels such as oil and kerosene provide an economical source of heat. But you need a large storage tank on site for a constant supply of fuel.

Some liquid-fuelled heaters release exhaust fumes with an oily smell. This can be unpleasant for workers. A solution is to vent the combustion by-products outdoors. This is sometimes done to heat the air over new concrete in winter.

Propane or natural gas

Propane or natural gas heaters provide an economical supply of heat. The equipment is lightweight and easy to move around on site.

Both gases are highly flammable and explosive. You need to take precautions when storing, handling, or using these gases. [See the safety talk on propane.]

Safety tips for heaters

- Only workers holding a certificate may operate a propane, gas, or oil heater. However, anyone can operate an electric heater.
- Do not block openings for ventilation.
- The cylinder connected to a heater must be at least 10 feet away.
- Keep the flame end of the heater pointed away from the cylinder and away from flammable materials. The heat from a burner can ignite materials well past the burner's end.
- Make sure the heater has a supply of fresh air to operate safely and efficiently, and to prevent buildup of CO.
- Test heated areas for the presence of CO.
- Place the heater on a firm, level surface to prevent tip over.

Demonstrate

Inspect heaters being used on site.

Compressed gas cylinders

List where cylinders are used and stored.

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Explain dangers

[Present talk near fuel gas cylinders.]

Compressed gas cylinders can take off and explode like rockets. But fire and explosion aren't the only hazards.

Leaking gas can make you dizzy or unconscious. Cylinders are also heavy and awkward to handle.

But our work would be difficult without compressed gas. So we have to know how to transport, store, and use the cylinders safely.

Identify controls

This is the WHMIS hazard symbol for compressed gas. [Show image at right.]

Cylinders are also labelled with their contents and handling instructions.

Read the WHMIS label for each of the different cylinders you use. Don't accept or use any cylinder that's not properly labelled.

Tips to handle cylinders safely:

- Secure cylinders in use with rope, wire, or chain to keep them upright.
- Remove gauges and other attachments before moving cylinders.
- Keep cylinders upright when you transport, store, or use them.
- Never drop cylinders or let them bang into each other.
- Move cylinders using a hand truck or dolly. Never roll cylinders like logs or hoist them by their collars.
- Use a hoisting cradle to lift and lower cylinders from level to level. Never use a magnet or sling for hoisting.
- Never transport cylinders in the trunk of a car or in a closed van. Escaping gas can collect in these confined spaces and create the risk of explosion or asphyxiation.
- Keep valves closed and cylinders capped when not in use.
- Store cylinders in a secure area, preferably outdoors, away from heat, ignition sources, and flammable materials such as wood or fuel.
- Don't store cylinders in an area where they could be knocked over by moving equipment, struck by falling objects, or damaged. Keep them away from areas such as elevators, traffic routes, and exit routes.
- Never store cylinders in enclosed, unvented places such as trailers.
- Chalk "MT" on empty cylinders to be returned to the supplier. Close valves and replace protective caps.
- Don't store cylinders of different gases in the same area. Keep them separate .

Demonstrate

Review labels. Check cylinders on site. Are they properly used and stored?

Inspect a sample cylinder and valve system for damage, leaks, and wear.

Inspect for leaks using soapy water or a leak detector.

Propane

List propane uses and locations on site.

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Explain dangers

Explosion and asphyxiation are the main risks with propane. Asphyxiation means loss of consciousness and suffocation.

Propane gas by itself is odourless. But suppliers add a strong-smelling chemical to the gas so that you can smell leaks. The smell is like rotten cabbage.

Propane gas is heavier than air. If it leaks from equipment or cylinders, it can accumulate in low-lying areas such as basements, pits, and trenches.

If enough propane gas collects in a low-lying area, it displaces air. If you enter that area you may be overcome and lose consciousness.

Propane will explode if ignited. Simply turning on a light switch or an electric drill can ignite propane concentrations in a basement or trench.

Propane-fired equipment releases carbon monoxide (CO). Even in small doses, CO can kill you. It's a clear, colourless gas that you can't smell or taste. The first signs of CO poisoning are headache and fatigue. [See the safety talk on carbon monoxide.]

Identify controls

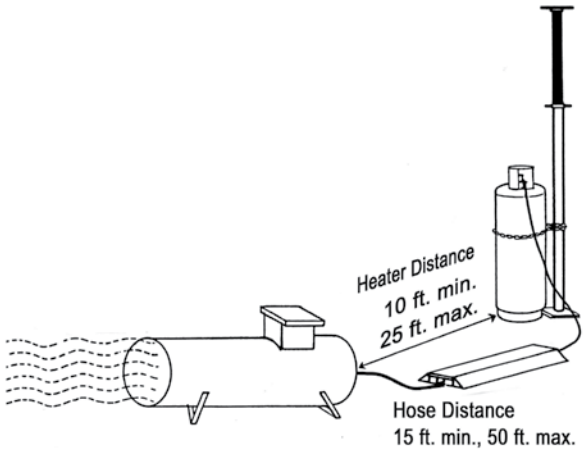
- Don't store propane cylinders inside.
- Always use a certified ROT holder to connect, disconnect, and operate propane cylinders.
- Always have a fire extinguisher nearby.
- Don't tamper with controls or safety devices.

If propane equipment such as a torch or heater goes out in a confined or low-lying space, act quickly.

- Shut off the gas and leave the area.
- Don't go back to re-light the equipment.
- Don't enter the area. Inform your supervisor.

The best way to prevent leaks is to handle propane cylinders and equipment properly. [See safety talk on compressed gas cylinders.]

- Whether you're transporting, using, or storing cylinders, make sure the relief valve is in contact with the vapour space in the cylinder.
- Keep propane cylinders at least 10 feet away from the heaters they are connected to.



Heater and Hose Distance from Propane Tank

Secure the cylinder and keep it at least 10 feet away from the heater. Hose length must be between 15 and 50 feet.

- Don't let propane saturate your clothing. It may not feel or smell unusual, but clothing remains highly flammable for some time after exposure. Saturated clothing should be aired outside.
- Never expose any part of your skin to liquid propane. Propane under pressure is extremely cold and can cause frostbite or cryo-burns.

Demonstrate

Review arrangements for storing, handling, and using propane on site.

Dry-ice blasting

During dry-ice blasting, the carbon dioxide levels can be three to four times higher than reasonable limits. Normal air contains about 21.8% oxygen, but during dry-ice blasting, the oxygen level can drop to 20.3%. Noise levels can also be very high at 800 times greater than the allowable limit of 85 decibels (dBA). At this level, workers can be overexposed to noise in as little as 30 seconds.

Explain dangers

Dry ice is used to remove mould contamination from surfaces. When the rice-sized pellets are blasted against a surface, they disintegrate and change to carbon dioxide gas. The mould, along with other debris, becomes airborne and later falls to the ground. During this process, workers must be aware of certain hazards.

- Mould exposure can cause health effects such as eye, nose, and throat irritation similar to asthma-like reactions or infections.
- High levels of carbon dioxide can cause a sense of heaviness in your chest. At high levels, it can also displace oxygen from the work area and cause you to lose consciousness.
- High noise levels can cause hearing loss.
- Wood dust can irritate the eyes, nose, and throat.
- Dry ice pellets can cause frostbite.

Identify controls

Following some simple steps can help reduce your risk of injury or illness when dry-ice blasting.

- Always wear the correct type of respiratory protection. A supplied-air respirator is the only device suitable to protect you against mould, high levels of carbon dioxide, and oxygen deficiency.
- Ventilate the work space using mechanical ventilation.
- The temperature of dry ice is about -70°C. Always wear your gloves and ensure that they are in good condition to prevent contact with skin.
- Noise levels from blasting are extremely high. You must use earplugs and earmuffs together at the same time.
- Carbon dioxide and oxygen levels in the air should be monitored continuously. If carbon dioxide levels become too high or oxygen levels become too low, follow the procedures outlined by your supervisor.
- If the work area is enclosed, keep flaps to the enclosed workspace closed as much as possible. Report any defects or holes on the flaps immediately.
- Post warning signs around entrances to the enclosure to prevent unauthorized entry.
- Full-body disposable coveralls and boot covers are recommended to reduce exposure to dust.
- If a decontamination facility is used, follow the entry/exit procedures.
- Use a HEPA vacuum or damp cloth to remove visible contaminants from your person before leaving the work area.
- Contaminated materials should be disposed of in 6-ml bags and sealed. The disposal bag should then be wiped down and placed into a second bag.

Demonstrate

Have every member of the crew inspect their respiratory protection devices for damaged facepieces, straps, valves, etc. Hoses and regulators should also be checked.

Consult the manufacturer's recommendations for appropriate inspection and maintenance procedures.

Demonstrate the proper selection and use of hearing protection according to the manufacturer's instructions.

Falling-object hazards

Over a five-year period, there was an average of 2,000 lost-time injuries caused by falling objects in the sectors served by IHSA.

Explain dangers

The most common injuries workers suffer from falling objects are bruises, fractures, strains, and sprains. The objects that commonly fall range from large items such as roof trusses and steel beams to small items such as fasteners and small hand tools.

Identify controls

There are two types of controls you can use to prevent falling objects from hurting workers:

1) **Physical controls** physically stop the object from falling (or from falling very far).
2) **Procedural controls** refer to changing the way you work so that objects can't fall.

Physical Controls

Guardrails
Toeboards must be installed on all guardrails. They stop objects from falling down to the level below. Toeboards must be a minimum of 3.5" high and installed flush with the surface.

If you pile material higher than 3.5" high, put plywood panels or screening on the guardrails. This will prevent materials from falling down to the level below and stop small objects from falling through the openings between rails.

Open grating covers
If you are performing work on open grating, place non-slip plywood or a similar product on top of the grating to prevent small objects from falling through it.

Barricades and overhead protective structures
Use barricades to block off exclusion zones—areas where workers are not allowed—below the work area. Combine barricades with signs that indicate it is an exclusion zone and entry is prohibited. This includes hoisting areas.

When barricades are not practical, use overhead protective structures. For minimum design requirements, refer to section 64 (3) in the construction regulations.

Tool lanyards and tethers
These attach tools directly to the worker's harness or tool belt. If used properly, they will prevent tools from dropping to a lower level.

Carts with sides
When moving equipment, tools, or material, always use a cart that is an appropriate size for what you are moving and make sure the cart has sides. If you need to extend something over the sides of the cart, you must secure the item and the cart must be stable.

Procedural Controls

Securing loads
When lifting, make sure the load is balanced and secured. Check for small or loose pieces before you lift. Otherwise, a shift in the load or the wind could cause objects to fall. Before placing a load on a scaffold or a platform, make sure the work area has properly built guardrails.

Good hoisting practices
Never lift, lower, or swing a load over someone's head. Use barricades to block off areas where loads are being lifted or lowered. If the operator's view is impeded in any way, use a signaller to assist the operator. Always use proper rigging procedures and ensure the rigging equipment is in good condition.

Good housekeeping
Keep tools and other materials away from edges, railings, and other elevated surfaces. Always stack materials on flat surfaces and secure them, if necessary, to avoid movement. When working, be aware of your surroundings and watch that you don't inadvertently knock or hit something off the level you are work on down to the level below.

Proper material stacking
To prevent tipping, store materials and equipment at least six feet away from an edge. If you are working near openings, arrange materials so that they can't roll or slide in the direction of the opening and use opening covers. Always secure material to prevent movement from the wind. When you remove something from a secured pile, don't forget to re-secure the material.

Demonstrate

Perform a site inspection to identify falling-object hazards.

Formwork—Placing concrete

Explain dangers

When it comes to placing concrete, the most important consideration is to ensure that formwork and falsework are complete. Some of the major hazards associated with placing concrete include

- **Overloading formwork and falsework**, especially if concrete piles up in one location or is poured too fast
- **Working at dangerous heights** near perimeters of decks, stairs, and shaft openings, or accessing platforms on wall and column forms
- **Electrocution and shock** if power tools, extension cords, and other electrical equipment are used near wet concrete or other wet areas. Concrete buckets and concrete pumps can also make contact with overhead powerlines.
- **Overhead powerlines, being struck by equipment, and pinch points** when receiving concrete pumps or buckets
- **Skin burns, severe allergic reactions, and dryness** if skin is exposed to wet concrete, if clothing becomes soaked, or if concrete enters your boots
- **Slips and trips** due to poor housekeeping
- **Cuts and impalement** when rebar is not properly protected with caps.

Identify controls

- Ensure guardrails are in place around perimeters, stairs and shafts, and work platforms on walls and column forms.
- Ensure that formwork is inspected by a professional engineer or by a competent worker designated by the professional engineer before the placement of concrete.
- Ensure that all rebar not part of the pour is properly capped to avoid cuts, abrasions, and impalement.
- Inspect the forms before the pour to ensure they are free of debris.
- Ensure the area around the pour is clean to avoid slips and trips.

- Before pouring, have extra shores and other materials readily available in case of an emergency.
- Always follow the specified pour rate, techniques, and procedures.
- Monitor the condition of forms before pouring and as concrete is placed. Bulging, slipping, uplifting, sagging, etc., are signs that the pour should be stopped immediately.
- If using a scaffold to access the top of a form, ensure it has been properly inspected by a designated competent worker or engineer.
- Always use 3-point contact to climb the scaffold ladder.
- If guardrails are missing from the scaffold, you must use a travel restraint system.
- Power supplies and extension cords should not be used unless they are equipped with ground fault circuit interrupters (GFCIs).
- Tape the top of your boots to your pants to prevent wet concrete from getting in.
- If your clothing becomes soaked, change clothes and clean your skin immediately.
- Workers not involved in the pour should be kept away from the area.

Demonstrate

If the situation allows, take the crew to an area where forms are being installed to observe the process. Identify GFCI-equipped circuits.

Formwork—Stripping forms

These are some injuries that workers have experienced while stripping formwork.

1. A worker was stripping and moving forms when he strained the tendon in his left forearm.
2. A worker was stripping when he fell six feet from a scaffold platform. He severely injured his leg.
3. A worker was stripping when a piece of plywood fell and struck his hard hat, twisting his head.

Explain dangers

Formwork stripping is one of the most hazardous operations in concrete construction.

Hazards can include the following.

- Panels and other materials could fall and strike workers during stripping.
- Stacked materials could fall and strike workers.
- Workers could fall when formwork breaks free or if forms are being stripped at dangerous heights.
- Materials could fall to lower levels and injure workers or pedestrians.
- Workers can injure their joints, muscles, and bones from reaching, prying, pulling, pushing, lifting, and carrying heavy forms, panels, and other components.
- Workers could be struck by loose concrete, rubble, debris, or over-pour left on columns, walls, and other structures. These hazards could also result in eye injuries.
- Sharp edges on formwork, protruding nails, snap ties, conduit, and bolts can cause pinches, cuts, scrapes, abrasions, and other injuries.
- Poor housekeeping can cause slips and trips.
- Protruding rebar can cause cuts, abrasions, and impalement.

Identify controls

- Maintain signs and barriers to prohibit unauthorized entry into the stripping area.
- Ensure that all exposed rebar is properly capped to avoid cuts, abrasions, and impalement.
- If guardrails must be removed, make sure everyone working in the area uses a fall protection system. Don't take shortcuts.
- Only strip what you can clean up during the same work shift.
- Ensure bracing is sufficient before breaking formwork from concrete.
- Never climb partially stripped formwork to reach high areas. Use appropriate work platforms.
- Make sure that work platforms are fully planked and have proper guardrails—including toe boards—for work over 2.4 metres. Planks for work platforms less than 2.4 metres high must be at least 460 millimeters wide.
- Never lean material against the wall. Place it neatly on the ground in a stable position.
- Never throw stripped material to the ground from a work platform. Always lower it by passing it to a co-worker or by another controlled method.
- Ensure the stripping area is clean to avoid slips and trips.
- Inspect columns, walls, and other structures and remove any loose concrete or debris.
- When stripping, always wear gloves and safety eyewear to protect against cuts, pinches, scrapes, and injuries from debris.
- Never alter tools.
- Use carts or cradles to move material.
- Never strip forms unless you have verified that the concrete strength is sufficient.

Demonstrate

If the situation allows, take the crew to an area where stripping will be done. Highlight some of the main hazards and identify the various controls that will be used, including required signs and barriers, methods for lowering material, and proper stacking and storage of stripped material.

Flying forms—Struck-by hazards

Explain dangers

Flying forms are popular because they can save time and, in some cases, are safer than using built-in-place methods.

Although there are some advantages to using flying forms, there are also some disadvantages. Flying forms have some significant hazards associated with them that can lead to serious injury if proper precautions aren't taken.

Being hit or struck by falling material or moving forms is one of the main hazards associated with flying forms. These types of struck-by hazards can cause serious injuries.

Flying forms are very heavy moving objects. If one hits you, it can cause cuts, broken bones, contusions, or amputations.

Here are some scenarios that can lead to a form, or something on the form, hitting a worker.

- A worker is positioned between an incoming form and a column or wall.
- The form is improperly or inadequately braced or supported.
- A form that is not properly secured can roll off the edge and strike workers below.
- Loose material or equipment on a flying form can fall and strike workers below.

Identify controls

Here are some simple steps you can take to reduce struck-by injuries when working with flying forms.

- Put danger signs and barriers in place before moving any forms so that all workers are aware of what is happening. Dangerous areas include the work area below the flying form, the floor area from where the form is pushed out, and the top floor area where the form will be received.

- Make sure all flying forms are free of loose material.
- Replace guardrails and shoring immediately after the flying form is flown out.
- Ensure that each guardrail has a toeboard, in addition to the other required components, to prevent material from falling off the work surface.
- During the stripping process, if the flying form has been lowered and left on rollers, make sure it is secured to the structure to prevent it from rolling off.
- Remind your workers to be aware of their surroundings and never place themselves between the formwork and column or wall.
- Ensure that the area is free of debris so you and your workers don't slip and fall.

Demonstrate

If the situation allows, take the crew to an area where flying forms are being placed so everyone can observe the process.

Show them the components of a guardrail system, focusing on the toeboard and its purpose.

Slips and falls—Unloading structural steel

Explain dangers

Unloading structural steel can be dangerous if not done properly. Slips and falls are common causes of injury. The risk is greater under the following conditions.

- There are no access points or the access points are in poor condition.
- It is wet or slippery outside due to snow, ice, or rain.
- The loads are unstable.
- You are working at heights.

NOTE: Most loads do not exceed three metres in height. But if they do, fall protection must be used as per the construction regulations.

Identify controls

When climbing on or off a flatbed trailer:

- Remove any mud, snow, ice, grease, or any other substance from your boots.
- Make sure the flatbed's running board, tread, step, foothold, and platform are clean.
- Always face the flatbed and maintain 3-point contact.
- Don't climb down with anything in your free hand. Put it on the vehicle floor and reach for it when you get to the ground.
- Place the arc or middle of your foot onto the step or foothold with your heel just behind.
- Ensure that you have a solid grip on the handles before stepping up.
- Always be aware of your surroundings.
- Use an appropriate access ladder—some ladders are designed with hooks that attach to the sides of a flatbed.

If the load requires workers to be more than three metres from the ground, they must use fall protection. If possible, use a passive fall protection method rather than an active one such as fall arrest.

Fall arrest systems require workers to be anchored overhead, which can create other hazards such as lack of mobility. The load could shift and contact the fall arrest system, leaving the worker stuck. The rigged load or the crane could also contact the fall arrest system.

To control fall hazards using passive fall protection:

1. **Decrease the fall distances and allow for easier access.** Build two access scaffolds in the unloading area, leaving just enough room for the truck to pull through with the flatbed positioned between the scaffolding. Workers can access the load without active fall protection being anchored overhead. You can also use two stationary flatbeds instead of scaffolds. Make sure the gap between the platforms and the trailer doesn't become a tripping hazard.
2. **Ask the fabricator or supplier to place the steel on a lifting rack.** Workers can use a crane to unload the steel with the lifting points on the rack rather than climbing onto the flatbed. Ensure the crane is capable of hoisting the entire load. Spreader beams may be required to prevent damaging the rack.
3. **Create bundles from both sides of the trailer.** Position workers on ladders or access platforms on either side of the load and feed slings from one side to the other, creating a basket or bundle. With the shipping chains in place, use a crane to add tension to the slings. Do not hoist the load. Only put tension on the slings. If a competent worker determines that the load is stable, remove the shipping chains and perform the lift. If not stable, put the shipping chains back on the load under the bundle and repeat the steps.

Demonstrate

For each of these procedures, place marker flags at the three-metre point in the unloading area as an indicator for workers. Remind workers that if they feel unloading the trailer is too dangerous, they have the right to refuse the work.

Working around conveyors and stackers

After only his fourth day on the job, a groundsperson working at a gravel pit was killed when he became caught between the tail pulley of the conveyor system and the frame of the cone crusher. Although an access guard door was in place to protect contact with pulleys, a space was excavated under this guard door so workers could crawl beneath it. It was routine for workers to adjust the belt's position while the system was running—even though the manufacturer's instructions required that the system be shut down before it was worked on.

Explain dangers

Many pits and quarries have installed some type of conveyor system. A conveyor system can carry a lot of material and requires a lot of energy to do this. If this energy is directed incorrectly, it could seriously injure workers.

Most serious injuries involving conveyor systems occur during cleaning or maintenance of the conveyor when guards, pull cords, emergency stops, or interlocking systems are bypassed.

Injuries that could result from working around conveyor systems include

- Crushing
- Pinching
- Entanglement
- Friction burns
- Shearing or cutting
- Being dragged into the conveyor
- Being struck by falling or moving material.

You need to be aware of hazardous areas around a conveyor that could cause injury. They include

- Rotating drums
- Any place where idlers and conveyor skirt meets
- Belt drive
- The skirt or scraper
- Belt take-up or tensioning devices
- Exposed drive shafts
- Moving loads.

Identify controls

Conveyors are the most common cause of serious injuries and safety violations in the aggregates industry. Following these steps can prevent injury.

- Always follow company rules when working around conveyors. Ensure you are familiar with section 196 of Regulation 854: Mines and Mining Plants.
- Never bypass guards or skip lockout procedures. Always follow the lockout procedures when materials jam or cause blockage, or when doing repairs or maintenance on the belt.
- Never use a tool to dislodge materials from an energized conveyor.
- Follow the company's safe procedures when lubricating conveyors and dressing belts.
- Never remove or alter emergency stops, interlocks, or guards. It is against the law.
- In an emergency, use the pull cord or e-stop to shut down the conveyor. Do not use pull cords or e-stops for normal shutdowns.
- Keep the areas around the conveyor systems tidy. Tools, rocks, and rubbish can cause trips, fires, or conveyor damage.
- Never climb, ride, or step over operating conveyors. Use protected passageways and designated travel ways.
- Avoid wearing loose-fitting clothing and tie back long hair to prevent entanglement.
- Ensure you are familiar with the sound of the start-up alarm.
- Always obey signs.

Demonstrate

Show workers where they can find more information about the company's rules for working around conveyors.

Show the workers where emergency stop mechanisms are located along the conveyor.

Working on stockpiles

A worker was breaking down frozen gravel on the surface of a stockpile with an excavator. A large amount of gravel suddenly broke free and hit the side of the excavator's boom and cab, injuring the worker's foot. The company was fined $65,000 for failing to remove frozen material from the stockpile.

Every year, workers are injured or killed when working on or around stockpiles of earth, clay, sand, or gravel. Often the victim is the driver of a haul truck, loader, or bulldozer, but occasionally it can be a pedestrian or the driver of a highway truck, utility truck, or scraper.

Explain dangers

- When material is being removed from a stockpile, the slope could collapse or large frozen chunks of material could fall off and severely injure the operators.
- When work is being done at the top of a stockpile, the equipment can weaken the crest of the pile. Drivers have died when their equipment tipped over and rolled down the slope.
- Equipment operating at the top of the stockpile could drive over the edge or through a berm.
- Pedestrians at the bottom of the slope could also be seriously injured by falling material.
- The stability of the slope can quickly change with fluctuations in the weather (changes in moisture, freezing and thawing, etc.).

Identify controls

Consider some of these simple safety tips.

Before starting work

- Use the site plan to remind yourself of the location of structures, stockpiles, and roadways.
- Never exceed the maximum height of any stockpile. Maximum height must be determine by an engineer.

When loading

- Never enter an active loading area.
- Never leave the cab of your vehicle while loading is in progress.
- For a linear stockpile, excavation must proceed along the working face. For a conical stockpile, it must proceed around the toe.
- If you are removing earth, clay, sand, or gravel with powered equipment, the working face should be sloped at the angle of repose, or the vertical height of the working face should not be more than 1.5 metres (5 feet) above the maximum reach of the equipment.
- If the stockpile is too high, some of the material should be bumped over the crest by means of a bulldozer or long-arm backhoe and buffer material. The area below should be cleared.
- Never undercut the working face or leave a hollow in it.

When operating on top of a stockpile

- Use a bulldozer or loader, together with buffer material, to push the material over the crest of the pile.
- Always keep an eye out for cracks, slumping on the slope, or bulging at the toe. These are signs that the slope may be unstable. If you see any of them, warn other workers immediately.
- Barriers and berms must never be moved or altered.
- When using a loader or bulldozer, always approach the crest at a right angle (90°) to the edge to keep the weight of the equipment away from the edge.

Demonstrate

Review the site plan and point out any stockpiles. Ask what the maximum height is for each stockpile. Ask loader operators to explain how they will excavate material from each stockpile.

Skid steers

Skid steers are incredibly versatile and highly manoeuvrable, but they can also be very dangerous. Proper precautions must be taken to prevent a serious injury or a fatality.

Explain dangers

Skid steer operators need to be aware of the hazards that they face and the hazards that they can cause for workers around them.

- Falls and rollovers (from instability and overloading)
- Striking workers and pedestrians
- Striking hidden obstacles
- Being struck by loader arms and attachments
- Being struck by falling materials
- Slips and trips
- Working around leading edges
- Exposure to fumes, noise, and vibration

Identify controls

Know your machine

- Get the proper training and review the user manual before operating a skid steer.
- Perform regular safety checks and document your findings.
- Check all high-pressure hydraulics for leaks.
- Find the rated operation capacity (ROC) for the machine and never exceed it. Overloading can make a skid steer excessively front-heavy. This can cause instability and reduce handling response.
- Never remove the rollover protective structure (ROPS) from a skid steer and keep side screens in place. People have been crushed to death when they were caught between the loader arms and the skid steer frame on unscreened machines.
- Always use the seat belt and/or the seat bar.
- When getting out of the machine, always turn it off first and lower the bucket or attachment.
- Always turn your machine off before changing attachments.
- Make sure any attachments you use are rated for your machine. Remember that an attachment will reduce your load capacity.

Know your surroundings

- Use barriers or another method to cordon off your work area. That way, you can concentrate on your work without having to worry about other people in the vicinity.
- If you have to work near other people, make sure you know where the blind spots are on a skid steer. Make eye contact with anyone entering the area you're working in, and turn off the machine if you need to have a conversation.
- Never lift, swing, or otherwise move a load over anyone.
- Watch out for uneven floors or for objects buried in the ground. If the machine hits them, it may stop suddenly.
- If working on an elevated floor, make sure the floor can support the weight of the machine.
- If working on an elevated slab, make sure bumpers or barriers are installed in front of all openings.
- If working near a trench, always stay a safe distance from the edge.

Know the safe operating procedures

- Adjust your speed to suit the working conditions and terrain. Avoid sudden stops, starts, and turns.
- Try to go around obstacles, rather than over or through them.
- Keep the bucket as low as possible when travelling or turning. A skid steer becomes less stable the higher the loader arms are raised.
- Never use a skid steer as a work platform or for carrying workers—it's against the law.
- Never try to operate the steering levers or any other hydraulic controls while standing outside the cab. Because of the hydrostatic drive, the skid steer will respond instantly when the levers are engaged.
- Make sure that the attachment locking devices are engaged, even if you are switching attachments for only a few minutes. If an attachment is not locked, it could break free and roll back down the loader arms.
- Use hearing protection when operating a skid steer.

Demonstrate

Demonstrate these safe work practices using the skid steer workers will be using on site.

Struck-by injuries—Compressor tools

Explain dangers

Tools that are powered by compressed air are fast, powerful, and ideal for repetitive tasks like nailing.

Nail guns are the most common source of struck-by injuries in Ontario's homebuilding sector. Over a five-year period, workers being struck by nails, brads, and tacks accounted for close to 500 lost-time injuries (LTIs).

The most common parts of the body affected are the fingers, hands, and eyes. Severe nail gun injuries have resulted in blindness, brain damage, bone fractures, and even death.

Identify controls

- Read all the safety materials and follow the manufacturer's instructions when using compressor tools. Workers should have some training on the specific tool they will be using.
- Adjust the compressor to the psi recommended by the manufacturer. Never exceed the maximum recommended air pressure.
- Disconnect the air hose before reloading, cleaning, or clearing a jam.
- Choose nail guns that have **sequential triggers** rather than **contact triggers**. Contact triggers can accidentally fire if the trigger is pressed and the nose accidentally touches anything. Studies have shown that using sequential triggers can cut injury rates in half without affecting productivity.
- Never hold or carry a nail gun with your finger on the trigger.
- Know where the joists or studs are before nailing through plywood or particle board. Nail guns can fire nails straight through this type of wood.
- Never point a nail gun towards anybody or yourself, even if you think it's not loaded.
- Wear all required personal protective equipment when using nail guns such as safety glasses that protect against flying particles from both the front and sides.
- Keep your hand away from the spot where you're nailing.
- Check surfaces before nailing into them. Look for knots, other nails, straps, hangers, or gusset plates that can cause recoil or ricochet.
- Ensure tools are in proper working order. Remove broken or malfunctioning tools from service immediately.

Demonstrate

Demonstrate how to use the specific type of compressor tools you are using on the jobsite. Give workers an opportunity to handle the tools and provide feedback.

Show workers where to find the manufacturer's instructions.

Discuss awkward working positions such as toe nailing and working overhead.

Encourage workers to report injuries and close calls.

Struck-by injuries—Electric saws

Explain dangers

Electric saws such as table saws, chainsaws, and circular saws are some of the most widely used power tools on construction sites. They're also among the most dangerous. Hundreds of Ontario workers are hospitalized each year after being struck by a power saw or the material they were cutting with it.

Common struck-by injuries from electric saws include cuts and lacerations, amputations, fractures, and eye injuries from flying debris.

Identify controls

- Read all the safety materials and follow the manufacturer's instructions when using electric saws. Make sure copies are available for reference on the jobsite.
- Wear all required personal protective equipment when operating electric saws. That includes safety glasses, hearing protection, a dust mask, and appropriate footwear.
- The blade of the saw should only extend 1/8 inch below the piece of material that you are cutting. The risk of a struck-by injury from kickback increases as more of the blade is exposed below the material.
- Never use your knees or foot to support the material you're cutting.
- Never pull the saw backward when you're cutting.
- Keep your hand away from the front of the saw.
- Never reach under, around, or behind the material you're cutting while the saw blade is moving.
- Never carry a saw with your finger on the trigger.
- Ensure blades and tools are inspected prior to use.
- Ensure all guards are in place and that they have not been tampered with.
- Never put the saw down until the blade/chain and motor has stopped.
- Position yourself so that you are in control of the saw.
- Never wedge, wire, or jam the guard to prevent it from working.
- Only competent workers should use an electric saw.

Demonstrate

- Demonstrate how to use an electric saw using the specific model you are using on the jobsite. Give workers an opportunity to handle the tool and provide feedback.
- Demonstrate how to properly hold lumber or material being cut and discuss awkward working positions.
- Show workers where to find the manufacturer's instructions. Encourage workers to report injuries and close calls.

Chainsaws

Explain dangers

- Chainsaw kickback can occur when the chain becomes snagged and suddenly stops moving. The change in momentum causes the chainsaw to move in the opposite direction, back towards the operator.
- The chain runs at very high speeds, and the cutting blade is extremely sharp. Each tooth is designed to remove a quarter-inch chip of material.
- A chainsaw is extremely loud, and parts of it can become very hot.
- Chainsaws produce a lot of vibration, both from the engine and from the process of cutting.
- A chainsaw with a combustible engine produces toxic exhaust fumes.
- The gasoline-oil mixture used for chainsaws with combustion engines can catch on fire if it's spilled while filling a hot engine.

Identify controls

Maintaining a chainsaw

- Always follow the manufacturer's maintenance instructions for your specific chainsaw. Keep a copy of the owner's manual on hand.
- Inspect the chainsaw before using it. Make sure that the guide bar is tight, the chain is snug, the machine is lubricated, and the teeth are sharp. Check the drive links, sprockets, chain catch, and cutters for damage. Run the saw at half throttle and apply the chain brake to make sure it works properly.
- Never use a chainsaw that has damaged parts.
- Never alter any of the safety features such as the chain brake, throttle trigger interlock, ramped depth gauges, etc.
- Make sure the ratio of gas to oil meets the manufacturer's recommendations (e.g., 50 to 1).

Wearing personal protective equipment

- Always wear eye protection that is CSA or ANSI-approved. A face shield may be required.
- Use gloves, a hard hat, CSA-approved safety boots, earplugs or earmuffs, and leg protection.
- Never wear loose clothing, unbuttoned jackets, flared sleeves and cuffs, scarves, tie strings, cords, chains, jewelry, etc. when operating a chainsaw.

Starting a chainsaw

- Keep everyone at least six feet away from you.
- Place the chainsaw on solid ground and secure it with one foot in the rear handle.
- Grasp the top handle with your left hand, apply the chain brake, and set the throttle lock. Pull the recoil handle towards your chest.
- Never "drop start" or "throw start" a chainsaw.
- Don't let the cord snap back to the starter.
- Let the chainsaw idle for a minute or two to warm up.

Operating a chainsaw

- Hold the saw firmly with both hands and keep your feet firmly planted before you start to cut.
- Stand to the left of the saw and hold your left arm straight. Activate the throttle with your right hand.
- To prevent kickback, cut only one thing at a time. Use the bumper spike to rest the chainsaw on top of what you're cutting and allow the sharp teeth of the chain and the power of the engine to do the cutting. Don't force it.
- Bring the saw to full operating speed before starting the cut. If you feel resistance or you need to apply extra pressure in order to cut, the chain may be dull. Using a dull chain is not only a safety hazard, but it also increases your risk of developing hand-arm vibration syndrome (HAVS).
- Never pull the chainsaw blade towards you.
- Don't operate a chainsaw above shoulder height.

Transporting a chainsaw

- Apply the chain brake and shut the motor off before setting the chainsaw down or moving it long distances.
- Allow the chainsaw to cool off.
- Use a bar guard to cover the chain when carrying or transporting it.
- Carry the saw facing downwards and to your side with the bar point behind you.
- During transit, use a carrying case if possible and make sure it's secured to prevent it from moving.
- Never transport a chainsaw in the passenger's seat of a vehicle.
- Where possible, transport the chainsaw in a well-vented cabinet or in the open air.

Demonstrate

Using the manufacturer's operating instructions, review the maintenance procedures with your crew.

Show workers the proper way to start the chainsaw and to hold it while cutting.

Mobile devices on worksites

Explain dangers

We all know the dangers associated with distracted driving. But what about the distractions caused by mobile devices on worksites?

Working on a busy jobsite or operating tools and heavy machinery requires your full concentration. Inattention or distraction can result in injury to yourself, injury to others, damage to property, or even death.

Operating a mobile device diverts your attention away from the task at hand or the hazards around you. If you're engaged in a phone conversation, your mind is on something other than your work or your safety. You may even find yourself removing your safety glasses, gloves, hearing protection, or hard hat in order to access your mobile device.

Remember: It's not just you. Your co-workers can also become distracted, putting you in danger.

Identify controls

To protect against the distractions caused by mobile devices on worksites, follow these safety guidelines.

- Never use your mobile device on a worksite unless authorized by your supervisor. That includes talking, texting, emailing, playing games, etc.
- Never use your mobile device while operating any tools, machinery, equipment, or vehicles or while performing activities that require your full attention.
- Don't use your mobile device while receiving work instructions or safety-related information.
- Wait until your lunch or rest break to use your mobile device for personal calls or other activities. But only use it in specially designated safe work areas, such as a site trailer or break room.
- Never operate a mobile device near flammable fumes or liquid, or when you're in a flammable environment.
- Turn off your mobile device completely when working. If your ringer goes off, it may startle you or someone in the area.
- Let your calls go straight to voicemail when you're working. You can retrieve them at a more convenient time.
- To reduce the temptation to use mobile devices on the worksite, ask workers to keep them in their vehicles or store them in a lockbox at the site trailer.
- If you have an urgent matter that requires keeping in contact with family members, bring it to the attention of your supervisor and work out a plan so that the communication can be done in a safe manner.
- If you need to access important work-related information on your mobile device, stop any work activities, inform your supervisor, and move to a safe work area.
- For supervisors, communication is part of the job. However, they should limit their mobile device use to the site trailer, site office, or other designated safe work areas away from general work activities. They should not make or take calls while directing activities on the site.

Demonstrate

If your company has a health and safety policy concerning the use of mobile devices on worksites, take the time to review it with your workers. Point out any designated safe work areas where they are allowed to use their mobile devices. Be clear on who the policy applies to (subcontractors, temporary workers, etc.) and what the consequences will be if they violate the policy.

If your company does not have a policy, have a discussion about the importance of one. You can download a sample policy on mobile devices from the **Policy and Program Templates** section on **ihsa.ca** under Company Health and Safety Rules.

Concrete trucks—Cleaning drums

Explain dangers

The mixing drum of a concrete truck must be cleaned regularly because concrete hardens and sticks to the drum.

During cleaning, workers may be exposed to these hazards:

- Start-up of the mixer unexpectedly
- Noise
- Vibration
- Respiratory hazards
- Skin hazards from wet concrete
- Heat stress.

Identify controls

- Never enter the mixer drum unless you have followed the company's written procedures for proper lockout and tagging.
- Inspect the inside of the drum for loose concrete that shows cracks, movement, or other signs that it could become loose once inside. Rotate sections of unstable concrete to the lowest position and work on it first.
- Inform everyone who may be affected by the truck that it will be out of service and that workers will be inside.
- Park the concrete truck in a secure location. Apply the emergency brake and remove the ignition key.
- Chock/block the wheels and post an "Out of Service" sign on each door of the cab.
- Disconnect the truck battery. Note: This must be done by someone who meets the legal definition of a competent person.
- Apply a lock to the positive terminal of the battery to make sure it cannot be reconnected. Each person who enters the drum should have their own personal lock attached to a hasp.
- Apply a tag to the lock to indicate that it should not be connected.
- Verify that the truck has no energy by attempting to start the ignition.
- Remove the ignition key and lock all doors to the truck. The key should stay with the worker who enters the drum. If multiple keys have been issued for the truck, find a way to prevent access to the cab.
- Even if lockout has been verified, the truck's drum can still rotate due to shifting loads or because of work inside. The drum must be secured manually to prevent movement.
- To secure the drum, attach one end of a tie-down to the top of the lower entry port and extend it over the drum. Attach a second tie-down to the bottom of the port. Connect both tie-downs to the frame of the truck.
- Never enter the drum from the upper charge unless the lower ports have been opened. If the ports are blocked by hardened concrete, use a sledgehammer to remove it.
- Never chip concrete overhead. Rotate the upper portion of the drum to the lowest position and work on it. Repeat the lockout procedures after rotating the drum.
- Wear the following personal protective equipment (PPE):
  - A hard hat that meets CSA or ANSI standards
  - Safety goggles or a face shield
  - CSA-certified Grade 1 work boots
  - Double hearing protection (i.e., earplugs and earmuffs together)
  - A NIOSH-approved respirator
  - Anti-vibration gloves
  - A light, loose, long-sleeved shirt and long pants.

Demonstrate

- Identify the competent person who will be responsible for disconnecting the battery. Also identify the helper.
- Demonstrate the proper procedure for inserting earplugs and review the manufacturer's instructions.
- Show how to perform a negative-pressure and positive-pressure seal check on a respirator.

(For more info, see Respirators—Fit safety talk.)

Carbon monoxide

List sources of CO on site.

_____

_____

_____

_____

_____

_____

_____

Explain dangers

- Carbon monoxide (chemical abbreviation: CO) is a clear, colourless gas you can't smell or taste.
- It's dangerous because it interferes with your body's ability to use oxygen. Even in small doses, carbon monoxide can kill you.
- The first signs are headache and fatigue. More exposure can rapidly lead to loss of consciousness, arrested breathing, heart failure, and death.
- A major source of carbon monoxide is engine exhaust. Gasoline, propane, and diesel engines all release carbon monoxide. Some types of welding may also produce it.

Identify controls

Since carbon monoxide has no taste or smell, you need a gas detector to see if it's present.

Some detectors are tubes that change colour when carbon monoxide is in the air. These can be used only once. Others are continuous monitors with a cell designed to sense carbon monoxide.

Whenever possible, operate engines outdoors. Welding machines and generators, for example, can be left outside—only the leads have to run into the building.

Never work alone in an area where carbon monoxide can accumulate.

When engines must be operated indoors, take these precautions.

- Make sure the area is well ventilated. Keep doors and windows open. Use fans to bring in fresh air if necessary.
- Limit running time and don't let engines idle.
- Monitor carbon monoxide levels regularly to make sure that ventilation is adequate.
- When necessary, use exhaust hoses or fans to draw engine exhaust out of the work area.
- Keep engines well tuned. They will run cleaner and produce less carbon monoxide.
- When possible, use equipment that is electrically powered rather than gasoline, diesel, or propane powered.
- When other controls are inadequate, workers must wear respiratory protection. This means a supplied-air respirator. You need a respirator attached to an independent supply of clean air.

Demonstrate

Point out sources of carbon monoxide on site. Demonstrate how to use a detector. Show how to ventilate indoor areas.

Hand-arm vibration

Explain dangers

Hand-arm vibration (HAV) is vibration transmitted into workers' hands and arms from work processes such as operating hand-held power tools. Frequent exposure to moderate- and high-intensity HAV can cause hand-arm vibration syndrome (HAVS).

HAVS is a general term that refers to the damage to nerves, blood vessels, muscles, and joints in the hands and arms due to HAV. HAVS initially affects the nerves. Symptoms include numbness, tingling, pain, or weakness. This can be followed by "Raynaud's phenomenon" or "white finger". Blood vessels become narrow and the reduced blood flow causes the fingers to become pale, waxy-white, or purplish. HAVS can also cause muscle pain and fatigue, joint stiffness, and loss of manual dexterity.

What is the current HAV limit?
The European Standard (Directive 2002/44/EC) recommends a daily exposure action value (EAV) of 2.5 m/s^2 and a daily exposure limit value (ELV) of 5.0 m/s^2.

The EAV is a daily amount of vibration exposure. If workers are exposed to more than the EAV, employers are required to take action to reduce HAV exposure.

The ELV is the maximum amount of vibration an employee may be exposed to on any single day. This should never be exceeded. A worker who is exposed to vibration levels above the ELV is considered to be at high risk of developing HAVS. (See Table 1.)

Identify controls

First, prepare an action plan to deal with the high-risk work tasks. Then, address the medium- and low-risk activities.

- Look for alternative work methods that eliminate or reduce exposure to vibration. For example, use an excavating machine rather than a breaker tool to break concrete.
- Make sure that the equipment selected for the task is the lowest vibrating tool that is suitable for the task and can do the work efficiently.
- Improve the ergonomic design of workstations. Awkward postures can increase the load on employees' hands, wrists, and arms.
- Use devices such as jigs and suspension systems to reduce the need to grip and support heavy tools.
- Do not use blunt or damaged tools and replace worn out items such as grinding wheels.
- Limit the time that workers are exposed to vibration. For example, put workers in teams where they switch tasks throughout the day. That way, one worker is not operating a vibrating tool for the entire day.
- Use gloves to keep hands warm and also provide some protection from vibration.

Demonstrate

Review the vibration levels of the tools you use on site (Table 1). The greater the exposure level, the greater the risk for HAVS and the more action employers will need to take to reduce the risk.

Table 1: Vibration Levels for Certain Vibrating Tools and Equipment

Low risk (<2.5 m/s^2)	**Medium risk** (2.5–5 m/s^2)	**High risk** (>5 m/s^2)
• threading machine • vacuum cleaner • band saw • spray gun • abrasive band • cordless screwdriver • jet washer	• angle grinder • floor sander • electric screw driver • core drill • hand-held sander • cross cut saw • chop saw • air drill • blower	• circular saw • chainsaw • impact drill • reciprocating saw • impact wrench • jackhammer • pneumatic hammer • air chisel • hammer drill

Note: The vibration levels are indicative only and will vary depending on equipment type, conditions of use, the age of the tool, how well the tool has been maintained, the task being carried out with the tool, and if the tool has been fitted with various accessories.

Winter hazards

List the winter hazards on site

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Explain dangers

The cold temperatures and icy conditions that are often a part of Canadian winters can cause hazards at the workplace.

- **Cold stress**—Exposure to the cold can lead to frostbite and hypothermia.

  Hypothermia—The body can no longer maintain its core temperature, causing persistent shivering, confusion, and poor coordination.

  Frostbite—Parts of the body are exposed to extremely cold temperatures or come into contact with cold objects, causing the tissues to freeze.

- **Slips and falls**—Ice, snow, slush, wet surfaces, and mud (during a thaw) can cause slips and falls. A slip on the ground can cost you weeks off work. A slip at height can cost you your life.

- **Carbon monoxide (CO)**—CO is a clear, colourless gas that you can't smell or taste. It interferes with your body's ability to use oxygen. Even in small doses, it can kill you.

Identify controls

- Wear several thin layers of clothing instead of one thick layer.
- Wear gloves, as well as a hat or other head covering that can fit under a hard hat.
- Wear one pair of thick socks or two pairs of thin socks.
- If you get hot when you're working, open your jacket but keep your hat and gloves on.

To prevent slips and falls:

- Clean the ice and snow off the soles of your boots and from access areas and work platforms.
- Use sand, salt, or other de-icing material. (Ice often forms on the underside of platform materials, so don't just turn them over.)
- When working at height, be extra careful in the morning since there may be new frost and snow.
- Watch your footing. Platforms may be clear in sunny areas but icy in the shade.
- When walking, have at least one hand free to help keep your balance and cushion a fall.

To prevent exposure to CO gas:

- When heating an enclosed space, use an indirect-fired heater.
- Check propane vehicle-cab heaters for leaks and proper venting.
- Operate engines outdoors when possible.
- When engines must be operated indoors, take the following precautions:
  - Choose electric rather than fuel-powered equipment.
  - Make sure the area is well ventilated. Keep doors and windows open, and use fans to bring in fresh air.
  - Monitor CO levels regularly with a gas detector.

Demonstrate

Ask workers to describe any winter-related problems they've had with:

- wearing proper clothing and personal protective equipment
- driving defensively
- operating heaters and gas-powered engines.

Solvents

Explain dangers

Solvents are often used with paints, lacquers, varnishes, adhesives, thinners, degreasers, cleaners, glues, and mastics.

You can be exposed—and overexposed—to solvents in various ways.

1. **Absorption**—the solvent penetrates your skin. This could be through direct contact with your skin while you clean tools.
2. **Inhalation**—you can breathe in solvent vapours when you're applying sealants, glue, and paint, or cleaning your tools.
3. **Ingestion**—this means swallowing. You can ingest solvents from your hands while you eat, drink, or smoke.
4. **Injection**—this can happen when your skin is punctured by a high-pressure spray gun.

Different solvents can affect your health in different ways. You can pass out and even die from exposure to very high concentrations of solvent vapour.

Short-term health effects from solvent exposure include

- irritation of eyes, lungs, and skin
- headache
- nausea
- dizziness.

Solvent exposure has three long-term health effects:

1. **Dermatitis**—inflammation of the skin. Look for redness, itching, swelling, and blisters.
2. **Nervous system disorders**—you may experience fatigue, muscle shakes, memory loss, or reduced mental performance.
3. **Damage to liver and kidneys**—chlorinated solvents can cause this.

Identify controls

- Some solvents are very flammable. Eliminate sources of ignition in the work area.
- When applying solvent-based materials, make sure there's enough ventilation. Open doors and windows. When that isn't enough, use fans.
- When the safety data sheet (SDS) requires a respirator, make sure that yours is approved for protection against "organic vapours." The cartridge is pink and marked "OV".
- Avoid skin and eye contact with solvents.
- Follow the instructions on the product label and SDS regarding protection, storage, handling, etc.
- If you don't understand the instructions, ask for help. Make sure you know what to do in case of an emergency.
- Don't eat or smoke where solvents are being used.
- After working with solvents, wash your hands thoroughly before eating or smoking.
- Don't use solvents to clean your skin or hair.
- Don't weld on materials that have been cleaned with chlorinated solvents. The result can be some very toxic gases.
- Keep lids on solvents when you're not using them. This keeps vapours from getting into the air.

Demonstrate

With your crew, review the information on the supplier or workplace label and SDS for a solvent product used on your site.

Silica

List silica hazards on site.

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Explain dangers

Silica dust and particles are a hazard on many jobsites.

Silica dust and particles are generated from

- cutting and drilling concrete
- sandblasting concrete
- cutting and drilling masonry
- grinding concrete and masonry
- sanding drywall.

If we breathe silica dust and particles into our lungs often enough and long enough, we can get a disease caused silicosis.

Silicosis is a disabling, progressive, non-reversible, often deadly lung disease. You may show no symptoms in the early stages and severe breathing problems in the later stages.

Many workers with silicosis can develop other health problems such as tuberculosis and lung cancer. They can also develop complications such as heart disease.

Identify controls

There are three basic ways to control silica dust on a site:

- prevent silica dust from getting in the air
- remove silica dust from the air
- prevent workers from inhaling silica dust.

When you're doing jobs that generate silica particles—or working close by—you need protection.

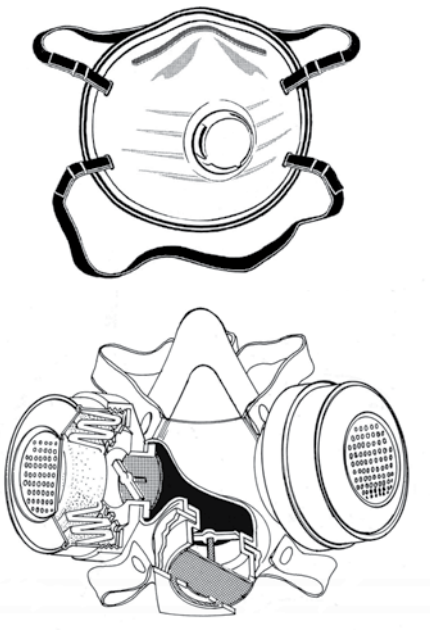
- Use WATER whenever possible to control dust. Wet cutting and other wet methods can keep dust levels very low.
- If water isn't practical, attach a dust collector to the tool or equipment.
- Wear a particulate respirator only where no other control methods are available.
- Minimum protection is a half facepiece air-purifying respirator with an N95 filter. As silica dust increases, you'll need more protection.
- Wear eye protection.

Demonstrate

Identify parts of a dust collector. Show the function of each part and how to attach and clean it.

OR

Show how to put on and wear a respirator.



Types of Half Facepiece Air-purifying Respirators

Lead

List lead hazards on site.

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Explain dangers

Exposure to lead is most common among plumbers, welders, painters, and demolition workers.

You're most at risk when there's lead dust, fume, or vapour in the air. For instance, when you're

- working with lead and metals containing lead such as solder
- applying or removing paints containing lead
- installing or removing sheet metal containing lead
- hot cutting on material containing lead
- renovating, demolishing, and doing other work on structures or material containing lead
- removing mortar from stone walls.

Lead gets into your body mainly through

- inhalation (breathing in dusts, mists, and fumes)
- ingestion (eating, drinking, smoking, biting nails, etc., without first washing your hands and face).

Symptoms of overexposure include

- headaches
- fatigue
- irritability
- pains in joints and muscles
- abdominal pain
- constipation.

Severe lead poisoning may cause much more serious symptoms such as kidney, nerve, and brain damage. It has also caused miscarriages and stillbirths in pregnant women and reduced sperm count in men.

Identify controls

- Your employer must inform you about any lead on site. That's the law. If you're unsure, or suspect that there's lead where you weren't warned about it, tell your employer.
- If you're welding, cutting, burning, or heating products containing lead, make sure you have local exhaust ventilation.
- On power tools that can generate lead-containing dust, use dust-collection systems.
- Wear respirators and protective clothing. Protective clothing includes coveralls, gloves, and eye protection such as safety glasses, goggles, or face shields.
- Change out of work clothes and shoes at the end of each shift and leave them at work.
- Never take protective clothing home for washing or cleaning. You could poison your family.
- Practice a high standard of personal hygiene—wash up thoroughly after each exposure to lead. Wash and shower at the end of a shift.
- Do not eat, drink, smoke, or chew gum in places that may have lead contamination.
- Get rid of any lead waste at the end of each day or shift in an appropriate manner.

Demonstrate

Show and explain lead control measures on the project.

HEPA filters

List HEPA filter uses on site.

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Explain dangers

"HEPA" stands for "high-efficiency particulate aerosol." HEPA filters can trap the microscopic toxic particles that pass right through ordinary filters.

There are two main applications for HEPA filters:

1. Industrial HEPA vacuum cleaners
2. Negative air filtration units.

HEPA filters can protect workers from microscopic particles that can pose a health risk. This includes dust, pollen, mould, and bacteria.

HEPA filters can pose problems when they

- are not replaced as required
- are not properly certified.

Identify controls

- Read and follow the manufacturer's instruction manual.
- If a vacuum or negative air unit requires a HEPA filter, make sure one is installed.
- Follow the manufacturer's instructions on how and how often to change the filter.
- HEPA filters cannot be cleaned. They must be replaced with new filters approved by the manufacturer.
- Filters are contaminated with toxic substances. When inspecting or replacing filters, do so in a safe, well-controlled place and wear personal protective clothing and equipment that may include an N100 NIOSH-approved air-purifying respirator, dust-resistant safety goggles, disposable coveralls, and impervious gloves.
- Don't punch holes in HEPA filters or pre-filters when they get clogged.
- Don't use compressed air to clean old filters or bang old filters to remove accumulated dust.
- Dispose of old filters as contaminated waste.

To qualify as a HEPA filter, the filter must be certified by the Institute of Environment Sciences.

A filter passing the certification test is given a number and the test results are recorded on the label.

Demonstrate

[Inspect a HEPA filter in front of your crew.]

- To ensure that the HEPA filter is authentic, look for the label from the Institute of Environment Sciences.
- Make sure the filter is not installed backwards, is properly seated in its housing, and is tightly secured.
- Inspect the filter housing for signs of dust that indicate the filter is being bypassed. A HEPA filter is useless if the housing leaks.
- Inspect the filter carefully for buildup and damage. If the filter appears to be clogged or damaged in any way, replace it with a new filter.
- If you see dust particles in the exhaust air flow, it means the HEPA filter has ruptured or failed and must be replaced.

Cement

List cement hazards on site.

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Explain dangers

Portland cement is used in Ontario every day. It can hurt you if it

- contacts your skin
- contacts your eyes
- is inhaled.

Cement usually contains a metal called hexavalent chromium. This metal causes allergic dermatitits (inflammation of the skin). [See safety talk on skin hazards—allergic contact dermatitis (ACD).]

Dry Cement

When you empty a bag of cement, the dust can irritate your skin. The dust reacts with sweat or damp clothing to form a corrosive solution.

Cement dust can also get in your eyes, causing redness, burns, or blindness.

Inhaling cement dust irritates your nose and throat. It can also cause choking and trouble breathing.

Wet Cement

Cement is also hazardous when it's wet—in mortar or concrete. If it gets inside your boots or gloves, or soaks through your clothes, it can cause burns and skin ulcers.

The burns caused by cement may be slow. You may not feel anything until several hours later. That's why it's important to wash cement off your skin right away.

Silica

Whether cement is wet or dry, you need to worry about silica. Repeated exposure to airborne silica can lead to silicosis, a disabling and often fatal lung disease. There may also be a link between silica dust and cancer. [See safety talk on silica.]

Identify controls

What to wear

- Wear a N, R, or P95 mask when pouring or mixing dry cement.
- Wear eye protection for mixing, pouring, and other work with dry cement.
- Wear alkali-resistant gloves.
- Wear coveralls with long sleeves and full-length pants.
- Pull sleeves over gloves.
- When working with wet mortar or concrete, tuck pants inside boots and duct-tape the top.

What to do

- Work upwind from cement dust.
- Remove rings and watches because cement dust can collect underneath and burn your skin.
- Remove any clothing contaminated by cement.
- Don't wash your hands with water from buckets used for cleaning tools.
- If your skin comes in contact with cement, wash with cold running water as soon as possible. Flush out any open sores or cuts. Get medical attention if your skin still feels like it's burning.
- After working with cement, always wash your hands before eating, smoking, or using the toilet.
- Read the safety data sheet (SDS) for procedures to follow after eye or skin contact with cement.
- If your eyes are exposed to cement, rinse with cold tap water for at least 15 minutes. Get medical attention if necessary.

Demonstrate

Review safety information on SDS or WHMIS label on cement bag with your crew.

Concrete

Explain dangers

Mixing concrete

Cement dust can irritate your skin. The dust reacts with sweat or damp clothing to form a corrosive solution. Cement dust is also dangerous if it gets into your eyes, or if you inhale it.

Working with concrete

Wet concrete or mortar can burn your skin or cause skin ulcers if it falls inside your boots or gloves or soaks through your clothes. Concrete finishers who kneel on fresh concrete have had their knees severely burned.

The burns caused by concrete may be slow. You may not feel anything until several hours later. That's why it's important to wash concrete off your skin right away.

Concrete usually contains a metal called hexavalent chromium. This metal causes allergic dermatitits (inflammation of the skin). [See safety talk on skin hazards—allergic contact dermatitis (ACD).]

Identify controls

Mixing concrete

- Wear an N, R, or P95 mask when pouring or mixing dry cement.
- Wear eye protection for mixing, pouring, and other work with dry cement.
- Work upwind from cement dust.

Working with concrete

- Remove rings and watches because wet concrete can collect underneath and burn your skin.
- Wear alkali-resistant gloves.
- Pull sleeves over gloves.
- Wear coveralls with long sleeves and full-length pants.
- Tuck pants inside boots and duct-tape the top to keep wet mortar and concrete out.
- Use waterproof boots high enough to keep concrete from flowing over the top.
- Remove any clothing contaminated by wet concrete.
- Don't wash your hands with water from buckets used for cleaning tools.
- When your skin comes in contact with concrete, wash with cold running water as soon as possible. Flush out any open sores or cuts. Get medical attention if your skin still feels like it's burning.
- After working with concrete, always wash your hands before eating, smoking, or using the toilet.

If your eyes are exposed to concrete, rinse with cold tap water for at least 15 minutes. Get medical attention if necessary.

Silica

Beware of silica, an ingredient in concrete.

Repeated exposure to airborne silica can lead to silicosis, a disabling and often fatal lung disease. There may also be a link between silica dust and cancer. [See safety talk on silica.]

You can inhale silica from cement dust, or from sanding, grinding, or cutting concrete.

- Make sure you have dust control measures in place.
- Where possible, wet-cut rather than dry-cut blocks and other concrete products.
- Wear an N, R, or P95 mask.
- Wear eye protection.

Demonstrate

Ask crew about precautions they take with concrete.

Moulds

List mould hazards on site.

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Explain dangers

Moulds can be a health hazard in buildings that are already built or under construction.

Some moulds are toxic. Touching them—or breathing in their spores—can be harmful.

Symptoms include

- irritated skin, eyes, nose, and throat
- runny nose and watery eyes
- trouble breathing
- fatigue and headaches.

People allergic to moulds may get nosebleeds and a severe cough.

If your immune system is weak, you shouldn't work in mould-contaminated areas.

Not everyone exposed to toxic moulds will develop symptoms.

Appearance

Moulds are colourful and woolly. They can be almost any colour—red, blue, brown, green, white, or black. They reproduce by releasing spores into the air. More mould may grow where the spores land.

Location

Mould thrives on cellulose material that is wet or water-soaked. This includes drywall, ceiling tiles, wallpaper, particleboard, insulation, and plywood.

Moulds love dark, moist places and can grow at room temperature.

Mould has been found in portable classrooms with moisture problems. This is usually a black mould that looks slimy.

You may be exposed to moulds when you work in damp locations or water-damaged buildings.

Sometimes, mould can be present when you don't see it. It can be growing behind drywall, under carpets, or in a ventilation system.

Identify controls

Visible mould may be just the tip of the iceberg. More mould may be growing out of sight behind walls, under floors, and above ceilings.

Samples have to be taken and analyzed in a lab to see whether the mould is dangerous.

If you find mouldy areas on a job, tell your supervisor. The company may arrange to have tests done.

Toxic moulds must be removed. There's no way to work around them. Removal calls for special procedures, including protective equipment such as respirators, coveralls, and gloves.

If mould removal is required, it's the company's responsibility to train and equip you for the job.

Demonstrate

Demonstrate clean-up measures for dealing with mould.

Sewage

List sewage hazards on site.

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Explain dangers

Sewage contains micro-organisms such as bacteria, viruses, fungi, and parasites. These can be particularly active in summer.

Exposure to equipment or material contaminated by sewage can cause

- gastroenteritis (stomach cramps, abdominal pain, diarrhea, vomiting)
- hepatitis (inflammation of the liver, jaundice)
- occupational asthma (breathlessness, tight chest, wheezing)
- infection of eyes and skin.

Sewage commonly infects workers by

- hand-to-mouth contact during eating, drinking, and smoking or by wiping the face with contaminated hands
- skin contact through cuts, scratches, or penetrating wounds
- inhaling dust contaminated by living or dead micro-organisms.

Identify controls

- Wear the protective equipment and clothing provided by your employer, such as gloves, goggles, face shields, and N95 respirators.
- Wash with clean water, soap, and paper towels. Shower for heavy contamination.
- Store clean equipment and clothing separately from dirty equipment and clothing. Don't mix them up.
- Use the designated clean area for eating and smoking. Change out of contaminated clothing and wash up before eating or smoking.
- Always wash your hands well before touching your face, eating, drinking, or smoking.
- Where contamination is heavy, you must
  - shower and change out of work clothes before leaving the job
  - never take contaminated clothing home for washing.
- Get shots or boosters for polio, tetanus, diphtheria, and hepatitis.

Demonstrate

Inspect clean and contaminated areas on site.

Identify precautions being taken in dirty areas.

West Nile virus

List WNV hazards on site.

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Explain dangers

Working outdoors in summer and early autumn, you can be exposed to West Nile virus. Mosquitos transmit the virus.

The chances of getting bitten by an infected mosquito are very low. Even when infected, most people don't show any sign of illness.

About 20% of those infected develop West Nile fever. The fever causes mild, flu-like symptoms:

- fever
- headache
- body aches.

One in 150 infected people get a severe form of disease. This is West Nile encephalitis or meningitis. It affects your brain. Damage can be permanent or fatal.

Symptoms include

- headache
- high fever
- neck stiffness
- disorientation
- shakes
- convulsions
- muscle weakness
- paralysis.

Breeding grounds

Mosquitos can reproduce where water stands for more than four days. On worksites, that means excavations, basements, and other low-lying areas.

Mosquitos can also hatch in equipment such as tarps, buckets, barrels, and wheelbarrows holding water. Even water-filled ruts in the ground can help breed mosquitos.

Identify controls

- Empty equipment regularly.
- Discard tires, buckets, cans, and containers.
- Drill drain holes in containers that can't be thrown out.
- Clean out eavestroughs, storm gutters, and roof gutters.
- Check flat roofs for standing water.
- Fill in ruts and other depressions where water can collect.

Clothing

Cover up, especially at dawn and dusk when mosquitos are most active.

- Wear long-sleeved shirts.
- Wear long pants tucked into your socks.
- Apply insect repellent containing DEET to your exposed skin—never under your clothing.

DEET

DEET is the most effective repellent available. The more DEET a repellent contains, the longer it will be effective.

- A product with 6.65% DEET provides about 2 hours of protection.
- 23.8% DEET provides about 5 hours of protection.

Don't use products with more than 30% DEET.

Stay on the safe side—use the lowest percentage of DEET you can get away with while still being protected.

Demonstrate

Inspect the project for places where mosquitos can breed.

Vibration white finger

List VWF hazards on site.

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Explain dangers

"Vibration white finger" is a disease that makes your fingers turn white. It starts when your hands are exposed to too much vibration.

Vibration white finger damages blood vessels, nerves, and muscles.

There are several symptoms:

- numbness and tingling in fingers
- whitening—first your fingertips, then your whole finger
- spasms in fingers
- attacks lasting up to half an hour—often with whiteness changing to deep red and fingers becoming very painful
- permanent loss of feeling in your fingertips
- reduced grip strength
- attacks that become more frequent and painful.

Tool and equipment operators are at the most risk. Their hands are often exposed to high levels of vibration.

High-vibration equipment includes road drills, chipping hammers, compactors, and chainsaws.

Risk depends on

- how long the vibrating tool or equipment is used
- whether operation is off-and-on, or continuous
- workplace temperature (cold is a major trigger)
- whether or not you smoke (smoking reduces blood flow to your fingers)
- the magnitude (acceleration) of vibration. Tools such as impact wrenches, chainsaws, and jack hammers can be high risk if workers use them more than 60 minutes (cumulative) per day.

Identify controls

- Where possible, do the job without using vibrating tools or equipment.
- Use tools with built-in anti-vibration features.
- Wear anti-vibration gloves as classified under ISO Standard 10819.
- Don't use vibrating equipment for long periods, especially in the cold. Short bursts are better.
- Keep your whole body warm—your hands and chest especially.
- Don't smoke.
- Keep equipment in good condition. Poorly maintained equipment can produce excess vibration. Report poorly functioning tools to your supervisor immediately.
- Follow an appropriate work/rest schedule. Rotate between different jobs.
- Exercise. It can maintain healthy blood circulation.
- Don't ignore signs and symptoms. See your doctor right away.

Demonstrate

Ask the crew to describe any problems they have had with vibrating equipment.

Sun protection

List jobs with highest UV exposure.

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Explain dangers

At some point, we've all been burned by the sun.

Sunburn is the effect of ultraviolet (UV) radiation on the skin. Ultraviolet light is beaming down on us every day, and always has. But now there's less protective ozone in the atmosphere and risks of exposure have increased.

UV rays are more powerful than visible light rays. They're so powerful that they can cause cancer.

Ultraviolet radiation can also cause cataracts, other eye damage, and premature aging of the skin.

When you work in the sun, especially in spring and summer, you need to minimize the hazards of UV exposure.

Identify controls

- Wear a shirt and long pants to cover most of your skin.
- Protect the rest of your skin with sunscreen. Use SPF 30 or higher. Follow the instructions about how often to reapply. Don't forget your ears. The more you sweat, the more often you need to reapply sunscreen.
- Protect your eyes. Wear safety sunglasses if the tint doesn't interfere with your vision. (Most safety glasses—clear or tinted—decrease your UV exposure.)

- Avoid contact with substances known to cause photosensitization, such as coal tar.
- SPF stands for Sun Protection Factor. Multiply the SPF number by 10 to know how many minutes you can stay in the sun without burning.
- Use a UV-blocking lip balm too.
- Remember: Sunlight doesn't have to be direct to do damage. Light reflected off surfaces such as sand, water, concrete, and snow can also cause UV exposure.
- Sunscreen should be standard equipment for anyone working outdoors during spring and summer. Keep a bottle handy in your toolbox.

Did you know?

Weather reports now include a UV index. This gives you an idea of how intense the ultraviolet radiation will be under clear sunshine or light cloud.

When the index is high (7 or higher) you can get sunburned in only 15 to 20 minutes.

The highest exposure of the day is from noon to 2 pm.

Demonstrate

Pass around bottle or tube of sunscreen (30 SPF or higher) and ask crew to apply it to exposed skin.

Heat stress

List cooling stations on site.

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Explain dangers

When your body's cooling system can't keep up with the heat, you dehydrate and your temperature rises above 38°C. That's when you can get heat-related illnesses such as

- heat rash (plugged sweat glands)
- heat cramps (sweating has caused salt loss)
- heat exhaustion
- heat stroke (very serious—you can die).

Let's take a look at two serious heat illnesses: heat exhaustion and heat stroke.

HEAT EXHAUSTION

Heat exhaustion is when your body cannot keep blood flowing both to vital organs and to the skin for cooling.

Symptoms

- weakness, feeling faint
- headache
- breathlessness
- nausea or vomiting
- difficulty continuing work.

Treatment

Get medical aid and cool down (move to a shaded area, loosen clothing, drink cool water). It takes 30 minutes at least to cool the body down from heat exhaustion, and if it's not treated promptly, it can lead to heat stroke.

HEAT STROKE

Heat stroke is a medical emergency. You can die from it. Your body has used up all its water and salt and cannot cool itself. Your temperature rises to dangerous levels.

Symptoms

- confusion and irrational behaviour
- convulsions
- unconsciousness
- no sweating—hot, dry skin
- high body temperature—40°C or more.

Treatment

If a co-worker shows symptoms of heat stroke, you should act fast.

- Call the local emergency number or get the worker to a hospital.
- Take aggressive steps to cool the worker down (immerse in a tub of cool water or cool shower, spray with a hose, wrap in cool, wet sheets and fan rapidly).
- If the worker is unconscious, don't give anything to drink.

Identify controls

Here's how to avoid heat stress in the first place:

- Wear light, loose clothing that allows sweat to evaporate. Light-coloured garments absorb less heat from the sun.
- Drink small amounts of water (8 oz) every half hour. Don't wait until you're thirsty.
- Avoid coffee, tea, beer, or other drinks that make you go to the bathroom frequently.
- Avoid eating hot, heavy meals that increase your body temperature.
- Remember that your physical condition can reduce your ability to deal with the heat. Age, weight, fitness, health conditions (heart disease or high blood pressure), recent illness, or medications can all affect your ability to withstand high temperatures.

Cold stress

Explain dangers

When you're cold, blood vessels in your skin, arms, and legs constrict, decreasing the blood flow to your extremities. This helps your critical organs stay warm, but you risk frostbite in your extremities.

WIND CHILL

The wind accelerates heat loss. For example, when the air temperature is –30°C,

- with 16 km/h wind (a flag will be fully extended) your skin can freeze in about a minute
- with 48 km/h wind your skin can freeze in 30 seconds.

FROSTBITE

This means that your flesh freezes. Blood vessels are damaged and the reduced blood flow can lead to gangrene. Frostbitten skin looks waxy and feels numb. Once tissue becomes hard, it's a medical emergency.

Treatment

- Get medical aid.
- Warm area with body heat—do not rub.
- Don't thaw hands and feet unless medical aid is distant and there's no chance of refreezing. Body parts are better thawed at a hospital.

HYPOTHERMIA

This means your core temperature drops.

Moderate symptoms

- shivering
- blue lips and fingers
- slow breathing and heart rate
- disorientation and confusion
- poor coordination.

Severe symptoms

- unconsciousness
- heart slowdown to the point where pulse is irregular or hard to find
- no shivering
- no detectable breathing
- resembles death—assume casualty is alive.

Treatment

- Hypothermia can kill—get medical aid immediately.
- Carefully remove casualty to shelter. (Sudden movement can upset heart rhythm.)
- Keep casualty awake.
- Remove wet clothing and wrap casualty in warm covers.
- Apply direct body heat—rewarm neck, chest, abdomen, and groin, but not extremities.
- If conscious, give warm, sweet drinks.

Identify controls

Here's how to control cold stress:

- Wear several layers of clothing rather than one thick layer to capture air as an insulator.
- Wear synthetic fabrics next to the skin to "wick" away sweat.
- If conditions require, wear a waterproof or wind-resistant outer layer.
- Wear warm gloves.
- Wear hats and hoods. You may need a balaclava.
- Tight-fitting footwear restricts blood flow. You should be able to wear either one thick or two thin pairs of socks.
- If your clothing gets wet at 2°C or less, change into dry clothes immediately and get checked for hypothermia.
- If you get hot while working, open your jacket but keep your hat and gloves on.
- Take warm, high-calorie drinks and food.

Asbestos—Type 1 operations (low risk)

NOTE: Before giving this safety talk, ensure the type of asbestos operation has been confirmed.

Explain dangers

Asbestos is a fibre that was used in many building materials up until the 1980s. Some products that are installed today still contain asbestos.

Breathing in asbestos fibres can cause

- Asbestosis (scarring of the lungs making it difficult to breathe)
- Lung cancer
- Mesothelioma (cancer in the lining of the chest and/or abdomen).

Quick Facts about Mesothelioma

1. Most people who get Mesothelioma have been exposed to asbestos.
2. Mesothelioma is an extremely painful disease.
3. There is no cure for Mesothelioma.
4. People usually live for only two years once diagnosed.

There are three types of asbestos operations in Ontario; **Type 1**, Type 2 and Type 3. In Type 1 operations, the risk of asbestos exposure to workers is low if specific procedures are followed.

Asbestos-containing materials (ACM) in Type 1 operations are non-friable. The fibres in the material are locked in by cement, vinyl, or another binding agent. However, cutting, grinding, abrading, sanding, breaking, drilling, or vibrating the material may be enough to release the fibres.

Some common types of non-friable asbestos-containing materials include

- gaskets
- asbestos cement
- vinyl tiles and acoustical plaster and tiles
- roofing felts
- drywall joint-filling compounds

Identify controls

The following steps are not only required by law but also can help reduce your risk of exposure to asbestos.

- Don't eat, drink or smoke in areas where asbestos could be present.
- Although the risk of exposure to asbestos is low for Type 1 operations, you may choose to use a respirator and protective clothing.
- Before beginning work, use a damp cloth or HEPA vacuum to clean up any visible dust.
- For non-friable asbestos, wet the material using a wetting agent and only use non-powered hand tools.
- Never used compressed air to clean the work area.
- Using a HEPA vacuum or damp mop, regularly clean up asbestos dust and waste.
- All personal protective equipment, such as respirators or protective coveralls, must be damp wiped or HEPA vacuumed before leaving the work area.
- Dispose of all asbestos waste and coveralls in dust-tight containers labeled with warning signs.
- Never reuse drop sheets.
- Rigid barriers/portable enclosures must be damp wiped or HEPA vacuumed; otherwise, do not reuse them.
- Always wash your face and hands before leaving the work area.

Demonstrate

Using the owner's record or report of asbestos (if applicable), review the following with your crew:

- the location of ACM on site
- areas to keep away from
- the specific procedures to follow.

Asbestos—Type 2 operations (medium risk)

NOTE: Before giving this safety talk, ensure the type of asbestos operation has been confirmed.

Explain dangers

Asbestos is a fibre that was used in many building materials up until the 1980s. Some products that are installed today still contain asbestos.

Breathing in asbestos fibres can cause

- Asbestosis (scarring of the lungs making it difficult to breathe)
- Lung cancer
- Mesothelioma (cancer in the lining of the chest and/or abdomen).

Quick Facts about Mesothelioma

1. Most people who get Mesothelioma have been exposed to asbestos.
2. Mesothelioma is an extremely painful disease.
3. There is no cure for Mesothelioma.
4. People usually live for only two years once diagnosed.

There are three types of asbestos operations in Ontario; Type 1, **Type 2** and Type 3. In Type 2 operations, the risk of asbestos exposure to workers is medium. Since exposure is likely to occur, precautions must be taken.

Asbestos-containing materials (ACM) can be "friable" or "non-friable". Friable ACM is easily crumbled or pulverized with the fingers, whereas "non-friable" asbestos is held together by some type of binding agent.

Identify controls

The following steps are not only required by law but can also help reduce your risk of exposure to asbestos.

- Disposable coveralls must be worn. Keep the wrists, ankles, and neck snug to prevent entry of dust. If your coveralls tear, replace them immediately.
- A NIOSH-approved respirator must be used when working in the area.
- Use rubber boots to keep dust out.
- Don't eat, drink, or smoke in areas where asbestos could be present.
- Do not allow workers without adequate personal protective equipment (PPE) into the work area. Ensure warning signs are in place.
- Never used compressed air to clean the work area.
- Before the work begins, wet the ACM using a wetting agent if safe to do so.
- An enclosure must be set up if you intend on removing a false ceiling if ACM is likely to be lying on the surface.
- If you disturb less than 1 m^2 of friable asbestos, it must be done inside an enclosure. If more than 1 m^2, this may be considered a Type 3 asbestos operation.
- Place asbestos waste, disposable clothing, enclosures, barrier materials, and other contaminated items into a labeled dust-tight container. Damp wipe or HEPA vacuum the waste containers before removing them from the work area.
- Using a HEPA vacuum or damp mop regularly clean up asbestos dust and waste.
- Drop sheets must never be reused.
- All personal protective equipment, such as respirators or protective coveralls must be damp wiped or HEPA vacuumed before leaving the work area.
- Always wash your face and hands before leaving the work area.

Demonstrate

Using the owner's record or report of asbestos (if applicable), inform your crew about

- the location of ACM on site
- areas to keep away from
- the specific procedures to follow, including signage to warn others of the work.

Review the specific type of respirator required for this job.

Dust

List tasks that can generate excessive dust.

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Explain dangers

Dust is found in many places on a jobsite and can be hazardous to your health.

This hazard varies depending on the type of dust, the amount of dust inhaled, the size of particulate, and how well your lungs are able to remove the dust.

Inhaling dust over many years can cause

- Fibrosis (hardening of the lungs, making it difficult to breathe)
- Cancer of the lungs, abdomen, and nose.

Even inhaling dusts over a couple of days or months can cause

- effects on the nervous system
- allergic reactions such as hay fever or more serious reactions such as asthma.

Examples of jobs that create dust include

- cutting concrete, wood, or other materials
- scoring/cutting tile
- mixing mortar
- pouring dry cement
- grinding
- knocking or bumping into dusty materials
- loading, unloading, or transporting dusty materials.

Identify controls

Prevent dusts from getting into the air by

- spraying water on the workpiece before cutting, pouring material, etc.
- spraying water on the ground before sweeping. If wet-sweeping is not possible, use a vacuum.
- using a dust collector for tools or equipment if available.

Consider different ways of doing the job that could reduce the amount of dust created. For instance, you could

- use low-speed rather than high-speed grinders
- order blocks in various sizes to minimize the need for cutting
- use pre-mixed cement or mortar
- shorten the distance that material is dropped or tossed when pouring or shoveling dusty materials
- stand opposite to the direction of the dust cloud.

Prevent dust accumulation by cleaning the work area frequently throughout the shift.

Wash your hands before eating, drinking, or smoking and at the end of your shift.

Use personal protective equipment when it is not possible to prevent dust from getting into the air. Consult the safety data sheet (SDS) for the product.

Demonstrate

Demonstrate how to use dust collecting equipment on tools or machinery.

Review company rules and procedures on respirators.

Lead-based paint—Welding and cutting

A U.S. study of lead-exposed construction workers found that the children of these workers were six times more likely to also have high levels of lead in their blood.

According to the study,
- only half of the workers changed clothes before the end of their shift
- almost all washed their work clothes at home
- half wore their work shoes home
- most did not shower at work before coming home.

Explain dangers

If you weld, cut, or heat metals containing lead-based coatings, you may be at risk of breathing in lead.

Lead is also hazardous if swallowed. It can contaminate your skin or clothes and find its way onto food, drinks, cigarettes, or anything that comes in contact with your mouth.

Lead can be tracked into your home or car and possibly expose family and friends. Lead is especially dangerous for children.

Some of the health effects associated with lead exposure include
- damage to the nervous system and kidneys
- cramps, nausea, vomiting, and weight loss
- reduction in red blood cells (anemia)
- abortion in pregnant women or infertility in men.

Exposure to lead may lead to lung or stomach cancer, as shown by experimental animal studies.

Identify controls

Before welding or cutting metals containing lead, minimize the risk of exposure to yourself and your family by following these steps.

- Do not eat, drink, smoke, or chew gum in the work area. Do not store food in the vicinity.
- Wash your hands with soap and water before breaks and at the end of the work shift. Be sure to scrub under your nails and use disposable towels.
- To prevent lead from being tracked home or into your car, change out of work clothes at the end of the work shift and leave them at work or place them into a plastic bag for washing. Do not wash them together with regular laundry.
- Place signs in the work area to warn workers of the lead hazard. Ensure nearby workers obey them.
- You should have at a minimum a half-mask particulate respirator with N, R, or P filter and 95, 99, or 100% efficiency. Inspect it to ensure it does not have any holes, it fits snugly, and that the straps fit properly around your head.

Coatings should be stripped at least four inches on both sides of the weld or cut line. Do not burn off coatings to strip. If the coating is not stripped and you are cutting or welding repeatedly and for a long time, additional measures are required, such as:

- Use more efficient respiratory protection, either
  - a full facepiece air-purifying respirator equipped with N, R, or P filter and with 100% efficiency
  - a tight-fitting powered air-purifying respirator with a high-efficiency filter
  - half facepiece or full facepiece supplied-air respirator in continuous flow, or
  - half facepiece supplied-air respirator in pressure demand or other positive pressure mode.
- Use a partial or full enclosure around the welding or cutting activity.
- Ensure that local exhaust ventilation is provided and used.
- Clean up the work area regularly by using a HEPA vacuum, wet sweeping, or wet shoveling.

Demonstrate

- If the paint has been tested for lead, review the report with the crew.
- Use the respirator manufacturer's instructions to perform a seal check of the respirator together with the work crew.

Needlestick and sharp-object injuries

Explain dangers

Occasionally workers may encounter needles, syringes, or razors on the job. Certain workplaces may be at a higher risk of encountering these types of hazards. They include

- housing or shelter projects
- public washrooms
- the bottom of elevator shafts
- marijuana grow-operations
- illegal drug labs.

The main risk to workers who have a needlestick injury is exposure to viruses such as hepatitis B and C, and human immunodeficiency virus (HIV).

- **Hepatitis B** is an illness that affects the liver. It causes liver inflammation, vomiting, and jaundice. Over the long term, it can cause scarring of the liver and liver cancer. It can eventually lead to death.
- **Hepatitis C** also affects the liver and can cause fever, loss of appetite, fatigue, and jaundice. Over longer periods of time, it causes scar tissue and liver failure. Some people may have no symptoms for many years but can still infect others.
- **HIV** is a virus that attacks the immune system, causing infection. When the body can't fight infections anymore, the disease becomes acquired immunodeficiency syndrome (AIDS).

Identify controls

Use adequate lighting when working in dark areas to avoid any accidental contact with used needles or other sharp objects.

Accidental contact with used needles can be avoided by following some simple procedures.

- If you find a needle or syringe, always assume it is contaminated.
- Before picking up the needle, notify your supervisor for direction. If your supervisor is not nearby, have another worker get the supervisor. Never leave the needle alone.
- Use a strong container (glass, metal, or durable plastic such as a peanut butter jar). Do not use pop bottles.
- Open the lid of the container and bring it close to the needle(s) or object(s). This will minimize the distance you have to carry the material.
- Use pliers, tongs, or tweezers to pick up the needle, syringe, or glass stem. Never use your hands.
- Hold the needle tip away from you at all times.
- Put the needle, syringe, or glass stem in the container.
- Close the lid securely.
- Do not dispose of needles in the garbage.

Many municipalities in Ontario have needle disposal sites. Used needles should be dropped off at these designated locations. Your company may also have some other arrangement for disposal. Always follow the disposal procedures.

What to do if you accidentally prick yourself?

1. Let the wound bleed.
2. Flush the area with water or wash with soap and water. If the skin has been broken, apply a topical antiseptic solution (e.g., iodine, isopropyl alcohol).
3. Do not apply disinfectants to the eyes, nose, or mouth.
4. Bandage the wound.
5. Seek immediate medical attention at the hospital emergency department.

Silica—Cutting and grinding concrete

After working 25 years as a tile setter, Angelo began experiencing shortness of breath and had developed pneumonia. As a terrazzo worker, Angelo regularly polished concrete, drilled tile, and mixed grout. At 49, he developed silicosis, emphysema, and asthma. Angelo never wore a respirator.

Explain dangers

You wouldn't breathe in carbon monoxide. So why would you breathe in the cloud of dust that's created when you cut or grind concrete, brick, or stone? That cloud contains very tiny particles of silica.

Your lungs have a tough time removing these particles. Over time, scars develop on your lungs. At first you may have no symptoms, but eventually you may develop shortness of breath, a severe cough, wheezing, and tightness of the chest. This can often be fatal.

Cutting and grinding silica without protection can lead to disastrous outcomes.

- You can develop silicosis after only a few weeks or months of exposure.
- The disease can become worse even after you've stopped working with silica.
- More and more studies are finding that silica exposure also causes lung cancer.

Most concrete and masonry products contain high amounts of silica. When you cut or grind these products, you are being exposed to silica if measures are not taken.

Although most diseases associated with silica exposure are not curable, they are preventable. Here are some measures you can take to reduce the amount of silica in the air when cutting or grinding.

Identify controls

Before you cut or grind, plan for the job.

- Notify workers that you will be generating silica dust. Tell them to keep at least 10 metres away. Post warning signs.
- Do the work in an area away from other workers or do it when no workers are around.
- Set up an enclosure around the cutting or grinding operation if you cannot prevent the spread of dust to nearby workers who are not protected.
- Use a respirator. An N95 filtering facepiece respirator is only appropriate for short-duration tasks or when local exhaust ventilation is available on tools. Otherwise, a more protective respirator is required.
- Before starting work, make sure you have all required PPE in place such as safety goggles, safety boots, a hard hat, and hearing protection.
- If your saw or grinder is equipped with local exhaust ventilation (vacuum attachment) or water attachment, inspect the device to ensure it is operating properly.
- In outdoor environments, set up your work area so that the wind blows from behind you and carries the dust cloud away from your breathing area.

During the cut or grind:

- If safe to do so, continuously and thoroughly wet the area that you will be cutting or grinding.
- If excessive dust is generated, stop the work. Determine if the tools or equipment require adjustment or replacement.

After you finish cutting or grinding:

- Remove dust from your tools with a damp cloth or HEPA vacuum.
- Clean the work area to prevent the buildup of silica. Wet sweep or use a HEPA vacuum but NEVER use compressed air to blow the dust.
- Wash your hands with soap and water after you finish.
- Shower and change out of your work clothes before going home to prevent exposure to family and friends.

Demonstrate

- With your crew, identify parts of the dust collector, show the function of each, and demonstrate how to attach and clean it.
- Show how to put on and wear the respirator. Demonstrate how to perform a seal check.

Skin hazards—Allergic contact dermatitis (ACD)

List ACD hazards on site.

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Source: Health and Safety Executive

Explain dangers

Some materials you use at work can cause a non-infectious skin disease called "dermatitis". There are two types of dermatitis:

1) **allergic contact dermatitis (ACD)** and
2) irritant contact dermatitis (ICD).

After prolonged or repeated skin contact with some materials, you may become "sensitized". Your skin will break out and become red, dry, itchy with blisters, and swollen.

Once sensitized, your body will not tolerate contact with the material, even when touching small amounts. Sensitization usually lasts a lifetime, meaning you may never be able to work with the material again.

Common causes of ACD on the jobsite include

- organic solvents in paints
- epoxy resins (especially the hardener)
- coal tar
- chromium in wet concrete
- formaldehyde
- natural rubber latex.

You can be at risk of developing ACD from substances that

- land on your clothes and seep through to your skin
- fall into your boots and stay there
- land on your skin and mix with sweat
- rub against your skin in tight spots such as under your wrist watch
- splash and land onto your face and neck.

Identify controls

- Know the skin hazards on the jobsite. Read the label or safety data sheet (SDS) for a controlled product before using it. Look for phrases such as "skin sensitization" or "skin irritant".
- Use gloves and other protective equipment specific to the hazard (consult the SDS).
- Avoid activities that may degrade your skin and increase the risk of sensitization.
- Avoid excessive hand washing and don't work with wet hands.
- Use mild soaps when washing your hands. Don't use solvents.
- Apply hand cream to prevent your skin from drying out.
- Inspect your clothing throughout the shift for contamination, in particular your knees, forearms and boots. If contaminated, change into dry clothing and wash the affected area.
- If working with wet concrete, tape the top of your boots to your pants, and tape your gloves to your wrists to prevent contact.

Demonstrate

Show workers the proper types of gloves and how to prevent materials from contacting their skin or getting trapped in clothing.

Skin hazards—Irritant contact dermatitis (ICD)

List ICD hazards on site.

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Source: Health and Safety Executive

Explain dangers

Some materials you use at work can cause a non-infectious skin disease called "dermatitis". There are two types of dermatitis:

1) allergic contact dermatitis (ACD) and
2) **irritant contact dermatitis (ICD)**.

ICD is caused by materials that directly damage the skin. Skin becomes dry and tight, swells up, cracks, and can become painful. Hands and forearms are most often affected.

Common causes of ICD on the jobsite include

- caustics and acids
- chlorinated solvents
- wet concrete
- calcium hydroxide
- excessive hand washing
- excess friction
- hot and cold weather.

You can be at risk of developing ICD from substances that

- land on your clothes and seep through to your skin
- fall into your boots and stay there
- land on your skin and mix with sweat
- rub against your skin in tight spots such as under your wrist watch
- splash and land onto your face and neck.

ICD can affect you after just a day of heavy contact or after a longer period of low exposure.

Identify controls

- Know the skin hazards on the jobsite. Read the label or safety data sheet (SDS) for a controlled product before using it. Look for phrases such as "skin sensitization" or "skin irritant".
- Use gloves and other protective equipment specific to the hazard (consult the SDS).
- Avoid excessive hand washing and don't work with wet hands.
- Use mild soaps when washing your hands. Don't use solvents.
- Apply hand cream to prevent your skin from drying out.
- Inspect your clothing throughout the shift for contamination, in particular your knees, forearms, and boots. If contaminated, change into dry clothing and wash the affected area.
- If working with wet concrete, tape the top of your boots to your pants, and tape your gloves to your wrists to prevent contact.

Demonstrate

Ask the crew to inspect their hands for signs of dryness, redness, flaking, or cracking. These are early signs of dermatitis and indicate the need for stronger skin protection measures.

Show workers the proper types of gloves and how to prevent materials from contacting their skin or getting trapped in clothing.

Spray polyurethane foam insulation

List spray foam insulation areas on site.

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Explain dangers

You are at risk if you work with freshly applied polyurethane foam insulation or work near someone who does.

Spray polyurethane foam insulation can contain *isocyanates*, which are chemicals that can cause a severe allergic reaction and lead to breathing difficulties (i.e., asthma attack).

It may take time to develop the allergy (weeks or years). But once you have become allergic, just one drop of isocyanate can trigger an asthma attack.

Other health hazards associated with isocyanates include

- irritation to the skin, eyes, nose, throat, and lungs
- coughing, chest pain, and fluid in lungs
- difficulty breathing.

Identify controls

- Read the safety data sheet (SDS) for spray foam insulation to understand the hazards and how to protect yourself.
- Enclose the spray areas and allow only those workers with proper protection to enter.
- If possible, schedule all other types of work at least 30 minutes after spraying has stopped to allow the foam to cure.
- Ventilate the area using an air mover and introduce fresh air into the space by using an air blower.
- If you spray polyurethane foam insulation, you should wear a full facepiece supplied-air respirator with breathing air taken from a clean area.
- The helper and other tradespeople who must work in the restricted area should wear a full facepiece air-purifying respirator equipped with a combination organic vapour/N100 filter cartridge. Check with the manufacturer to see how often the cartridge should be changed.
- Before using a respirator, you must be fit tested and trained to correctly use and maintain it.
- Avoid skin contact by using rubber gloves and coveralls when spraying.
- Wash your hands and face before eating, drinking, and smoking and after you're finished working with insulation.
- Secure and cover containers of liquid isocyanates to prevent evaporation.

Demonstrate

Get an SDS for spray foam polyurethane insulation and review its ingredients and its recommended exposure controls/personal protection.

Review your company's rules and procedures on respirators.

Welding—Inhalation hazards

Explain dangers

Welding releases toxic fumes, gases, and vapours into the air. Breathing in these contaminants can make you sick if you don't take steps to protect yourself. In confined spaces, welding fumes and gases can be much stronger.

Fumes are released when heating the base metal, surface coatings, electrode, and fluxes.

Gases are released in welding from shielding gases, heating the electrode coverings and fluxes, reactions by ultraviolet radiation, and heating solvents and other surface coatings.

Inhaling these contaminants can cause immediate health effects such as eye, nose, and throat irritation or a flu-like condition called "metal fume fever". Metal fume fever causes chills, dry mouth and throat, muscle pain, fatigue, fever, and vomiting.

Long-term exposure to welding fumes can cause more serious health effects such damage to the nervous system, bone damage, fluid in the lungs, bronchitis, loss of consciousness, suffocation, severe allergies, and nasal and lung cancer.

Identify controls

Gather some information before you start welding.

- Consult the safety data sheet (SDS) for the welding rod to determine the hazardous components and recommended control measures.
- Determine the composition of the base metal before welding begins.

You can take some simple steps to help reduce your exposure to welding contaminants.

- Keep your head as far away from the fumes as possible.
- If welding outdoors, position yourself so the wind blows from behind you through the weld area and carries the contaminants away from your breathing zone (wind at back).
- Weld on clean metal only. Remove any surface coatings, paints, or degreasers. Coatings should be removed at least four inches on each side of the weld point.

Fume extractors are the best way to reduce your exposure.

- Position portable hoods as close as possible to the weld to extract the most fume.
- Ensure that the air velocity is enough to remove airborne contaminants.
- Ensure that the ventilation unit is maintained properly. Prior to use, check that fans are working properly and that filters are in place and are clean.

If adequate ventilation is not available or if the welding process creates a toxic fume such as from stainless steel and beryllium, use respiratory protection.

- For low levels of fume that are relatively non-toxic, a disposable filtering facepiece respirator may be adequate. Where high levels of fume are expected or the fumes are toxic, a half facepiece respirator with cartridges suitable for fume and gases should be used.
- In areas where gases may build up or oxygen may become deficient, a supplied-air respirator or self-contained breathing apparatus may be needed.
- Always consult the respirator manufacturer for operating conditions and maintenance procedures.

Demonstrate:

With the crew, review the safety data sheet (SDS) for welding rods, paying special attention to:

- hazardous ingredients
- health hazard data
- preventive measures.

Working around bird and bat droppings

During a work project to demolish an old city hall, a colony of bats was seen nearby and a buildup of bat guano or droppings was found. Workers did not use personal protective equipment. Within three weeks, a total of nineteen people had been diagnosed with *Histoplasmosis* and developed severe breathing problems that required hospitalization. Some of these people worked on the demolition, some only visited the site, while others only lived or worked nearby.

Explain dangers

When working around areas contaminated with bird and bat droppings, workers can be exposed to fungi that can cause serious infections called *Histoplasmosis* or *Cryptococcosis.*

While fresh bird droppings are not expected to contain the fungi, fresh bat droppings may be contaminated.

Disturbing the droppings or contaminated soil may release tiny particles into the air called "spores". The spores can be inhaled and infect a worker's lungs.

Most people who become infected with the fungi experience no symptoms, but some may experience mild flu-like symptoms.

For some people, especially those with weakened immune systems, the disease can be life-threatening because it can spread to other areas of the body, become severe, and eventually cause death.

Identify controls

Always assume droppings are contaminated. Take the following precautions to reduce your risk of infection.

- If you have a weakened immune system, you should consult your doctor before working in the area.
- When removing large amounts of droppings, use the following types of personal protective equipment (PPE):
  - rubber boots
  - disposable gloves under work gloves
  - disposable coveralls
  - respiratory protection.
- Respirators should always be worn when working around bird or bat droppings. Appropriate respirators could range from an N95 filtering facepiece for low-risk tasks to a full facepiece air-purifying respirator or powered air-purifying respirator for high-risk tasks.

Follow these additional procedures to minimize the risk of infection.

- Eliminate the roost (nest) if the building is not going to be demolished and seal entry points if possible.
- Avoid disturbing material that could be contaminated to prevent the generation of dust and inhalation of spores.
- Never dry-sweep or dry-shovel material. Soak the material with water or a wetting agent to keep dust and spores down.
- Use a HEPA vacuum to clean up the contaminated material (if available).
- Dispose of the waste in 6-ml disposal bags and follow the disposal procedures outlined in your company's health and safety policy.

For larger contamination, a disinfectant may be used. For these applications, consult the manufacturer's directions.

Demonstrate

Review the PPE requirements for the job with workers. Ensure they understand how to use each piece of equipment correctly. Make sure respirators have been fit tested, and show workers how to do a seal check. (Refer to the chapter on PPE in IHSA's *Construction Health and Safety Manual,* M029).

Musculoskeletal disorders (MSDs)—Risk factors

List MSD hazards on site.

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Explain dangers

Musculoskeletal disorders (MSDs) are injuries of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs. MSDs do not include musculoskeletal injuries that are the direct result of a fall, a struck-by or struck-against event, vehicle collision, violence, etc.

Some recognized risk factors for MSDs are:

1) **Forceful exertion**

- Force is the amount of effort required to perform a task or job.
- Lifting, pushing, pulling, and gripping a tool are examples of activities that require you to exert force or muscle effort.

2) **Repetitive movements**

- Movements performed over and over are called repetitive movements.
- Nailing a deck, screwing drywall, and tying rebar are examples of repetitive tasks.

3) **Awkward postures**

Awkward postures are those in which joints are held or moved away from the body's natural position. Examples are stooping (bending over), kneeling, and reaching overhead.

4) **Secondary risk factors**

- **Contact pressure** is any external pressure applied to soft tissues of the body. Holding tools where handles press into parts of the hand is an example of contact pressure.
- **Vibration** can cause damage to nerves and blood vessels as well as other soft tissues.

Identify controls

Two approaches are widely accepted for preventing MSDs. The preferred approach is to design the job to the capabilities and limitations of the workforce.

1. **Engineering Controls**

Engineering controls are measures taken to physically modify the forcefulness, repetitiveness, awkwardness, or vibration levels of a job. Examples include modifying the workstation layout as well as selecting and using tools, work materials, and work methods that will reduce MSD risk.

2. **Administrative Controls**

Administrative controls are management-directed work practices and policies to reduce or prevent exposures to risk factors. Administrative control strategies include changes in job rules and procedures such as more rest breaks, job rotation, and training.

Although engineering controls are preferred, administrative controls can be helpful as temporary measures until engineering controls can be implemented or when engineering controls are not technically feasible.

Demonstrate

Ask the crew to describe any tasks that can contribute to MSDs and any solutions that can reduce the risk of MSDs.

Musculoskeletal disorders (MSDs)—Controls

List MSD controls on site.

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Identify controls

Here are some examples of what you can do to reduce or prevent MSDs.

Manual handling of tools and materials

- Plan ahead to minimize material handling.
- Use carts, dollies, hoists, or other mechanical handling devices.
- Use ladder hoists, gin poles, daisy chains, or cranes to move materials on or off roofs.
- Use chain falls, motorized buggies, carrying handles, or extension handles for carrying large or awkward materials such as drywall.
- Break loads into smaller units. For instance, put cement in bags weighing less than 50 lb.
- Use shoulder pads when carrying loads on shoulders.
- Exercise and stretch before starting work.
- Label materials with their weight.
- Get another person to help you lift heavy objects or awkward loads.
- Use proper lifting techniques. Lift with your legs, do not bend over and lift with your back, and keep the load close to your body.

Work at ground or floor level

- Use tables, benches, or stands to bring work to waist height.
- Store materials at waist height.
- Change positions (e.g., sit, stoop, or kneel with kneepads).
- Use pipe stands on pipe and steam fitting jobs, D-handles or longer handles for shovelling, rebar-tying devices, stand-up fastening systems for roof insulation, rug rippers, carpet stretchers, and pipe/conduit benders.

Overhead work

- Use drywall lifts, materials lifts, duct jacks, scissors lifts, and extension poles or stands for tools when doing overhead work.
- Make use of adjustable scaffolds, aerial work platforms, or other work platforms to decrease awkward postures.

Kneeling

- Use high-quality kneepads.
- Wear pants with kneepad pockets.
- Take short rest and stretch breaks.

Hand tools

- Use handles that are more comfortable and give you a better grip.
- Select hand tools that are designed for a neutral wrist posture and that reduce the amount of force required.
- Use tools that are low torque, low kickback, and lightweight.
- Maintain your power tools regularly so that they run with low vibration.
- Use vibration-absorbing padding on grips and handles.

Demonstrate

Ask your crew to share ideas about how to reduce the risk of MSDs.

Back care—Basic lifting

List lifting hazards on site.

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Explain dangers

Some jobs involve a lot of manual lifting.

- Back, neck, and shoulder injuries are common.
- Manual lifting in cramped or awkward conditions increases the risk of injury.

Identify controls

Avoid lifting above shoulder height. This causes your back to arch and puts a lot of stress on your shoulder and on the small joints in your spine.

Don't try to catch falling objects. Your muscles may not have time to coordinate properly to protect your spine.

Push rather than pull. Pushing lets you maintain the normal curves in your back and puts less stress on the spine.

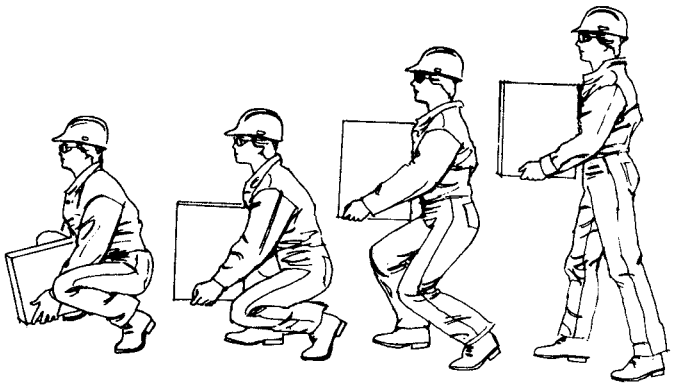
Safe lifting starts with planning.

- Size up the load.
- Make sure the path is clear.
- Get help if you need it.
- Use a dolly or other materials handling equipment whenever you can.

Demonstrate

Demonstrate as you talk.

- **Get as close to the load as possible.** This is very important. Our lifting capacity is reduced the further away we are from the load.
- Put yourself in the best possible position for the lift. Try to avoid twisting from the waist, reaching out, and leaning over material or equipment when you lift.
- Use a well-balanced stance with one foot slightly ahead of the other.
- Tighten your stomach muscles as you start to lift.
- Keep your lower back in its normal curved position and use your legs to lift.
- Pick up your feet and pivot to turn. Don't twist your back.
- Lower the load. Maintain the curve in your lower back. **You can hurt your back just as easily lowering a load as lifting it.**



Two-person lift

Partners should be roughly the same height.

Before the lift, both partners should agree on:

— the type of lift (waist-high, shoulder-high, etc.)

— who will take charge

— how they will lower the load.

Back care—
Lifting sheet materials, part 1

List sheet material locations on site.

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Explain dangers

If you don't lift large sheet materials like plywood correctly, you risk back, neck, and shoulder injuries.

Identify controls

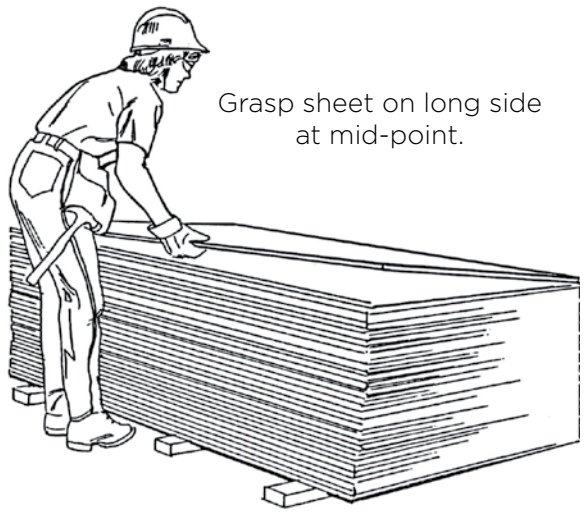
Stack sheets at a convenient height or store them up off the ground on blocking or trestles.

Here's how to lift correctly.

Demonstrate

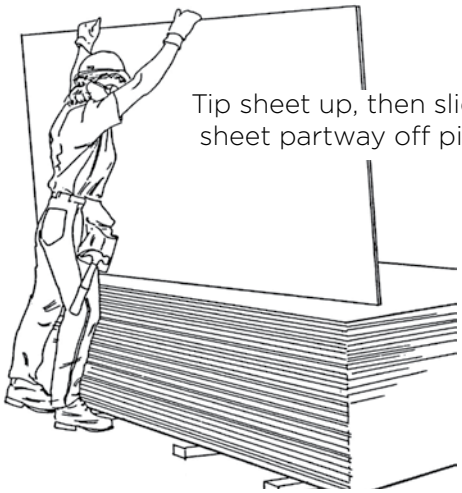
Demonstrate how to lift sheet material off a pile.

1



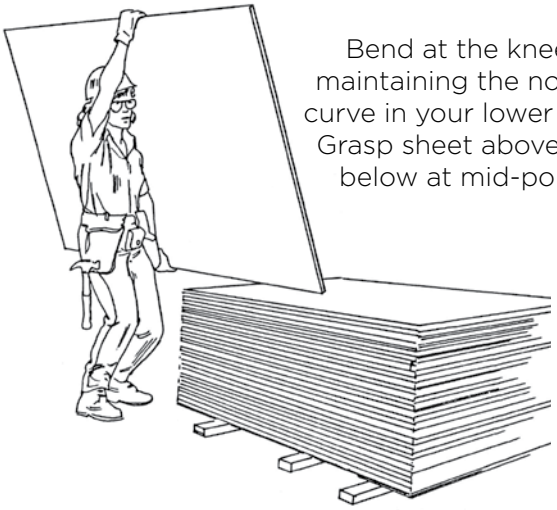
Grasp sheet on long side at mid-point.

2



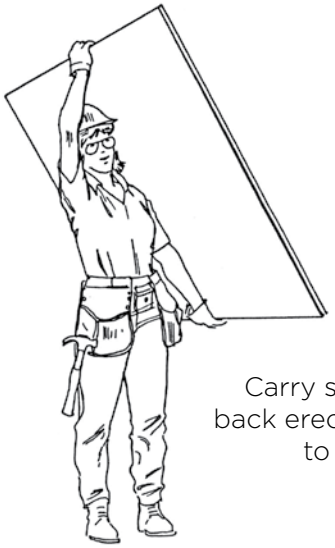
Tip sheet up, then slide sheet partway off pile

3



Bend at the knees, maintaining the normal curve in your lower back. Grasp sheet above and below at mid-point.

4

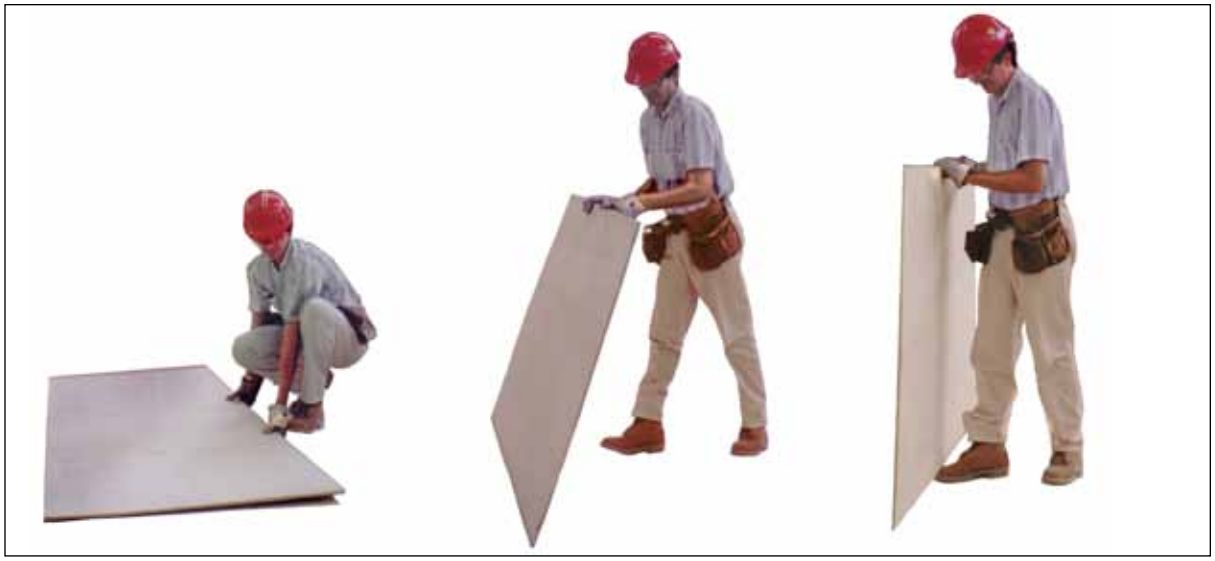


Carry sheet, keeping back erect. Avoid leaning to one side.

Back care—
Lifting sheet materials, part 2

Demonstrate

Demonstrate how to lift sheet material off the floor.



Bend knees, keeping back as upright as possible.

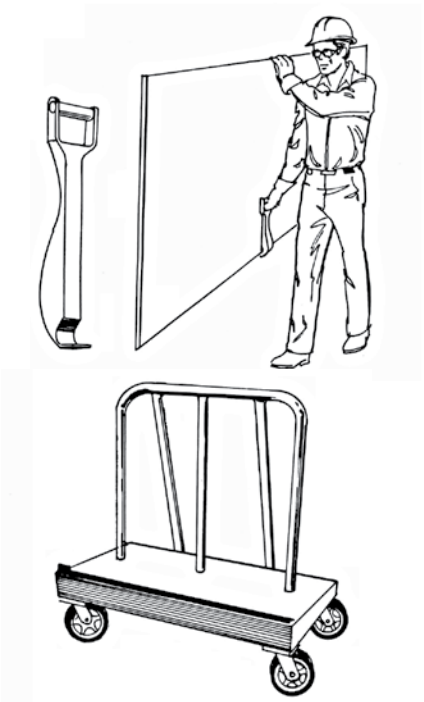
Tip sheet up to horizontal position.

Lift sheet slightly and put toe under mid-point.

Bend at knees, keeping back upright. Slip free hand under sheet.

Stand and lift, maintaining the normal curve in your lower back.

Use a carrying handle to move sheet material a distance.



If the walking surface is level and hard, use a drywall cart.

Stretching exercises

Explain dangers

Getting ready for the job means more than lining up tools and material. We should get our muscles ready too. Exercising before work can help prevent back, neck, and shoulder injuries.

Demonstrate

We recommend you hand out IHSA's ***Before You Start Work*** exercises card (V012) to your employees. Learn to do the exercises before you give the talk. Demonstrate each exercise to the group, and ask the group to do it after you.

CAUTION: Participation must be voluntary. If workers have any doubts about their ability to do the exercises safely, they should not do them. If they feel any pain, they should stop immediately.

Warm up first

This helps to get your muscles warm and loose. A warm muscle is a lot less likely to tear than a cold one.

March in Place

Stand in position. Pump your arms and legs in opposite directions. Make sure that your heels touch the ground. Continue 3 to 5 minutes.

Arm Circles

Stand with arms raised horizontally and slightly in front of shoulders, palms down, and feet shoulder-width apart. Rotate arms in a forward circular motion for 15 seconds. Relax. Repeat 3 to 5 times.

Now we're ready for some stretching exercises. They should be performed in a slow, controlled manner and held in a sustained stretch for 20 to 30 seconds. Avoid bouncy, jerky movements. Stretch only to a comfortable position, not to the point of pain.

Knee to Chest

Support yourself with one hand. With your free hand, pull your knee toward your chest and hold it for 30 seconds. Repeat with the other leg. Repeat 3 times for each leg.

Hip Stretch

Stand with one foot in front of the other. Place your hands just above the knee of your front leg. Gently bend your front knee. Keep your back foot flat on the floor. Hold 20 to 30 seconds. Repeat with other leg. Repeat 3 times for each leg.

Thigh Stretch

Support yourself with one hand. With your free hand, bend your leg back and grasp your ankle. Gently pull your ankle towards your body. Keep your trunk straight. Hold 20 to 30 seconds. Then repeat with the other leg. Repeat 3 times for each leg.

Calf Stretch

Lean on a solid support with your outstretched hands. Bend one leg forward and extend the other leg straight behind you. Slowly move your hips forward. Keep the heel of your back leg on the ground. Hold 30 seconds, relax, and repeat with the other leg. Repeat 3 times for each leg.

Backward Stretch

Stand up and bend backwards, holding for 2 to 4 seconds. Repeat 3 times. This will help relieve lower-back muscle tension. Do this stretch after working in a crouched, bent, or stooped position.

Whole-body vibration (WBV)

List whole-body vibration hazards on site.

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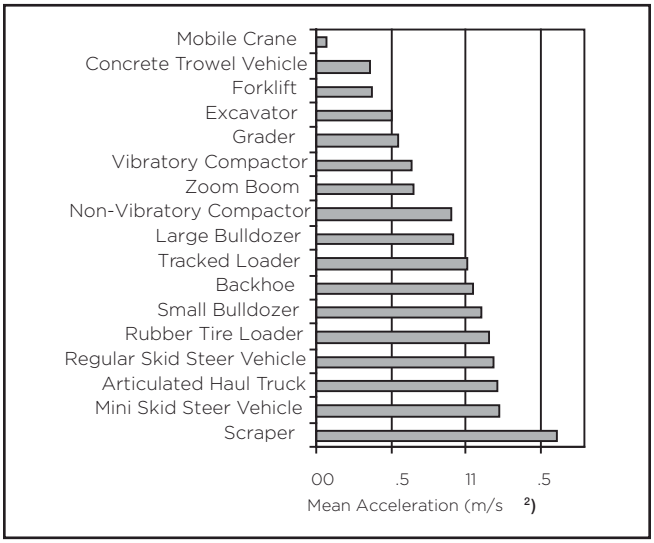
Explain dangers

Heavy equipment operators are exposed to vibration from bulldozers, backhoes, loaders, skid steer vehicles, excavators, and other machines (Chart 1).

The three main sources of whole-body vibration (WBV) from heavy equipment are:

- low-frequency vibration caused by the tires and terrain
- high-frequency vibration from the engine and transmission
- shock from running into potholes or obstacles.

Chart 1: Vibration Magnitude of Equipment



For eight hours of continuous work, the magnitude of vibration should not exceed 0.5 m/s².

Source: ISO 2631; The European Vibration Directive.

To determine the health effects of WBV, comparisons were made between operators of heavy equipment and workers in a similar environment who were not exposed to WBV.

With short-term exposure to vibration magnitude at 1 m/s², workers reported symptoms such as abdominal and chest pain, headaches, nausea, and loss of balance. Long-term exposure to WBV can cause serious health problems, in particular those related to the spine and the gastrointestinal system.

Identify Controls

Until improved equipment comes on the market, heavy equipment operators should do the following to reduce WBV.

- Report any poorly maintained equipment to your supervisor. A good suspension system and correct tire pressure will help to reduce vibration.
- If your seat has hydraulic dampers and shock absorbers, adjust the seat to your weight and height.
- Slow down when driving over potholes and rough terrain such as shale or rock.
- Report any rough terrain to your supervisor Other workers may be able to level or smooth out the road.
- Get out of your vehicle (in a safe location) for a few minutes every hour to stand, stretch, and give your body a break from vibration.

Demonstrate

- Ask the crew to describe any problems they have had with WBV.
- Use Chart 1 to show them the vibration level of their equipment.

Welding—MSDs

Explain dangers

Welding presents workers with a number of hazards. The most common are

- metal fumes
- welding arc light (both visible light and invisible ultraviolet light)
- particles getting in your eyes
- burns
- noise.

Welding also comes with the risk of developing a musculoskeletal disorder (MSD). Most studies on this topic have found that the main contributing factors to MSDs come from work conditions such as

- awkward postures from squatting, kneeling, or stooping due to the confined or tight locations
- lifting heavy equipment or materials
- keeping your neck bent or keeping your shoulders raised for a long time
- increased stress on your neck from supporting the heavy weight of a hard hat and welding mask.

These conditions can lead to MSDs such as back shoulder, neck, or knee problems.

Identify controls

You can prevent MSDs associated with welding by reducing or eliminating:

- forceful exertion (e.g., heavy lifting).
- awkward postures (eg. body positions where you don't move for a long time).

Reducing forceful exertion

- Use auto-darkening lenses. They darken as soon as the arc is struck, eliminating the need to keep opening and closing your helmet. This reduces neck strain.
- Use mechanical lifting equipment whenever you can, particularly when loading or unloading material.
- Pre-assemble parts and use material handling equipment to help reduce unnecessary lifting.
- Use height-adjustable mobile lift tables for transporting material into the workshop. These tables can also be used to support material when you're loading machines. A smaller table can be used for smaller sheets of metal or machines such as a punch press. The larger table can be used for the "break and bending presses" as well as incoming materials.
- When you have to lift, ask someone to help you.

Reducing awkward postures

- Position the work at a height between your waist and your shoulder.
- Use lifting and turning tables with wheels.
- Use welding guns that have swivels and can be used in either hand.
- Sit on a work stool when the work is low.
- Use a work table or workbench instead of bending over to work on the ground.
- Use a rotating clamp for pipe.
- Put your welding leads on pulleys.
- Take stretch breaks throughout the day to relieve discomfort and get the muscles moving.

Demonstrate

More than half of the injuries to welders involve the back, neck, shoulders, arms, and hands. Ask workers to describe any problems they have had to these parts of the body.

Discuss how those problems can be avoided.

Flying forms—MSDs

Explain dangers

Flying forms are popular because they can save time and, in some cases, are safer than using built-in-place methods. Although there are some advantages to using flying forms, there are also some disadvantages. Flying forms have some significant hazards associated with them that can lead to serious injury if proper precautions aren't taken.

One of the significant risks of working with flying forms is musculoskeletal disorders (MSDs). MSDs are injuries of the muscles, nerves, tendons, ligaments, joints, cartilage, or spinal discs. They typically occur after years of work involving excessive force, awkward positions, and repetitive tasks.

Although flying forms are moved by heavy equipment from one area to another, it's the workers who must assemble them. The tasks involved in assembling the forms can put you at risk of developing an MSD.

Some of these hazardous tasks are

- bending and kneeling to cut or nail material
- bending or kneelng to assemble forms below knee level
- working in tight spaces
- carrying and lifting heavy forms, shoring, steel, and wood columns
- working with hand tools such as wrenches, hammers, and pry bars
- putting pressure on your shoulders while carrying large objects or kneeling on the ground
- the repetitive motion of hammering, which can impact your wrists and arms.

Identify controls

- Get help from a co-worker if something is too heavy for you to handle safely.
- Use a cart to transport materials.

- Use mechanical equipment such as cranes, forklifts, or backhoes to lift or move heavy objects.
- If you have to carry heavy materials because a cart or other device is not available, use shoulder pads.
- Place heavy materials close to your work area to reduce the carrying distance.
- Use sawhorses or a raised bench to cut plywood.
- Whenever possible, store heavy materials at least at standing knee height to avoid bending.
- Use proper lifting techniques. Lift materials with your legs rather than bending over and lifting with your back. Keep the load close to your body.
- Consider using pre-assembled, engineer-approved guardrail systems instead of building wooden guardrails and posts at the jobsite.

Demonstrate

- Identify all transportation devices available on site that workers can use (e.g., carts, lift trucks).
- Demonstrate the proper technique for lifting.
- Survey the work area and provide tips for improvement (e.g., store material closer to work areas, ensure work tables are the proper height).

Driving—MSDs

A truck driver on a long trip across Canada started feeling discomfort in his lower back. He continued driving and made as few stops as possible in order to reach his destination quickly. His discomfort became worse but he tried to ignore it—the pain had always gone away in the past.

Once he reached his destination, he had trouble walking and was not able to get a restful sleep because of his back pain. The driver ended up missing a month of work and needed therapy to treat his back pain.

Explain dangers

Even when you're sitting still in a moving vehicle, your body is subjected to external forces that can increase your risk of developing lower back pain. These forces include

- the accelerations and decelerations of the vehicle
- the swaying of the vehicle from side to side
- the vibration from the engine and rough road conditions.

Because your hands and feet are actively involved in the driving task, they are not able to support and stabilize your lower body to counteract these external forces.

In order to stabilize the upper body, the lower back muscles have to be constantly active. As a result, these muscles become fatigued leading to muscle pain in the lower back.

Identify controls

- Adjust the seat for a comfortable sitting position that gives you full access to the vehicle controls.
- Adjust the steering wheel for a comfortable arm position.
- Adjust the mirrors so that you have good visibility while maintaining a neutral neck position.
- If the seat has an air suspension system, adjust it so that the seat is comfortable and provides support.
- Try to get out of your vehicle every hour or two to stand, stretch, and move around for a few minutes. Changing your posture will help reduce stiffness and fatigue.
- Don't do any heavy lifting immediately after a long period of driving. Take a few minutes to walk around until your back regains its structural integrity.
- Try not to drive with your wallet in your back pocket. This can put extra pressure on your sciatic nerve and cause your spine to become misaligned.
- Maintain a good sitting posture by putting a roll or cushion between your lower back and the seat to keep the natural curve in your lower back.
- Don't sit in one position for a long time. Change your position by arching your back to reduce muscle tension or adjusting the lumbar support on your seat.

Demonstrate

Ask your workers to describe any back problems they have had while driving.

Show workers a comfortable sitting position while driving. With feet on the pedals, recline the seat to a 100 to 110 degree angle (shoulders will be slightly behind the hips) and move the seat backward or forwards until the knees are the same height as the hips.

Report Form

Title of Safety Talk _____

Company	Project
Talk given by	Date

Crew attending

List other topics discussed during the talk

Concerns	Response/follow-up

Signed _____ Title _____

Use this master to make copies. Fill out a report form for each talk delivered.
Retain a copy for company records.

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Document what happens on site

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Member: $24.95 **Non-Member:** $49.95

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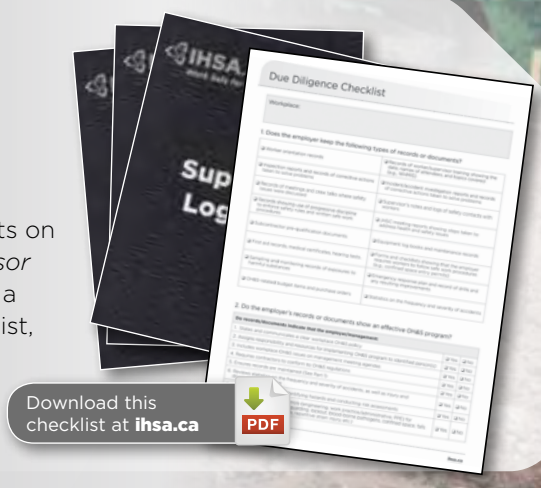

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What you do matters to the health and safety of your employees

EDUCATE

Educate yourself and your employees.

- Take advantage of IHSA's 22 free training programs for members.
- Access hundreds of free products and downloadable resources. www.ihsa.ca/Free-Products/Downloads.aspx
- Learn about your rights and responsibilities under the *Occupational Health and Safety Act*.

ENGAGE

Engage your workers in health and safety.

- Give five-minute safety talks each morning. www.ihsa.ca/resources/safetytalks.aspx
- Conduct regular health and safety meetings.
- Keep a record of what happens on the worksite.

EVALUATE

Evaluate your current health & safety program.

- Take **IHSA My Health and Safety Program** online. www.ihsa.ca/SmallBusiness/My-Health-Safety-Program.aspx
- Conduct hazard assessments and workplace inspections. www.ihsa.ca/smallbusiness/resources_small-businesses.aspx
- Help workers understand the importance of reporting gaps in your health & safety system.

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- utilities
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