

# 1. On-the-job safety measures

## Overview

### Purpose

Safety is the responsibility of all workers in all trades. Gas technicians/fitters routinely work in potentially dangerous locations with equipment that could cause injury to oneself and others. A gas technician/fitter must be thoroughly familiar with hazards and safety procedures that relate to work habits, work sites, and use of various tools and equipment.

### Objectives

At the end of this Chapter you will be able to:

- describe personal safety factors;
- describe site hazards and protections;
- describe safety of tools and equipment; and
- describe general safe work habits.

### Terminology

Term	Abbreviation (Symbol)	Definition
Confined space		Work area where location, design, or construction restricts entry and exit and where equipment, operations, or atmospheres may pose hazards to health and safety.
Group safety equipment		Equipment such as fire extinguishers and first aid kits supplied by the employer and positioned around the job site.
Lockout procedures		Procedures using locks and safety tags to ensure the isolation and lock off of all sources of potential, kinetic, and stored energy during work on a system.
Musculoskeletal disorder hazards	MSD hazards	Aspects of the job or the process of doing the job that increase the risk of a worker developing a musculoskeletal disorder (MSD). Primary hazards are force, postures, and repetition.

Term	Abbreviation (Symbol)	Definition
Personal protective equipment	PPE	Standard safety clothing.
Ventilation equipment		Equipment found in workshops designed for the removal of harmful dust or fumes.

## Personal safety

Personal safe work practices are as important as a gas technician's/fitter's trade skills. The way of handling personal safety underlies all the other safety issues and rules to live by at work. Personal safety is a combination of knowledge and awareness: a gas technician/fitter must be knowledgeable and skillful in the use and care of tools and aware of the hazards and safety procedures that apply to any job or job site.

Consider the following factors in personal safety:

- work habits
- MSD hazards
- clothing
- protective equipment

## Work habits

A competent worker learns skills to the point where they become automatic. Skilled workers have learned to do the job both safely and correctly without losing sight of how actions may affect the safety of other workers.

Adopting the following behaviours will help you be a safer person to work with:

Behaviours	Description
Courtesy	Means taking into account the safety of those you are working with. Put yourself in the other person's place and keep the other person in mind.
Attention	To the safety of your environment and those working nearby helps avoid accidents.
Safe conduct	Includes wearing appropriate clothing and protective equipment, observing good housekeeping and safety procedures, and displaying common sense. Safe conduct also involves following correct procedures after an accident has occurred.

## MSD hazards

### Musculoskeletal disorders

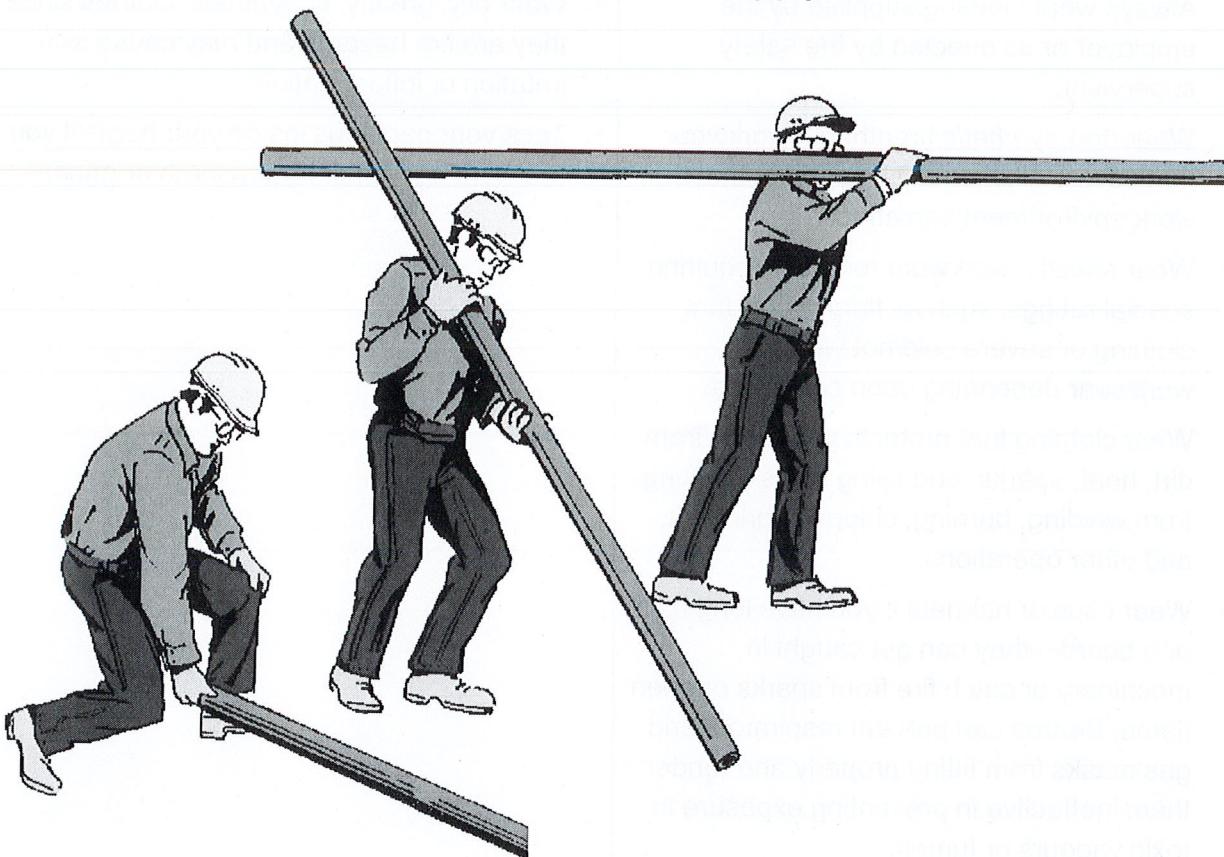
Many jobs have MSD hazards—aspects of the job or the process of doing the job that increase the risk of a worker developing an MSD. While a number of things can increase MSD risk, the

primary MSD hazards are force, fixed or awkward postures, and repetition (refer to the WSIB MSD prevention toolbox).

MSD hazard	Description
Force	<p>The amount of effort exerted by the muscles and the amount of pressure on body parts that result from different job demands.</p> <p>All work tasks require workers to use their muscles to exert some level of force. However, when a task requires them to exert a level of force that is too high for any particular muscle, it can damage the muscle or the related tendons, joints, and other soft tissue.</p> <p>This damage can occur from a single movement or action that requires the muscles to generate a very high level of force. However, more commonly, the damage results when muscles generate moderate to high levels of force repeatedly, for a long duration, and/or while the body is in an awkward posture.</p> <p>Some job tasks result in high force loads on different parts of the body. For example, lifting a heavy load that is far from the body increases the load on the lower back. This can potentially damage both the spinal discs and the vertebrae.</p> <p>Working with hand tools that have hard or sharp edges, i.e., those which require resting the forearms on the hard edge of a desk, can potentially cause damage to tendons, muscles, blood vessels, and nerves under the skin. This is often referred to as contact stress.</p> <p> For more information, go to Canada's National Workplace Health and Safety website with links to federal, provincial and territorial governments and their agencies: <a href="http://www.canoshweb.org/">http://www.canoshweb.org/</a></p>
Posture	<p>Another name for the position of various parts of the body during any activity.</p> <p>For most joints, a good or "neutral" posture means that the joints are being used near the middle of their full range of motion. See Figure 1-1 for an example of good posture when lifting pipe.</p> <p>The farther a joint moves towards either end of its range of motion or the farther away from the neutral posture, the more awkward or poor the posture becomes and the more the muscles, tendons, and ligaments around the joint experience strain. For example, when arms are fully stretched out, the elbow and shoulder joints are at the end of their range of motion. Pulling or lifting repeatedly in this position poses a higher risk of injury for the worker.</p>

MSD hazard	Description
Repetition	<p>The risk of developing an MSD increases when the same parts of the body are used repeatedly, with few breaks or chances to rest.</p> <p>Highly repetitive tasks can lead to fatigue, tissue damage, and, eventually, pain and discomfort. This can occur even if the level of force is low and the work postures are not very awkward.</p>
Other MSD hazards and workplace factors	<p>The following are other MSD hazards and workplace factors that you should consider:</p> <ul style="list-style-type: none"> <li>• contact stress</li> <li>• local or hand/arm vibration</li> <li>• vibration</li> <li>• whole body</li> <li>• cold temperatures</li> <li>• hot work environments</li> <li>• hot work environments</li> <li>• repeated impacts</li> <li>• work organization</li> <li>• work methods</li> </ul> <p> For more information, go to Canada's National Workplace Health and Safety website with links to federal, provincial and territorial governments and their agencies:</p> <p><a href="http://www.canoshweb.org/">http://www.canoshweb.org/</a></p> <p>Consult the employer's policies and procedures for additional workplace safety requirements.</p>

**Figure 1-1**  
**Correct method of lifting pipe**



## Clothing

For gas technicians/fitter, wearing street clothing is not usually recommended on the job. Each work task will dictate which work clothing is necessary for the job conditions. In general, observe the following rules relating to clothing and personal habits:

Do...	Do not/never...
<ul style="list-style-type: none"> <li>• Always wear clothing supplied by the employer or as directed by the safety supervisor.</li> <li>• Wear <i>non-synthetic</i> breathable workwear that covers all exposed body parts that the work environment can affect.</li> <li>• Wear specific workwear for tasks requiring special ratings, such as flame-retardant clothing or severe cold/hot weather workwear depending upon conditions.</li> <li>• Wear clothing that protects your body from dirt, heat, sparks, and flying chips resulting from welding, burning, chipping, grinding, and other operations.</li> <li>• Wear caps or hairnets if you have long hair or a beard—they can get caught in machinery or catch fire from sparks or open flame. Beards can prevent respirators and gas masks from fitting properly and render them ineffective in preventing exposure to toxic vapours or fumes.</li> <li>• Remove rings, metal watchbands, bracelets, loose ties, and neck chains when working around electrical equipment or machinery with moving parts.</li> <li>• Always adhere to your companies' Occupational Health and Safety guidelines.</li> </ul>	<ul style="list-style-type: none"> <li>• Wear oily, greasy, or synthetic clothes since they are fire hazards and may cause skin irritation or inflammation.</li> <li>• Tuck your pant legs inside your boots if you are working with or near a torch or grinder.</li> </ul>

## Protective equipment

Specific work conditions will dictate the necessary personal protective equipment (PPE) you will use as a gas technician/fitter. You should note, however, that safety equipment including PPE is considered the “last line of defence”. You should employ first and foremost an awareness of your environment and safe work practice.

Standard safety clothing is usually mandatory; however, some sites or employers may require you to wear additional equipment (note that they always require eye protection and safety footwear).

In particular, you must have equipment for the following:

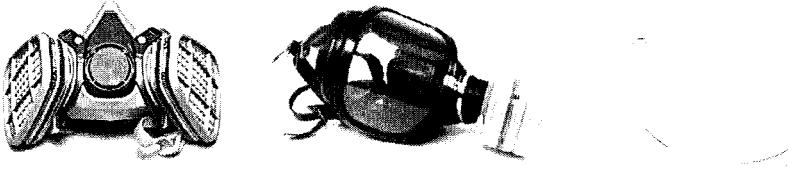
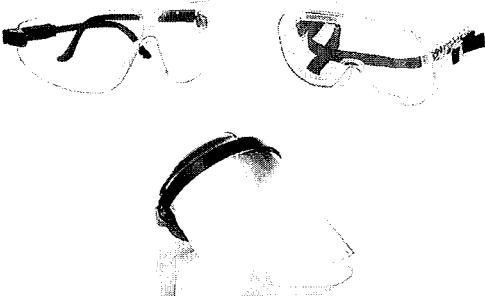
- head protection
- respiratory (lung) protection

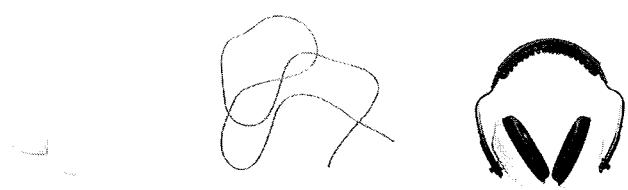
- specific eye protection
- hearing protection
- hand protection
- foot protection

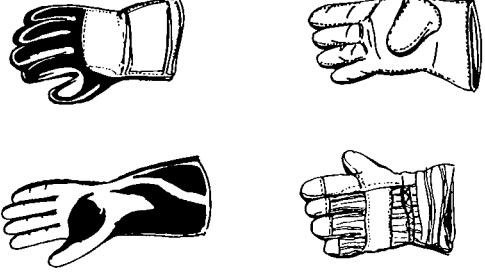
Equipment for...	Description
<p>Head protection</p> <p><b>i</b> Reference CSA Standard Class E I or II for additional information.</p>	<p>Regulatory authorities and employer requirements may demand that workers wear hard hats and accessories (see Figure 1-2) in specific areas and to suit specific job conditions. They can require a variety of protective gear. Most head protection is adjustable, and some have chin straps, liners, or ear muffs.</p> <p>You must not wear metallic hard hats when working on electrical equipment. Regulations prohibit you from altering your hard hat in any way, as it will reduce the level of protection provided by the hat. Painting, placing stickers on, or drilling holes in the head protection is not allowed.</p>
<p>Respiratory (lung) protection</p> <p><b>i</b> Reference CAN/CSA Z94.4 and CSA Z180.1</p>	<p>You may be exposed to airborne particles, chemicals, toxic gases, or fumes that can cause lung damage if inhaled. In situations involving such exposure, use an approved mask or respirator. Figure 1-3 shows some examples. You should immediately consult your supervisor if you suspect a designated substance that may be a respiratory hazard.</p> <p>When using a filter respirator, ensure that you are using the correct cartridge for the gas or hazard you are exposed to. Refer to the manufacturer's specifications for the equipment you are using.</p> <p>A gas technician/fitter may need to have special certification for a respiratory system. Refer to the Occupational Health and Safety Act (OHSA) and employer Occupational Health and Safety (OH&amp;S) requirements and policies.</p>

**Figure 1-2**  
**Standard hard hat**



Equipment for...	Description
	<p style="text-align: center;"><b>Figure 1-3 Respirators and masks (SCBA)</b></p> 
<p>Eye and face protection</p> <p> Reference CSA Z94.3.1, CSA Z462</p>	<p>Eye protection is one of the most important safety concerns of workers and people on a job site. Workers must wear the appropriate eye and face protection for the task performed or the work conditions. OH&amp;S regulations require certified eye and face wear, which also come as part of the employer's requirements. From the many types and styles of eye protection available (Figure 1-4), ensure whatever type you choose is CSA-certified and suitable for the job conditions.</p> <p style="text-align: center;"><b>Figure 1-4 Three types of eye protectors</b></p>  <p>Assess the task to be performed, select the eye and face protection required, and wear it for the duration of the work.</p> <p>It is a good habit to wear general eye protection at all times while you are in the work zone or on the work site as a precaution against unforeseen hazards.</p> <p>Ensure that you clean and check regularly all eye and face protection, replacing it as required. Inform your supervisor of any faulty equipment.</p> <p>Improper or faulty eye protection devices can be hazards in themselves. Whatever job you are doing—drilling, grinding, chipping, cutting, or welding—use adequate eye protection.</p> <ul style="list-style-type: none"> <li>• Wear specific protection for electrical work, as required by CSA Z462, to protect eyes and face from arc flash.</li> </ul>

Equipment for...	Description
	<ul style="list-style-type: none"> <li>• Wear goggles when chipping concrete or handling caustic liquids and proper flash goggles when working around welding.</li> <li>• Welding goggles or helmets are not suitable for grinding.</li> </ul> <p><b>⚠ Caution!</b> Never assume that your regular prescription glasses, sunglasses, or contact lenses will give you adequate eye protection. Without proper eye protection, dust particles, wood chips, sparks, or "flash" may still cause eye injury.</p>
<p>Hearing protection</p> <p> Reference CSA Z94.2</p>	<p>Many job situations also require hearing protection. Noise can affect you in the following ways:</p> <ul style="list-style-type: none"> <li>• Moderate noise levels over a long period can diminish your ability to hear certain types of sounds.</li> <li>• High noise levels impair your hearing. For example, you can suffer permanent hearing loss from power saw noise or from high-pressure air outlets.</li> <li>• High noise levels also affect your mental state, making you irritable and mentally fatigued. This type of fatigue affects your ability to concentrate and stay alert, so you are more likely to overlook a hazard.</li> </ul> <p>Figure 1-5 shows two types of ear plugs and ear muffs.</p> <p style="text-align: center;"><b>Figure 1-5</b> <b>Hearing protection equipment</b></p>  <p>Remember the following four points when choosing ear protection:</p> <ol style="list-style-type: none"> <li>1) Choose a type of protection suitable to the job you are doing.</li> <li>2) Ear plugs should be pliable, fit each ear tightly, clean, and free of damage.</li> <li>3) Ear muffs make it easier to hear certain signals in noisy environments.</li> <li>4) Headphones designed for listening to music do not provide adequate protection.</li> </ol>

Equipment for...	Description
<p>Hand protection</p> <p> Reference CSA Z462 for additional information on electrically rated hand protection.</p>	<p>Accident statistics indicate that approximately 30% of work-related injuries happen to fingers, hands, and arms. Exposed hands and skin are susceptible to physical, chemical, and radiation hazards. Workers must protect hands and skin from injury by keeping hands shielded from the present hazard.</p> <p>Using the right hand protection could avoid many of these accidents. Figure 1-6 shows various types of protective gloves.</p> <p style="text-align: center;"><b>Figure 1-6</b> <b>Protective gloves</b></p> 

Equipment for...	Description
	<p>Remember, you are ultimately responsible for protecting your own hands. Consider the following types of gloves, and choose the one that is right for your job:</p> <ul style="list-style-type: none"> <li>• thermally insulated gloves when handling hot metal or cold substances, or working in cold weather</li> <li>• rubber or approved plastic-treated gloves when handling chemicals, such as acids and cleaning chemicals (Refer to MSDS sheets for specific gloves to be worn.)</li> <li>• gauntlet-type welder's gloves when welding or flame cutting</li> <li>• rubber gloves certified for electrical apparatus over 50 volts as required by CSA Z462 (which you do not use for other purposes since you may damage them and render them useless for electrical work)</li> <li>• leather or vinyl-coated gloves when handling lumber or steel</li> </ul>
<p>Foot protection</p> <p> Reference CSA Z195 for additional information.</p>	<p>Note that a gas technician's/fitter's working environment calls for Grade 1 footwear, which should comply with CSA Z195. This type of footwear has a green equilateral triangle with sides measuring approximately 25 mm (1 in) sewn or otherwise permanently attached to the right shoe upper as a means of indicating that sole protection and Grade 1 toe protection are provided. The green patch comes with a permanent marking that shows either the registered identifying logo or mark of the certifying agency (e.g., CSA).</p> <p>In addition, you should use footwear with electric shock resistance soles to reduce the risk of injury following accidental contact with live electrical conductors. This footwear type has a rectangular white patch sewn, embossed, or otherwise permanently attached on the outside of the right boot or shoe. The patch has markings that include an orange-colored Greek letter omega (<math>\Omega</math>) and the registered logo or mark of the certifying agency. Note that electric shock resistance does not mean they are shockproof. Many factors such as voltage level influence the capability of this footwear to resist the passage of electrical current. Wear and wet conditions may significantly lower the effectiveness of this footwear.</p> <p>Regularly inspect the sole and heel of the footwear and remove metal pieces. Replace footwear when the tread pattern is eroded by wear. In addition, you should remove road salt and other contaminants from the footwear. Regular application of water repellent compounds to the upper can enhance resistance to water.</p> <p>Most workplace injuries involving the feet deal with ankle injuries. You can minimize these injuries by the following:</p>

Equipment for...	Description
	<ul style="list-style-type: none"> <li>• Proper mounting and dismounting techniques. Using three points of contact (two hands and one foot, or two feet and one hand) when climbing on and off ladders, ramps, heavy equipment, and machinery can help reduce the chance of ankle injuries. Workers should avoid jumping off equipment.</li> <li>• Proper housekeeping procedures to reduce tripping and slipping hazards.</li> <li>• Use of high-cut (260 mm or 8 in) or medium cut (150 mm or 6 in) CSA-certified Grade 1 work boots. The extra support afforded by high-cut boots is one of the most appropriate ways to help prevent some of these injuries, especially in wet or sloping environments.</li> <li>• Lacing of boots to the top of the eyelets supplied will add greatly to the ankle support provided.</li> <li>• Not wearing badly worn boots, which do not offer the same support to the ankles as the firmness of the leather in newer footwear. The protective rating of the boot may be void as well if the wear is excessive.</li> </ul>

## Site hazards and protections

A gas technician/fitter will work in a variety of different work environments in many capacities and will encounter hazards specific to the work site. Technicians/fitters must learn to identify these hazards and take precautionary measures to protect themselves from harm.

### Site hazards

Site hazards change with each specific work site or area. Therefore, you need to determine and understand many hazards found on work sites. Your first action is to identify the hazards and ask questions if you are unsure of the situation. Always consult your supervisor for information about the hazard and the protections that you need to work safely.

### Physical hazards

Gas technicians/fitters commonly experience the following physical hazards:

- working in restricted spaces and cramped work areas
- difficulty in gaining access
- moving or non-fixed equipment or appliances
- corrosive residues
- electrical hazards
- movement of liquids or solids in pipes, tubes, or other vessels
- temperature extremes

Generally, you can identify physical hazards quite easily. Before starting work on a job site, you must:

- inspect a confined space from outside without entering;
- identify equipment that can suffer adverse effects from stored pressure, accidental contact, or gravity;
- check site plans and proposed work with the site manager and other tradespersons; and
- check for exposed electrical conductors or energized equipment.

Atmospheric hazards or environmental hazards are generally chemicals or materials in the air around the work site. They could also be in confined spaces and are often more difficult to assess. The particulate or gases usually require the use of special testing devices like a gas analyzer. You must check the atmosphere every time you plan to enter a confined space, and regularly while you work there. Some examples of atmospheric hazards are:

- combustible or explosive gases and vapours;
- too much or too little oxygen; and
- toxic fumes (CO).

Various types of gas detection equipment are available, and you must use the proper equipment to test specific conditions. Other Chapters and Units will describe these in more detail.

## Confined space

A gas technician/fitter will work on sites having confined spaces. A confined space is a work area where location, design, or construction restricts entry and exit and where equipment, operations, or atmospheres may pose hazards to health and safety.

Before engaging in confined space activities, you usually have to undergo site- and situation-specific training and certification. Consult the safety authority in your area for local requirements, and seek clarification regarding the employer's policies and procedures.

Visit [www.ccohs.ca](http://www.ccohs.ca) for more information.

## Site protection

Be aware that companies and employers are responsible for posting cautions and warnings to ensure the safety of everyone working on site. Before you start on a job, ensure that you know how the safety installations work and where they are located in your workplace. Be aware of the locations of the smoke and heat detectors and automatic sprinkler systems, as well as doors, passageways, and emergency exits.

Site safety procedures must include provisions for group safety, ventilation, good on-site "housekeeping", first aid facilities, and access, egress, exit, evacuation, rescue, and emergency shutdown.

## Group safety equipment

Group safety equipment includes items such as fire extinguishers and first aid kits supplied by the employer and positioned around the job site. The types and amount of equipment supplied depend on the size and type of the job involved.

Equipment	Description
Fire extinguishers	Fire extinguishers are designed to fight small fires, but a standard extinguisher is of little value after a fire is well under way.
Fire blankets	Gas technicians/fitters occasionally find themselves required to weld or use a cutting torch above flammable substances. In this situation, you should always use an approved fire blanket (ultra-heavy fibreglass Pyroblanket) to catch sparks and slag.

Fire safety is described in more detail in Chapter 4. *Fire Safety Practices*.

## Ventilation equipment

Most types of ventilation equipment found in workshops are designed for the removal of harmful dust or fumes.

Equipment	Description
Vacuum systems	Remove sawdust and chips from machines in millwork and joinery shops.
Exhaust systems	Remove exhaust gases from mechanical shops; you must use this whenever you a gasoline or diesel engine.
Special ventilating equipment	Removes harmful dust and toxic paint fumes used in body shops and spray-painting booths. You also use special equipment in confined or enclosed areas, especially during oxyacetylene cutting or welding.

## Clear access ways

Do not allow material to block or restrict access ways since blocked access ways can slow or prevent escape in the event of fire or evacuation. Partially blocked, littered, or otherwise restricted access ways can cause someone to fall. This is a serious hazard around machinery or when the worker is carrying something heavy, sharp, or breakable.

## Good housekeeping on site

Good site safety practice comes down to two factors: cleanliness and common sense. The following are general rules for preventing accidents and increasing your safety awareness on job sites:

General rule	Description
Keep work areas clean	Waste build-up is a major fire risk. Except in cases of spontaneous combustion, the waste does not actually cause the fire, but furnishes fuel that will spread the fire if it is ignited by sparks. Keep the work area clean!
Keep lockers and storage areas clean	Do not use lockers and storage areas for storing waste, particularly paint-smeared or oily cloths.

General rule	Description
Dispose of oily waste	You must avoid the build-up of oily waste on rags or clothing to prevent the very real risk of spontaneous combustion. Collect oily waste and rags in designated covered containers, which are usually painted red and emptied daily. Launder oil-smeared clothing immediately.
Report and clean up spills immediately	A spill of a relatively small amount of volatile or flammable liquid can pose a serious fire hazard. For example, the vapour from a 100 ml (3-1/2 oz) spill of gasoline (a very small spill) could provide over 2200 m <sup>3</sup> (77 700 cu ft) of explosive gasoline-air mixture. Some spills require reporting to the local environmental authority. Be aware that most chemicals cannot be disposed of through your local sewer system. Check with your local environmental agency prior to discharging any such substance to a drain.

## First aid equipment and training

Most modern industrial settings include a first aid station with a trained attendant or a staff person trained in workplace first aid procedures. The person who staffs the station is able to perform a wide variety of services, from bandaging minor cuts to stopping major bleeding and splinting broken bones.

Take some time to find out where the first aid station is, who staffs it, and what services are available. If you have an injury, no matter how minor, ensure that the incident is reported in the first aid station log. Minor problems often develop into major problems; therefore report all injuries promptly.

If you are working alone or in an isolated area, be sure to have easy access to first aid supplies and have a way of notifying someone nearby.

It is a good policy to keep first aid certification current.

## Emergency plans and shutdown systems

Every work site should have an Emergency Response Plan. Workers need to familiarize themselves with this plan and consult their supervisor for training requirements.

Many shop areas have emergency shutdown systems or “panic buttons.” When you enter a shop or industrial setting for the first time, locate and learn how to use the emergency shutdown.

These systems are installed so that only one switch has to be thrown to kill the power to a large amount of equipment. Such systems are to be used when a person is being electrocuted or is caught in a piece of machinery. Under these circumstances, you don’t have time to hunt for and throw the “correct” switch. Hit the panic button!

Make a habit of observing these emergency stations when familiarizing yourself with a facility.

## Safety of tools and equipment

A gas technician/fitter is required to use hand, power, electric, and pneumatic tools. The use and care of tools is very important to any tradesperson. All these tools have specific safety rules geared to the specific type of tool to protect you and others from harm. As a general rule for all

tools, if you are not familiar with a piece of equipment, do not use it until you have read the instructions and are ready to proceed. Before you use them, make sure that hand and power tools are inspected, serviced, repaired, sharpened, or dressed as needed to make them safe for use.

You will also find yourself in areas where maintenance procedures are being carried out on powered machinery. At such times, detailed tag and lockout procedures are essential to prevent anyone from operating a machine that is being worked on and to prevent the unexpected energizing of a machine.

## Hand tools

Basic hand tools are the first tools that you are required to use on the job site.

There are a number of general safety rules that you must follow when you use them:

Do...	Do not/never...
<ul style="list-style-type: none"> <li>• Always select the proper tool for the job.</li> <li>• Keep hand tools clean, serviced, and in good condition.</li> <li>• Check that handles of hammers and axes fit tight into the head of the tool.</li> <li>• Only use pipe wrenches to turn or hold a pipe.</li> <li>• Replace worn jaws on pipe tools.</li> <li>• Select wrenches with sufficient capacity and leverage.</li> <li>• Pulling on wrenches is preferred to remain in control of the force.</li> <li>• Return tools to their proper place when not in use.</li> <li>• When using sharp-edged tools, always cut away from the body.</li> <li>• Always wear or use PPE that is appropriate for the hazards presented by the work and equipment being used.</li> </ul>	<ul style="list-style-type: none"> <li>• Use a tool for a purpose other than what it is meant for.</li> <li>• Use damaged or unsafe tools.</li> <li>• Leave tools where they protrude or can fall and strike someone. Obviously, this is a real hazard where work is done above ground level.</li> <li>• Use a file or rasp without a handle. If you slip, the tang of the file or rasp may puncture the palm of your hand.</li> <li>• Use pipe extenders with wrenches.</li> <li>• Use wrenches to bend or twist, creating excessive torque.</li> <li>• Use pliers instead of a wrench or a wrench as a hammer.</li> </ul>

## Power hand tools

The following are general safety rules relating to power hand tools:

Do...	Do not/never...
<ul style="list-style-type: none"> <li>• Only authorized persons are allowed to use power tools or equipment. Consult your supervisor.</li> <li>• Before using any power tool, review the operation and safety manual for the specific tool. Workers must be trained for each different tool.</li> <li>• Shut off machinery when you leave the immediate area. Make sure revolving machinery has stopped before leaving.</li> <li>• Let revolving machinery stop on its own.</li> <li>• Before adjusting or cleaning, be sure all machinery is stopped, disconnected, and locked off.</li> <li>• Before using any tool, check the condition of all guards, tool retainers, power supply cords, extension cords, and other accessories. Report any damage or defects, and remove the tool from service.</li> </ul>	<ul style="list-style-type: none"> <li>• Slow down or stop a machine with your hands.</li> </ul>

## When operating tools

<b>When operating...</b>	<b>For safety...</b>
Power tools	<ul style="list-style-type: none"> <li>Always use protective equipment to protect your eyes and/or face from flying particles. Always use a dust mask when sanding or buffing with power tools.</li> <li>Beware of moving parts: the drill, blade, disk, grinding wheel, or other device.</li> <li>Do not use power tools without all guards and covers in place. Equipment manufacturers usually build safety features into their equipment: use them! It is unsafe to bypass, disconnect, or remove guards, hoods, or shields.</li> <li>Be careful when using tools with spinning chucks or shafts because they can catch and entangle hair, sleeves, or other loose clothing.</li> </ul>
Power tools with axles (arbors)	<p>Some power tools have axles (arbors) for mounting grinding wheels or other rotating tools. Special rules apply as follows:</p> <ul style="list-style-type: none"> <li>Always check to see that the wheel, blade, or other rotating tool is securely mounted on the arbor. If it is not, add a bushing to properly secure the wheel. (The wheel will shift if the hole is too big, and cause an imbalance on the rotating arbor. This creates vibration and loss of control.)</li> <li>When replacing a grinding wheel, be sure that the wheel is rated to match the RPM of the machine. Otherwise, you run the risk of having the wheel shatter.</li> </ul>
A drill press	<p>When using a bench-mounted or floor-mounted drill press, be sure to:</p> <ul style="list-style-type: none"> <li>use a vice or clamps to hold material;</li> <li>use a face shield;</li> <li>set the drill speed and feed to match your particular drilling Chapter;</li> <li>check whether the equipment is free from obstruction; and</li> <li>check that people are well clear before the machinery is turned on.</li> </ul>

## Electrical tools

There are three types of electric tools:

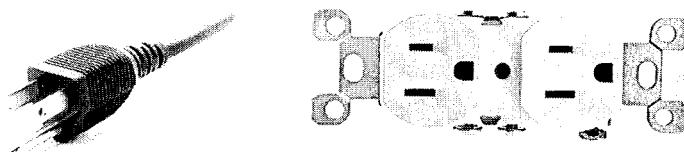
- 1) cordless (battery-powered)
- 2) plug load-powered
- 3) fixed powered non-portable (mostly large tools)

The following rules are general and apply only to the electrical safety of portable tools:

**Note:** When you need to disconnect fixed powered tools, consult your supervisor and an electrician.

- Treat cordless tools and equipment the same as electric power tools and equipment while operating, servicing, or maintaining them. Cordless equipment is preferred for wet or outdoor usage.
- Always disconnect, unplug (remove battery), or lockout electrical tools before making adjustments. Adjustments include changing saw blades, grinding wheels, or doing preventative maintenance.
- When using plug load-powered electric power tools, make sure the terminal (in the electrical outlet) and the ground pin (on the power cord) are in place and in good repair.
- Polarized sockets are outlets that will only accept their own style of plugs, inserted in one way (Figure 1-7).

**Figure 1-7**  
**Three-prong polarized plug with grounded, polarized receptacle**



- Make sure the insulation on the power cord is not cut or frayed. Damaged cords can cause an electric shock.
- Position the cord to prevent it from being damaged while you use the tool.
- Some hand-held electric power tools have an insulated handle or housing and are called "double insulated". These tools have no ground in the plug. Be sure you correctly identify these tools before using them.
- Hold electric tools firmly and with adequate control, and assume a comfortable, balanced position.
- The proper and safe way to lift tools is by their handles. Do not lift an electric tool by its power cord. Cords can easily suffer damage from improper handling or as a result of pulling or jerking their plugs out of the socket. Always remove plugs by grasping and pulling them straight out of the socket.
- When using any corded power tool wet or outdoors, ensure that the circuit it is connected to is provided with a ground fault circuit interrupter (GFCI). Consult your supervisor before proceeding.

## Pneumatic tools

Portable pneumatic (air-powered) tools have similar hazards as electrically powered tools, plus some that are unique:

- You can trip over air supply hoses just as you can trip over electric cords. Route air hoses overhead or out of the way, so you cannot trip on them.
- If the air hose is cut, broken, or disconnected while under pressure, it can flail about and injure people. Do not allow them to lie where vehicles can cut or run over them.
- The air blowing from a hose can cause chips, dirt, and debris to fly about, causing irritation or danger to the eyes and lungs.
- Do not use air hoses to clean your clothes or body. Air pressure directed at you can be forced under your skin (which is painful) or into your bloodstream (which can kill you).



Never point an air hose at another person.

## Lockout procedures

Lockout procedures are quite basic. If you work on a machine or system, use locks to ensure that all sources of hazardous energy are isolated and locked off during work.

Lockout must involve more than merely disconnecting the energy source. You must assess the system hazards thoroughly, and isolate and lock off all energy sources — potential, electrical, pneumatic, hydraulic, rotational, or gravitational, static or dynamic. This is called zero energy state.

Not ensuring the isolation and verification of all forms of energy have led to injuries and deaths among many workers.



Never work live unless you are authorized and supervised!

Lockout procedure involves two parts: locks and safety tags.

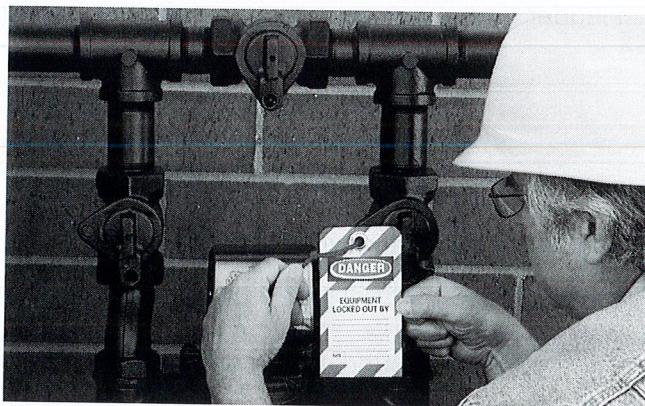
- Locks are keyed to render a system inoperative.
- Safety tags are used to identify the person who locks out a system and, sometimes, to warn other workers not to power up a system that cannot be locked out.

Each worker has his or her own lock and key (combination locks are not allowed), and you should use only these locks to lock out energy sources. Personnel then place safety tags (Figure 1-8) on the locks, and only those who placed them can remove the tags and locks. The shift supervisor, however, keeps and takes control of a master key for use in an emergency.



Reference CSA Z460 and CSA Z462 for additional information.

**Figure 1-8  
Safety tag**



The machine operator receives information on service or maintenance plans, but rules strictly forbid operators and other workers to remove either the tag or the lock.



It is against regulations and extremely dangerous to remove someone else's lock.

These procedures apply not only to stationary industrial equipment but also to mobile equipment, including passenger cars, truck equipment, and heavy construction equipment.

## Multiple lockout

Sometimes more than one person is working on a system or piece of machinery, and since each maintenance worker must use the lockout procedure before starting his or her Chapter, a device called a safety hasp is used to hold the locks. It is attached to the control box of the system or machinery so more than one lock may lock out the power (Figure 1-9). That way, when one worker is finished, the power remains locked out until the last worker is done.

**Figure 1-9  
Safety hasp used for multiple lockout  
Image courtesy of Master Lock and Padlock Outlet**



## Ladders and scaffolds

Accidents involving ladders and scaffolds are a major cause of injuries and fatalities in the workplace. Use the correct ladder for the job: do not improvise or use a ladder for any purpose other than its intended use.

### Ladders

#### Common hazards

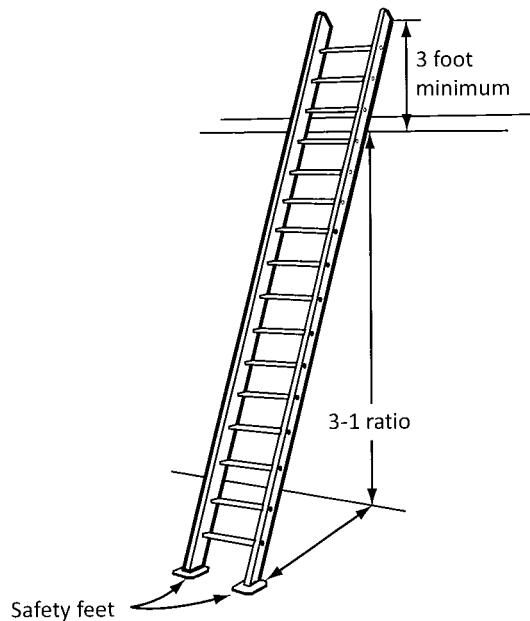
The following are common hazards associated with ladders:

- falls or slides from ladders because of slippery rungs or steps or workers not gripping ladder rungs properly
- ladders not being properly secured to ground, wall, or other equipment, or being set at too sharp or wide angles to surfaces supporting them
- high winds that cause them to fall over
- workers leaning out at dangerous angles from ladders
- too close proximity to electrical lines, particularly aluminum ladders, which are good conductors of electricity
- damaged or defective ladders
- dents, warps, bends, and loose rungs



Reference CSA Z11 for additional information.

**Figure 1-10**  
**Proper positioning of ladder**

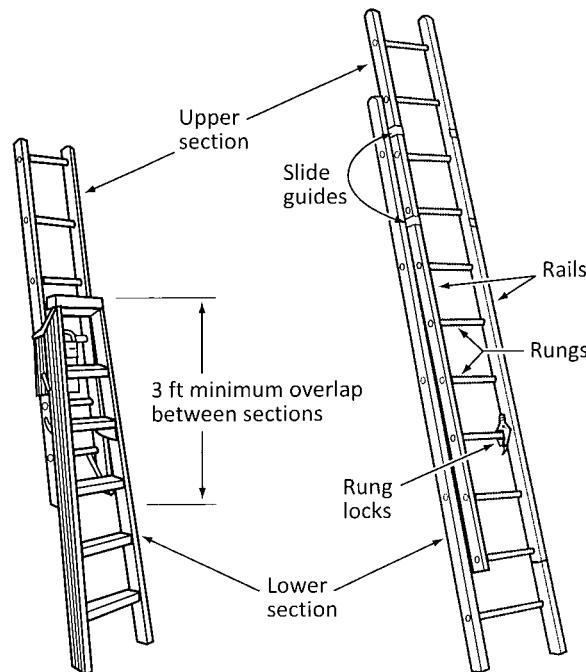


## Precautions to take

Whenever you use a ladder, observe the following precautions:

- Check for defects.
- Check if there are no power lines close by.
- Ensure that the ladder is on a firm, level surface and there are no debris, loose materials, or equipment close to its base, and that the base cannot be moved accidentally. (Don't erect ladders on boxes, carts, tables, etc.)
- Avoid using ladders in doorways, passageways, driveways, etc., where they can be accidentally struck or knocked down.
- Never position ladders against a flexible surface.
- Ensure the ladder is set 1 ft (30 cm) out for every 3 ft (90 cm) up (Figure 1-10).
- Ensure that the top rails are at least 3 ft (90 cm) above the sill or landing so you can grip the ladder securely when you are stepping on or off. Never straddle between the ladder and another object (Figure 1-10).
- Face the ladder when going up or down and maintain a "3-point contact", which means placing two hands and one foot or two feet and one hand on the ladder at all times.
- Check that your clothing and tools will not catch on the railings and that your boots are clear of slippery materials.
- Lift tools or materials with a hoist rope (in a bucket) rather than in your hands.
- At heights over 10 ft (3 m), wear a safety belt or harness that is tied to the building you are climbing to.
- Ask for help when you have to erect long or heavy ladders.
- Don't use ladders as braces, planks, runways, or for any other purpose for which they are not designed.
- Always rest ladders on their side rails, not their rungs.
- A minimum 3 ft (90 cm) overlap between the upper and lower sections is required when using extension ladders (Figure 1-11).

**Figure 1-11**  
**Minimum 3 ft (90 cm) overlap required between upper and lower sections of extension ladders**



### Ladder inspection and maintenance

Do...	Do not/never...
<ul style="list-style-type: none"> <li>• Regularly inspect them for:           <ul style="list-style-type: none"> <li>– straightness;</li> <li>– rigidity;</li> <li>– frayed or worn ropes on extension types;</li> <li>– dents and bends;</li> <li>– rail and rung strength;</li> <li>– proper swivelling and non-skidding of the feet; and</li> <li>– cracks, splits, or rotting on wooden ladders.</li> </ul> </li>   <li>• Regularly check that ladders are free of:           <ul style="list-style-type: none"> <li>– grease;</li> <li>– oil; and</li> <li>– pieces of stone, metal, or other materials.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Use ladders that are defective.</li> <li>• Paint a ladder—it may cover defects and make the rungs slippery.</li> </ul>

## Scaffolds

Different types of scaffolds are used for a variety of tasks in the workplace. Since gas technicians/fitters may be required to assemble and use scaffolds, they need to become familiar with the relevant hazards. Scaffolds are an elevated platform and require fall protection at all times. Training and certification is required for most fall protection; consult your supervisor for instruction.

### Scaffold Use

Before starting to work on a scaffold, ensure that:

- there are no overhead wires close by;
- the scaffold is securely mounted and tied;
- it can bear the weight of workers and the tools, materials, and equipment to be carried;
- the supervisor and crew have experience working on scaffolds;
- the weather conditions are favourable;
- there are no dangerous obstructions; and
- provisions are made to divert pedestrian traffic around it.



Reference CAN/CSA Z797 for additional information.

## General safety rules

Preventing work-related injuries and diseases and creating a healthy work environment are the main safety objectives. Identifying hazards and eliminating risks and/or minimizing them as much as possible requires everyone's attention.

The following safety rules apply in all training and work situations. You must follow these rules when doing any practical task. Expect your instructor to observe your work habits as they apply to these rules and to mark you on how you use them while you are in the shop.

### Review and use the rules

Get into the habit of using safe work practices now. Review and use the rules and consult the employer's safety policy.

Safe work practice	Description
No horseplay	Do not tolerate running, wrestling, throwing objects around, and all other types of unsafe behaviour in the shop.
Clean up	Good housekeeping is a must in any shop or site situation: keep your work area clean; remove or protect protruding sharp objects; post hazard signs; store gas cylinders upright.
Keep tools and equipment orderly	Your tools are important to your job: keep them clean and store them properly when not in use.

Safe work practice	Description
Do not place articles on ladders or where there are falling hazards	Tools and materials left on raised areas, such as ladders, can easily fall and injure someone. Remember: the life that you save may be your own.
Work with adequate lighting	You must be able to see what you are doing: if you need more light, use a trouble lamp.
Lift correctly	Improper lifting can cause injury: use the correct posture and rigging equipment.
Use protective equipment	Safety gear and clothing are required when working in the shop or job site: use the appropriate equipment for the job at hand.
Tag and remove defective items	You must tag a tool or piece of equipment that is defective must be tagged to indicate that it should not be used. You should remove all defective items from the work area.
Report accidents and injuries	You should report any accident or injury, no matter how minor it may seem to you, to your supervisor, and if necessary, to the first aid attendants.
Be aware of your state of health	Report any health problems to your supervisor. Even a minor problem, such as a mild head cold affecting your sense of balance, could cause hazards if you must operate on high scaffolding, for example.
Do not work while impaired by alcohol or medication	Avoid drinking alcoholic beverages or taking medication that suppresses the activity of the central nervous system (barbiturates or tranquilizers) before or during work.
Correct or report unsafe situations immediately	You must correct any safety violation or unsafe condition right away or report it immediately to your supervisor, who will take action.

The above safety rules may seem like common sense and rather obvious, but you must ensure that you follow them wherever you are working.

You can find additional health and safety rules in this site:

[http://www.hrsdc.gc.ca/eng/labour/health\\_safety/index.shtml](http://www.hrsdc.gc.ca/eng/labour/health_safety/index.shtml)

## Responsibilities of parties involved

Everyone involved in a construction site has specific responsibilities for safety.

The following guidelines are typical of those found in provincial Acts and Regulations for construction projects.

<b>Party</b>	<b>Responsible to ensure that...</b>
Constructor  The person who undertakes a job for an owner and can include the owner when he/she undertakes all or part of a job alone or with more than one employer	<ul style="list-style-type: none"> <li>The measures and procedures required by the current Acts (e.g., <i>Occupational Health and Safety Act</i>) and Regulations (e.g., Regulations for Construction Projects) are carried out on the job site.</li> <li>Employers and workers on the job site comply with applicable Acts and Regulations.</li> <li>The health and safety of workers on the job site is protected.</li> </ul>
Employer	<ul style="list-style-type: none"> <li>The equipment, materials, safety clothing, and protective devices required by law are provided.</li> <li>The equipment, materials, and protective devices provided are maintained in good condition and used as prescribed.</li> <li>The measures and procedures required by law are carried out.</li> <li>Information, instruction, and supervision are provided to protect the health and safety of workers.</li> <li>A competent person is appointed as supervisor.</li> </ul>
Supervisor	<ul style="list-style-type: none"> <li>Workers work in the manner and with the protective devices, measures, and procedures required by all applicable Acts and Regulations.</li> <li>Workers use or wear the equipment, protective devices, or clothing that the employer requires to be used or worn.</li> <li>Workers are advised of any potential or actual danger to their health and safety.</li> <li>Workers are provided with instructions on the measures and procedures to follow for their protection.</li> </ul>

<b>Party</b>	<b>Responsible to ensure that...</b>
Worker	<ul style="list-style-type: none"> <li>• He/she work in compliance with all applicable Act and Regulations.</li> <li>• He/she use or wear the equipment, protective devices, or clothing that the employer requires to be used or worn.</li> <li>• He/she report to the employer or supervisor any: <ul style="list-style-type: none"> <li>– problem with equipment that may endanger the worker or other workers.</li> <li>– contravention of all applicable Acts or Regulations.</li> <li>– hazard on the job site.</li> </ul> </li> <li>• He/she never work in a manner that may endanger anyone.</li> <li>• He/she never engage in any prank, contest, feat of strength, unnecessary running, or rough and boisterous conduct on the job site.</li> </ul>
Health and safety representative	<ul style="list-style-type: none"> <li>• The health and safety representative performs site inspections, helps to mediate disputes over unsafe conditions, may assist in investigating serious accidents, and confers with supervisors, workers, and inspectors (typically from the Ministry of Labour) when necessary.</li> </ul> <p> Always think about safety. If you do not, you are, quite literally, an accident looking for a place to happen!</p> <ul style="list-style-type: none"> <li>• At the provincial and territorial level, the name of the government department responsible for OH&amp;S varies with each jurisdiction. Usually it is called a ministry or department of labour. In some jurisdictions, it is a workers' compensation board or commission that has the responsibility for occupational health and safety. Each provincial or territorial department is responsible for the administration and enforcement of its occupational health and safety act and regulations.</li> </ul> <p>A list of Canadian government departments with chief responsibility for occupational health and safety is available at : <a href="http://www.ccohs.ca/oshanswers/information/govt.html">http://www.ccohs.ca/oshanswers/information/govt.html</a></p>