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4.0 Personal Safety

Introduction

This chapter addresses ways of protecting your body from the risks and hazards of working in the mineral exploration industry with emphasis on the need for and use of personal protective equipment (PPE). It is in the best interest of each employee to become as knowledgeable and self-reliant as possible regarding their personal safety. Therefore, employees should be trained and certified in the correct selection, use, care and maintenance of PPE, as required. Although PPE provides a personal means of defence against hazards, employees need to understand that they should not develop a false sense of security and rely on PPE to the exclusion of other safety measures. The resources section lists many government websites to enable the reader to seek out additional information regarding PPE and safety protection for employees.

Acronyms

AHJ – Authority Having Jurisdiction

ANSI – American National Standards Institute

ATV – All-Terrain Vehicle

COPD – Chronic Obstructive Pulmonary Disease

CSA – Canadian Standards Association

dB – Decibel

EES – Excellence in Environmental Stewardship

EHS – Environment Health and Safety

ERP – Emergency Response Plan

JSA – Job Safety Analysis

MSDS – Material Safety Data Sheet

OHS – Occupational Health and Safety

PFD – Personal Flotation Device

PPE – Personal Protective Equipment

RPP – Radiation Protection Program

SOP – Safe Operating Procedures

UV – Ultraviolet

UVA – Ultraviolet A (wavelength range between 400-320 nanometres)

UVB – Ultraviolet B (wavelength range between 320-280 nanometres)

WHMIS – Workplace Hazardous Materials Information System

XRF – X-ray fluorescence

4.1 Risks and Hazards

Accident statistics collected by the Association for Mineral Exploration British Columbia (AME BC) and the Prospectors & Developers Association of Canada (PDAC) are presented each year in the *Canadian Mineral Exploration Health and Safety Annual Report*. Statistics consistently indicate that over 60% of exploration work related injuries are due to: (1) slips, trips, and falls, (2) the misuse of tools and camp equipment, and (3) injuries due to improper lifting. In addition, ATVs are a frequent cause of injuries, as it is easy to travel too fast for the surface conditions and overturn them. Fatalities are most frequently related to transportation accidents (especially helicopters and ATVs) and breaking through ice. All exploration employees should work in a manner to prevent injury to themselves and their co-workers.

Some consequences of injuring various body parts:

- Back – strains, lifting injuries, chronic back pain, paralysis
- Extremities – cuts, crush and pinch injuries, burns, broken bones, loss of fingers and toes
- Skin – cuts and abrasions, burns, sunburn, frostbite, rashes, insect bites, diseases
- Eyes – vision damage, blindness, retinal burns, punctures, snow blindness
- Hearing – hearing loss, deafness, infections
- Head – impact injuries, cuts, concussion, brain injuries, death
- Lungs – asphyxiation, suffocation, drowning, lung diseases (including asbestosis, asthma, cancers, chronic obstructive pulmonary disease)

4.2 Hazard Control and Personal Protective Equipment (PPE)

Risk assessments, job safety analyses (JSAs) and hazard controls are parts of due diligence with respect to safety and should be carried out to protect employee health and safety. The following preferred order for risk management techniques is well accepted in the manufacturing and construction industries: (1) eliminate the hazard, (2) apply engineering controls, (3) apply administrative controls, and finally (4) provide personal protective equipment (PPE) for employee protection. It is much more difficult to follow this management order in the mineral exploration industry where many of the significant hazards are related to terrain, weather and transportation in remote locations. For these reasons PPE plays a very important role for employees working outdoors where hazards are usually uncontrolled. Refer to sections 1.2 Due Diligence with Respect to Safety, 2.1.4 Job Safety Analyses and 2.1.5 Risk Assessments.

General recommendations regarding personal protective equipment (PPE)

- In Canada, Occupational Health and Safety (OHS) legislation mandates the use of PPE when working conditions require an employee to place a part of his or her body at risk. Where the use of PPE is not legislated, companies should develop their own requirements and enforce them.
- The correct use of PPE is an important part of safety and demonstrates due diligence with respect to safety.
- PPE must be compatible. One type of PPE should not interfere with the intended use of another or create a new hazard, i.e., safety glasses should not prevent earmuffs from fitting correctly.

- Choose PPE equipment that is suitable for the size of the person who wears it. Consider the size, fit, weight and comfort of the equipment. A person is more likely to wear PPE if it feels comfortable.
- Some projects may require specific PPE procedures where there are particular risks (e.g., uranium or asbestiform mineralization).

Responsibilities regarding PPE

Exploration companies

- Develop and implement safe operating procedures (SOPs) regarding the use of PPE.
- Employers should make PPE available and take all reasonable steps to make sure employees use appropriate PPE for the jobs they perform. Employers may be required to supply PPE, depending on jurisdictional regulations.
- Employers should provide adequate training in the correct use and maintenance of PPE. Document the training in accordance with jurisdictional requirements.
- It is advisable to develop a policy regarding the required use of PPE with consequences when an employee refuses to wear it (e.g., a “no PPE – no work” policy).

Project supervisors

- Make sure risk assessments and job safety analyses (JSAs) are completed to determine the required PPE for the location and jobs.
- Provide a list of required PPE for various tasks. Provide written instructions for future reference regarding the correct methods to use PPE.
- Provide training in the proper use, fit and care of the PPE. Training should include demonstrating the correct way to wear and adjust PPE, especially for items such as earplugs and respirators, as their incorrect use greatly diminishes the protection they provide.
- Periodically assess the condition of required PPE to be sure it is still doing its job.

Employees

- Use all mandatory PPE and follow company SOPs and training regarding PPE and protective clothing.
- Know how to wear and adjust PPE so it functions correctly.
- Maintain and care for PPE and replace it when it is worn or damaged.
- Know the limitations of the PPE you use.

4.2.1 Physical Conditioning

Field work is physically demanding. Employees who lack adequate physical conditioning are more susceptible to the following injuries. Some injuries may result in long term disability or even death.

Potential injuries

- Musculoskeletal disorders (sprains, strains, tendonitis, repetitive strain injuries etc.)

- Joint injuries
- Back injuries
- Bone fractures

Prevention and preparation

To avoid strains and injuries that result from physical challenges, it is advisable to follow these general procedures before you begin fieldwork:

- Have a general medical checkup if it has been a year or more since the last one. This may be a mandatory procedure depending on company policy. Immunizations should be up-to-date.
- Have a dental checkup if you will be working in a remote area.
- Employees should give consent and inform the project medic about personal background health information in case it is needed in an emergency. Supervisors and first aid workers must exercise confidentiality and can only disclose personal health information with the permission of the employee or as required by law. While health forms filled out by employees should be kept in strict confidence, employees with health issues that might cause them to become incapacitated should inform their supervisor and co-workers about all allergies, required medications or adverse reactions and special dietary requirements. Occasionally, allergies to certain foods, insect bites or medications can cause fatal reactions. If you have a special medical condition or allergy, teach co-workers to recognize symptoms of an impending attack. They need to know how to administer medication (e.g., insulin, epinephrine) because you may be unable to administer medication to yourself. A stressful situation can trigger symptoms of some disorders such as diabetes or asthma. If you require such a medical kit, keep it with you at all times.
- Make sure to take more than an adequate supply of any required medication to the field.
- Learn to swim; wear a personal flotation device (PFD) when you are working on water or near deep water. Refer to Chapter 17. Boats, Canoes and Inflatables.
- Do some physical training to strengthen weak muscles. Different jobs require various degrees of physical fitness. Know your limitations and work with the “buddy system” for lifting heavy loads. Only take on work that is within your physical abilities.
- Plan traversing schedules so that the most challenging traverses are done when field crews are in the best physical condition or there is extra support (e.g., mountaineering specialists or helicopters).
- To prevent injuries at the end of the day when you are tired:
 - Pace yourself during the day while on traverse.
 - Pay extra attention to your footing when your pack is heaviest such as at the end of the day.
 - Control your speed and pay extra attention to road or trail conditions when driving back to the project or camp.

4.2.2 Head Protection

Head injuries are serious and may result in headaches, concussion, brain damage and even death. Hard hats and helmets for specialized activities are designed to minimize head injuries.

Risks and hazards to the head

- Impact injuries due to contact with sharp edges, low overhead hazards, sharp puncturing objects, flying debris, or falling on tools or sharp rocks
- Slips, trips and falls due to rough or slippery ground, working at height without fall protection
- Electrocutation due to contacting overhead electrical sources

Prevention and preparation

Hard hats

Both Canadian and US Occupational Health and Safety legislation specify that everyone should wear a good quality, appropriate, government approved hard hat when working in any location where there is a risk from falling objects, flying debris, or where one might be harmed by machinery in operation, unsecured equipment and sharp edges etc. Some examples of locations and situations where a hard hat should be worn include:

- Mine sites – all active, abandoned, surface and underground mines
- All drill sites
- Open pits, trenches, quarries
- Sampling on steep slopes or cliff faces
- Slinging operations
- Construction sites and where heavy equipment is present
- Where your head might contact electrical conductors
- Using chainsaws or rock saws

Hard hat tips

- Use a hard hat that is correctly rated for the job and meets the appropriate CSA, ANSI or standards of the authority having jurisdiction (AHJ). There are several types and classes of hard hats. The webbing inside hard hats should provide shock absorption from falling objects, lateral impacts and help protect your head during a fall.
- Use a face shield attached to the hard hat for protection from chemicals, dust or electrical sparks etc., as required.
- Inspect your hard hat every day before use. Replace it if the shell is damaged, i.e., cracked, brittle, dented, discoloured or flaking, or if the strap system is frayed or torn. Hard hats should be replaced at least every three to five years as they can become brittle. The strap system should be replaced annually if it is used frequently.

- Make sure the hard hat fits properly; it should stay on when you bend over but not be so tight that it marks your forehead. There should be 2.5 cm (1 in) between the shell of the hard hat and the strap system that absorbs the shock.
- Never wear your hard hat backwards; in that position it cannot protect your head as it is designed to do. Do not insert anything between the webbing and the shell or the suspension will not be able to absorb an impact properly.
- Seasonal issues: In winter, wear a hard hat liner for warmth during very cold temperatures but make sure the hard hat fits over it correctly. In summer, hard hats may have fabric attached to protect the worker's neck from sun, but the hat must fit correctly.
- Use a chin strap to secure the hard hat when it is windy or when working at or near a helicopter landing area.
- Care for the hard hat correctly. Clean and store it correctly. Do not paint it or apply solvents as these can make the shell either soft or brittle.
- Additional information regarding hard hats is available at the following websites:
<http://www.ccohs.ca/oshanswers/prevention/ppe/headwear.html>
http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/head/page00.shtml

Helmets

The required or suggested use of helmets may depend on jurisdictional OHS legislation and company SOPs.

- Regional legislation may require riders and passengers to wear government approved helmets when riding ATVs, snowmobiles or a 2-wheel motor bike. Helmets worn with a face shield provide the most protection. Refer to Chapters 14. All-Terrain Vehicles and 15. Snowmobiles for additional information.
- When traversing in mountainous terrain where falling rocks may be a risk, it may be advisable to wear a climbing or mountaineering helmet with a secure chin strap rather than a hard hat. Mountaineering helmets are designed with no brim to prevent them from catching on rocks should you slip and fall.
- Where legislation does not require the use of helmets, employees should use common sense and wear a helmet when conditions are hazardous.

4.2.3 Eye Protection

Eye injuries may result in eye infections, retinal or corneal burns, diminished eyesight or blindness.

Risks and hazards to eyes

- Blindness or other injuries may be caused by flying rock or metal chips when using a rock hammer or a chisel, or when sharp objects or tools impact the eyes.
- Eye injuries may result when dust or debris gets into eyes, or when branches whip into eyes while traversing or riding an ATVs or snowmobiles etc.
- Burns or eye damage may result from contact with chemicals or from broken hoses that eject hydraulic fluids.

- Retinal damage (even blindness) may result from welding or the use of lasers or UV lights.

Prevention and preparation

Protect your eyes and sight by wearing appropriate safety glasses, goggles, or a face shield when exposed to hazards.

- In Canada, safety eyewear should meet the CAN/CSA-Z94.3 Industrial Eye and Face Protectors standard for impact resistance.
- In the USA, industrial protective eye glasses must meet the ANSI Z87.1 standard.
- Lenses should be appropriate for the job and work location.
 - Clear lenses are appropriate for most work and should offer almost 100% ultraviolet (UV) protection.
 - Tinted or dark lenses with UV protection are essential when working where there is high sun exposure (e.g., snowfields, glaciers, on water, in deserts and at high altitude). Tinted lenses in safety glasses are available that offer full UV protection.
 - Coloured lenses: Grey and green lenses are best for drivers in order to see traffic lights. Amber lenses are best for seeing contrast, such as when working on ice, snow and water. Lenses should not be so dark that they diminish your vision. Transitional or “photochromatic” lenses that change colour in response to the level of light are often acceptable for work in areas where the light levels vary, but they may not be dark enough for protection when working on snow and water.
 - Polarized lenses are important for work locations where glare is a factor such as on snowfields, glaciers and on water.
- UV protection should protect against both UVA and UVB radiation. Most safety glasses offer very good UV protection and are available with tinted lenses.
- If safety glasses are not required, wear sunglasses when working where your eyes are exposed to extra sunlight as described above. One solution is to wear polarizing “clip-on” lenses that fit over sunglasses with UV protection.
- Cold weather – wear eye protection with frames made of nylon or rubber as they do not become brittle.
- Ask a supervisor if you are unsure of which type of equipment or lenses are appropriate.
- Tip: To remove goggles or safety glasses after working in dusty or gritty areas, tilt your head forward and downward. Close your eyes and release the straps holding the glasses from the back of your head. Pull them away and downward so any debris falls away from your eyes.
- Additional information to help make the correct selection for eye protection and safety lenses is available at the following websites:
<http://www.ccohs.ca/oshanswers/prevention/ppe/glasses.html>
http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/eyes/page00.shtml

Safety Goggles

Wear safety glasses with side shields or goggles at the following work sites or when performing some jobs such as:

- During any and all exposure to broken or flying rock. This includes sampling rocks, splitting core or whenever you are near someone doing this work.
- Operating a chainsaw, core saw, rock saw, core splitter
- Sites where heavy machinery is present
- Drill sites
- Mine sites
- Traversing through wooded and brushy areas
- Working in dusty conditions
- Riding ATVs or snowmobiles on narrow, heavily wooded trails
- Working at or near helicopter landing sites
- Blasting operations

Goggles are a safer choice for the following jobs:

- Slinging overhead loads: Safety glasses can blow off if not firmly attached to your head.
- Working above eye level
- Handling hazardous or corrosive fluids or materials
- Boosting batteries
- Using ultraviolet (UV) lamps
- Using additional eye protection with a face shield

Wearing contact lenses creates additional safety issues

Always wear safety glasses or other appropriate eye protection in addition to contact lenses, as the lenses do not protect your eyes from injury. In some circumstances their presence may increase the potential risk of eye injury.

- Always wear safety goggles with no side perforations if it is necessary to handle corrosive or hazardous fluids. They prevent them from getting into your eyes and under the lenses and potentially causing extensive eye damage.
- Practice wearing a respirator with your contact lenses before working for long periods.
- Information about the safety of wearing contact lenses in the workplace is available on the following website: http://www.ccohs.ca/oshanswers/prevention/contact_len.html

4.2.4 Hearing Protection

Although permanent or temporary hearing loss can develop rapidly, it can also develop so gradually that one is unaware it is happening. Sustained noise levels can also cause increased blood pressure and levels of stress.

Risks and hazards to hearing

- Deafness may result from exposure to high noise levels when:
 - Flying in aircraft

- Working around helicopter landing sites
- During slinging operations
- Working around heavy machinery and generators
- Using machinery (e.g., chainsaws, rock saws, drills)
- Ear infections caused by using dirty earplugs.
- Serious injury or death may result if you are unable to hear alarms or warning sounds such as those on heavy equipment or fire alarms.

Prevention and preparation

Helicopter engines, chainsaws and drilling equipment etc., frequently produce noise levels above 85 decibels (dB). The louder the noise, the shorter the duration needed to damage your hearing and result in permanent hearing loss. Even sustained noise levels in the moderate range can result in permanent hearing damage. Preserve your hearing by using hearing PPE and wearing it the entire time you are exposed to noise hazards.

A noisy work area should be monitored to determine the noise level. A company should try to reduce excessive noise by engineering it out, controlling or diminishing it through good maintenance, acquiring quieter equipment, and/or reducing the time that employees are exposure to the noise. Hearing PPE is essential, but additional efforts should be made to control noise.

Hearing protection should be worn when noise levels are high, such as when operating certain tools or equipment and during noisy activities. Some examples include:

- Helicopter and charter aircraft flights: Use disposable earplugs during all helicopter and charter aircraft flights. Some companies provide earmuffs for all passengers. Use these in addition to earplugs when appropriate.
- Chainsaws, rock saws
- Drilling sites
- Equipment such as rock crushers and pulverizers, air hammers, pluggers
- Riding muskeg tractors, snowmobiles
- Any activity where there is potential for exposure to excessive noise

Earmuffs and Earplugs

Employees should be trained to properly fit and maintain their earmuffs and earplugs. Make sure hair and glasses do not interfere with hearing protection. Earmuffs are available to accommodate specific noise levels and in different styles for use with hard hats and for people who wear glasses. Earmuffs are the preferred PPE for noise reduction as they generally provide superior protection and are safer to use than earplugs. Use earmuffs that fit correctly and are comfortable. Companies should consider providing an annual hearing test to detect changes in hearing when employees work where noise levels are a hazard.

Earmuffs

- They must fit tightly to be effective.
- Replace the outer foam cushions when they become worn or brittle.

Earplugs

- They must be worn correctly to be effective. Follow the manufacturer's instructions to insert them.
- Take proper care of reusable earplugs and replace them as necessary. Try not to insert them with dirty fingers as you may transfer bacteria to your ear canal.
- Do not share earplugs, as infections can be transmitted between people this way.
- Disposable earplugs are intended for single use only so discard them after use.
- Use earplugs in conjunction with earmuffs for additional protection, as appropriate.
- Tip: If you use helicopters frequently, consider attaching reusable earplugs on a cord to your jacket or field vest so they are always available.

Audio entertainment devices and headsets

In general, it is not good practice to allow employees to wear personal electronic music devices with headphones or earplugs (including iPods) when working, especially with or around machinery, when riding ATVs or when traversing. Many people have the music turned up loud and as a result:

- They may not hear instructions or shouted warnings from co-workers – either in person or by radio communication.
- They may not hear warning sounds from machinery that is not functioning properly.
- They may not hear the audible backup warning signals from moving equipment.
- They may not become aware of dangers such as bears.
- They will be generally distracted from the job at hand thus increasing the risk of accidents.

Music played in camp from a portable radio through loudspeakers may be acceptable as long as it is not too loud; external sounds (e.g., warnings) must still be apparent. The project or camp supervisor should make clear protocols with respect to this topic and make sure they are followed. Wearing headphones when working on a computer or relaxing in the camp may be acceptable as long as the music is not at unacceptably high levels and does not interfere with the work of others.

Additional information regarding hearing protection is available at the following websites:

http://www.ccohs.ca/oshanswers/prevention/ppe/ear_prot.html

http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/ears/page00.shtml

4.2.5 Hand Protection

Protect your hands from injuries such as cuts, abrasions, smashed or crushed fingers, broken bones and repetitive strain injuries.

Risks and hazards to hands

- Cuts, impact injuries, crushed fingers may result when:
 - Handling core boxes, using rock saws and core splitters

- Tools break or are misused
- Handling sharp rocks or objects
- Crushed and severed digits caused by getting caught in pinch points and rotating parts of machinery
- Cuts or dermatitis caused by contact with sharp and/or poisonous vegetation
- Burns caused by contact with hot stoves, lanterns, hot motorized equipment, chemicals or explosives
- Frostbite caused by exposure to cold due to inadequate gloves or clothing
- Skin cancers may develop after lengthy exposure to sun.
- Electrocution caused by contact with faulty electrical tools or extension cords, using improperly grounded tools or saws, or using electrical equipment in wet conditions
- Blisters caused by repetitive manual work
- Repetitive strain injuries may result from repeating the same task and/or using computers.
- Vibration injuries may result from using pluggers

Prevention and preparation

- Wear gloves when performing work that requires hand protection. Choose the correct type of gloves for the job. Training is required for the correct use, inspection and maintenance of some types of gloves.
- Avoid wearing rings, watches, or jewellery and improperly fitting gloves when operating machinery, as they may become caught in the equipment and cause severe injury. Some jobs benefit from wearing properly fitting gloves to increase your grip (e.g., using chainsaws or when handling drilling equipment).
- Traversing: Wear appropriate gloves to protect your hands from the sun, the cold, from sharp or poisonous vegetation and from repeated handling of rough rocks.
- Hand care: Do not neglect cuts and burns. Get appropriate first aid or medical attention right away to prevent infections. Wounds that do not heal can become dangerously infected, especially in tropical climates. Look after your hands in dry and in cold climates by applying lotion or salve to prevent cracks that frequently develop and are slow to heal.
- Handwashing: Protect your hands by washing them with mild cleansing agents. Avoid using solvents to remove grease, as they may be absorbed through the skin or damage your skin.
- Apply sunscreen to protect your skin including on the back of the hands, as skin cancers frequently develop there after years of sun exposure.

Gloves

Choose the correct job-rated gloves for proper protection. Use and maintain them according to the manufacturer's instructions. Training may be required to use some types correctly.

- Leather gloves protect from cuts and scratches as well as from heat to a limited degree. Wear them when doing heavy manual labour.
- Cold protection: For cold weather work and snowmobiling, wear insulated gauntlets or gloves. Double layered gloves are more effective than a single layer style. Wear thin

inner gloves if it is necessary to remove outer gloves to write notes or do delicate tasks. Use waterproof and fuel proof insulated gloves when handling fuel and salt in cold conditions. Neoprene gloves can protect your hands in cold, wet conditions.

- Electric shock: Wear leather lineman gloves to prevent static electric shock when slinging loads under helicopters.
- Corrosive materials: Use nitrile, neoprene or butyl rubber gloves, as appropriate, to handle corrosive materials. Choose gloves with the required permeation rate and breakthrough time, which is determined by the use of the gloves. Training is required when gloves are used as PPE for chemical hazards. Check the relevant Material Safety Data Sheet (MSDS) for PPE information.
- Explosives: Use nitrile rubber gloves to handle explosives, as this material is the least likely to cause a static spark of electricity. Only fully trained and certified employees may handle explosives and they should be trained in the use and maintenance of the correct type of gloves.
- Kitchen gloves: It may be advisable to wear disposable plastic gloves when handling food. Gloves need to be discarded each time they become contaminated. Wearing gloves does not reduce the need for good handwashing procedures. It is advisable to wear rubber gloves when washing dishes to protect hands from excess exposure to water. When using rubber and plastic gloves, keep your hands away from heat sources as the gloves can melt and cause burns.
- Latex gloves: Inform the supervisor if you know or suspect you have an allergy or react to natural rubber latex or synthetic rubber. There are two types of reactions: (1) *irritant contact dermatitis*, which is a skin rash caused by sweating in gloves or by irritants on the skin that are trapped in the gloves, and (2) *allergic contact dermatitis*, which is a skin rash caused by an immune response to the chemicals present in the gloves. There are two types of allergic reactions – the less serious rubber chemical allergy and the potentially very serious natural rubber latex protein allergy. A person with a natural rubber latex protein allergy should inform the first aid attendant and co-workers and consider wearing a Medic-Alert bracelet and carry an epinephrine autoinjector if they work where there is risk of exposure.
- Glove care and maintenance:
 - Wear gloves that fit correctly. If they are too tight they may rip; if they are too loose, they may come off unexpectedly or your grip may be affected.
 - Carefully inspect the finger tips and the areas between fingers for holes and damage before using gloves, especially if they are designed to protect your hands from chemicals etc.
 - Continuously monitor the condition of the gloves and change them before they wear out.
 - Wash off contaminants before you remove gloves; know how to remove and dispose of gloves properly.
 - Glove failure – know how to address chemical burns. Remove chemical-soaked gloves and wash your hands for at least 20 minutes under cool running water unless the chemical reacts with water. Be familiar with the specific MSDS so that you immediately use the correct first aid procedures.

Additional information regarding hand protection is available at the following websites:

<http://www.ccohs.ca/oshanswers/prevention/ppe/gloves.html>

http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/hands/page00.shtml

http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/skin/page00.shtml
http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/latex_allergies.pdf
http://www.ccohs.ca/oshanswers/diseases/skin_cancer.html
http://www.ccohs.ca/oshanswers/diseases/washing_hands.html

4.2.6 Foot Protection

Treat your feet well by protecting them with appropriate footwear. Improper work boots may result in chronic foot pain or injuries.

Risks and hazards to feet

- Slips, trips, and falls may result when footwear lacks appropriate traction (e.g., wrong type, soles are worn out).
- Impact injuries and puncture wounds may be caused by dropping sharp or puncturing objects, heavy core boxes, or heavy sample bags on your feet.
- Blisters or lacerations caused by wearing improperly fitting footwear
- Snakebite or cuts from sharp vegetation due to inadequate footwear
- Frostbite, permanent tissue damage, amputation of toes may result from exposure to cold weather or temperatures when wearing inadequate footwear.
- Trench foot or immersion foot caused by continuously wearing wet socks and boots
- “Athlete’s foot” may develop as a result of wet, sweaty feet.
- Electrocution caused by working with faulty electric tools and equipment, using tools while standing on wet ground, or contacting live wires without wearing appropriate footwear

Prevention and preparation

Feet are vulnerable to abuse from heat, cold, water and vegetation (e.g., cactus) and to various diseases and infections. Sandals and athletic shoes are not recommended footwear for field work or work at project sites. Make sure work boots fit correctly to help avoid blisters and break in new boots before the field season begins. Good traction is essential. Consider the terrain and working conditions when choosing footwear:

- **Safety boots:** Wear approved safety boots when handling core and core boxes, when working underground, in open pits or trenches, around heavy equipment such as drill rigs or excavators, when handling heavy materials, and when using heavy mechanical tools or equipment (e.g., axes, heavy sledges, chainsaws, plugger drills). Wear non-conductive boots if you are likely to encounter electrical hazards.
- **Cold climate conditions:** Wear heavily insulated waterproof boots with removable wool or felt liners. Take a spare set of liners so they can dry out on alternate days. Carry extra socks and change them frequently to keep your feet dry to prevent frostbite or immersion foot disorders.
- **Hot climate conditions:** Feet will sweat heavily so keep your feet as dry as possible by washing them and changing socks frequently. This helps prevent infections.
- **Traversing:** Wear durable boots that have proper ankle support. The soles should provide appropriate traction for the terrain. Refer to section 6.3.5 Clothing for additional information on footwear.

- Wet boots dry faster when they are not waterproofed. It is important to dry your feet and keep them warm at night to prevent developing foot disorders generically referred to as foot rot. Refer to 9.9.6 Immersion Foot.
- Wear appropriate leather or winter boots when riding ATVs or snowmobiles and place your feet correctly on the machine to prevent injury.
- Wear high leather boots (snakeboots) and appropriate long pants when working in areas where poisonous snakes are a hazard.
- Gaiters protect your feet and lower legs from various hazards including snow, mud, ice, and vegetation such as thorny scrub, cholla, and cactus. Strong gaiters made of thick leather are necessary for snakebite prevention.
- Blisters: As soon as you feel a hot spot on your foot, stop and apply moleskin or 2nd skin to the area to prevent a blister from developing. Wash your feet to keep the area clean and put on fresh socks.
- Wear socks appropriate for your working conditions. Cotton absorbs sweat but will not wick it away. Wool insulates and wicks dampness away. Change socks frequently and carry extra clean, dry socks (a Ziploc-type bag will keep them dry). Change footwear, dry your feet, and put on dry socks when you return to camp with wet feet.
- Do not wear athletic shoes where snakes and/or sharp vegetation such as cactus are hazards. Do not wear athletic shoes in place of field boots.
- Walking without boots or shoes to protect your feet increases the opportunity for injury, infections, insect and snakebites. Parasites such as Cutaneous larva migrans, hookworm, and strongyloidiasis can enter your body through unprotected feet. Standing on discarded used needles can be a hazard in any part of the world.

Additional information regarding footwear is available at the following websites: http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/feet/page00.shtml
<http://www.ccohs.ca/oshanswers/prevention/ppe/footwear.html>
http://www.ccohs.ca/oshanswers/prevention/ppe/foot_com.html

4.2.7 Lung Protection

Some aspects of mineral exploration may expose employees to poor quality air. While some hazards to the lungs may be immediately obvious (e.g., smoke, dust) and have immediate consequences, other hazards may be insidious (e.g., carbon monoxide) or cause damage that develops long after exposure (e.g., radiation). Working conditions that may present high and unsafe levels of airborne particulates include: (1) using rock or core saws and (2) confined spaces, trenches and old mine workings where toxic atmospheres or insufficient oxygen levels may be encountered. Carbon monoxide and carbon dioxide may also be a hazard in buildings or tents in camps due to inadequate heater ventilation (see sections 18.4.4 Lanterns, Heating Stoves and Appliances, 22.7.3 Carbon Monoxide and 22.7.2 Carbon Dioxide).

Risks and hazards to lungs

- Asphyxiation or suffocation may be caused by exposure to toxic or oxygen deficient atmospheres.
- Lung diseases and/or lung damage may develop from exposure to hazardous dusts, respirable silica, asbestiform minerals and hazardous chemicals etc.

- Radiation exposure may result from working with radioactive minerals under improper conditions.

Prevention and preparation

To provide safe air, mechanical ventilation (engineering controls) should be the first choice to reduce hazards to the lungs rather than relying on PPE alone. Rock saws and machines that produce air contaminants should be enclosed and properly vented to permanently extract airborne dust and contaminants from the work area. Gasoline powered motors must never be used underground, in trenches or pits, or in any confined spaces. Before entry, the atmosphere of old mine workings must be properly checked and ventilated, if necessary. In addition, there may be a risk of encountering unexpected airborne contaminants and gases, such as hydrogen sulphide (H₂S), carbon dioxide (CO₂) and carbon monoxide (CO) when examining buildings, surface tailings or rock waste piles on old properties or mine sites. It is essential for employees to be aware of these hazards and be trained in confined space recognition if their job has any potential for encountering such conditions. For additional information, refer to sections 21.5 Trenches and Pits, 22.4.3 Tailings and Water-Filled Areas and 22.11 Confined Spaces. Refer also to section 5.4.2.1 Trenches in the Environmental Stewardship toolkit on the e3 Plus website: www.pdac.ca/e3plus.

Certain jobs require respiratory PPE to protect your lungs because it is often impossible to reduce and/or remove contaminants to a safe level through other means.

- Often, a dust mask does not offer sufficient protection even if the filters are changed frequently. Disposable dust masks do not generally offer adequate protection even if they are changed frequently because the average dust mask is intended only for sawdust particles.
- Various types of respirators and cartridges are available. Careful analysis of potential contaminants is important in order to select the appropriate respirator, which depends on both the type and the potential concentration of the airborne contaminants. Professional expertise may be necessary to determine site specific requirements. Proper employee training is essential because a respirator must be fit tested to function correctly.

Respiratory Protection

Appropriate respiratory protection should be worn when working at some jobs or sites, such as when employees are required to:

- Enter any confined space
- Operate rock saws, core saws or core splitters
- Work in a crushing or screening room
- Work around cyclone drill outlets or exhaust hoses
- Work in dusty environments
- Work in some active underground mines
- Work with certain chemicals
- Enter old mine workings or caves
- Enter old buildings, especially if water is present
- Enter any situation where poor air quality may be encountered

Hazardous materials

The following specific materials associated with mineral exploration can cause potentially severe lung damage.

- Silica dust is very hazardous to your lungs. Fresh silica dust is much more reactive in the lungs than old silica dust.
- Exposure to dust and droppings in old underground workings (or caves) where bats are or have been present may result in Histoplasmosis – a potentially fatal lung infection. If this type of environment is suspected, do not enter the workings without careful consideration and preparation. Use all required PPE, which includes disposable clothing, gloves and a respirator equipped with a high efficiency particulate air (HEPA) filter capable of filtering particles down to two microns in size. A respirator needs to be fit tested to the individual wearer and it should be checked frequently to make sure it functions properly. For additional information refer to section 12.8.5.5 Histoplasmosis.
- Uranium projects – see section 4.2.8 Protection from Ionizing Radiation below
- Rocks containing amphiboles and other asbestiform minerals, including some ultramafic rocks and some kimberlites.
- Drilling muds and chemicals – wear a dust mask and pour powders etc., so the wind carries the dust away from your face.
- Hydrogen sulphide (H₂S) may be present in old workings, buildings and in or near tailings and waste rock piles. It can form through the reduction of sulphides. Refer to section 22.7.4 Hydrogen Sulphide for information regarding exposure limits and occurrences.
- Carbon dioxide (CO₂) and carbon monoxide (CO) are often present in old mine workings. These gases can be present in low spots due to density and will not dissipate. They are odourless, colourless and fatal. Refer to sections 22.7.2 Carbon Dioxide and 22.7.3 Carbon Monoxide for information regarding properties and exposure limits etc.
- For additional detailed information, refer to section 20.7.4 Hazardous Materials and section 5.10 Rock and Core Handling and Cutting Equipment.

Additional information regarding respiratory PPE is available at the following websites:

http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/breathe_safer.pdf

http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/lungs/page00.shtml

<http://www.ccohs.ca/oshanswers/prevention/ppe/respslct.html>

<http://www.ccohs.ca/oshanswers/prevention/ppe/respcare.html>

4.2.8 Protection from Ionizing Radiation

Uranium exploration projects should develop a radiation protection program (RPP) that includes safety education, training and any required certification to use equipment, PPE requirements for sampling and working with core, and any requirements to wear a dosimeter to detect radiation exposure. For additional information, refer to section 5.11 Portable Handheld XRF Analyzers in these Guidelines and Chapter 15.0 Guidelines for Radiation Protection during Exploration for Uranium in the Environmental Stewardship toolkit on the e3 Plus website: www.pdac.ca/e3plus

PPE:

Train employee to use PPE correctly. The aim is to keep radioactive material away from your skin and out of your eyes and lungs. To prevent contact:

- Wear cotton gloves to handle mineralized materials (samples, core) and coveralls. Leave coveralls and gloves at the work place and wash them according to RPP instructions.
- Wear appropriate respiratory protection when cutting core or samples to prevent breathing mineral particles. Wear safety glasses to protect against flying rock and radiation.
- Wear a lead apron when examining high grade core.
- Additional PPE should be worn as appropriate to address specific risks and hazards at the work site.

Core shack and sample handling routines:

Follow RPP procedures to reduce potential exposure to radiation when handling samples, while traversing and when logging core.

- Wear PPE – especially gloves, eye protection and coveralls, as required.
- Follow careful handwashing hygiene when through with work. Do not eat or smoke when handling samples or while in the core shack. Bandage all open wounds.
- Do not lick any samples.
- Keep outcrop samples in sealed, heavy poly bags.
- Where there is potential for collecting high grade samples, cache the samples at the outcrop – do not carry them with you in your backpack. Transport samples outside any enclosed passenger areas when travelling, i.e., not in the cabin of a helicopter or the cab of a truck. Transport them in the belly pod of a helicopter or in the back of a pickup truck.
- Locate the core shack and core stockpiles a sufficient distance away from the project living quarters and drill rig (at least 20-30 metres). Make sure mineralized core does not remain inside the core shack for more than 48 hours. Make sure the core shack is well ventilated, especially in winter.

4.3 Lifting and Back Protection

Back injuries may result in muscle spasms and chronic back pain. Falls may result in spinal injuries and even paralysis.

Risks and hazards

- Slips, trips and falls caused by uneven or steep terrain, poor ground conditions (e.g. mud, snow, ice), and inadequate footwear
- Back strain may result from using improper lifting techniques, carrying overloaded backpacks, lifting heavy core trays, and lifting stuck snowmobiles and ATVs etc.

Prevention and preparation

Back injuries are a common workplace injury. Employees should be trained to avoid unnecessary physical stress and strain and how to recognize factors that may contribute to back or lifting injuries. They can easily result from the improper lifting of heavy camp equipment, core trays, drill samples, drill pipe and bits – or even from changing a tire or lifting a spare wheel off the roof of a vehicle. Injuries may result if you lift with a bent back or with the object held away from your body or to your side. To avoid back injury, it is important to keep your back muscles strong and flexible and to use correct lifting procedures. In addition, wearing proper footwear with good support will

help keep you free of back pain. Make sure your work boots are comfortable. Use good posture when standing, walking and working. Sit correctly when doing office work, especially when using a computer. The screen should be at eye level and the chair should support your back.

Lifting Procedures

Follow correct lifting procedures when lifting any object, especially a heavy one.

- Use mechanical devices when possible (e.g., a hand truck or a pushcart to move heavy loads).
- Take care when lifting heavy core boxes, as many back injuries are a result of lifting very heavy core boxes.
- Bugged down snowmobiles and ATVs account for many back injuries. Take care when lifting the back of a snowmobile that is stuck in snow or slush. Before trying to lift or move a mired ATV, release the suction by digging the mud away from the wheels. Carry a manual winch (a “come-along”) when working where an ATV or snowmobile is likely to get stuck frequently. Take care when loading ATVs and snowmobiles into or out of the bed of a pickup truck or a trailer. Refer to Chapters 14. All-Terrain Vehicles and 15. Snowmobiles for additional information about safe loading and extraction techniques.
- Get help to move or lift very heavy loads.
- Provide refresher training several times a year to emphasize correct lifting methods at project sites where lifting jobs are common.

Follow these correct lifting procedures when you lift any object, especially a heavy one.

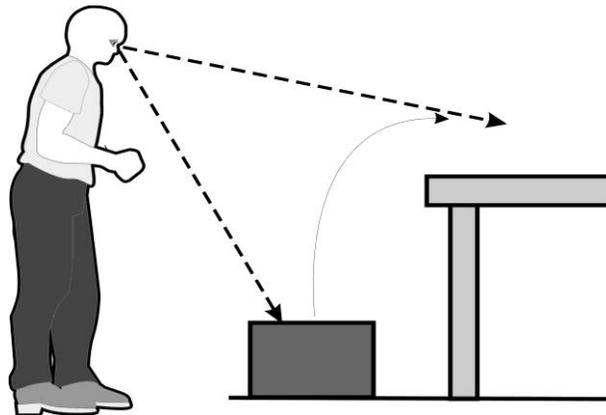


Figure 4.1: Correct lifting procedures

1. Plan the lift before you begin. Make sure your footing is secure and the route is clear if you must carry the object. Pay extra attention if you must carry a load on a ramp or stairs.
2. Position your legs shoulder-width apart with one foot slightly ahead of the other. This position forces you to bend the knees rather than the back.
3. Bend your knees and get a good grip. Use gloves if your hands are sweaty or if the object is slippery.

4. Lift with your legs, not with your back. Keep your back straight, avoid twisting and never jerk when you lift. Cradle heavy objects close to your body when carrying them.
5. Lift within your ability. Try not to exceed 22 kg (50 lb) per lift. Get assistance if there is any possibility that you might injure yourself if you lift the object alone. Do not “show off” by doing the job alone.
6. When you lift with a team, make sure to plan the lift together and execute the lift according to the plan. Only one person should call the directions.
7. If you hand off a load, make sure the next person has a good grip before letting go.
8. Do not carry a load in front of your face – you need to see where you are walking.

Additional information regarding back safety is available at the following websites:

http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/back/page00.shtml

http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/back_talk.pdf

4.4 Skin Protection

The skin is the largest organ of the human body (a fact most people do not realize) and its health and condition are often taken for granted. Skin can be damaged easily by heat, cold and injuries so that it becomes the entry way for pathogens and toxins. This section covers information about skin protection from harmful vegetation. Information about skin protection from sun, insects and hazardous chemicals or materials is cross referenced to other chapters as listed below.

Risks and hazards to skin

- Abrasions and cuts may result from impact with sharp objects or falling on rough ground.
- Sunburn may result from exposure to sun without using sufficient sunscreen.
- Frostbite may result from working in cold weather without proper gloves, boots or clothing.
- Insect-borne diseases and allergic reactions may result from insect bites and stings.
- Burns may result from contact with hot machinery, equipment, fuels or chemicals etc.
- Dermatitis, rashes or cuts may result from contact with poisonous and/or sharp vegetation.

Protection from poisonous or skin irritating plants

Be informed about potentially skin irritating plants that may grow in the project area. In some places there are plants with roots, stems and leaves that contain oils or sap that can cause severe skin irritation.

Precautions and preventions

- Protect your skin from sharp and thorny plants. In temperate regions, devil's club is a common plant with spiky thorns that may be difficult to extract once embedded in the skin. Stinging nettles can also be a nuisance. Cactus, cholla and other spiky plants are common in dry desert regions. Contact with them may cause cuts, infections, dermatitis or allergic reactions.

- Learn to recognize poison ivy, poison oak, poison sumac (present in parts of North America) or any other skin irritating plants that may grow in the project area.
 - Avoid contact with any animals or clothing that may have come in contact with irritating plants, as the oils can be transferred to your skin.
 - If possible, wash exposed skin immediately after contact. Some sources suggest immediately applying rubbing alcohol or hydrogen peroxide to help prevent a rash. If possible, wash any exposed skin with soap and water within 30 minutes of exposure to reduce the likelihood that the oils will penetrate your skin. Wash all clothing and equipment that may have come in contact with the plants, as the oils remain active for months.
 - If a reaction develops, treat with calamine lotion or ointments containing zinc oxide or hydrocortisone. Cold compresses may help relieve itching. Avoid scratching as it can spread the rash or cause infection. Seek medical attention for severe cases and if the rash does not improve.
 - Note: DO NOT burn the plant material, as the oils may become windborne and if you breathe them you may develop a severe internal allergic reaction.
 - Additional information, including photos of the leaves of poison ivy, poison oak, poison sumac and associated rashes and blisters, is available at the following website:
<http://safety.eas.ualberta.ca/node/69>
- General information regarding protection and care for your skin is available at the following website:
http://www.rhdcc-hrsdc.gc.ca/eng/labour/publications/health_safety/skin/page00.shtml

Protection from the sun

The sun produces ultraviolet (UV) radiation that can cause serious sunburn to skin and eyes. As both direct and reflected radiation cause burning, avoid exposure to the sun as much as possible by wearing appropriate clothing, using a wide spectrum sunscreen with a high sun protection factor, and wearing sunglasses with lenses with UV protection. Skin damage from repeated sunburn can lead to skin cancers including melanoma. Refer to section 9.10.4 Sunburn for detailed information regarding protection from the sun.

Protection from insects

In Canada and the USA biting insects may be a mere nuisance or a serious distraction. In addition to potential annoyance (and allergic reaction in some people), insect bites may cause serious diseases. Depending on the project location, employees may be exposed to West Nile virus and western equine encephalitis from mosquito bites, Lyme disease and Rocky Mountain spotted fever from tick bites, and fleas that occasionally carry plague.

In warmer countries, insects may carry organisms that cause diseases such as malaria, dengue fever and yellow fever; they can transfer pathogens into your body with a single bite. Fortunately, by protecting yourself from mosquito bites, you also gain protection from ticks, sandflies, black flies, tsetse flies and leeches etc. To reduce insect bites, wear appropriate clothing, use insect repellent on your skin and apply insecticide to clothing.

For additional information:

- Refer to sections 10.7 Insects, Arthropods and Leeches and 12.8.4 Protection from Insect Bites for detailed information regarding protection from insect bites in all parts of the world.

- Refer to section 12.8.5 Diseases for detailed information regarding diseases associated primarily with insects in parts of the world other than North America.
- Refer to section 18.6.5 Diseases for detailed information regarding diseases associated with insects in North America.

Protection from potential exposure to chemical hazards

Employees who may be exposed to or use hazardous materials should receive basic and site specific Workplace Hazardous Materials Information System (WHMIS) training plus training to use the products safely. They should be familiar with the Materials Safety Data Sheet (MSDS) for relevant hazardous products, any required PPE, and first aid measures to use after inadvertent exposure.

- Refer to sections 18.2.3 Workplace Hazardous Materials Information System (WHMIS) regarding WHMIS training and 20.7.4 Hazardous Materials for detailed information about specific hazardous chemical substances commonly used at exploration sites.

4.5 Resources

The Prospectors & Developers Association of Canada (PDAC) thanks the following for granting permission to include material from their publications.

Association for Mineral Exploration British Columbia (AME BC)

Their permission does not imply that they endorse the PDAC Health and Safety Guidelines. The PDAC is solely responsible for the content of these Health and Safety Guidelines.

Books

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