18.0 Camp Set Up and Management

18.1 Risks and Hazards Associated with Exploration Camps

18.2 Jurisdictional Regulations and Company Policies
   18.2.1 Alcohol and Drug Policies
   18.2.2 Firearms Regulations and Policies
      18.2.2.1 Risks and Hazards
      18.2.2.2 Company Owned Firearms in Canada
      18.2.2.3 Company Firearms Policy
      18.2.2.4 Essential Safe Firearms Practices
   18.2.3 Workplace Hazardous Materials Information System (WHMIS)
      18.2.3.1 Responsibilities of Suppliers, Employers and Employees
      18.2.3.2 WHMIS Hazard Classifications, Symbols and Labels
      18.2.3.3 Material Safety Data Sheets (MSDSs)
      18.2.3.4 Site Specific WHMIS Training Requirements

18.3 Responsibilities (Due Diligence) and Camp Management

18.4 Camp Management Guidelines
   18.4.1 Site Selection and Location
      18.4.1.1 Site Layout and Organization
      18.4.1.2 Communications
   18.4.2 Fire Safety
      18.4.2.1 Fire Extinguishers
      18.4.2.2 Firefighting Basics
   18.4.3 Fuels and Fuel Handling
   18.4.4 Lanterns, Heating Stoves and Appliances
      18.4.4.1 Carbon Monoxide Poisoning
   18.4.5 Generators
   18.4.6 Electrical Safety
      18.4.6.1 General Guidelines for Electrical Safety
      18.4.6.2 Lockout and Tag Out procedures
      18.4.6.3 Batteries

18.5 First Aid
   18.5.1 Emergency First Aid Planning and Preparation
   18.5.2 First Aid Kits and Supplies
   18.5.3 First Aid Training

18.6 Health
   18.6.1 Employee Hygiene
   18.6.2 Guidelines for Kitchen Safety, Food Handling and Food Storage
      18.6.2.1 Kitchen Operations Safety
      18.6.2.2 Food Preparation Safety
      18.6.2.3 Kitchens: Animal and Insect Controls
   18.6.3 Drinking Water Safety
   18.6.4 Waste Management
   18.6.5 Diseases
      18.6.5.1 Diphtheria
      18.6.5.2 Giardiasis
      18.6.5.3 Hantaviral Diseases
      18.6.5.4 HIV/AIDS
18.6.5.5 Lyme Disease
18.6.5.6 Measles
18.6.5.7 Mumps
18.6.5.8 Polio
18.6.5.9 Rocky Mountain Spotted Fever
18.6.5.10 Rubella
18.6.5.11 Tetanus
18.6.5.12 Tuberculosis (TB)
18.6.5.13 West Nile Virus

18.7 Manual Handling
18.8 Housekeeping
18.9 Resources
18.0 Camp Set Up and Management

Introduction

Careful planning and a concern for health, safety and the environment are essential for good project management. Field camps or rented accommodations should provide adequate working, eating and sleeping arrangements for field personnel and should be appropriately equipped to encourage employees to work safely and efficiently. At the same time, camps should make as little impact as possible on the environment. Project managers have to allow sufficient time to secure the required permits and permissions before sites are opened. Consider the following factors when selecting a project or camp site:

- Time of residence: Will the camp be in operation for a field season or year round?
- Duration: Temporary or a permanent establishment
- Size of the camp (at each time of year)
- Accessibility: Transportation access (vehicle, helicopter and fixed wing) may impact the site selection
- Required permits

Acronyms

AHJ – Authority Having Jurisdiction
CPR – Cardiopulmonary Resuscitation
ELT – Emergency Locator Transmitter
ERP – Emergency Response Plan
GFCI – Ground Fault Circuit Interrupter
GPS – Global Positioning System
kW – Kilowatt
LPG – Liquefied Petroleum Gas
MSDS – Material Safety Data Sheet
OHS – Occupation Health and Safety
PAL – Possession and Acquisition License
PFD – Personal Flotation Device
PLB – Personal Locator Beacon
SOP – Safe Operating Procedure
TDG – Transportation of Dangerous Goods
UV – Ultra Violet
W – Watt
WHMIS – Workplace Hazardous Materials Information System
18.1 Risks and Hazards Associated with Exploration Camps

- Non-compliance orders or charges from authorities having jurisdiction (AHJs)
- Slips, trips and falls caused by uneven surfaces, wet or icy ground, obstacles, poor housekeeping, poorly built steps, inadequate lighting
- Back injuries and strains caused by improper lifting and manual handling techniques, slips and falls
- Cuts, lacerations and other injuries caused by the improper use of chainsaws, axes, hammers and other tools, or improper tool maintenance
- Fires caused by improper fuel storage, fuel use, and fuelling practices; faulty heating equipment or failure to turn off equipment; exploding fuel or propane tank; clothes draped above heaters or on electrical wires; failure to extinguish open fires or cooking fires
- Illnesses spread by contaminated water, food or sewage contaminated drinking water
- Diseases spread by local insects, parasites, vermin and larger animals
- Animal attacks caused by poor choice of camp location inadequate garbage disposal, poor camp hygiene and lack of electric fencing
- Carbon monoxide poisoning caused by poorly maintained heating equipment; inadequate ventilation of core shack, buildings or tents; misuse and/or lack of maintenance of motors and engines; not following procedures when working in confined spaces, inadequately ventilated tents
- Electrocution, electric shock, or burns caused by inadequate or improper wiring, lack of lockout tag out procedures, lack of qualified personnel to install or repair electrical equipment, lack of adequate employee training
- Cuts, burns caused by spilled hot food or liquids, misuse of kitchen equipment, hot equipment (core saws, generators, heating stoves)
- Injuries or occupational illness caused by exposure to hazardous materials
- Firearms accidents caused by improper use, lack of firearms policy or absence of implementation of safe operating procedures (SOPs), using the wrong ammunition
- Damage from floods or landslips caused by poor camp location
- Transportation related risks caused by camp location, lack of training, not enforcing SOPs, travelling at excessive speed for terrain conditions
- Additional risks caused by working around drill sites and or heavy equipment at advanced exploration sites

18.2 Jurisdictional Regulations and Company Policies

In most countries and jurisdictions, various acts and regulations apply when establishing exploration and mining camps. Depending on the size of the camp, regulations may require permits for camp construction, access routes, water use and waste disposal etc. Allow sufficient time to contact local authorities having jurisdiction (AHJs), determine the requirements and obtain all necessary permits to be in compliance with regulations prior to establishing a camp.

Examples of required permits include: land use permits, work permits, timber cutting permits, water use permits or licenses, waste disposal or effluent discharge permits and drilling permits. Access agreements with local aboriginal groups may be required to access land and set up
camp, and if the camp is located on or near a watercourse, Department of Fisheries and Oceans (DFO) regulations may apply. In addition, consider the following requirements: various building and electrical codes, health and first aid regulations, spill containment and reporting regulations, as well as transportation of dangerous goods (TDG) and Workplace Hazardous Materials Information System (WHMIS) requirements. Some jurisdictions require notification to the health authorities when opening a camp.

Many jurisdictions have specific requirements for camp personnel e.g., a camp manager may have to hold specific certifications, or there may be specified medical personnel requirements according to camp size. If planning a rotation of personnel in camp, make sure sufficient qualified persons are available for the rotations.

Some jurisdictions have websites that list laws and regulations which require compliance from the the mining industry. The jurisdictional Workers’ Compensation Board or equivalent authority and the government department that includes mines are sources of information. Two helpful jurisdictional websites:


18.2.1 Alcohol and Drug Policies

Exploration companies should have a clear and concise policy to address alcohol and drugs at project and camp sites. The policy should conform to regulations of the authorities having jurisdiction (AHJs), including the regional Mines Act and Regulations. Companies should respect the wishes of local communities, especially when working in or near a “dry” community. Refer to section 2.1.3 Alcohol and Drug Policies for references and a suggested list of topics to address. There should be a provision for employees to sign off that they understand the policy and regulations.

18.2.2 Firearms Regulations and Policies

Exploration companies should have a firearms policy in place when circumstances may require firearms on site. Only under special circumstances – for the protection of human life from animal attacks – should firearms be kept in camps and/or carried by employees on traverses. In some areas, it may be preferable to have local people (possibly indigenous people) with hunting experience to act as guards where there is a threat of wild animal attack. In countries where firearms are deemed necessary for personal security during exploration work, a company should hire armed personnel to act as guards rather than permit their own employees to carry firearms. The company should carry out a country risk assessment to determine whether the risk to personal safety is worth doing business in the location.

18.2.2.1 Risks and Hazards

- Injury or death caused by the unintentional discharge of a firearm
- Injury or death caused by the intentional misuse or careless use of a firearm
- Personal injury to the shooter, which may include hearing loss or getting shot from an accidental discharge during a slip or fall, crossing an obstacle, when the firearm is placed upright against an object, or forgetting to unload the firearm
- Bear attack when a bear is shot and injured but not killed
By acquiring a firearms business license, it is possible for a company to purchase non-restricted firearms for qualified employees to use in the field for protection from life-threatening attacks by wild animals. To obtain a firearms business license in Canada, the company must submit an application to the Chief Firearms Officer of the province or territory where the firearms will be stored when not in use. Because applications are made through the office of the provincial or territorial Chief Firearms Officer, it is necessary to apply to the correct jurisdiction.

- If after use in the field, the firearms will be stored where the company head office is located, the application should be made in the province or territory where the company head office is located and where it holds a municipal business license.
- If the firearms will be stored in a different province or territory outside of field season, the application should be made to the Chief Firearms Officer of that province or territory, even though the company head office is located in a different jurisdiction.

For inquiries regarding applications for a firearms business license: Telephone the Chief Firearms Office at 1-800-731-4000 and request to speak with the Chief Firearms Officer in charge of firearms business licenses for the appropriate province or territory.

The process to acquire a firearms business license requires an application by a person within the company who assumes responsibility for the firearms and an inspection by a local firearms officer who will determine whether the storage facility, access and the control of the firearms meet the licensing requirements. Conditions may be placed on the license that (1) firearms are for use in remote areas for the protection of life from wild animals, (2) firearms may be used only by employees working in remote areas who have a Possession and Acquisition License (PAL) and (3) the firearms may be transported throughout Canada to remote work locations.

**18.2.2.3 Company Firearms Policy**

The company firearms policy must conform to all federal, provincial, territorial and local regulations. In Canada, only people who have a valid PAL are permitted to use or handle company owned firearms, except for individuals who are aboriginal, meet specific criteria, and qualify for alternative certification.

A mineral exploration company’s firearms policy should cover the following:

- The company has the responsibility to exercise full control over the use, transportation and storage of firearms.
- Authorization for firearms use, transportation and removal from storage must be for qualified employees only. Unqualified employees must not have access to firearms.
- All employees permitted to use firearms must have appropriate training and a license in accordance with the codes, statutes or laws of the local jurisdiction e.g., a Possession and Acquisition License (PAL) in Canada. Employees must adhere to the company policy and safe operating procedures (SOPs) regarding use of firearms.
- A firearms policy should define the following:
  - Who is in charge of firearms
  - Who is permitted to use the firearms
  - How access to firearms is controlled
  - Requirements for transportation, storage and care of firearms and ammunition
Only non-restricted firearms are permissible in camp
The circumstances when firearms may be used
The muzzle of the firearm must always be controlled.
Who is designated to shoot should a bear or other wild animal invade camp
Firearms must not be used for hunting.
Whether or not possession of personal firearms on site is permissible
That all restricted firearms and prohibited weapons and devices are prohibited on site
Disciplinary actions for violation of the firearms regulations and policy
Contractors working on site are required to follow the company firearms policy.

18.2.2.4 Essential Safe Firearms Practices

Essential firearms safe practices include but are not limited to the following:

- Develop and implement company SOPs that comply with federal, provincial, territorial and local regulations regarding the safe use of firearms. See the section regarding SOPs below.
- Training and practice: It is advisable to provide additional firearms practice and training (including target practice) by a certified instructor to employees who possess a PAL before they go on site.
- Notification: In Canada, notify local police authorities when firearms are present in camp.
- Make sure all employees are aware of the firearms policy and regulations. There should be a provision for them to sign off that they understand the policy and regulations.
- Store firearms unloaded, with a trigger lock in place and in a locked container. Store ammunition locked separately. Make sure the correct ammunition is available for the specific firearm.
- When a company secures a firearms business license and purchases firearms for use at camps, it may be advisable to purchase only one type of firearm so that all ammunition can be used in every firearm. This can prevent potential mix ups during an emergency.
- Employees who are permitted to use firearms must (1) know where they are kept, (2) be able to access and unlock the firearms and (3) obtain the correct ammunition in an emergency situation.
- When removed from storage, a firearm must be under the immediate control of a qualified person at all times. Immediate control means within an arm’s length of the qualified person.
- A firearm used for predator control may be stored temporarily unlocked and out in the open, as long as it is unloaded and ammunition is not readily accessible.
- Keep firearms in good condition and fully functioning. Any firearm that is not absolutely dependable is a liability to the person using it and for others whose safety depend upon it.
- Keep firearms clean and stored to prevent condensation and ice forming in the barrel in cold climates.
Where field traverses may expose employees to animal attacks (e.g., polar bears or grizzly bears), it is advisable to hire trained bear guards from local communities and traverse in groups of three with two people recording information and one acting as bear guard.

Notify the appropriate government wildlife agency to deal with and/or dispatch a troublesome bear if the bear’s presence is not an immediate emergency. Although the purpose of firearms in camp is for protection of life from wildlife attacks, except under emergency conditions, it is the job of the wildlife agency rather than a company employee to remove or dispatch a bear.

Refer to Chapter 10, section 10.3.1 Precautions and Preventions for information regarding trained bear guards. Also refer to section 10.3.9 Bear Deterrents regarding deterrents and appropriate firearms for defence against bears.

Safe operating procedures (SOPs) regarding firearms must include but not be limited to the following:

- It is the responsibility of the exploration manager and the camp manager to make sure everyone in camp adheres to the firearms policy and regulations.

- Follow correct procedures when handling a firearm.

- Follow correct procedures when loading and unloading a firearm.

- Transport firearms safely to and from camp, field traverses and other locations.
  - Address potential transportation of firearms by vehicles, ATVs, snowmobiles, boats or fixed wing aircraft and helicopters.
  - On firearms equipped with a safety, keep the safety in the “on” or locked position, but do not rely on the safety because it is a mechanical devise that may fail.
  - Firearms must be unloaded with the safety on and locked before entry into any means of transportation. Place them in a secure position where they will not be dislodged or stepped on. Firearms must be placed in the cargo compartment of an aircraft or a boat, and are best transported in a vehicle inside the closed and locked cargo compartment.
  - Always make sure that firearms are unloaded before entering camp or any building.
  - Always make sure that firearms are unloaded but with ammunition available while on traverse.

- SOPs should include basic firearms safety practices.
  - Incorporate the Vital Four Firearm ACTS of Firearms Safety and PROVE the firearm safe (below)
  - Be familiar with the different types and models of firearms and the action mechanism of each firearm at the site.
  - Never modify or alter a firearm.
  - Never assume a firearm was unloaded by the previous holder before storage.

- Follow correct procedures when shooting at a specified target, both during practice or in an emergency.
The following information is reproduced from Section 2: *Basic Firearm Safety of the Canadian Firearms Safety Course: Student Handbook*. These are the most important firearms safety rules – the acts that must be carried out by everyone qualified to use firearms at an exploration project or camp.

**The Vital Four Firearm ACTS of Firearms Safety**

**Assume** every firearm is loaded.
- Regard any firearm as a potential danger.

**Control** the muzzle direction at all times.
- Identify the safest available muzzle direction.
- Keep the firearm pointed in the safest available direction.
- The muzzle of a firearm should not be pointed towards yourself or any other person.

**Trigger** finger must be kept off the trigger and out of trigger guard.
- Resist the temptation to put your finger on the trigger or inside the trigger guard when you pick up a firearm.
- Accidental discharge is far more likely to occur if your finger is on the trigger or inside the trigger guard.

**See** that the firearm is unloaded. PROVE it safe.
- Do not handle the firearm unless you can PROVE it safely.
- Check to see that both chamber and magazine are empty. Do this every time you handle a firearm, for any reason.
- Pass or accept only open and unloaded firearms. This is an important habit to develop.

**PROVE** it safe:

**Point** the firearm in the safest available direction.

**Remove** all cartridges.

**Observe** the chamber.

**Verify** the feeding path.

**Examine** the bore.

The firearm is now unloaded and safe until it leaves the direct control of the person who unloaded and PROVEEd it safe.

Additional information is available on the following websites:

Every camp uses hazardous materials. Some obvious products include propane, diesel, Jet B fuel, hydraulic fluids, some drilling additives and bear spray. Less obvious hazardous products are those used in camp kitchens such as cleaning agents (oven cleaner) and chlorine bleach, chemicals required for water treatment, lime used in privies. Core and sample preparation facilities use hydrochloric acid and other chemicals for mineral testing. These products can potentially cause injuries, occupational illnesses, fires or explosions. The degree of risk depends on the quantity, toxicity, concentration, whether the material is flammable, explosive or under pressure.

Employees have the “right to know” about the potential risks of hazardous materials used on site, and companies are required by law to provide such information and train employees to protect themselves and work safely. This can be accomplished through Workplace Hazardous Materials Information System (WHMIS) training.

WHMIS is the Canadian standardized system that provides specific information about the safe use of hazardous materials or controlled products in the workplace. Controlled products are any products, materials or substances that are regulated by WHMIS legislation. WHMIS legislation is implemented through federal, provincial, and territorial regulations. The WHMIS system includes (1) hazards identification and classification, (2) labelling, (3) material safety data sheets (MSDSs) and (4) employee education programs. Education and training should include a four hour basic WHMIS course taught by a certified WHMIS trainer so all employees receive WHMIS training and certification. Some employees should receive additional site specific WHMIS training, depending on their work and potential exposure to specific controlled products on site.

Note: Presently, there are plans for WHMIS legislation to adopt the international Globally Harmonized System of Classification and Labelling of Chemicals (GHS) in Canada\(^1\). Like WHMIS, the GHS defines and classifies hazards of chemical products and uses labels and MSDS-type sheets to communicate health and safety information. Changes are likely to affect the content and format of labelling and MSDS sheets but not the responsibilities of suppliers, employers and employees. General information about GHS is available at: [http://www.ccohs.ca/oshanswers/chemicals/ghs.html](http://www.ccohs.ca/oshanswers/chemicals/ghs.html)

Information regarding various hazardous materials used in mineral exploration and which are commonly found in camps and drill sites is available in section 20.4.7 of Chapter 20 Hazardous Materials and in Chapter 10. Hazardous Material on the e3 Plus Excellence in Environmental Stewardship Toolkit at: [http://www.pdac.ca/e3plus/](http://www.pdac.ca/e3plus/)

18.2.3.1 Responsibilities of Suppliers, Employers and Employees

Suppliers that sell or import controlled products are required to label the controlled products or containers of controlled products and provide a material safety data sheet (MSDS) with the product.

Employers are required to make sure all hazardous products are labelled and that all MSDS sheets are readily available to employees for reference. Employers are also required to develop, implement and maintain a WHMIS education and training program for workers who are or may be exposed to controlled products at work. Some of this material can be incorporated into induction and safety meetings.

\(^1\) Regulatory proposals to update WHMIS are expected in 2010.
Education should provide information about how the WHMIS system works, hazard identification and classification, plus how to read, interpret and understand the information on WHMIS labels and MSDSs. The required level of education depends on the specific controlled products, the risk of exposure and the specific work carried out by employees at the site.

Training has to address specific information and knowledge required to interpret information on labels and MSDSs in order to protect employee health and safety. Training should include information about the use, handling, storage, disposal, and emergency procedures to take if exposed to the controlled products. It may be advisable to develop safe operating procedures (SOPs) that address critical aspects of some controlled products. The degree of training will vary with each site and between employees at the same site depending on an individual's job.

Employees are required to take part in WHMIS training provided by the employer. They should use the training to work safely with the various controlled products on site. They are required to understand the information on labels and MSDSs and report illegible, damaged and/or missing controlled product labels to the employer so they can be replaced.

18.2.3.2 WHMIS Hazard Classifications, Symbols and Labels

WHMIS hazard classification and symbols

WHMIS uses eight hazard symbols to indicate which type of hazard(s) must be considered when working with a controlled product. See the following table. Chemicals are divided into groups with similar properties or hazards. Controlled products are divided into six (6) classes of which two classes are split into divisions and subdivisions. Note that many products fall into one or more categories.

Detailed information about WHMIS classification is available at the following websites:

http://www.ccohs.ca/oshanswers/legisl/whmis_classifi.html#_1_4
http://www2.worksafebc.com/i/construction/Toolbox/pdfs/TG07-13_WHMIS.pdf
Table 18.1 WHMIS Classifications and Symbols for Hazardous Chemicals

<table>
<thead>
<tr>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A: Compressed Gas</td>
<td>Products under pressure. For example, oxygen, propane, acetylene, fire extinguishers</td>
</tr>
<tr>
<td>Class B: Flammable and Combustible Material</td>
<td>Six Divisions use the same symbol. Flammable gases, liquids, solids and aerosols; Combustible liquids; Reactive Flammable materials: For example: propane, acetylene, gasoline, diesel fuel, paint thinner, spray paint</td>
</tr>
<tr>
<td>Class C: Oxidizing Materials</td>
<td>Materials may not burn, but provide oxygen to a fire. For example: nitric acid, hydrogen peroxide, sodium hypochlorite – bleach</td>
</tr>
<tr>
<td>Class D, Division 1: Materials Causing Immediate and Serious Toxic Effects</td>
<td>For example: sulphuric acid, hydrofluoric acid</td>
</tr>
<tr>
<td>Class D, Division 2: Materials Causing Other Toxic Effects</td>
<td>Immediate irritation or chronic health effects: For example, asbestos fibres, silica dust, acetone, mercury, lead, xylene, sodium hypochlorite – bleach</td>
</tr>
<tr>
<td>Class D, Division 3: Biohazardous Infectious Materials</td>
<td>Commercial cultures containing infectious organisms: For example: viruses: Hepatitis B; bacteria: salmonella; parasites: Giardia</td>
</tr>
<tr>
<td>Class E – Corrosive Materials</td>
<td>Materials that cause burns to skin or eyes: For example: sulphuric acid, nitric acid, sodium hydroxide, hydrofluoric acid, sodium hypochlorite – bleach</td>
</tr>
</tbody>
</table>
WHMIS labels

WHMIS legislation requires specific labels on controlled products. Labels alert employees to the risks and necessary precautions to take when handling a controlled product. Labels must be easy to read and must not be defaced. If a controlled product is missing a supplier label when it is received, the product should not be used until a supplier label and MSDS are received from the supplier. There are three types of WHMIS labels.

1. Supplier labels

   Controlled products are required to have a supplier label affixed to them. Supplier labels must be bilingual and have a distinctive WHMIS hatched border. Only specific information is permitted on the supplier label:

   - Product identifier – name of the product
   - Supplier identification – name of the manufacturer or distributor
   - Hazard symbols – one or more symbols of the applicable WHMIS hazard classes of the controlled product
   - Risk phrases – words that notify users of the main hazards of the product
   - Precautionary measures – PPE, handling, storage, and disposal requirements of the product
   - First aid measures – appropriate first aid emergency measures in case of exposure
   - Reference to the MSDS – a statement that an MSDS is available

   For small containers of less than 100 mL, only the product identifier, supplier identification (hazard symbols), and the reference to the MSDS are required to appear on the supplier label.

   An example of a supplier label and information about them is available on the following website:

   [http://www2.worksafebc.com/i/construction/Toolbox/pdfs/TG07-38_WHMIS_supplier_label.pdf](http://www2.worksafebc.com/i/construction/Toolbox/pdfs/TG07-38_WHMIS_supplier_label.pdf)

2. Workplace labels

   A workplace label has less detailed information than a supplier label. The WHMIS hatched border, bilingual labelling and hazard symbols are optional. Required information can be written with a permanent marker directly on the container or on a label that is applied to the container.

   Workplace labels must appear on a product container when:
Controlled products are transferred into a secondary container
The supplier label is missing or illegible
A controlled product is produced and used on site

Workplace labels must contain the following:

- Product identifier (name)
- Specific safe handling information, including required PPE and protective clothing
- Reference to the MSDS if an MSDS has been produced by the supplier

### Table 18.2 Example of a Workplace Label

<table>
<thead>
<tr>
<th>METHANOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Wear chemical resistant goggles and gloves.</td>
</tr>
<tr>
<td>• Wash thoroughly after handling.</td>
</tr>
<tr>
<td>• Keep container tightly closed.</td>
</tr>
</tbody>
</table>

SEE MATERIAL SAFETY DATA SHEET

An example of a workplace label and information about them is available on the following website:

[http://www2.worksafebc.com/i/construction/Toolbox/pdfs/TG07-37_WHMIS_workplace_label.pdf](http://www2.worksafebc.com/i/construction/Toolbox/pdfs/TG07-37_WHMIS_workplace_label.pdf)

### 3. Other means of identification

Workplace labels are not always practical. Other ways to identify controlled products may be used on tank cars, piping systems and on reaction or process vessels at a site. Product identification may include warning signs, symbols, placards or coding systems that use colour, numbers or letters. When these methods are used, employees must be trained to recognize and understand them.

#### 18.2.3.3 Material Safety Data Sheets (MSDSs)

A material safety data sheet (MSDS) contains more detailed information than appears on supplier or workplace labels. No controlled product should be accepted upon delivery unless accompanied by an MSDS. However, when only a small amount of a controlled product is purchased, it may be necessary for a company to obtain the MSDS on the internet and print it on site.

Location: Companies and contractors should make sure MSDSs for all controlled products used on site are easily available for access by all employees and subcontractors. Keep up-to-date original MSDS sheets well organized and in a central location. Keep copies of important MSDSs in relevant locations so they are available when needed (e.g., drill shack, kitchen, first aid station, storeroom, core facility, eye wash stations). In addition, it is advisable to keep an electronic copy of each MSDS. Check the file annually and request updated MSDS sheets. Suppliers are required to update MSDS sheets every three years in Canada but it is the responsibility of the employer to request the current MSDS.
Interpretation: Employees should receive instruction in the content and significance of technical information on an MSDS. They should be able to read, locate and interpret the most important and relevant information. Some MSDS sheets are clearly written and easy to understand but many are not. Presently in Canada, there are nine sections of required disclosure information on an MSDS. There is no set format and sections may appear in any order although all nine sections must be present and complete².

2. Preparation Information: Name and telephone number of party responsible for the preparation of the MSDS, date of preparation
3. Product information: Product identifier and product use information; manufacturer's name, full street address, city, province, postal code and emergency telephone number; supplier's name, full street address, city, province, postal code and emergency telephone number; Product identification number (PIN)
4. Physical data: A physical description: physical state, boiling and freezing points, pH, appearance, specific gravity, smell
5. Fire or explosion data: Conditions of flammability, means of extinction, flash point, hazardous combustion products, explosion data
6. Reactivity data: Reactivity, conditions of chemical instability, names of incompatible substances or classes of substances, conditions of reactivity, hazardous decomposition products
7. Toxicological properties: Route of entry to the body, effects of short and long term health exposure, various types of toxicity
8. Preventative measures: Specific control measures: engineering controls, PPE, safe work procedures, handling, storage and disposal measures, spill procedures
9. First aid measures: Specific first aid measures in case of illness or injury caused by exposure

Before using a product, workers should be familiar with the MSDS:
1. Match the name of the product to the MSDS to verify the product being used.
2. Be familiar with the hazards.
3. Understand the safe handling, storage and disposal requirements.
4. Know what first aid measures to use, if necessary.

Although many countries require MSDS sheets to accompany hazardous products, the format and required information on MSDS sheets are not yet internationally standardized. When exploration companies work in countries that lack MSDS requirements, the company should obtain or compile an MSDS database. The following websites have information about content requirements and writing an MSDS in Canada and other countries.

Canada: http://www.ccohs.ca/oshanswers/legis/msdss.html
http://www.ccohs.ca/oshanswers/legisl/msds_prep.html

USA: http://www.msdswriter.com/learn_writer.cfm

² GHS uses the term Safety Data Sheet (SDS) and defines a 16-headings format for the disclosure information. Canada presently accepts the GHS format when certain conditions are met.
As the GHS will eventually standardize the content of MSDSs (SDS under the GHS), this website provides the status of implementation of GHS:

http://www.unece.org/trans/danger/publi/ghs/implementation_e.html

Figure 18.1 Keep copies of MSDSs in a convenient location for easy referral. © Bill Mitchell

18.2.3.4 Site Specific WHMIS Training Requirements

WHMIS legislation requires employees to receive additional site specific training that covers specific controlled products that the employee works with or work around. The level of training will depend on the likelihood of exposure in the work place. For example, training for specific controlled products on site should include:

- Safe storage, handling use and disposal of controlled products including those that are contained or transferred into any pipes, process or reaction vessels, tank cars or tank trucks etc., if present on site.
- Emergency measures (spills, first aid etc.) required for controlled products if employees are exposed. Depending on the location and level of hazard presented by a controlled product, it may be appropriate to train only a few employees – or all employees in emergency procedures.
- Emergency procedures if there is potential exposure to “fugitive emissions” (emissions of gases or vapors of controlled products from leaking pressurized equipment). Depending on the level of hazard and the site, it may be appropriate to train all employees in ER procedures (e.g., chlorine gas leak).

Additional WHMIS information is available on the following websites:

18.3 Responsibilities (Due Diligence) and Camp Management

A camp manager must carefully plan all aspects of camp management. He or she must have the highest regard for safety and convey this attitude to all employees. In addition to hiring terrain experts as required (e.g., mountaineering, working on ice), managers should consider the need to hire specialists for health related reasons such as designing drinking water treatment and sewage treatment systems.

Some management responsibilities include but are not limited to:

- Compliance: Make sure that all necessary permits and permissions are in place.
- Risk assessments: At the onset of the project, carry out a risk assessment of the site and surrounding terrain, as necessary. Develop and implement plans to eliminate or mitigate the risks and hazards. See the following section “Site Risk Assessments” and refer to section 2.1.5 Risk Assessments.
- Safe operating procedures: Establish and implement site specific SOPs that augment the general company SOPs, as necessary. Take the results of the risk assessments into consideration. See the following section “Site Risk Assessments”.

Emergency response plans: Establish a site specific ERP that conforms to the company ERP. Post the plan at each communications station. Each field employee should have a copy of the ERP and be trained to carry out assigned duties. Include contractors’ employees when planning site emergency response procedures to avoid confusion and additional problems during emergencies. Place a copy of the ERP in each vehicle, boat and/or aircraft and at the drill site for reference, as required. At the onset of field work, test the ERP contact frequencies and numbers to see that they work as expected. Examples of some of ERPs procedures are given in Chapter 3. Emergency Response.

Equipment: Select appropriate equipment for field use. Make sure all equipment functions properly; test and maintain equipment when necessary. Make sure there is an adequate supply of tools, spare parts and fuel. Consider the need for spares of essential items such as radios and antennas. Depending on the location, it may be difficult to replace or repair some items, especially communication equipment. When planning a camp, an equipment check list is useful to be sure all necessary equipment, spare parts and supplies are mobilized into camp.

Communications: Make sure all communication equipment is appropriate for the field area and that employees are trained to use it, especially the equipment at the communication centre. Establish and adhere to communication routines and schedules between field crews and camp. This includes daily check-in and emergency routines.

Safety meetings: Make sure all site personnel receive a safety induction at the start up of camp or field season. All employees starting work throughout the season should receive the same induction. Hold regularly scheduled safety meetings and extra safety meetings to deal with specific tasks or topics, as required.

Hold health and safety committee meetings as required. When a camp employs more than the designated number of employees – usually 20 or 25 employees – OHS regulations may require a joint health and safety committee composed of equal numbers of workers and management representatives. Refer to section 2.1.2 Safety Meetings for additional information.

When a camp uses air support, make sure the pilot conducts appropriate briefings. Special briefings should be held before slinging work and when unusual manoeuvres are used (e.g. toe-in landings). A complete safety orientation is required when there is a new aircraft or a new pilot. Refer to Section 16. Aircraft.

Make sure visitors receive a safety induction, which may be abbreviated if the visit is very short, although anyone staying on site for (perhaps) more than 24 hours should receive a full induction.

Training: Make sure employees are trained to do their jobs safely.

First aid: Make sure that all first aid kits meet the required standards of AHJs and are replenished as needed. Make sure additional appropriate first aid equipment is available at all times including stretcher(s) will fit into the emergency means of transportation.

Maintenance: Establish a maintenance schedule for the camp and equipment that includes regular inspections of all generators, pumps, hoses and fittings and other mechanized equipment, including all means of transportation. Follow maintenance schedules for water treatment and sewage treatment systems.

Inspections: Conduct spot checks. Include the kitchen, kitchen staff, latrines and waste disposal sites – on a daily basis, if necessary. Inspect firefighting equipment and caches, first aid treatment area, fuel storage areas and drill sites, as required.
Documentation: Maintain records as required by AHJs for inspections, training, first aid, safety meetings, and equipment maintenance records and communications logs.

Forms: Keep an adequate supply of forms for reporting incidents/accidents to AHJs, such as required by the jurisdictional Workers’ Compensation Board, spill reports, inspection and audit forms, maintenance check forms, TDG forms etc.

Site Risk Assessments
Complete a thorough risk assessment of any new project or camp site taking into consideration physical location, human safety and the environment. It is necessary to reassess some risks every year (or more often) and when the site expands activities (e.g., trenching, drilling and bulk sampling). Include the following in the site risk assessment and develop risk mitigation processes and procedures.

- Site location: Consider the arrangement of the camp in relation to the required setback from water bodies, the organization and optimum space requirements for tents, water and sewage systems, fuel storage area, road access, air strip or helicopter landing pad, work areas, drill sites, core handling areas, as required.

- Communications: Assess the requirements for communication equipment taking into consideration the degree of remoteness or isolation of the site. Determine the most appropriate means of communication and whether backup is available. Remember that some foreign countries restrict the importing of communication equipment.

- Fire: Assess the potential fire hazards, whether for forest fire, bush fire, tent fire or lightning strike. Consider the prevailing wind direction and the requirements of emergency evacuation plans when organizing the site layout. Include an examination of MSDS sheets for controlled products that may pose a fire risk.

- Wind: Pay special attention to wind direction and the possibility of (1) the spread of fire to or from fuel storage areas, (2) blowing dust from road, vehicles and drilling activities, (3) drifting snow for winter camps and (4) the potential cooling effect of wind in warm climates.
  - Locate vehicles, fuels, waste disposal areas etc., downwind from camps.
  - Avoid windswept areas such as ridges or gullies to minimize wind damage.

- Terrain: Assess hazards in each locality and avoid the following:
  - Dangerous trees and overhanging branches that may fall on tents or workers, or stumps that may impede equipment
  - Areas prone to seasonal flooding, flash flooding, potential inland flooding from large storms, including dry streambeds and the immediate shorelines of lakes or streams
  - Steep terrain or unstable ground with potential for land slip, including potential rock falls, landslides, mudslides, avalanches, the base of cliffs and recently cleared areas
  - Soils that may become dusty when dry and/or muddy when wet

- Animal hazards: Avoid setting up a camp on or near game trails and feeding areas that attract bears. Locate camp sites far away from water where predatory animals (especially crocodiles, alligators, hippos) may reside, even at the expense of a convenient, safe drinking water supply. Avoid or eradicate bee, wasp, ant or other insect nests. Refer to Chapter 10. Wildlife.
Disease risks, according to location:

- Whenever possible, locate camps at least one kilometre away from swampy areas, stagnant waters or areas with drainage problems. This will reduce the numbers of insects and the risk of mosquito-borne diseases such as malaria. Avoid rocky areas if sandfly-borne diseases such as leishmaniasis are a risk. Screen and spray camp structures with insecticides as required.
- Determine the requirement to treat water to prevent water-borne diseases such as Giardia, other diarrheal diseases and schistosomiasis.
- Refer to sections 12.8.5 Diseases and 18.6.5 Diseases for information about specific diseases.

Special site risks:

- Determine any specialized equipment requirements for the field project. For example, equip high altitude camps with oxygen tanks and portable hyperbaric chambers.
- In areas where tsetse flies are a hazard, remove all tall vegetation and brush near camp so the flies have no place to rest.
- In areas where malaria is a risk, do not allow any standing water to accumulate. Remove old tires, containers and equipment where water can collect and provide breeding places. Follow screening and spraying procedures. These precautions will help reduce the incidence of all mosquito-borne diseases. Refer to sections 12.8.4 Protection from Insect Bites and 12.8.5.9 Malaria.
- Consider the risks when returning to an established camp with standing structures that have not been used for some time. To mitigate the risks, check the structures for wildlife that may have taken up residence (e.g., snakes, scorpions). In Central or South America where Chagas’ disease is a risk, fumigate the structures before you sleep in them to eliminate any infected Reduviidae insects (cone-nosed bugs).

18.4 Camp Management Guidelines

The following sections provide considerations and guidelines that should facilitate camp operations and promote the health and safety of employees.

18.4.1 Site Selection and Location

A project or camp manager may or may not have responsibility for choosing the site location except when the initial site is established. Given the opportunity to choose a site, the following sections and sub sections should be considered.

When choosing a new location for either a permanent or temporary camp, be sure the site will comply with local regulations.

- Obtain all required permits from AHJs. See 18.2 Jurisdictional Regulations and Company Policies.
- Permission to use or access private land is always required even though permits may not be necessary. Land access agreements may be required with landowners and all field employees must extend full courtesy to landowners. Follow their directions regarding the use and closure of gates, access through stock grazing lands, use of water sources and
private roads. Keep landowners informed of your presence and the methods of transportation that will be used – especially helicopters.

- If possible, check with people who have previously used a site to identify potential problems and confirm its suitability.
- Establish a camp location as near as possible to the work or field area and to any roads or an airstrip. This minimizes travel time and exposure to risks associated with transportation to and from the work site.
- Consult the following publication if establishing a camp in bear country:

  *Guidelines for Industrial Activity in Bear Country:*
  

Features to consider when selecting a site:

- Camps are generally best located in dry, sunny, well drained site with sufficient elevation to avoid potential flooding or a negative environmental impact on local water resources. The site should be near a fresh water supply and extreme care should be taken not to pollute or contaminate any sources of water. Ideally, camps should be located reasonably close to existing roads to accommodate access.
- The available space should be large enough to operate comfortably and safely for the expected duration of the project. Take into account the need for future expansion of the camp should the project progress.
- Address site hazards such as: limited or confined work areas, the need for special platforms for steep terrain, guard barriers to prevent falls into old open mine works, adequate access and parking space for service vehicles and equipment, aircraft etc., or the need for electric fencing for protection from bears. If helicopter support is planned, be sure that there is adequate space to construct the landing pad an appropriate distance from the living area.
- Determine if there are any overhead or underground power lines, cables, or gas and water pipelines in the immediate area. Contact the appropriate authorities before any excavating or drilling commences to prevent inadvertent contact. Refer to 21.3.4 Working Near Power Lines.

### 18.4.1.1 Site Layout and Organization

Design the layout to meet fire, health and safety regulations and codes and other requirements of the authorities having jurisdiction (AHJs). The following are organizational guidelines:

- Locate tents, kitchen area, fuel storage area and the helicopter landing pad with fire prevention in mind.
- Arrange the camp to minimize the risk of encroachment by animals. There should be no “dead ends” where wild animals may become trapped.
- Locate a camp a minimum of 200 m from an airstrip. (Helicopter landing pads may be closer.) Locate an airstrip and a helicopter landing pad so aircraft do not pass over the camp at a low altitude. Conversely, if wind direction is critical, position the camp to prevent aircraft flying over it.
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EXCELLENCE in HEALTH AND SAFETY

CAMP SET UP AND MANAGEMENT

- Locate fuel storage areas at least 100 m away from the camp. See section 18.4.3 Fuels and Fuel Handling.
- Tents:
  - Space tents and buildings at least 15 m apart to reduce the potential spread of fire.
  - Arrange tents in a line or a semi-circle, rather than in a full circle or a square to prevent a tent being in the target area should a bear invade the camp. Consider setting up an electric fence around camps where bears are common. Refer to section 10.3 Bears.
  - Ideally, the kitchen area should be at least 20 m downwind from sleeping tents.
- If possible, establish a camp near a river or a lake, but not closer than 50 m, or as specified by AHJs.
- Water requirements: Plan for water requirements. Check that the potable water supply is clean or treated as appropriate. Send water samples to a reputable laboratory for analysis to evaluate its purity with respect to inorganic and organic contaminants and to make sure it meets drinking water standards. See section 18.6.3 Drinking Water Safety.
- Electricity requirements: Larger camps commonly use electrical generators to supply power to the various buildings or tents. The generator should be placed in a convenient location, preferably away from sleeping tents due to noise and exhaust hazards. Select a generator of appropriate size for the load by assessing the number of lights, appliances, equipment and other sources of power draw. Carefully plan the layout of the electrical distribution system and grounding with reference to local electrical codes. A qualified electrician should complete the installation of camp electrical generation and distribution systems to ensure compliance. See section 18.4.6 Electrical Safety.
- Sanitation and waste management requirements: Plan camp sewage, wastewater requirements and waste disposal facilities appropriate for the size of the camp and that conform to the site permit. See section 18.6.4 Waste Management.

18.4.1.2 Communications

For detailed information regarding communication requirements and protocols for camps, transportation, traversing and emergencies, refer to Chapter 19. Communications. The following are fundamental when planning a field camp:

1. Determine the best communication equipment for the geographic location and terrain, and supply the camp with sufficient equipment, including an independent backup system.
2. Designate a communication centre that also functions as a means of tracking the location of all employees.
3. Post all important information for communication equipment at the communication centre. This includes:
   - Operating instructions for all communication equipment.
   - The emergency response plans in detail. How and who to contact for various emergencies.
   - How to contact the on site and off site first aid emergency personnel, nearby first aid facilities (other camps) and medical centres
   - Contact list of company headquarters, offices and supervisory personnel
List all possible contacts for all possible emergencies, including local regulatory offices, police and helicopter or fixed wing transportation operating in the vicinity.

4. Train all employees to use the communication equipment. It is essential that everyone is able to follow the posted instructions.

18.4.2 Fire Safety

Fire is the greatest risk in a camp. The consequences of fire may be extremely serious. Should a camp burn, people may be seriously injured or killed or left without shelter, first aid, communications, transportation, food, water and clothing. The abrupt loss of a camp may result in an immediate and serious survival situation, especially in freezing weather.

Based on a risk assessment, determine the needs for mitigation and fire prevention methods. Each camp must have the appropriate firefighting equipment as required by local authorities. Depending on the jurisdiction, it may be advisable to exceed the local requirements.

Fire safety practices for camps

- Arrange camps to reduce the spread of fire. Maintain a safe distance between tents and/or buildings and consider the prevailing wind direction. Make sure appropriate and properly functioning fire extinguishers and smoke detectors are present in permanent structures and tents. Keep a sand-filled bucket beside the entrance of each tent.

- Depending on the size of the camp, place firefighting equipment including fire extinguishers and a fire horn in one or more muster stations in a central location(s). Keep a water hose and pump in place at a water source to fight fires (lakeshore, river bank).

- Place fire extinguishers in a strategic location – near the exit of a tent, cabin or a drill shack. Do not bury fire extinguishers under equipment, clothing or supplies or at the back of a tent or drill shack. Locate extinguishers in the office and kitchen tents, sleeping tents, the incineration site, generator enclosures, drill shack, fuelling locations and fuel storage areas, helicopter landing pad and/or air strip, and in vehicles.

- Fire extinguishers should be the appropriate size to fight a potential fire. Although regulations may require only one 10-lb extinguisher at specific locations, it is recommended to keep two 20-lb extinguishers at fuel storage areas, fuelling areas, drill shacks, and the kitchen.

- Develop an emergency evacuation plan. Develop alternate plans if the location requires them. Post the plans and make sure each person, including visitors, are familiar with the plans. Periodically hold practice fire drills.

- Allocate parking for vehicles so there are two exit routes whenever possible.

- Construct firebreaks around camps where applicable (e.g., in grasslands, dry season in Africa or Australia). The firebreak should be at least 5 to 10 metres wide. Follow the recommendations of AHJs.

- Maintain good housekeeping routines in camps to diminish the risk of fire.
  - Reduce clutter. Do not stack core boxes or other combustible materials against accommodation structures. They provide fuel for potential fires and may block exits and emergency equipment.
  - Incinerate oily rags so it is not necessary to store them. If this is not permitted, store them in a sealable metal container. Keep it closed to exclude oxygen.
Keep grass and flammable vegetation cleared away from propane tanks or fuel storage areas.

- Each camp should establish a smoking policy so that smoking is permitted only in areas declared safe for smoking. Smoking should be discouraged in sleeping tents and trailers or caravans. Do not permit smoking in or near:
  - Storage areas for fuels, chemicals, flammable materials such as solvents, paints, lubricants
  - Aircraft and helicopter landing areas
  - Fuelling areas or fuelling procedures for machinery, vehicles, extra fuel container
  - Maintenance areas when servicing: batteries, engines or motors, hydraulic systems etc.
  - Any designated “No Smoking” area

Fire prevention practices for employees

Employees are required to carry out all activities and procedures in a manner that minimizes the risk of fire. Be informed about the local fire hazard rating and carry out work in compliance with any mandated restrictions.

- When open fires are permitted, keep them small and locate them in a safe place. Never leave them unattended. Fires in wooded areas should be built only on mineral soils. Scrape away all organic materials before building a fire. Make absolutely certain that organic materials are never left smouldering under any fire. Extinguish all open fires thoroughly with water when they are no longer required. When you are sure a fire is extinguished, add several more buckets of water just to be safe.

- If waste is incinerated, separate and remove all dangerous goods that might explode (e.g., batteries, aerosol cans).

- Turn off cook stoves when not in use. Make sure oil stove heaters are turned down or off whenever you leave camp. Perform regular maintenance on stoves, stovepipes and draft regulators, which will reduce the potential risk of carbon monoxide poisoning.

- Turn off all non-essential propane tanks when you temporarily leave camp.

- Light lanterns outside the tent and bring them inside only when burning properly.

- Use caution when burning mosquito coils. Place them in a metal container when lit and be sure to extinguish them whenever you leave camp.

- Clear brush and grasses from around portable generators, water pumps, compressors or any small motors.

- Use caution and correct procedures when fuelling camp equipment and vehicles. Check with someone who knows how to do the job if you are unfamiliar with the routine.

- Make sure proper safeguards remain in place around I.P. motor generators and transmitters as this equipment is a significant fire hazard.

- When parking a vehicle, make certain the exhaust system does not come in contact with dry flammable materials such as grass. Catalytic converters may become very hot. Check for build-up of flammable material such as grass, seedpods, twigs and other organic debris under the vehicle chassis and sump guard, and clean out these areas regularly.
18.4.2.1 Fire Extinguishers

Fire extinguishers and equipment should meet or exceed Canadian standards. Everyone is required to know the location of all firefighting equipment and be trained to use it. Fire extinguishers are labelled with letters, symbols and pictographs according to the class of fire they are designed to fight. Not all fire extinguishers carry pictographs on the label.

All fires require three elements: (1) fuel, which can be solid, liquid or gas, (2) oxygen and (3) heat sufficient to raise the fuel above the temperature of ignition. To extinguish a fire, it is necessary to remove one of the three elements.

Fires are classified according to the material involved in the fire.

Class A: Ordinary combustible material e.g., wood, cloth, paper, rubber and many plastics. Ordinary combustibles leave an ash when burned. All Class A fires must be extinguished by cooling the material below the temperature of ignition. The burning material must be soaked with an extinguishing substance to prevent re-ignition.

Class B: Flammable liquids (e.g., gasoline, grease, oil, diesel, kerosene, tar). Class B fires must be extinguished by removing oxygen (smothered) so the vapors cannot reach the source of ignition. Never use water; it causes the fire to spread.

Class C: Electrical equipment (e.g., wiring, fuse boxes, appliances, circuit breakers, machinery, battery powered equipment). Class C fires of “live” electrical equipment must be extinguished by using an extinguishing substance that does not conduct electricity. Never use water, which will increase the likelihood of electric shock or electrocution. Multi-purpose dry chemical fire extinguishers are safe to use but leave a residue that will damage electronic equipment.

Class D: Combustible metal such as magnesium and other metals and/or metallic dust. The class is rare and the extinguishing material is designed to fight the specific metal that is burning.

Class K: Cooking oils such as vegetable fats or animal fats – a classification used only in the restaurant industry although occasionally some camps can experience these fires.
Generally, only three types of fire extinguishers are used in camps:

1. Water or foam
2. Carbon dioxide (CO₂)
3. Dry chemical – regular dry chemical (BC) extinguishers use sodium bicarbonate or potassium bicarbonate, while multi-purpose dry chemical (ABC) extinguishers use monoammonium phosphate

<table>
<thead>
<tr>
<th>CLASS OF FIRE</th>
<th>FIRE EXTINGUISHER TO USE</th>
<th>DO NOT USE</th>
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<tbody>
<tr>
<td>CLASS A: Ordinary</td>
<td>Pressurized water</td>
<td>Carbon Dioxide (CO₂)</td>
</tr>
<tr>
<td>combustibles</td>
<td>Foam</td>
<td>Ordinary dry chemical</td>
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<td></td>
<td>Multipurpose dry chemical</td>
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<tr>
<td>CLASS B: Flammable</td>
<td>Foam</td>
<td>Pressurized water</td>
</tr>
<tr>
<td>liquids</td>
<td>Carbon Dioxide (CO₂)</td>
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<td>Ordinary dry chemical</td>
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<td>Multipurpose dry chemical</td>
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<tr>
<td>CLASS C: Electrical</td>
<td>Carbon Dioxide (CO₂)</td>
<td>Pressurized water</td>
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Use the correct fire extinguisher for a fire; otherwise you may be injured or cause the fire to spread. Each fire extinguisher carries a label with symbols of the class or classes of fire it can extinguish. Many fire extinguishers are multi-purpose and carry two or more symbols. Class A and Class B fire extinguishers carry a numerical symbol to indicate the relative effectiveness of the extinguisher. The higher the number, the more effective the fire extinguisher (i.e., bigger). A “2A 10BC” is the minimum acceptable size of multi-purpose fire extinguisher and a larger size is preferable, even in a tent or small office. Size 2A 10BC are adequate for placing in vehicles.
Additional information

- Class D fires require specialized fire extinguishing material and would not be present at a normal exploration camp.

- Class K fires are those involving restaurant kitchen appliances. Camps might consider supplying class K fire extinguishers for kitchens if deep fat fryers are used. Class K extinguishers use a wet chemical potassium acetate based agent with a low pH that is specifically engineered to extinguish deep fat fryer fires. They are intended to supplement automatic system protection; do not rely solely on a class K extinguisher.

- Halon extinguishers are no longer made and should not be used as they form dangerous gases when used to extinguish a fire. Respiratory PPE is required, especially if a fire is in an enclosed space.

- Fire extinguisher maintenance should include a monthly inspection, recharging as soon as an extinguisher is used, annual servicing to replace damaged parts, and keeping records of inspections and the repairs.

- Recharging fire extinguishers: Report the use of a fire extinguisher to a supervisor immediately so it can be recharged and made serviceable again. Even minimal use may compromise the performance of an extinguisher in the event of a fire. When you grab a fire extinguisher, you count on it being full.

Figure 18.4: Firefighting practice – refilling a (BC) fire extinguisher with extinguishing powder (sodium bicarbonate). © Courtney Mitchell

18.4.2.2 Firefighting Basics

Training: Be trained to operate each fire type of extinguisher and all other firefighting equipment in the camp. You will not have time to learn how to do so in an emergency. Training should include practice extinguishing a fire and it is best to practice extinguishing the types you are most likely to encounter.
If you encounter a fire, sound the alarm for a fire immediately. Shout loudly.

Use the correct fire extinguisher. Fight a fire only if it is a small fire and you believe you can put it out quickly.

Never fight a fire that is burning between you and the exit. First get out and then fight the fire with your back to the exit.

Never turn your back on a fire as it may flare up or change suddenly.

In very cold temperatures a water-based extinguisher is not effective, as the water base may freeze. A water-based extinguisher used on an electrical fire may cause electrocution or shock; if used on a class B fire of flammable liquids, it may cause the fire to spread.

Treat a fire as an electrical fire if there is any suspicion that it may be an electrical fire. Do not use a water extinguisher. Disconnect the power source(s) if it is safe to do so.

Stand upwind from a fire to fight it. Do not stand downwind as the smoke and flames are dangerous if they contain hazardous chemicals. Also, the smoke and air may become superheated.

Do not fight fires that involve explosives or chemicals. Evacuate the area if there is any chance of chemicals or explosives associated with a fire.

Machinery fires burn with great intensity. The air downwind may become superheated and damage lung tissue.

After extinguishing a fire, watch the area carefully to be sure it does not re-ignite.

Remember the acronym PASS. To use a fire extinguisher properly:

- **P**ull the pin to unlock the discharge lever.
- **A**im low at the near edge and base of the fire.
- **S**queeze the lever (or button) to discharge the contents.
- **S**weep from side to side while directing the discharge at the base of the fire. Drive the fire toward the far edge. Do not aim at the centre of the fire as the force of the discharge may spread the fire outwards.

Additional information about fire extinguishers and fires is available at:


www.fireextinguisher.com
18.4.3 Fuels and Fuel Handling

Camps often require a variety of fuels, which are commonly stored in 205-litre (45-gallon) fuel drums or in smaller drums and jerry cans. Camps that require large volumes of fuel supplies sometimes use large capacity above ground storage tanks. Some fuels require special handling, such as propane and acetylene, as they are stored in cylinders under high pressure.

Comply with regulations of the AHJs regarding all aspects of location and placement for fuel storage areas (caches), transportation of fuels, and handling procedures of fuels and waste fuel products. Keep appropriate spill kits where fuel spills may occur.

In Canada as of June 12, 2010, new regulations apply to both aboveground and underground storage tanks for petroleum products with a capacity over 230 litres that are located on federal or aboriginal lands. Storage tank systems must be registered with Environment Canada and meet standards to prevent leaks and spills. For information refer to: www.ec.gc.ca/st-rs

This section contains limited information about fuel storage, handling, and transportation as the subjects are covered in the e3Plus Excellence in Environmental Stewardship Toolkit. Refer to sections 10.1 Fuels and Petroleum Products and 10.2 Propane and Other Liquefied Petroleum Gases on the e3Plus website: http://www.pdac.ca/e3plus

Risks and hazards

- Environmental damage caused by fuel or oil spills is the greatest risk.
- Fire and/or explosion caused by: misting fuel coming in contact with an open flame, static discharge
- Burns or chemical burn injuries caused by fires, explosions or skin contact with fuels
- Inhalation injuries caused by the toxic, corrosive, or asphyxiant properties of some compressed gases
Impact injuries caused by mechanical failure of compressed gas cylinders. If cylinders are knocked over and the regulator is sheared off the contents may diffuse and/or the cylinder may become a missile and cause great damage.

Carbon monoxide poisoning caused by incomplete combustion of fuels in heating stoves, generators, saws or appliances where there is insufficient ventilation.

Fuel storage tips

Correct storage is essential to prevent fires, environmental damage and wasted fuel. In addition to outdoor fuel storage requirements, AHJs may require fireproof cabinets and ventilation, and they may prescribe minimum distances between storage facilities for certain products.

- Fuel drums and tanks:
  - Store all flammable and combustible liquids safely in accurately labelled containers that conform to WHMIS regulations (e.g., fuels and propane). Refer to 18.2.3 Workplace Hazardous Materials Information System.
  - Store each type of fuel in a separate cache; it is important not to mix different types of fuels, especially aviation fuels.
  - Store full factory sealed fuel drums by lying on the side with both bungs horizontal in the 9 o’clock and 3 o’clock position, which prevents air and moisture from entering. This is mandatory for aviation fuel drums and recommended for diesel.
  - Fuel drums should be stored in a secondary containment system, which should be rated for diesel and aviation fuels, as required. Check the specification sheet for the rating information.
  - Post signs that clearly prohibit smoking and open flames in fuel storage and handling areas.
  - Most fuel drums are clearly marked but occasionally markings are erased. If in doubt about the identity of a fuel – DO NOT USE IT. Report it to the supervisor or camp manager.
  - Make sure empty and half full fuel drums cannot be blown over by aircraft prop wash or the rotor wash from helicopters.
  - Mark fuel drums with company ownership as required.

- Secondary containment systems should be rated for aviation and diesel fuels. Check the specification sheet for rating information.

- Storage requirements for compressed gas cylinders: Compressed gas storage areas should be a minimum of 30 metres from any occupied building or tent. Separate the storage areas in compliance to WHMIS and MSDS specifications.
  - Flammable gases must be stored separate from oxidizers (e.g. hydrogen peroxide, nitric acid, sulphuric acid)
  - Corrosive substances must be stored separate from flammables
  - Full cylinders must be stored separate from empty cylinders
  - All cylinders must be stored separate from corrosive vapors
Situate fuel storage areas away from the camp; ideally, locate the cache a minimum of 100 m (300 ft) from structures. Do not locate fuel drums too near the helipad in the event of a helicopter accident. Store fuel in a cleared, bermed area surrounded by a firebreak.

- Keep an accurate inventory as required by AHJs. Document the fuel caches. Include:
  - Date the cache was set up
  - Number of drums and the type of fuel
  - Dates of additions and deletions to the cache
  - Maintain a running total of full and empty drums at the cache.

Fuel handling tips

Handle fuel carefully to prevent accidents including fires, spills and fuel contamination. Employees who handle fuel should receive appropriate training in WHMIS and transportation of dangerous goods (TDG). Keep appropriate spill kits at fuelling sites or stations and take precautions to prevent injury and environmental damage.

- Wear PPE: Wear safety glasses or goggles and gloves. When drums are under pressure from sun exposure, the bungs may come off unexpectedly and the contents may splash out.
- Fuel drum placement:
  - Aviation fuel requires careful handling to prevent contamination.
    - Aviation fuel drums must be stored horizontally but may be placed upright when they may be used. Once a drum is opened and partially used, it is very important to replace and securely tighten the bungs. Store a drum in use in an inclined position (preferably 60-70° from the vertical). Elevate the edge next to the large bung with a rock or a piece of wood so that the (small?) bung is at the high side (12 o’clock position) to prevent water entering the drum.
    - Do not expect pilots to use fuel more than two years old or if the bung seals are damaged. Pilots may refuse to use fuel that is stored upright for more than one day.
- Transferring fuel by hand from drums to smaller containers:
  - For fire safety, use only CSA-approved fuel containers and restrict the size to no larger than 20 L.
  - For diesel fuel, use yellow CSA-approved containers.
  - Use hand or power pumps with a flash or spark arrester to prevent a static spark when transferring fuel into jerry cans.
  - When transferring fuel to smaller containers, label each container clearly according to WHMIS requirements.
  - If it is necessary to use the same pump for various fuels, be sure to flush the pump out first and empty the waste into a container – never onto the ground. Label the waste fuel container.
  - Never use your mouth to siphon fuel.
- Follow the correct fuelling procedures and use the correct fuel for equipment, vehicles, ATVs, snowmobiles and boats. Check the operator’s manual or ask someone who knows
how to do the job correctly. Fuel may need filtering to prevent scale or dirt from entering fuel tanks.

- Manage waste petroleum products according to requirements of the AHJs. Isolate waste products in sealed appropriate containers until they can be properly disposed of either on or off the site.

- It is advisable not to refill fuel drums. If refilling a drum with gasoline, diesel or stove oil is unavoidable, follow these guidelines:
  - Use the same type of drum and ground the drum before filling. If you are not sure what type of fuel was previously in the drum – do not use the drum.
  - Closely inspect the drum for cleanliness inside and out and check for damage – do not use damaged drums.
  - Label the contents on the outside of the drum with indelible markings.
  - Make sure both bungs are tightly secured before transporting the refilled drum.
  - Do not refill drums with aviation fuel without the written permission of the charter aircraft company.
  - It is difficult to prevent spills so keep a spill kit close by during filling procedures.

Transporting fuel drums and compressed gas cylinders

- Follow all TDG regulations for transportation. The following Transport Canada website provides information about dangerous goods training and links to a variety of topics regarding dangerous goods: [http://www.tc.gc.ca/tdg/training/menu.htm](http://www.tc.gc.ca/tdg/training/menu.htm)

- Transport fuel drums upright in the back of pickup trucks – never in the cab. Carefully secure all drums so they cannot shift while underway.

- Transport and manoeuvre individual cylinders with the aid of a hand truck. Never roll them on their side over the ground or floor to move them.

- Follow safe slinging procedures when transporting fuel, refer to section 16.12 Slinging.

Propane gas handling tips

Propane (a type of liquefied petroleum gas – LPG) is compressed into liquid and stored in special cylinders. General information about propane can be found in section 10.2 Propane and Other Liquefied Petroleum Gases in the Excellence in Environmental Stewardship Toolkit on the e3 Plus website: [http://www.pdac.ca/e3plus](http://www.pdac.ca/e3plus)

- Handle propane storage tanks and cylinders carefully. Use, transport and store propane cylinders in an upright position. Make sure the safety cap covering the valve is in place on propane cylinders during transportation.

- Secure propane cylinders upright against the outside wall of the building, tent or drill shack when in use. They should be placed on a solid base or non-combustible rack and secured so they cannot tip over. Do not place them directly on wet soil as this may cause corrosion. Shield propane tanks from radiant or other direct heat sources and shield hoses from excessive heat and foot traffic. If a cylinder freezes to a surface, use warm water below 52°C (125°F) for thawing.

- Use only the correct installation methods, the correct tools and the proper fittings (regulators, hoses) when connecting propane cylinders to fuel lines.
- Store full and empty gas cylinders separately outdoors according to WHMIS regulations. Never store propane tanks inside living, working quarters, in basements or with oxidizers; oxidizers react with propane and contribute to fire and explosion.

- As propane gas is heavier than air, escaping gas will accumulate in low areas. Proper ventilation around all propane burning equipment is essential to prevent explosion.

- Propane pressure varies with the temperature of the liquid propane, not with the amount of propane in the cylinder. Never heat up a propane tank by using a torch etc., to try to increase the flow of gas from the cylinder.

- Always use soapy water to check for leaks at the joints and fittings. Never use a flame to check for leaks.

- Make sure the safety shut-off valve works properly.

- Propane tanks have a limited life span. Do not use corroded or rusty tanks or those that have past the expiry date.

- Propane tiger torches are useful to heat drilling equipment in very cold weather. Use them carefully as it is easy to start a fire with them.

![Figure 18.6: Correctly stored compressed gas cylinders – upright, secured with safety caps in place and off wet ground to prevent corrosion. © Courtney Mitchell](image)

Additional information about storage and handling flammable fuels and compressed gases is available on the following websites:

- [http://www.ccohs.ca/oshanswers/prevention/flammable_general.html](http://www.ccohs.ca/oshanswers/prevention/flammable_general.html)
18.4.4 Lanterns, Heating Stoves and Appliances

Most camps contain a variety of lanterns and heaters. Each type has different controls and characteristics. If you have not used a particular type before, read the manufacturer's operator manual or instructions and ask someone who knows how to use it.

Fire is a serious risk that may be caused by:

1. Using the wrong type of fuel
2. Smoking during fuelling
3. Careless behaviour care when lighting lanterns or heating stoves

Propane or battery-powered lanterns are safest. Lanterns that burn flammable liquid can be knocked over and spill fuel, which may cause a rapidly spreading fire. Hang lanterns from the ceiling as they are more easily overturned when placed on a table. It is not advisable to use lanterns that burn naphtha or camp stove fuel, as the fuels are highly volatile and flammable.

When using this fuel is unavoidable, take the following precautions:

- Use the correct fuel.
- Light the lantern outside the tent.
- Pump the fuel tank to the recommended pressure.
- Light the match before turning on the fuel. Hold the flame under the burner.
- Let the mantle and burner tube heat up gradually. Open the fuel valve gradually until the mantle lights before opening valve wide. Do not pump the lantern too hard at first. Pump a lantern carefully once the flame is going smoothly.
- Never smoke while lighting lanterns and stoves.
- Place lanterns far enough away from the walls and ceiling of tents so the radiant heat does not set the tent on fire.
- Be careful when taking down a hanging lantern. Use a glove or stick, as the handle may be very hot.
- If a lantern runs dry, let it cool and make sure it is out before opening and adding fuel. Fuel vaporizes when poured into a hot lamp and may explode. Wipe off spilled fuel before lighting it again.
- When lighting a new mantle let it burn in the open for 15 minutes. This will allow toxic vapors dissipate.
- Always keep lanterns away from fuel drums, cans or tanks that contain or have contained flammable liquids.

Precautions for heating stoves in tents

- Place oil and wood stove on a suitably sized sheet of metal. Place stoves at least 1 metre from any flammable material such as tent walls, and beds. Place a heat resistant barrier on the walls nearest the stove. Aluminum foil may be used, which will also reflect heat around the tent.
• Place insulation between the chimney and the support pole whenever an outside chimney needs a support pole. Brace and wire all pipes until they are solid enough to withstand a windstorm. Make sure the chimney does not touch the tent and the chimney vent that passes through the tent is made of adequate insulating material. Always use a heat-resistant spark arrester on oil and wood stoves at the chimney top.

• For all heaters/stoves, always check that the tent is well-ventilated but not drafty. Carbon monoxide and toxic fumes are significant hazards. See the following section 18.4.4.1 Carbon Monoxide Poisoning.

• New stoves and pipes smoke as the protective coating burns off. Make sure there is good ventilation as this smoke may contain toxic gases.

• When lighting a cold oil stove, let a small amount of oil run into the firepot. Light it by tossing a small piece of lighted paper into the firepot.

• If an oil stove is HOT, turn off the oil and do not light it again until the firepot cools. Oil evaporates when it seeps into a hot firepot, which may cause an explosion.

• Clean oil stove filters regularly.

• Clean soot buildup from chimneys

• Frequently inspect all fuel lines (hoses). Rubber hoses are superior to copper piping.

• Remember to turn stoves down or off when the tent or camp is not occupied.

• Install heating fuel on a proper stand outside the structure. Use absorbent mats to soak up any minor leaks from fittings of oil drums used for heating.

• Do not move kerosene heaters when lit.

• Do not put wet clothing, gear or packs within 1 metre of a heating stove or hang them from electrical cords or ropes above a stove. If clothing falls onto the stove it will catch fire.

Propane heaters and appliances

Propane fuel may produce deadly carbon monoxide through incomplete combustion. No propane heaters or appliances should be used in tents or any sleeping quarters without excellent ventilation. Whenever possible, place propane appliances such as refrigerators outside a building. Place a carbon monoxide detector in any area where propane appliances are used. See the following section 18.4.4.1 Carbon Monoxide Poisoning.

Make sure all fittings on the supply line are secure.

• Make sure there is adequate ventilation.

• If you smell propane (rotten eggs or cooking cabbage smell), do not try to light the heater or appliance. Check all connections using soap and water – never check with a match or flame.

• Read the instructions for operating and lighting the propane heaters, stoves, refrigerators, or other appliances.

• Most propane stoves and appliances have a pilot light that must be lit first.

• Keep combustibles away from any propane stove or appliance.

• If gas runs out:

  1. Turn off all control valves at the stove or appliance.
2. Turn off the shutoff valve on the gas cylinder.
3. Change the gas cylinder.
4. Open the valve on the new gas cylinder and check for leaks.
5. Open the valve at heater and light the pilot light.

- Propane refrigerators: Always transport refrigerators in the upright position. Install refrigerators in an area with sufficient ventilation. Keep them level and prevent them from rocking.
- Never operate propane without a proper regulator at the outlet of a propane cylinder.

![Figure 18.7: A refillable heating oil tank and berm lined with chemical resistant fabric. © Bill Mitchell](image)

18.4.4.1 Carbon Monoxide Poisoning

Carbon monoxide is the leading cause of death by poisoning in North America. Carbon monoxide is a colourless, tasteless odourless and non-irritating gas so you are unaware of it when you breathe it. Carbon monoxide combines readily with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. Carbon monoxide can build up rapidly and poisoning can occur in very short time – even within minutes.
Risks

Primary risks to exploration employees are from small portable generators, heating stoves and gas powered tools when used where ventilation is inadequate. Small stoves or heat sources used inside a tent are particularly dangerous (e.g., during bad weather in fly camps). Risks are caused by:

- Confined spaces or semi-confined spaces: Toxic CO levels build up very quickly, sometimes in a few minutes and exceed the safe limits
- Ignorance: Lack of awareness of the risks and situations where CO poisoning can occur
- Indoor use of propane or gasoline fuelled equipment
- Pre-existing medical conditions: Chronic lung or cardiovascular disease increases the susceptibility, smokers
- Reproductive toxin: Pregnant women are very vulnerable, as the CO in their blood poisons the fetus more rapidly than it poisons the mother.

Sources of CO

- Incomplete combustion: Improperly adjusted oil or gas burners in space heaters, heating stoves, cooking stoves, and all fires
- Gasoline powered tools – chainsaws, chop saws, pressure washers, portable generators
- Vehicles
- During normal combustion very little CO is produced. However, incomplete combustion of any fuel greatly increases the production of CO.

Symptoms of carbon monoxide poisoning

The symptoms depend on the concentration, the degree of physical exertion, and length of exposure. Because the brain is sensitive to oxygen deprivation, behaviour changes and confusion are common, but more easily recognized symptoms include the following:

- Low concentrations produce a slight headache, shortness of breath, nausea and dizziness
- Higher concentrations produce a severe headache, mental confusion, dizziness, impaired vision and/or hearing, and collapse or fainting with physical exertion
- Extreme concentrations produce unconsciousness, coma and death

Prevention and preparation

Prevent exposure whenever possible.

- Include an assessment of all items that have the potential of generating carbon monoxide poisoning. Mitigate the risks.
- Develop and implement SOPs for working with equipment that produces CO. Develop ERPs that address potential CO poisoning.
- Educate workers about the risks, warning signs and required first aid treatment for CO poisoning.
- Engineering controls:
  - Install ventilation that is appropriate for the work space. Work in trenches and underground require proper air and exhaust ventilation for diesel motors – never
use gasoline powered motors even near a trench where the exhaust may descend and accumulate.

- Replace gasoline powered equipment with electric or diesel powered equipment when appropriate
- Maintain fuel powered equipment in good condition and inspect it regularly
- For heating and cooking stoves, make sure the flame of liquefied petroleum gas burns with a clear, blue flame. A flickering or yellow flame indicates that the air intake is restricted and needs adjustment, as more CO is produced when combustion is incomplete as indicated by a yellow flame.

- NEVER use a heat source inside a tent without excellent cross ventilation. Open vents at the top are not sufficient. Small heat sources in small tents or cabins are a deadly combination.

- Start vehicles and heavy equipment outdoors or in well-ventilated areas, especially in cold temperatures as engines produce more CO when it is cold.

- Do not barbecue with charcoal in any enclosed space. Coals emit carbon monoxide even when they are not glowing.

- Detection instruments: Use as detection instruments appropriate for the work site.
  - Gas detection tubes – indicate the level of CO by colour changes
  - Electronic detectors: various sizes – portable and stationary.
  - Do not use a home detector for buildings at a work site.

- Refer to section 22.7.3 Carbon Monoxide for information about carbon monoxide and for information about the occurrence in old underground workings.

### 18.4.5 Generators

Field camps use a variety of generators in exploration activities. Small camps usually use small gasoline or diesel powered generators with a generating capacity of 300-5000 W. Permanent camps commonly use larger diesel powered generators with capacities of 2-50 kW or more. Generators are also commonly used in ground geophysical surveys.

Guidelines for the safe operation of generators

- Comply with the relevant building, fire and electrical codes regarding the use of generators and electrical distribution systems.

- Only trained personnel should operate and maintain generators. However, keep the operating instructions for each generator available in case a problem develops and the person who normally runs the generator is not present.

- Exhaust emissions contain poisonous carbon monoxide (CO). Never run a generator in a building, tent or in an enclosed area unless the exhaust pipe discharges outside the area so fumes cannot re-enter the enclosure.

- Operate the generator on a level surface. Otherwise, fuel and oil spillage may result. Use drip trays, absorbent pads and have a spill kit available.

- Know how to stop the generator quickly. Label the emergency shut-off; understand the operation of all the controls.
A generator is a potential source of electrical shock. Do not allow the generator to get wet. Cover it to protect it from rain or snow. Do not use a generator if your hands are wet.

Small generators

- When using generators in the field, make certain they do not rest on any organic material or vegetation that might ignite.
- Place small generators at least 1 metre (3 ft) away from any tent, building or other equipment when the generator is operating.
- Refer to 5.9 Small Generators for additional information regarding portable generators that may be used as the power source for field equipment or surveys.

Large generators

- Larger generators and electrical distribution systems should be installed and/or inspected by a qualified electrician.
- Install large generators away from tents and structures and in insulated housing to reduce noise. Whenever possible, locate them downwind to reduce noise and emission pollution.

Installation and maintenance

- To prevent damage to the generator, make certain it is grounded. Connect a length of heavy wire from the ground terminal to a ground spike. Grounding protects the generator from damage due to lightning. Be aware, however, that grounding the generator may increase the danger of shock to a person standing near it if the soil or flooring beneath the generator is wet.
- Install a ground fault circuit interrupter (GFCI) at the generator and plug all cords into it.
- Carry out regular maintenance and repairs. This includes regular oil changes and coolant level checks. Shut off the engine before carrying out maintenance. Keep a written log of maintenance and servicing.
- Place and operate small generators in a metal or plastic pan or drip tray to catch spills that frequently occur during fuelling.

Fuelling procedures for generators

- Fuel generators during daylight hours. Never allow a generator to run dry of fuel (unless you intend to do so). Each evening there should be enough fuel in the tank to last until morning.
- If fuelling must be done in darkness (e.g., Arctic winter), make sure there is adequate lighting to do the job safely.
- Gasoline is commonly used in small generators and it is extremely flammable and explosive. Fuel only in a well ventilated area with the generator engine stopped.
- Do not smoke or allow flames or sparks in the area where the generator is being fuelled.
- Take care not to overfill the fuel tank and cause spillage. Replace the filler cap tightly after fuelling. Clean up any spillage.
If diesel generators are fed directly from 205 L (45-gallon) drums or a larger tank, place the drum or tank in a spill containment structure and keep an appropriate spill kit on hand.

Table 18.4 Fuel Characteristics.

<table>
<thead>
<tr>
<th>FUEL</th>
<th>USE</th>
<th>DISTINGUISHING FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP-4, also known as Turbo B, Jet B, Jet A</td>
<td>Jet Helicopter Twin Otter Turbo Beaver Sharp Heater</td>
<td>Very pale straw colour, Could be confused with Naphtha Has oilier smell than Naphtha</td>
</tr>
<tr>
<td>Avgas 100/130</td>
<td>Non-Jet Aircraft Single Otter Beaver DC-3 Cessna 180/185</td>
<td>Green colour Sickly sweet smell</td>
</tr>
<tr>
<td>Naphtha (not recommended for use due to its flammability)</td>
<td>Coleman Stoves Lanterns Coleman Heaters</td>
<td>Clear colour This is a lighter fuel than JP-4. Leaking drums may have a crystalline deposit at the leak site in cold temperatures.</td>
</tr>
<tr>
<td>Propane</td>
<td>Kitchen appliances Propane heaters Tiger torches</td>
<td>Manufacturers add an odorant to create a distinctive smell like rotten eggs or boiling cabbage so vapors can be detected when there is a leak.</td>
</tr>
<tr>
<td>Regular Gasoline or Petrol</td>
<td>Generators</td>
<td>Slightly yellow colour Same smell as gas you put in a car</td>
</tr>
<tr>
<td>Diesel</td>
<td>Diesel Generators Oil Stoves Drill Engines</td>
<td>Noticeably heavier than other fuels Oily smell of old stoves</td>
</tr>
<tr>
<td>Stove Oil</td>
<td>Oil Stoves</td>
<td>Same as diesel, but pink coloured</td>
</tr>
</tbody>
</table>

NOTE: If in doubt about the identity of a fuel – DO NOT USE IT. Report it to your supervisor.

18.4.6 Electrical Safety

Qualified electricians should design and install electrical systems and wiring and carry out all repairs to electrical equipment. Employees who use electrical tools and equipment should be trained and should refer to the manufacturer’s operator manual for safe operating procedures, especially the first time an item is used or if they have not used the equipment recently. Seek instruction when you are unsure about the correct use of electrical tools, equipment or appliances.

18.4.6.1 General Guidelines for Electrical Safety

Avoid electrical hazards by following safe work practices. An electric shock can be fatal when current passes through the body. Electrical burns can be extremely serious and may even require amputation of digits or limbs.

- Any moisture may provide a path for electricity and result in shock. Keep all appliances, power tools, plugs and cords away from water and damp surfaces.
• Make sure all electrical equipment is properly grounded.

• In the event of an electrical fire, always use a C-rated fire extinguisher – never use water, which will increase the risk of electrocution.

• Use extreme caution when handling aluminum ladders or other conductive materials and prevent them from touching exposed overhead electrical wires, light bulbs or other conductors.

• Do not work alone with or near high voltage electricity. Use the “buddy system” so emergency measures can be initiated if one person is injured.

• Treat every wire as if it were energized or “live” until you confirm that it is not.

• Clearly label the circuit breaker(s) and the main power emergency switch. Everyone should know the location and how to operate them to cut off power.

Electrical equipment

• Use the correct power tool or appliance for the job. Securely store all equipment in its designated storage place when not in use. Keep items in good repair and free of dirt and grease; never use defective or worn tools or appliances.

• Grip the plug and not the cord when unplugging a tool or appliance. Always handle plugs with dry hands.

• Unplug tools, appliances and machinery before inspecting, cleaning, clearing a stoppage, or carrying out maintenance.

• Refer to sections 5.5 Power Tools and 5.10.3 General Safety Regarding Rock Cutting Saws for additional information.

Circuits

• Make sure all electrical systems are correctly grounded. All circuits should be equipped with ground fault circuit interrupters (GFCIs) also known as earth leakage safety switches or residual current devices. GFCIs protect people from electrical shock, as they will interrupt the circuit before a fuse in a circuit breaker panel is triggered.

• Keep the access clear around circuit panels and junction boxes. All workers should know the location of circuit breakers and fuses, especially for their immediate work area.

• Minimize hazards caused by electrical cabling by burying, elevating or barricading exposed cables. Mark the location of any buried cables. Protect cords and cables from damage when they cross roads or passage ways. Secure or suspend electrical cords with non-conducting materials. Make sure that cables do not get wet.

• Use only approved armoured (teck) cable for burial.

Electrical cables, power and extension cords

• Make sure power cords use the appropriate voltage for the electrical grid system. Use cords with ratings appropriate for the job.

• It is preferable to use only circuits with GFCIs. However, if there is no GFCI, use electrical cords that contain inline GFCIs. To use electrical cords that lack GFCIs may require a documented inspection program; therefore it is usually cheaper and safer to purchase and use cords with inline GFCIs.
Visually inspect power cords before use. Make sure they are free of breaks in the insulation and have no taped splices. Inspect them for fraying and damage before each use. If damaged, cords should be repaired by an electrician or discarded.

Use the correct type and length of cord for the job. A power cord should be as short as possible for the job. A cord should never be near your feet where it may become a tripping hazard, or draped over a workspace or cooking surface where it may get caught.

Do not allow vehicles etc., to drive over power cords. Place the cord between planks for protection.

Maintenance

- All electrical and repair work should only be carried out by qualified electricians. Tag out defective tools and bring them to the attention of the supervisor for repair. Maintenance employees should be trained in and follow lockout procedures, as required.
- Wear proper PPE when carrying out maintenance work (e.g., safety glasses and electrical rated footwear).

18.4.6.2 Lockout and Tag Out procedures

Lockout is a program required by occupational health and safety legislation and regulations that requires machinery to be secured against inadvertent movement and the release of energy sources during maintenance work. Companies should develop a lockout and tag out program to implement during installation, maintenance and repairs of machinery and equipment. Employees who work with machinery or carry out maintenance on electrical circuits should receive formal training to learn lockout and tag out procedures.

During installation or maintenance on equipment, machinery or power systems, it is important to (1) clearly notify co-workers that a device is not working (tag out) and (2) make sure that all possible forms of energy have been shut off and/or released so power will not be restored until work is completed and the “lockout” is removed by the designated person(s).

Tag out procedures

Set up a tagging system for hand tools and any piece of equipment that requires servicing, maintenance and/or repairs (including generators, vehicles, ATVs, snowmobiles). A specific “OUT OF SERVICE” tag that is signed and dated should be attached to the item that briefly explains the problem. Report the problem to a supervisor. The tag should: (1) be clearly written, (2) weatherproof, (3) securely attached, and (4) only be removed by a designated employee when required work is completed by a qualified person. No one should operate any equipment that carries an “OUT OF SERVICE” tag.

Lockout procedures

A company should develop written lockout procedures to provide for the safety of maintenance workers and verify that no energy (power) will suddenly and unexpectedly be released or restored. Procedures should be in compliance with lockout regulations of the AHJs.

- The term “energy-isolating devices” refers to switches, circuit breakers and valves that must be locked out. A stop button on a control circuit is not a sufficient control for locking out. The main power source must be locked out that supplies a stop button on a machine.
Personal lockout locks: Issue each worker who maintains or services equipment that requires locking out a personal lock with only one key, which is kept by that person. Only that person may place the lock on a switch, valve, or circuit panel to lock out energy and only that person may remove the lock when work is completed. Each person who works on a machine or circuit places his or her personal lock on the switch and removes it. This prevents someone from inadvertently restoring the energy source.

Develop and implement procedures to address when lockout work carries over to other shifts.

Lockout is not required when a tool or piece of equipment that receives power through a disconnected supply (power cord) is kept under the immediate control of the worker at all times until the work is completed.

Employees are required to implement the company’s written lockout procedures and follow them step by step. The steps include:

1. Identify the machinery, equipment or power system. Notify other affected employees that the lockout system will be implemented. Make sure no other employee will be harmed by shutting off the equipment or machinery.
2. Shut off the equipment or machine and make sure that all moving parts are completely stopped.
3. Identify and turn off (de-activate) all energy sources. Turn off the switches or valves or other energy isolation devices so the equipment is completely isolated from all energy sources. Dissipate stored energy through bleeding, blocking or grounding etc. See the following section regarding various forms of hazardous energy.
4. Apply a personal lock to the switch or control of each energy-isolating device (energy source). Each person who will work on the equipment must apply their personal lock.
5. TEST the lockout to make sure it is effective and make sure each and every source of energy has been locked out. Before testing, it is essential to make sure all employees are clear and no hazards will be created if the lockout fails.

Forms of hazardous energy include the following:

- Electrical energy: Low voltage and high voltage equipment can kill workers. Never work on electrical equipment, lighting systems, or electrical panels unless they are locked out.
- Kinetic energy: Moving machinery parts may continue to move after electric power has been turned off. Guarding, blocking or restraints may be required during maintenance. Parts may be controlled by hydraulic or pneumatic pressure, which must be released and/or blocked.
- Potential energy: Some materials or parts of machines or equipment may be suspended or elevated when the energy source is stopped. Block any elevated machine parts that might fall due to gravity and pin or block parts suspended by hydraulic or pneumatic pressure. Loaded springs are a source of potential energy.
- Chemical energy: Flammable and combustible materials release energy in the form of a chemical reaction when they burn.
- Thermal energy: Thermal energy is energy that can be transferred to a cooler body. Hot steam pipes and pressurized gases are sources of thermal energy.
- Radiation energy: Lasers, light and ionizing radiation X-rays are forms of radiation that may require control.
18.4.6.3 Batteries

A variety of batteries are used in camps. Six- or twelve-volt lead acid batteries power various means of transportation and communications equipment in camps. Batteries are essential to power handheld Global Positioning Systems (GPS) units used for navigation and emergency location equipment, Emergency Locator Transmitters (ELTs), and Personal Locator Beacons (PLBs). Most units use AA or AAA batteries; rechargeable NiMH or Lithium ion batteries are recommended by some manufacturers for some equipment.

General battery tips

- Cheap batteries are false economy in the field.
- Follow the manufacturers’ instructions to install and recharge batteries correctly.
- Do not mix batteries. Use the same brand and chemical type. All batteries should be the same age – replace all of them at the same time.
- Do not leave equipment switched on when the batteries are depleted. Remove depleted or damaged batteries. Do not leave them in equipment as they may corrode or leak and cause damage.
- Pay attention to the expiry date on batteries in PLBs and ELTs. Batteries should be replaced before the expiry date. Good batteries in ELTs should provide continuous transmission for 48 hours.
- If you carry battery powered equipment in very cold weather, keep the items close to your body inside several layers of clothing to preserve the charge. Take them out to use briefly and replace them in your clothing as soon as possible.

Battery recharging tips

- Follow the recommendations in the manufacturers’ operator manuals for communications and navigational equipment regarding rechargeable batteries and rechargers. Match the charger with the battery. Some batteries should be almost, but not totally depleted before recharging.
- Charge batteries at room temperature whenever possible – not at temperatures below 0°C or above 40°C.

Battery storage tips

- Store batteries in cool, dry, well ventilated areas. Keep them away from any heat source, including direct sunlight.
- Never store batteries with flammable or explosive materials or with food.
- Store batteries of like chemistry together – not mixed with other types of batteries.

Safe battery disposal

Follow the jurisdictional regulations for safe battery disposal.

- Comply with AHJs regarding recycling lead acid batteries (vehicles, ATVs, snowmobiles and boats).
Nickel cadmium and lead acetate batteries can contaminate the environment and cause health problems. Make every effort to recycle or dispose of all batteries according to regulations.

Do not throw batteries into a fire as they may explode, injure people and contaminate the environment.

Additional information is available at the following websites:

**Electrical safety:**
- [http://www.ccohs.ca/oshanswers/safety_haz/electrical.html](http://www.ccohs.ca/oshanswers/safety_haz/electrical.html)

**Lockout:**

**Batteries:**
- [http://www.ccohs.ca/oshanswers/safety_haz/garages/batteries.html](http://www.ccohs.ca/oshanswers/safety_haz/garages/batteries.html)
- [http://www.ccohs.ca/oshanswers/safety_haz/battery-charging.html](http://www.ccohs.ca/oshanswers/safety_haz/battery-charging.html)

### 18.5 First Aid

As a part of due diligence and compliance with AHJs, exploration companies are required to provide an adequate level of first aid resources in camps, including first aid staff, equipment and supplies. Injuries and illnesses usually happen suddenly and often they are unexpected. Because medical aid may be many hours away, the presence of well trained personnel and adequate first aid resources are essential. First aid providers should have the appropriate required level of training.

#### 18.5.1 Emergency First Aid Planning and Preparation

Regulations in the province, territory or state set out minimum requirements for the number of first aid providers, the size of treatment facility, and the quantity of first aid equipment and supplies. The requirements are determined by the size of camp and the degree of remoteness – the travel time required to obtain medical treatment. Compliance with AHJs is essential.

- Regulatory requirements for first aid provision may be found in jurisdictional Mines Acts and Regulations, jurisdictional Workers Compensation Board regulations, and possibly the regulations of the Ministries of Health and/or Labour etc.
A designated first aid area is required. Sick quarters may be required for large camps.

Large or advanced exploration sites should consider hiring a nurse or a paramedic.

Camps should be equipped with an appropriate first aid and wilderness first aid texts. It may be advisable to stock references that address special circumstances such as hypothermia, cold water immersion hypothermia, and high altitude.

Responsibilities of first aid attendants with advanced first aid qualifications:

- Obtain a medical information sheet from each employee that provides the attendant with current and past medical information. It is understood that many jurisdictions have privacy regulations relating to medical matters. It may be advisable for a company to consult a lawyer on how this issue should be handled.

- Complete a first aid record form for all injuries brought to the attention of the attendant. Any condition serious enough to impair a worker’s ability to do his or her job should be referred to a first aid attendant for evaluation and the potential need for treatment in a medical facility. Employees should have minor cuts and injuries checked as they may develop into serious problems if ignored. Companies must retain first aid records on file for three year or as required by AHJs.

- Complete a medical assessment form when transferring an employee for medical aid.

- Maintain a complete first aid kit and document each use, which is a legal requirement in most jurisdictions. Carry out a monthly inventory of supplies and replenish the supplies after use so there is no shortage. Keep the first aid area clean and organized.

First aid preparations for camps should include the following potential events.

- Common illnesses and disorders should be addressed as appropriate with isolation, disinfecting the area, and monitoring the health of the patient. Common disorders include: colds, flu and other viruses, athlete’s foot, fungus (ringworm), and scabies.

- Initial treatment for life-threatening illnesses such as malaria, as appropriate

- Treatment for burns, scalds and sunburn

- Abrasion, sprains and broken bones caused by slips, trips and falls or transportation accidents

- Serious cuts and lacerations from chainsaws, axes or other cutting tools

- Specific injuries or illnesses due terrain or climate, as appropriate:
  - Hypothermia, frostbite, cold water immersion hypothermia
  - Hyperthermia or heat exhaustion, heat stroke
  - Dehydration
  - Tick bites, spider and scorpion bites
  - Snakebite – know where antivenin is available for treatment
  - Acute mountain sickness, which may require oxygen therapy
  - Animal attack and accidental exposure to bear spray
Post a notice with first aid contact information at central locations and at each communication station:

1. Name(s) of first aid attendant and work location on site
2. Telephone number, radio frequency or sat phone number to reach the first aid attendant from any location at any time
3. Operating instructions for both radio and sat phone
4. Contact number(s) for the nearest medical treatment centre and transportation providers (helicopter, fixed wing etc).
5. The times required to reach the medical centre by each and every available means of transportation

18.5.2 First Aid Kits and Supplies

First aid kits are required to meet the specifications of the AHJs. First aid supplies and medications should reflect the anticipated injuries or illnesses, including those due to environmental conditions and diseases common in the area as determined from risk assessments.

- First aid kits should contain sufficient supplies for the size and location of the camp. Include blankets, spine board, a basket stretcher(s) that fits in a truck or helicopter, as well as the appropriate quantity of oxygen, which is dependent on the time required to reach a medical treatment centre.
- Maintain kits so they are well stocked, clean and sterile and the contents are not expired.
- At remote sites, it may be necessary to stock medications that can be administered by people with advanced first aid training under the specific direction of a doctor by radio or satellite telephone. For example, the Royal Flying Doctor Service is available in Australia and different services are available for other parts of the world.
- A suitable first aid kit should be present in every truck, ATV, snowmobile, boat, drill rig, as well as in heavy equipment.
- Traversing employees should carry an adequate first aid kit at all times.
- Consider potential first aid requirements for specific locations or activities and stock appropriate first aid equipment.
  - High altitude camps require oxygen and equipment to treat various forms of acute mountain sickness.
  - Heat exhaustion and/or heat stroke in very hot climates
  - When working on ice, be prepared to treat hypothermia, frostbite and cold water immersion hypothermia. Hypothermia kits should be available (i.e., in snowmobiles, vehicles, at drill sites).
  - Be prepared for serious cuts and injuries where there is work with chainsaws, heavy equipment and vehicles including ATVs and snowmobiles.

18.5.3 First Aid Training

It should be the goal of every exploration company that all employees, including temporary field employees and office staff, are certified in standard first aid and cardio pulmonary resuscitation (CPR). Up-to-date first aid and CPR certification should be mandatory for all permanent and long
term exploration employees. People with first aid training are more likely to assist in a valuable way during an emergency.

- Only the 16-hour first aid training that includes the transportation endorsement is acceptable by all jurisdictional Workers’ Compensation Boards across Canada.
- In addition to standard first aid, wilderness first aid training is strongly advised for employees who work in remote locations, although there is no standardized certification for the courses.
- Advanced first aid training is highly advisable for people who spend long periods of time in the field and may be required for people in charge of camps. Advanced first aid certification requires a minimum 70 hour first aid course that includes transportation and oxygen therapy (i.e., Industrial First Aid, Level 3 First Aid, or Advanced First Aid).
- CPR refresher training should be taken annually. Standard first aid requires recertification every three years. Advanced first aid training requires recertification every two years.
- Consider bringing a first aid trainer into large camps to train as many employees as possible.
- It is advisable to consider reimbursing summer students and short term employees for the cost of their first aid training.

18.6 Health

In remote areas, it can be challenging to manage exploration camps and provide a healthy lifestyle for employees. This requires keeping camps as clean as possible through careful attention to sanitation despite isolation and climatic conditions. Difficult working conditions may lead to physical stress and fatigue and contribute to employees’ susceptibility to illnesses and/or accidents.

Risks and hazards

- Water-borne diseases caused by contamination at the water source, inadequate water purity testing, improperly maintained water system; the presence of parasites, bacteria, viruses, animal or human waste products, or toxic chemicals in the water system.
- Water-borne diseases caused by sewage contamination of ground or surface waters.
- Food-borne diseases caused by cross-contamination, spoiled food, food poisoning from food handlers’ lack of hygiene, the presence of parasites or bacteria on raw food.
- Communicable diseases spread by kitchen workers and camp employees caused by unhygienic practices, lack of immunizations, confined living conditions.
- Animal attack or vermin invasion caused by improper food storage, preparation or disposal practices. Attractants result in human habituation and/or food conditioning of animals.
- Poor nutrition caused by inadequate diet, inadequate or inappropriate food supplies.
- Inability to meet project goals caused by lost time from employee illnesses.
- Employee burnout caused by fatigue and/or mental stress, which contributes to accidents.
18.6.1 Employee Hygiene

Exploration employees typically spend weeks or months working long hours while living in exploration camps. Clean water and safe nutritious food are essential for both productivity and morale. Good personal hygiene standards are important so dirt and potential infections from work sites do not contaminate the kitchen and eating areas.

- Handwashing facilities should be located to encourage employees to wash their hands before eating, after using the toilet, and after handling any materials that might cause contamination (e.g., residues from samples containing radioactive minerals or asbestiform minerals). Frequent handwashing reduces the likelihood of contracting contagious diseases.
- Bathing/shower facilities should be used on a regular basis (daily is best).
- Clothes washing facilities should be used frequently to keep work clothes free of grease, grime and dirt. Some sampling areas may require clothes washing facilities so potentially contaminated work clothing remains in that area. Under some circumstances, for example drill camps, it may be necessary to have dedicated washing machines for excessively dirty, greasy clothes.

18.6.2 Guidelines for Kitchen Safety, Food Handling and Food Storage

Provide balanced, healthy and nutritional meals for field employees. Food-borne illness can, however, sweep through a camp and disable many people at one time. Therefore, hygienic food preparation and handling procedures and safe food storage are critical to maintaining employee health. The risk of food contamination increases in hot, moist weather conditions, especially in the tropics where bacteria can multiply very rapidly.

- Set up the cooking area separate from the sleeping area. The space between these locations should be open with clear visibility if bears are a risk.
- Restrict food to the kitchen and dining areas; no food should be permitted in sleeping or work areas to control vermin (or bears).
- Set up handwashing facilities so workers can wash before meals. Workers should not wear dirty work clothes and boots in the kitchen and eating areas.
- Projects should have a policy stating that employees must not feed wildlife. Feeding wildlife encourages animals to become human habituated and food conditioned. Some carry life-threatening diseases such as rabies and plague.
- Camps should have an emergency lighting system in the kitchen area in the event of a power failure.

Kitchen staff

Preventing food-borne illnesses starts with selecting competent food handlers. They should be familiar with safe food preparation, storage and cleanup practices.

- Select camp kitchen staff carefully. Whenever possible, hire kitchen staff with food handling certification. In Canada, food handler training is available in every province and territory and a requirement in some provinces.
- Make sure the food handlers have up-to-date immunizations. Prior to employment, food handlers should undergo medical screening for communicable diseases (e.g., TB and
hepatitis), and in some locations they should be tested for typhoid, cholera, and/or worms (ova and parasites).

- **Handwashing:** Make sure that all kitchen staff use proper handwashing techniques with soap and water. Insist that staff practice meticulous personal hygiene before and during food preparation, after touching unsanitized surfaces (including face, nose, hair etc.), handling garbage and after using the toilet. If necessary, train food handlers in required handwashing procedures.

- **Consider placing hand sanitizer dispensers at key locations.**

- **No smoking is permitted while preparing food.** Cover skin infections or cuts with waterproof dressings. Kitchen staff should inform their supervisor if they are feeling ill.

- **Long hair should be restrained or worn up and out of the way.** Do not wear loose clothing, especially loose sleeves that may catch fire or catch on sharp edges.

- **Follow safe lifting and manual handling techniques to prevent back injuries and repetitive strain injuries during kitchen work.**

### 18.6.2.1 Kitchen Operations Safety

- **Kitchen fire safety**
  - **ALWAYS keep an appropriate-sized fire extinguisher(s) in the kitchen mounted in an easily accessible place near an exit.** Depending on the kitchen size and set up, consider stocking a Class K fire extinguisher(s) designed for fighting fires in deep fat fryers.
  
  - **If a fire starts on the stove – turn off the heat and cover the pan. Use salt or baking soda on the flames, not water, as it will cause grease to flare and splatter and spread the fire. Use a B or BC type fire extinguisher if one is required.**
  
  - **If clothing catches fire, drop to the ground and roll. STOP – DROP – and ROLL.**
  
  - **Follow firefighting routines. See section 18.4.2 Fire Safety**

- **Burn prevention – common injuries for kitchen workers.**
  - **Always use dry kitchen towels, hot pads or oven mitts when handling hot utensils and pots and pans. Damp items will produce a steam burn on the hands or arms.**
  
  - **Do not move pots that contain hot oil. Let them cool in place before moving them.**
  
  - **Work cautiously with steaming pots. Lift the lid carefully away from your face. Pour hot liquids carefully.**

- **Handle kitchen knives properly.**
  - **Keep knives sharp and use the correct knife for the job.**
  
  - **Cut away from yourself and cut food on a cutting board – not in your hand.**
  
  - **Store kitchen knives safely – never store them loose in a drawer where grabbing one may result in a severe cut. Do not leave sharp knives in a sink or put them in a dishwasher.**

- **Follow safe practices when using electric kitchen appliances.**
  - **Read the manufacturer’s operator manual and be familiar with the safe operating procedures. Refer to section 18.4.6. Electrical Safety.**
Outlets with GFCIs (Ground Fault Circuit Interrupter) are recommended. Do not overload outlets; use power bars.

Only use electrical cords that are in good condition and that are as short as possible for the job. Have frayed electrical cords repaired or replaced; only certified electricians should make repairs.

Never unplug electrical cords with wet hands. Always unplug an appliance before cleaning it or clearing a blockage.

Tips for sanitizing kitchen and food preparation surfaces

- Sanitizing solution: Make a dilute bleach solution by putting about 15 ml (1 Tablespoon) of 5% bleach in 4 litres (1 gallon) of water. This produces a bleach solution that works well for sanitizing surfaces and eating utensils. Use this solution in a spray bottle on surfaces after they are washed with hot soapy water. If a washing cloth is kept in the solution for cleaning tables, change the solution at least once a day (more frequently for large facilities). Make a fresh solution often.

- Food preparation areas must be kept meticulously clean. It is essential to wash all food preparation surfaces with hot soapy water before food preparation begins and again before a different food is prepared on the surface to prevent cross-contamination. Rinse with a sanitizing solution.

- Use cleaning products appropriate for the equipment used (i.e., stove, refrigerator). Post appropriate MSDSs nearby.

- Wash hands before and after handling any raw meats or foods that might carry bacteria on the surface such as melons or dirt-laden vegetables.

- Clean plates, utensils and cooking containers after each meal. Use cleaning products appropriate for the equipment used (i.e., stove, refrigerator). Post appropriate MSDSs nearby.

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- Use cleaning products appropriate for the equipment used (i.e., stove, refrigerator). Post appropriate MSDSs nearby.
melons before slicing and fruits that will be peeled by knife or by hand to prevent bacteria being carried onto the fruit.

- If possible, use a designated cutting board for meat, poultry and seafood, and a separate board for vegetables and fruits. This way, raw fruits and vegetables will not be accidentally contaminated by raw meats etc. Wash cutting boards with hot soapy water and sanitizing solution after use.

- Keep raw meat, poultry and seafood separate from all other foods. Store them on the bottom shelf of a refrigerator. Then, leaking packages will not drip onto other foods.

- Wash foods in a bowl, not in a water-filled sink. After washing meat, chicken, or fish, always wash the sink as well as the container, as splashed water may contain contaminating bacteria.

- When cooking meats, poultry or seafood on a grill, place the cooked food in a clean container. Discard marinades after raw items are removed.

Critical food temperatures – heating, cooling and refrigeration tips

- It is essential to keep prepared food at a safe temperature to prevent the growth of bacteria. This requires that cold foods be kept cold (less than 4°C or 40°F) and hot foods be kept hot (warmer than 60°C or 140°F). Bacteria grow rapidly in the temperature range between 4°C to 60°C (40°F to 140°F). Food should be heated rapidly and cooled rapidly through this temperature range.

- Food that requires refrigeration should be discarded if it sits for two hours or more between the temperature range of 4°C to 60°C (40°F to 140°F).

- A large pot of hot food takes a long time to cool through the critical temperature range. To chill cooked food quickly, place it in a shallow pan to expose a large surface area to cooler temperatures and/or place it into a number of smaller containers.

- Store all leftover food in sealed, metal or plastic containers and refrigerate as necessary. Label and date the containers.

- Defrost all foods in the refrigerator. Always defrost meat in a refrigerator – not out in the open on a work surface or outside on the barbecue.

Food storage tips

- Food handlers should unpack and inspect all food shipments for quality immediately after it arrives. Inspect for quality, freshness, and potential contamination including by vermin. After inspection, store it promptly for maximum safety. Proper storage includes both preservation of food quality by refrigeration and prevention of invasion by nuisance animals and insects. Never store food in sleeping tents.

- Store perishable goods in appropriate places – cupboards, refrigerators or freezers. Store heavy and bulky items on lower shelves but not necessarily the lowest shelf. Store foods in containers that are insect proof, rodent proof and bear proof, as required. Label the contents.

- Once frozen goods have thawed, they must not be refrozen. Cook thawed food as soon as possible or discard any food that has been thawed for too long.

- Rotate stored food so that food is used up in the order received. Pay attention to expiry dates and required storage instructions such as “refrigerate after opening”.

HS-WS-v1.0
Page 1 of 82
Store food in covered containers or plastic bags in refrigerators to prevent juices from other items dripping onto them. Seal raw meat, poultry and fish and place them on the lowest shelf of a refrigerator so they cannot drip onto other foods.

Discard food when (1) packaging seals are broken, (2) any tins are rusted, “bloated” or “popped”, (3) it has passed the expiry date and (4) improperly stored food (e.g., without required refrigeration).

Always keep grease stored in an airtight container; use as soon as possible.

If a camp will be left unattended during the day, it is very important to prevent bears and other animals from accessing food. Place all food in metal storage drums whenever possible. In addition, strong smelling foods should be carefully sealed in layers of resealable plastic bags. Consider using an item such as a “Critter Gitter”, which is an infrared motion detection device that emits a very loud noise and flashing lights to scare off animals that enter the designated detection area. Place it so the food is in the detection area (refer to section 10.3.6 in Chapter 10).

18.6.2.3 Kitchens: Animal and Insect Controls

Vermin include rats, mice, cockroaches, bedbugs, flies and other noxious animals or insects. Construct camp buildings to exclude vermin as best possible. Companies should take adequate steps to keep the premises free of vermin and insects by using appropriate fly screens, traps and baits. If mice are a problem where Hantavirus is known to be present, follow the safe cleaning procedures in section 18.6.5.3 Hantaviral Diseases.

Bears: All kitchens or cooking areas must be kept clean, whether they are established or fly camps. Bears have a very keen sense of smell and will seek out and find carelessly stored food and incompletely burned garbage (i.e., attractants).

- Control the smells of food, garbage and waste products to minimize attracting bears. See section 18.6.4 Waste Management Guidelines.
- Prepare only enough food that can be consumed at one meal. Store food in bear proof containers.
- Use non greasy foods whenever possible. Use or incinerate all leftover grease as soon as possible.
- Remove leftover lunch food from daypacks and dispose of it properly each day.
- For fly camps:
  - Suspend food stores (caches) between trees when possible. Food should hang at least 4 m off the ground and at least 100 m from the sleeping tent.
  - Store food in proper bear proof containers. If this is not possible, several layers of very heavy plastic bags may work if they are carefully sealed to be airtight.
- Refer to section 10.3 Bears in Chapter 10 for additional information.

Additional food safety information is available in section 12.8.3 Safe Food and Water and on the following websites:

http://www.fsis.usda.gov/Factsheets/Food_Safety_in_the_Kitchen/index.asp
18.6.3 Drinking Water Safety

The primary risks associated with drinking water are disease-bearing organisms, turbidity and the presence of toxic chemicals or sewage that may contaminate drinking water. These are worldwide issues, and water in any locality and in any climate or terrain may be affected by one or more of these factors. For information about location, supply and storage of potable (drinking) water, refer to Section 9.0 Water Use and Conservation in the e3 Plus Excellence in Environmental Stewardship Toolkit. Website: http://www.pdac.ca/e3plus

General requirements for drinking water

Depending on the degree of risks and water treatment requirements, it may be advisable to seek expert advice to develop a treatment system for drinking water. It is essential to eliminate any disease-causing organisms, solids and any toxic chemicals from drinking water.

- Determine the quantity of drinking water required for the camp. Consider the factors: (1) whether the camp is temporary or permanent, (2) number of employees, (3) the season, (4) the exploration activities (e.g., drilling, mineral/rock cutting, sorting) and (5) existing and future requirements (showers, dishwashers, clothes washers) of the camp or project.
- Obtain the required permits, which will depend on the jurisdiction.
- Follow prescribed treatment procedures to make sure the water supply is safe to drink. Where camps are not subject to water quality regulations, water should meet WHO drinking water guidelines or better. Refer to the following website: http://www.who.int/water_sanitation_health/dwq/gdwq3rev/en/index.html
- Install an approved water treatment and purification system. Various types of water treatment/purification systems are commercially available. Some systems employ filtration, chlorination, reverse osmosis, or ultra violet technology or a combination of
these. UV systems are commonly used in camps. Consult an expert on the most appropriate type of system for a specific site, as necessary.

- Take monthly (or more frequent) water samples for analysis to confirm that water meets drinking water standards.
  - Operate and maintain the water treatment system according to the manufacturer’s instructions.
  - Change any filters and check the UV lights, as appropriate, to make sure they are functioning and that the light is not blocked by stains or dirt etc. Replace the UV bulbs if the light is blocked.

- As a general rule, drinking water should be treated with 0.4-0.5 mg sodium hypochlorite/litre water although the precise amount of sodium hypochlorite required to disinfect drinking water is dependent on the water chemistry (pH), temperature, contact time, and amount of sediment in the water being treated. Chlorine disinfection of drinking water has limitations against the protozoan pathogens – in particular Cryptosporidium. Refer to the following website: http://www.cdc.gov/crypto/factsheets/filters.html

- Bleach: Bleach is used for sanitizing purposes in kitchens. In an emergency it can also be used to purify drinking water or for part of that process. Refer to Chapter 12, section 12.8.3.3 Water Treatment in Remote Areas or Developing Countries.

Tips regarding water sources at established camps

- Procedures to sanitize a water storage tank: When reopening a site, the water tank must be sanitized before the water is potable.
  - Clean the water storage tank and then fill the tank with water. Treat the volume of water in the tank with the appropriate quantity of sodium hypochlorite (bleach). Run the taps until the water smells of bleach. Let the water stand in the lines and the tank for at least 24 hours to kill any residual bacteria. While this water may be used for showering, it should not be used for cooking or drinking for at least 24 hours. The water should immediately be sent for testing to confirm it is safe to drink. Use precautions when drinking, cooking or brushing teeth with this water until the test results confirm the water is safe to drink.

- Components of water treatment systems: At the start of a field season, place new water filters and new ultra violet (UV) lights in the treatment system, if applicable. If the site operates year round, inspect and maintain components on a regular schedule.

- Water shipped by tanker trucks: If large volumes of potable water are transported to the site in water tankers, chlorine should be added to provide a free residual chlorine concentration of at least 0.5 mg/litre at the point of delivery to users. Tankers should be used solely for drinking water or, if this is not possible, must be thoroughly cleaned prior to use to be sure that there is no residual contamination.

- System shut down: When the water system is shut down, the water tank must be completely drained. It will be necessary to use a sump pump to empty out all the water. It is very important to remove all sand and sediment so there is no place for bacteria to grow when the tank is not in use. It is advisable to make sure there are filters and UV lights available for start up at the next field season.

- Schistosomiasis: If schistosomiasis is endemic in the area, take extra care with treatment of drinking and bathing water. Refer to 12.8.3.4 Safe Water for Swimming and Bathing and 12.8.5.13 Schistosomiasis.

- Additional information is available on the following websites:
Proper waste management is fundamental to camp safety. Project management should determine how waste products are ultimately handled – whether they are recycled or subject to various treatment and disposal options. Depending on the regulations, it may be advisable to seek expert advice to develop a waste management program. It is essential to eliminate potential camp sewage discharge or spills that may contaminate surface and ground water, eliminate potential disease-causing organisms and smells from accumulations of waste deposits that attract wildlife, including vermin.

Waste management is addressed in the e3 Plus Excellence in Environmental Stewardship Toolkit. Refer to Chapter 12.0 Waste Management for details regarding waste identification, classification, management, camp sewage and wastewater and hazardous wastes. Website: http://www.pdac.ca/e3plus

General tips regarding waste management

- Secure required permits and follow all applicable regulations of the AHJs regarding waste classification, management and disposal, including for any hazardous waste products that may be produced at the site.
- Recycle as much waste as possible and consider donating safe materials that might otherwise be disposed of as waste for public use, especially when a camp is in a developing country.
- Waste storage areas:
  - All waste storage areas should have restricted access to limit entry by employees, the public and animals.
  - Comply with regulations for management of dangerous waste products. Store them in appropriate labelled containers in a secure area until they are removed from the site for recycling or disposal. Comply with regulations such as TGD (transportation of dangerous goods) or hazardous materials.
  - Provide fly-tight garbage containers in convenient locations. Maintain containers so they do not become foul smelling, unsightly or breeding place for flies.
- In bear country, waste odours may attract bears creating a hazard for people, for company property and for the bears.
  - Wash all bottles to eliminate odours and recycle if possible.
  - Recycling cans: Recycling cans is the best solution but storing soda pop cans for recycling is not advisable in bear country as their smell is a strong attractant. It is better to squash them … burn them …and then recycle or dispose of them according to local regulations.
  - Tetra pak drink boxes create a lot of garbage that attracts bears. Find an alternative.
Incineration versus burning

It is important to dispose of food waste daily. Incineration is usually best completed at least once a day, as required. If burning and/or incineration are options, understand the difference between the two processes.

- **Incinerators**: When burning waste is permissible, most regions require the use of an incinerator rather than a burn barrel. Use a properly designed auxiliary fuel-fired commercial refuse incinerator that complies with local regulations.

- **Burn barrels**: A burn barrel is usually an oil drum punched full of holes to allow some extra airflow to create a hot fire. A burn barrel may be acceptable for a very small, temporary or fly camp, but this method requires a lot of attention and fuel to thoroughly burn garbage. Burn barrels require the use a slow burning fuel, such as diesel, combined with lots of air to create a hot incinerating fire. Quick burning fuels do not burn garbage thoroughly; they scorch the garbage and spread the smells. The top of any burn barrel must be covered with a wire mesh lid to prevent sparks from starting a forest fire and stop animals and the wind from removing garbage. Check local regulations to make sure that using a burn barrel will be in compliance for any camp.

- **Waste disposal facilities must conform to the site permits. Remove waste to an approved landfill location or incinerate it completely. Where permitted, locate the incineration area 100-200 metres from camp. In open areas it is advisable for the burning site to be visible from camp in order to monitor it. Clear away vegetation within 3 metres of the incinerator and have a fire extinguisher in place. All incinerators should have a wire mesh lid to stop garbage from being removed by animals and winds.**
  - Incinerate waste daily, preferably after each meal, but do not burn it in the evening when lingering smells might attract bears while people sleep.
  - Where permitted, incinerate all waste completely to ash and cool it. If waste is not completely burned to ash, store the residue in airtight containers in an appropriate area protected from animals. Remove it to a proper disposal site.
  - Landfills: Burying refuse is not usually permitted except for combustion residue (ash) from incinerators. It may be possible to obtain a landfill permit for remote camps where transportation to a municipal landfill is impractical. Usually, waste residues should be stored in animal-proof containers and hauled together with non-food waste to a municipal landfill.

- **The potential for attracting bears is a serious risk due to smells when a fire smoulders or contains insufficiently burned garbage.**

- **All burning or incineration must be continuously monitored. Keep a 20-lb fire extinguisher immediately available.**
Wastewater and sewage

Treat wastewater and sewage according to regulations of the AHJs and the camp permits. Large camps will require a properly designed and approved sewage disposal system such as a septic tank and a subsurface leach field. Expert advice may be required, especially where septic tanks and leach fields will not work. Commercially available wastewater treatment packages are viable alternatives.

- Grey water: The wastewater left over from dishwashing, showers and washing machines should be carefully treated to remove odours. Where regulations permit, use dolomite or lime in sumps in preference to a water/bleach solution. Do not allow grease or fine food particles to accumulate in sumps; use grease traps to recover the waste and then incinerate it. Cover sumps with plywood to minimize access and odours. It is recommended to fence in large sumps (required in some jurisdictions).
  - Large permanent camps should treat grey water with approved sewage treatment systems.
In small camps with no grey water disposal system, strain food bits out of dishwater. Place them with garbage and pour dishwater into a proper location and treat it with dolomite or lime to remove odours.

- Camp sewage: Treat and maintain camp sewage as appropriate for the site and size of camp. Incinerators or composting toilets are possible alternatives that could be considered for small to medium sized camps. A proper sewage and/or latrine system is necessary to control potential water contamination, odours and diseases. Construct and maintain latrines (when permitted) where chemical or water flush or other types of toilets are not used.
  - Construct and maintain all camp sewage toilets correctly.
    - Prevent flies, insects, and rats from gaining access to waste materials.
    - Prevent surface or ground water from entering the pit or vault.
    - Prevent waste material in the privy from contaminating any water supply.
    - Self closing seat covers are advisable and should be in operation at all times.
  - If latrines are permitted, latrines must conform to public health standards or to any conditions stipulated in work permits. Locate a latrine at least 100 m (300 ft) from any stream or shoreline. It should be downwind from camp and at least 30 to 40 metres away from the kitchen area. Locate handwashing facilities between the latrine and camp to promote hygiene. A good place is at the beginning of the access path to the latrine.
  - A plan for a latrine: Dig a hole about 1.5 m square and about 1.5 m deep. Cover the hole with wooden planks leaving a hole for personal use. Place the latrine shelter on top of the hole. Cover the opening when not in use to reduce flies and the possibility of small animals falling in. Keep a container of lime with a designated ladle to disinfect the latrine. Place lime and dirt in the pit daily. Peat moss may work if there is not too much urine. When the latrine is no longer required, fill the hole with the excavated soil. Keep the path to the latrine clear so it can be used safely at night.
  - Use dolomite lime and earth regularly in latrines. Burn all tampons and sanitary napkins in a very hot fire.

### 18.6.5 Diseases

This section addresses diseases that present a risk in North America. Immunization is available for most of them because they also present a risk worldwide. A few of the diseases present the greatest risk in North America (e.g., Lyme disease, West Nile virus, Rocky Mountain spotted fever and Hantaviral pulmonary syndrome). Some diseases, including Hepatitis A and B, HIV/AIDS, and tuberculosis present potential health risks in field camps in North America and worldwide.

Cross references to other diseases: Travel related diseases are covered in section 12.8.5 Diseases of chapter 12 and include the following:

- 12.8.5.1 Chagas Disease (American Trypanosomiasis)
- 12.8.5.2 Cholera
- 12.8.5.3 Dengue Fever
- 12.8.5.4 Hepatitis, Viral
12.8.5.5 Histoplasmosis
12.8.5.6 Japanese Encephalitis
12.8.5.7 Legionnaires’ Disease
12.8.5.8 Leptospirosis
12.8.5.9 Malaria
12.8.5.10 Meningococcal Disease
12.8.5.11 Plague
12.8.5.12 Rabies
12.8.5.13 Schistosomiasis
12.8.5.14 Travellers’ Diarrhea
12.8.5.15 Typhoid
12.8.5.16 Yellow Fever

### 18.6.5.1 Diphtheria

**Description**

Diphtheria is a serious bacterial disease. In northern and temperate regions, it occurs more frequently during colder months of the year. In the tropics, it occurs year round. The disease is spread by direct contact with infected persons through coughing and sneezing, or rarely by contact with articles that contain the discharge of diphtheria lesions. Lesions develop at the site of the infection in the throat, nose or on the skin.

- Fauclial or laryngeal diphtheria affecting the mouth and throat is a serious disease with a fatality rate of 5% to 10% or higher in some regions. It usually affects infants, young children and adults who have not been immunized. Severe side effects to the heart may develop. This form is more common in northern and temperate climates.

- Nasal diphtheria is a mild form but it may become chronic.

- Cutaneous diphtheria affecting the skin may resemble impetigo. It occurs more commonly in the tropics than in temperate regions.

**Symptoms**

- Symptoms develop within two to five days of exposure and include sore throat, nausea, fever, chills and vomiting.

- Severe sore throat with patchy white/gray membrane in the throat and swelling in the neck area develop with faucial diphtheria

- Skin lesions develop with cutaneous diphtheria.

- Cardiac complications may develop and result in death.

**Prevention**

- Be immunized. Without immunization, the infection may reoccur.

- Seek medical attention.
18.6.5.2 Giardiasis

Description

(Other names: beaver fever, backpacker’s diarrhea)

Giardiasis is a diarrheal disease caused by a common parasite with worldwide distribution. *Giardia lamblia* parasites commonly occur in rural or mountainous areas and may occur in some urban areas, so be educated about the disease. People may contract giardiasis through direct contact with contaminated animal or human feces or by drinking or accidentally swallowing water containing parasites in lakes, rivers, streams, springs or ponds. The parasites may disappear but the disease may become chronic and last a long time.

Symptoms

- Symptoms may take one to two weeks to appear. They include severe diarrhea, bloating, severe gas, burping, cramps and nausea, headache, fatigue or chills.
- Seek medical treatment for this type of diarrhea. Medication reduces the duration of the symptoms.

Prevention

- Treat all water used for drinking, cooking or making ice etc., when working where the disease occurs. Chemical treatment may not be sufficient if the water is cold and/or cloudy. It may be necessary to filter and/or boil the water to make it safe. Carry drinking water on traverses – do not rely on finding safe water.
- Practice good hygiene. Wash hands thoroughly with soap and water before preparing food, before eating and after using the toilet.
- Never swim in a beaver pond or in water that may contain human or animal sewage.
- Do not drink untreated water or use ice made from untreated water in countries where the water supply is not dependably safe.

Areas of concern

- Western and northeastern North America, Nepal, Russia (urban and suburban), tropics

Additional information regarding giardiasis is available on the following websites:

http://www.cdc.gov/ncidod/dpd/parasites/giardiasis/factsht_giardia.htm
18.6.5.3 Hantaviral Diseases

Description

(Other names: Hantaviral pulmonary syndrome (HPS) – Hantavirus adult respiratory distress syndrome; Hemorrhagic fever with renal syndrome (HFRS) – Epidemic hemorrhagic fever, Korean hemorrhagic fever, Nephropathia epidemica, Hemorrhagic nephrosonephritis)

There are two types of hantaviral syndromes: pulmonary and renal. Hantavirus pulmonary syndrome (HPS) occurs primarily in rural western North America and is a rare but very serious disease. Hemorrhagic fever with renal syndrome (HFRS) is more widespread, occurs mainly in the eastern hemisphere, and causes hemorrhagic fever and renal (kidney) damage. Hantaviral diseases are most frequently transmitted to humans through breathing air contaminated with the saliva, urine and feces of mice and rats. Outbreaks of HPS seem to coincide with expanding rodent populations due to increased food supply following abnormally wet spring weather.

Symptoms

- Hantavirus pulmonary syndrome
  - Initial symptoms are flu-like and include fever, muscular aches, dry cough and shortness of breath.
  - Symptoms may rapidly progress to pulmonary edema and death. The mortality rate is between 40-60%.
  - This life-threatening disease requires urgent medical attention.
- Hemorrhagic fever with renal syndrome
  - Headache, backache, fever and chills, bleeding, renal (kidney) failure
  - Requires urgent medical attention although it does not have the high mortality rate of HPS.

Prevention

Be vigilant if deer mice live in the area and/or the rodent population has increased noticeably. While deer mice are the primary reservoir, cotton rats and rice rats carry Hantavirus in the southeast USA, and the white footed mouse is a carrier in the northeast USA and parts of Canada. Other species of rodents carry the virus in other parts of the world. The following website has links to maps showing the geographic range of carrier species in North America and occurrences of HPS in the USA: http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/rodents.htm.

- Risk factors: Contact with fresh rodent droppings, urine, saliva or nesting materials, which includes cleaning out seasonally used cabins or storage buildings, entering crawl spaces, buildings, cleaning out infestations of potential carriers, handling dead or living rodents
- Use respiratory protection where air, dirt and dust may be contaminated by rodent saliva, urine or feces or nesting materials. Avoid direct contact with potentially contaminated dust and dirt.
- Follow safe cleaning procedures that include but are not limited to the following:
  - Air out seasonal structures or other closed potentially contaminated buildings for one hour before cleaning. Stay out of the building during this time.
  - DO NOT remove droppings and nests by dry vacuuming or sweeping as this causes particles to become airborne.
Disinfect the rodent materials. Use a spray rather than a stream with 10% bleach-water solution to wet down dust and dirt before cleaning to keep dust from becoming airborne. This is very important as the virus is easily killed with disinfectant (and exposure to sunlight).

PPE: Use respiratory PPE with the proper rating for the cleaning tasks at hand, wear disposable gloves and washable clothing. Wear an appropriate NIOSH-approved filter mask that is fitted with 100 series filters or a respirator with a P100 cartridge. When finished, follow disinfecting and washing procedures for PPE. Refer to the WorkSafeBC publication “A Hantavirus Exposure Control Program for Employers and Workers” below.

- Trap and kill rodents in buildings and tents. To dispose of dead rodents, wear disposable gloves and disinfect the trap and mouse with a bleach/water solution before disposal and double bag the remains. Avoid poison as this allows infected mice to live longer and continue to spread infecting body fluids and feces.

- Pay scrupulous attention to maintaining a clean camp. Wet mop floors to dampen dust when cleaning. Protect food in rodent-proof containers. Do not eat food contaminated by rodent excrement.

- Refer to the WorkSafeBC publication “A Hantavirus Exposure Control Program for Employers and Workers” for detailed information regarding employer and employee responsibilities, exposure control plan, essential and recommended PPE, general hygiene precautions, rodent handling and decontamination procedures. The publication is available at the following website: http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/hantavirus.pdf

Areas of concern

- Hantavirus pulmonary syndrome – most cases have occurred in rural western North America. HPS has been confirmed in South America. Hantavirus is known to be present in deer mice in Yukon and all provinces except PEI and Nova Scotia.

- Hantavirus hemorrhagic fever – worldwide, mostly in the eastern hemisphere

Additional information regarding Hantavirus is available on the following websites:
http://www.ccohs.ca/oshanswers/diseases/hantavirus.html
http://www.cdc.gov/ncidod/diseases/hanta/hps/noframes/FAQ.htm

18.6.5.4 HIV/AIDS

Description

HIV/AIDS is a disease caused by the family of viruses known as the Human Immunodeficiency Virus (HIV). The viruses attack the immune system and central nervous system, which makes a person susceptible to unusual infections, tumours and cancers that are often fatal. AIDS (acquired immunodeficiency syndrome) is the final stage when the body can no longer fight the infections. The virus is spread from person to person through the transfer of body fluids, as in sexual intercourse (vaginal, anal and oral), blood transfusions, injection with unsterilized needles, during childbirth, inadequately sterilized medical/dental and acupuncture equipment, tattooing,
electrolysis and IV drug use. While there are drugs that slow the progression of HIV, there is no cure and there is no vaccine.

AIDS is not transmitted through social contact such as touching, through food, water, air, or activities such as swimming. It is not transmitted by insects or animal bites.

You risk acquiring AIDS through casual sexual contact. Travellers throughout the world face the additional uncertainty of exposure to contaminated blood in the event of an emergency. Many African countries have a particularly high risk of AIDS transmission. To minimize the risk of acquiring this fatal disease, use good judgement in your daily life and use additional vigilance during travel and work abroad.

Precautions
1. Practice safe sex at all times.
   - Use latex or polyurethane condoms and use them correctly. Do not have unprotected sex with anyone but your usual partner.
   - Avoid contracting other sexually transmitted diseases (STDs). Being infected with an STD makes you more likely to become infected by the AIDS virus during sexual intercourse with an infected person.
2. In developing countries, avoid vehicle accidents to prevent the potential need for blood transfusions.
   - Drive defensively and use seat belts at all times. Don't drink and drive.
   - Hired drivers should be persuaded to drive cautiously.
   - Whenever possible, avoid driving at night where animals or pedestrians are a hazard.
3. Avoid unnecessary needle injections and blood transfusions in developing countries or where there is a risk of rescreened blood products.
   - Be fully immunized prior to travel.
   - Prior to travel, find out the location and contact telephone numbers of safe health services (local doctors and/or clinics) in each country where you will travel or work. A travel medicine clinic or doctor can provide this information. It is best to be prepared before you require emergency medical services. In the event that you lack this information and need medical help, your home country embassy can usually supply a list of medical contacts for services within the country.
   - Ask the treating medical person if an oral medication (e.g., malaria) is available. Decline injections if an oral medication is available.
   - In the event of an accident etc., ask the treating medical facility if a blood transfusion is really necessary. If you are in a condition to ask, it is probably not necessary. Request intravenous fluids such as normal saline, ringers solution and plasma expanders that are not blood products.
   - Carry sterile needles in your travel medical kit should you require them for regular treatment e.g., diabetes, or if there is any possibility that you may need an injection or blood test during your travel. Take the supplies to a medical facility and have a trained person use them, as required.
4. Do not share razors or toothbrushes, which may facilitate the transfer of blood from cuts or bleeding gums.
Additional information regarding HIV/AIDS is available at or through links on the following websites:

http://www.cdc.gov/hiv/topics/basic/index.htm

18.6.5.5 Lyme Disease

Description

Lyme disease is transmitted to humans by the bite of infected black legged deer ticks (*Ixodes scapularis* and *Ixodes pacificus*) in either the adult or nymph stage. Ticks are most abundant during spring, summer and autumn. They occur most commonly in areas of brush or tall grass. The deer ticks and nymphs are very small making detection difficult.

Symptoms

If it is unrecognized and untreated, Lyme disease can cause severe arthritis, neurological and/or heart problems.

First Stage: It is vitally important to obtain medical treatment at this stage. Doxycycline is an appropriate antibiotic that can be used for tick-borne illnesses.

- A characteristic bull’s-eye rash may appear at the site of a bite three to 30 days after becoming infected. Be aware that this rash only appears in about half the infections. Seek medical advice immediately if you find a suspicious ring-like rash area on your body. This symptom will disappear on its own after one to three weeks.

- Flu-like symptoms are common along with the rash. These include sore muscles, stiff neck, painful joints, fatigue and coughing. While most symptoms abate in a couple of weeks, the fatigue and muscle aches may last for months.

Second Stage: Neurological and cardiac problems may develop weeks or even months after the initial infection.

Third Stage: Chronic arthritis and chronic fatigue may develop months or even years later.

Prevention

Preventing tick bites is the key to minimizing the risk of Lyme disease.

- Clothing: Wearing light coloured clothing makes ticks more visible. Wear long, tucked-in pants, long sleeves and footwear that completely cover your feet.

- Apply insect repellents containing DEET to your skin and spray clothing with permethrin products.

- Conduct daily checks on clothing and on your body for attached ticks.

- Removal of ticks: The transmission of the bacteria requires only approximately 24 hours of attachment, so it is important to find and remove ticks quickly. For instructions to safely remove ticks, refer to section 10.7.3 Ticks.
After an attached tick is removed, watch for symptoms or signs of tick-borne disease for 30 days. Watch specifically for a skin lesion or rash at the site of the bite and for fever over 38°C (100.5°F). If these symptoms occur, seek prompt medical attention for assessment for possible tick-borne disease.

- Refer to 10.7.3 Ticks for additional tips to prevent tick bites.

Areas of concern

- The Americas (endemic areas: northeastern USA and southeastern Canada), Europe and parts of Central Asia

Additional information regarding Lyme disease is available on the following websites:

http://www.canlyme.com/
http://www.cmaj.ca/cgi/content/full/180/12/1221
http://www.cdc.gov/ncidod/dvbid/Lyme/
http://www.ccohs.ca/oshanswers/diseases/lyme.html
http://www.phac-aspc.gc.ca/id-mi/tickinfo-eng.php

18.6.5.6 Measles

Description

(Other names: rubeola or red measles)

This moderately severe viral disease is easily transmitted between people by airborne droplets and direct contact. Complications from measles may include pneumonia and encephalitis. The disease affects adults and infants more seriously than children. Employees who travel or work in developing countries should make sure they are vaccinated.

Symptoms

- Fever, rash, cough, conjunctivitis
- Serious complications occur in 20% of reported measles cases. They may include ear infections, pneumonia, blindness or encephalitis, which may lead to permanent brain damage or death.

Prevention

- Be immunized with measles or MMR (measles-mumps-rubella) vaccine.

Areas of concern

- Worldwide, but measles is most common in parts of Africa, Asia and the eastern Mediterranean
Additional information regarding measles is available on the following websites:

- http://www.cdc.gov/measles/about/overview.html

### 18.6.5.7 Mumps

**Description**

This viral infection is spread by airborne droplets and by direct contact with saliva of infected persons. Employees who travel or work in developing countries should make sure they are vaccinated.

**Symptoms**

- Fever, swelling of the salivary and parotid glands

**Prevention**

- Be immunized with MMR (measles-mumps-rubella) vaccine.

**Areas of concern**

- Worldwide

Additional information regarding mumps is available on the following websites:

- http://www.cdc.gov/mumps/about/index.html

### 18.6.5.8 Polio

**Description**

(Other names: Infantile Paralysis, Acute Poliomyelitis, Polioviral fever)

Polio is a serious viral disease that attacks the nervous system and may result in paralysis or death. The virus is spread through close contact with infected people and through contaminated food and water.

**Symptoms**

- Mild cases may last a few days and involve fever, sore throat, stomach ache and headaches.
- Severe cases involve severe muscle pain, inability to move the limbs and severe breathing difficulties.
- People who experience paralysis may develop permanent weakness in the limbs.
Prevention

- Be vaccinated against polio.
- Where the wild type virus still exists there is risk of infection unless you are vaccinated. Employees who travel or work in high risk areas – countries where polio is endemic, countries where cases have been recently imported, or countries that are near these regions – should check with their healthcare provider and make sure they are vaccinated.

Areas of concern

- Africa, Asia, the Middle East and Eastern Europe

Additional information regarding polio is available on the following websites:

http://www.cdc.gov/vaccines/vpd-vac/polio/in-short-both.htm

18.6.5.9 Rocky Mountain Spotted Fever

Description

(Other names: North American tick typhus, New World spotted fever, Tick-borne typhus fever, São Paulo fever)

The rickettsia parasite that causes this rare disease infects humans through bites of the wood tick, dog tick, or lone star tick. The disease is serious and requires antibiotic treatment. Severe cases have a shorter incubation period. If untreated, it is occasionally fatal.

Symptoms

- Flu-like symptoms occur two to 14 days after infection. These include severe headache, fever, nausea and vomiting and confusion.
- A red rash appears on the wrists and ankles and then spreads to the rest of the body. Abdominal and joint pain may develop.

Prevention

- Take active measures to prevent tick bites. Use insecticide on clothing and insect repellent containing DEET on exposed skin.
- Check frequently for ticks on your clothing and body during the day and at night.
- Refer to section 10.7.3 Ticks for additional information about preventing tick bites and removing embedded ticks.

Areas of concern

- North America – the mid-Atlantic coastal states, Rocky Mountain states, Washington state, and British Columbia, Canada
- Central and South America – Mexico, Panama, Costa Rica, Columbia, Brazil
Additional information regarding Rocky Mountain spotted fever is available on the following websites:

http://www.cdc.gov/ticks/diseases/rocky_mountain_spotted_fever/faq.html
http://www.cdc.gov/ticks/diseases/rocky_mountain_spotted_fever/index.html
http://www.healthlinkbc.ca/kbase/nord/nord600.htm

18.6.5.10 Rubella

Description
(Other name: German measles)

Rubella, a viral infection, is spread by airborne droplets and direct contact with infected persons. While it is a mild rash illness, it produces anomalies in 90% of developing fetuses, especially if the mother contracts rubella during the first trimester of pregnancy. The risk of rubella is high in many developing countries so it is important to be vaccinated.

Symptoms

- Diffuse rash, low grade fever, headache

Prevention

- Be immunized with MMR (measles-mumps-rubella) vaccine.

Areas of concern

- Worldwide

Additional information regarding rubella is available on the following websites:


18.6.5.11 Tetanus

Description
(Other names: Lockjaw)

Tetanus is a disease associated with wounds. They may be relatively minor wounds that are contaminated with dirt, feces or saliva, or they may be more severe such as burns, crush injuries, and deep wounds. The disease develops when tetanus bacteria *C. tetani* enters the body, often through a puncture wound or blister, where they produce neurotoxins that grow in the anaerobic environment at the site of the injury.

Symptoms

- Symptoms usually develop five to 10 days after the injury.
Sore throat, stiff muscles, painful muscle spasms, fever, headache

Death may result when respiratory muscles fail to function.

**Prevention**

- Be immunized. Keep immunization up-to-date with a booster every 10 years. This is important so you need not risk an injection with contaminated needles/syringes if you are injured in a developing country.
- Carefully clean puncture wounds and leave them uncovered to reduce the risk of creating an anaerobic environment conducive to the growth of tetanus toxins.
- If you receive a “dirty” wound such as a bite, crush injury or puncture, make sure you have had a tetanus immunization within the past 5 years. If not, get another immunization.

**Areas of concern**

- Worldwide

Additional information regarding tetanus is available on the following websites:


http://www.healthlinkbc.ca/kbase/topic/special/tp23583spec/sec1.htm

**18.6.5.12 Tuberculosis (TB)**

This bacterial disease is still common throughout the world. To become infected it is usually necessary to have prolonged contact with a diseased person who has an active case of tuberculosis. The tuberculosis bacillus is spread through cough droplets in the air or through saliva. The disease can be dormant in the body for many years (latent TB). When active, the disease causes cavitation in the lungs, cough, fever, weight loss and coughing up of blood. There are also extrapulmonary forms of tuberculosis that can infect parts of the body other than the lungs.

The dormant stage can be detected by a skin test called a Mantoux test (or PPD) or by a Tine test. A chest X-ray and sputum smear and culture can detect the active stage. The TB skin test is an important screening tool. If it is positive, the next step is a chest X-ray. If the chest X-ray is positive, you will receive treatment with three medications. If the chest X-ray is negative, you may or may not be treated with one medication depending on your age, the time period from the last negative skin test and other factors.

Tuberculosis is a serious health problem in many parts of the world.

- TB infects one-third of the world’s population. Once infected, a person may develop an active case of TB and spread the infection to others.
- Unless successfully treated through a sustained course of medication, a patient may relapse and/or may develop a drug-resistant strain of TB. He or she will continue to spread TB to others.
- A person infected with TB who subsequently becomes infected with HIV has a greatly increased chance of developing an active case of TB.
A person infected with HIV who subsequently becomes infected with TB is at much greater risk to develop life-threatening tuberculosis. In fact, some patients die within weeks of becoming infected with TB. In 2009, one out of four TB deaths was HIV-related.

Symptoms

- A bad cough lasting longer than three weeks
- Coughing up blood or bloody sputum, weakness, chest pain, loss of appetite, weight loss, fever, chills and night sweats

Precautions

- Company employees who move to work and live in developing countries should have a skin test every year. If the test is positive, further investigation is necessary.
- A skin test should be done after exposure to an active case. If it is initially negative, repeat the test in three months.
- In developing countries, companies should screen prospective cooks, teachers and household employees for tuberculosis with sputum smears and X-rays before hire. If there is an active case, the person is infective until he or she has completed two weeks of treatment. A treatment course of nine months should be completed as a condition of hire, but he or she may begin work after the first two weeks of treatment.
- Avoid unpasteurized milk and dairy products. TB-causing bacteria can be spread through milk from infected cattle.
- It is imperative for anyone receiving treatment for TB to complete the full course of antibiotic to protect others and reduce the risk of developing drug-resistant TB.

Areas of concern

- Worldwide.

Additional information regarding tuberculosis is available on the following websites:

  - [http://www.cdc.gov/tb/topic/basics/default.htm](http://www.cdc.gov/tb/topic/basics/default.htm)

18.6.5.13 West Nile Virus

Description

West Nile virus is primarily transmitted to people through the bite of an infected mosquito.

Symptoms

- Symptoms usually develop from two to 15 days after infection. Most infected people have no symptoms, or they have mild flu-like symptoms that usually only last a few days, although they can last a few weeks.
About 20% of infected people develop West Nile fever, which may include fever, headache, body aches, fatigue, and sometimes a skin rash on the trunk and swollen lymph glands.

Less than one per cent of infected people, often those with weakened immune system or over the age of 50, may develop severe West Nile disease. West Nile meningitis or encephalitis, or West Nile poliomyelitis with symptoms that include rapid onset of severe headache, high fever, stiff neck, nausea, stupor, disorientation or coma. The symptoms of severe disease may last several weeks or even result in death.

There is no specific treatment.

Prevention

- Prevent mosquito bites. Wear light coloured clothing that covers your skin and use insect repellent that contains DEET on exposed skin. Apply an insecticide or DEET to clothing. Take extra caution to protect against bites between dusk and dawn, but protect yourself during the day as well, as some carriers are day biting mosquitoes.
- Control mosquito populations around the site by emptying all standing water from containers.
- Refer to sections 10.7.1 Mosquitoes and Flies and 12.8.4 Protection from Insect Bites for additional information to prevent mosquito bites.

Areas of Concern

- Parts of North America, Europe, the Middle East, Africa and Asia

Additional information regarding West Nile virus is available on the following websites:

- [http://www.cdc.gov/ncidod/dvbid/westnile/index.htm](http://www.cdc.gov/ncidod/dvbid/westnile/index.htm)
- [http://www.cdc.gov/ncidod/dvbid/westnile/RepellentUpdates.htm](http://www.cdc.gov/ncidod/dvbid/westnile/RepellentUpdates.htm)
- [http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm](http://www.cdc.gov/ncidod/dvbid/westnile/wnv_factsheet.htm)

18.7 Manual Handling

Manual handling includes lifting and carrying and any activity where workers are required to raise or lower, push or pull, or otherwise move or hold objects. Common manual handling tasks include moving sample bags and core trays, operating rock sample or core cutting tools, lifting heavy boxes of supplies, moving 205 L fuel drums and propane gas cylinder tanks. When setting up a new camp take the opportunity to plan and organize the site to facilitate manual handling, which will help reduce common injuries. Established camps will benefit from a thoughtful analysis of manual handling risks and hazards.

Risks and hazards

- Serious back injuries, back strains and joint sprain injuries caused by using poor lifting and techniques, lifting heavy loads
- Slips, trips and falls caused by carrying heavy items on slippery, wet, icy, or rough surfaces, wearing improper footwear, working in a disorderly work site.
- Collapse of shelving or stacked materials caused by insufficient support

Preparation and prevention

When carry out a site risk assessment, include handling processes. Address the identified risks and hazards and mitigate the problems. Consider the following:

- Training: Train employees in proper lifting techniques and carry out refresher training several times a year, including several times during field season, as required. Training should include proper stretching and warm-up exercises.

- Workplace and work station layouts: Arrange layouts to eliminate manual handling as much as possible. Consider the required movement of different loads. When possible:
  - Arrange work to be done at waist level in a position that does not require much bending, twisting or reaching.
  - Avoid moving loads to a position below mid-thigh or above shoulder level.
  - Avoid movements that require a worker to place a load very accurately or carry a load a long distance.
  - Use provided equipment to prevent and reduce injuries (e.g., hand trucks).

- Worker actions and postures: Avoid movements that are erratic, hard to control, twisting, bending low, or stretching high. Do not sustain awkward body positions for long periods of time.

- Weight: Consider the weight of objects in conjunction with their size and shape. Heavier objects are more risky to move, and those of the same weight that are compact are easier to grip and move than bulky, awkwardly shaped items.

- Lighting: Provide good lighting. Workers must be able to see well in order to work safely.

- Hot or cold climate conditions: Control temperatures, wind, sun exposure and exposure to rain or snow as much as possible. Warehouses and core shacks should be comfortable to work in.

- PPE and clothing: Wear gloves, eye protection and restrict loose clothing that might catch on machinery or tools. Loose sleeves, drawstrings and long unrestrained hair are hazards.

Planning storage facilities

Storage areas should be spacious enough and arranged to reduce potential hazards. When laying out storage, work areas such as core logging facilities and drill sites, consider the following:

- Size, surface characteristics, shape, stability and weight of objects. Know the characteristics of the materials so they can be handled as safely as possible.

- Assess the space requirements to store equipment and materials and the required vertical and horizontal movements for handling them.

- Materials should be easy to access and easy to stow to avoid unnecessary lifting, twisting, bending or reaching by employees.

- Keep storage areas free of tripping and fire hazards.

- Plan storage of hazardous chemicals and materials according to requirements for the isolation, compatibility and containment. Check the posted MSDS sheets.

- Storage locations should have proper signs to indicate what is permitted for storage.
Plan the site layout to include potential growth.

Handling tips

- Eliminate handling heavy objects as much as possible. To reduce risks, use mechanical handling devices (e.g., small hand trucks or trolleys). Make use of waist high spaces for interim transport or temporary storage. For example, put core boxes temporarily in the back of a pickup truck rather than on the ground.
- Know the rated capacities for materials handling equipment to avoid overloading.
- Two persons should lift and stack heavy core trays (e.g., massive sulphides).
- Do not carry out manual handling tasks when fatigued; it is easier to injure yourself.
- Use appropriate PPE (e.g., gloves, eye protection) when handling wire rope, drill rods and any sharp, hot or slippery objects, core boxes and rough samples.
- Stack heavier items on lower shelves, preferably about waist level. Avoid overhead lifting whenever possible.
- Remove all nails from used timbers (lumber) before stacking.
- When storing loads on blocks, do not release a load until your hands are clear.
- Forklift trucks: The operator must be trained and certified, as forklifts can be dangerous to operate. Centre a load on the forks as close as possible to the mast. Drive slowly.
- Follow safe and correct stacking procedures. Know the height limitations for stacking various materials.
  - Stack bags and bundles in interlocking rows. Stack bagged material by stepping back the rows and cross-keying the bags at least every 10 layers.
  - Do not stack pipes and bars in racks so they protrude into an aisle as this may create a hazard to passers-by.
  - Provide adequate end supports for stacked materials to prevent collapse and spreading.
- For storage, block fuel drums on the bottom tier when they are placed on their sides to prevent shifting and spreading. Elevate the bottom layer on timbers. For safety, only stack drums two tiers high.
18.8 Housekeeping

Good housekeeping is an important element of camp safety, as a dirty, messy site impacts employee work attitude as well as safety. Good housekeeping prevents injuries and illnesses, especially those due to:

- Trips, slips and falls
- Fires
- Inadequate storage, handling and labelling of hazardous materials
- Poor sanitation e.g., athlete’s foot, scabies, food poisoning, vermin infestation

Aspects of good housekeeping

- Address housekeeping requirements and expectations at the safety induction meeting at the start of the field season. Review them at safety meetings as required.
- Comply with requirements of the AHJs for storage and handling systems for hazardous material, fuels, compressed gas cylinders, explosives and firearms etc.
- Carry out inspections to make sure the site is orderly. Document inspections.
- Dispose of rubbish and other wastes daily according to requirements of AHJs.
- Keep storage areas free of debris, vegetation and rubbish to prevent fires and tripping hazards.
- Keep walkways and paths well lit, especially at night and apply sand or other material to create non-slip surfaces when mud, snow or ice are hazards.
- Keep flammable materials – including wet clothing – away from heat sources such as heating stoves, radiators and heating ducts, lights and electrical wiring.
- Keep the area around electrical panel and junction boxes clear.
- Place “No Smoking” and relevant hazard signs where flammable materials are stored.

Figure 18.10: A dangerous pile of geofabric rolls: Provide adequate end support to prevent collapse.
© Courtney Mitchell
Use tarpaulins to protect materials that may be damaged by weather or sunlight.
Keep gear organized and in appropriate storage areas.
- Tools and power tools, cords
- Communications equipment, batteries, radio antennas
- Allocate an area in tents or cabins to dry wet clothing where they will not become a fire or a tripping hazard. Never permit wet items to hang from electrical power cords or near heat sources where they may fall and start a fire. Keep wet items on the floor at least 1 metre back from heat sources.

For additional information, refer to sections 6.2 Housekeeping and 6.3 Housekeeping and Hazardous Materials in the e3Plus Excellence in Environmental Stewardship Toolkit.
Website: http://www.pdac.ca/e3plus

18.9 Resources

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

1984 Enterprises Inc.
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Canadian Diamond Drilling Association

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


Internet Resources


Industrial Accident Prevention Association. *Fire Extinguishers.*


U.S. Environmental Protection Agency. *Drinking Water Contaminants.*


WorkSafeBC. *Lockout.*

WorkSafeBC. Toolbox Meeting Guide. *WHMIS hazard symbols.*

WorkSafeBC. *WHMIS Core Material: A resource manual for the application implementation of WHMIS.*


WorkSafeBC. *Working Safely around Electricity.*


**References for Diseases**

Canadian Centre for Occupational Health and Safety. *Hantavirus.*

Canadian Centre for Occupational Health and Safety. *Lyme Disease.*


Centres for Disease Control and Prevention. *DEET (General Fact Sheet).*

Centres for Disease Control and Prevention. Parasitic Disease Information. *Giardiasis.*

Centres for Disease Control and Prevention. *Hantavirus Pulmonary Syndrome (HPS): What You Need To Know.*

Centres for Disease Control and Prevention. HIV/AIDS. *Basic Information.*
Centres for Disease Control and Prevention. *Learn about Lyme Disease.*

Centres for Disease Control and Prevention. *Measles.*

Centres for Disease Control and Prevention. *Mumps.*

Centres for Disease Control and Prevention. *Polio Disease In-Short.*

Centres for Disease Control and Prevention. *All About Hantaviruses. Rodents That Carry the Types of Hantavirus Which Cause HPS in the United States.*

Centres for Disease Control and Prevention. *Tickborne Rickettsial Diseases.*

Centres for Disease Control and Prevention. *HIV/AIDS. Basic Information.*


Centres for Disease Control and Prevention. Travelers’ Health – Yellow Book. Chapter 2. The Pre-Travel Consultation Routine Vaccine-Preventable Diseases: *Rubella*

Centres for Disease Control and Prevention. Travelers’ Health – Yellow Book. Chapter 2. The Pre-Travel Consultation Routine Vaccine-Preventable Diseases: *Tetanus*


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