Shared health
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Manitoba

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Section 1 – Introduction

The health, safety and well-being of the Shared Health Staff, students and visitors and the protection of the environment are of utmost importance to Shared Health. Staff in the workplace at the various Shared Health sites across Manitoba performs multiple duties that include laboratory testing, diagnostic imaging procedures and Pathology services. This manual, encompassing guidelines and procedures has been developed in order to address the health, safety and environmental challenges in various areas.

This manual is to provide supplemental information to the Shared Health and Regional Health Authority (RHA) safety policies as well as define *minimum* standards for safe practices in the various Shared Health sites. For further information on safety related issues while working for Shared Health, please refer to the Health and Safety Section (70) of the Shared Health Intelex policy reserve.

1.1 Statement of Principle – Workplace Safety & Health

Shared Health is committed to:

Promoting an organizational culture that ensures the highest possible occupational health and safety star employees.

A belief that safety is the responsibility of all members of the organization including Senior Management, Managers and Supervisors, and Workers.

Securing its employees and other persons from risks to their safety, health and welfare arising out of or in connection with activities in their workplace.

Promoting the highest degree of physical, mental and social well-being of its employees.

Ensuring that Senior Management, Managers and Supervisors, and Workers recognize and understand their unique and critical role to ensure a safe and healthy workplace.

Working collaboratively with all Safety and Health Committees and Representatives regarding the health and safety of the Shared Health organization.

Complying with all Government Health and Safety Legislation.

Jim Slater
November 1, 2011

Section 2 - Definitions

The Act	Manitoba Workplace Safety and Health Act
ALARA Principle	As Low As Reasonably Achievable
BSO	Shared Health BioSafety Officer
Safety and Health Committee	Refers to a workplace safety and health committee established under section 40 of the Manitoba Workplace Safety and Health Act W210 10/02.
Competent Person	A person who, possesses knowledge, experience and training to perform a specific duty;
CT Scan	A medical imaging procedure that utilizes computer-processed X-rays to produce tomographi images or 'slices' of specific areas of the body.
Cytotoxic Hazardous Medications	Medications which are potentially detrimental or destructive to cells within the body. Cytoto› Hazardous Medications are a category of hazardous medications deemed to pose maximal risk in the event of occupational exposure. The term is commonly used when referring to antineoplastic medications that non-selectively damage or destroy dividing cells but in not limited to this purpose. This includes all dosage forms and routes of administration (e.g. parenteral, oral, topical, inhalation, etc.).
Due Diligence	Everyone shall take all reasonable precautions, under the particular circumstances, to prevent injuries or accidents in the workplace.
Diagnostic Imaging	Area of practice that includes Xray, MRI, CT scans, EKG, U/S and other specialties.
Diagnostic Imaging Staff	Any employee, student, or visitor conducting medical diagnostic imaging within Shared Health sites.
EHS	Environmental Health and Safety
EHSO	Shared Health Environmental Health and Safety Officer
EKG	Electrocardiogram
Incident	An event that results in injury to people and/or damage to the environment, equipment, property and/or material.
JHA	Job Hazard Analysis
Laboratory	For the purposes of this manual, a laboratory is considered to be any space where scientific research, experimentation or analysis is conducted. Computer “labs” are excluded from this definition.

Laboratory Staff	Any employee, student or visitor conducting scientific research, experimentation or analysis within a laboratory.
MRI	Magnetic Resonance Imaging - is a medical imaging technique used in radiology to visualize internal structures of the body in detail.
Near Miss	An unplanned event that did not result in injury, illness, or damage – but had the potential to do so.
Research Laboratory	A laboratory designed primarily for research.
Safety	Refers to the prevention of physical injury to workers and the prevention of physical injury to other persons arising out of or in connection with activities in the workplace.
Supervisor	A person who has charge of a workplace or authority over a worker.
Worker	A person who works at a particular occupation or activity.
Worker Safety and Health Representative	The person designated as a worker safety and health representative under the Manitoba Workplace Safety and Health Act W210 10/02.

Section 3 - Rights and Responsibilities

3.1 Duties of the Employer

Ensure, so far as is reasonably practicable, the safety, health and welfare at work of all his/her workers;

Comply with the Manitoba Workplace Safety and Health Act (W210) and its regulations (217/2006);

Provide and maintain a workplace, necessary equipment, systems and tools that are safe and without risks to health, so far as is reasonably practicable;

Provide to all workers such information, instruction, training, supervision and facilities to ensure, so far as is reasonably practicable, the safety, health and welfare at work of all workers;

Ensure that all workers, and particularly the Supervisors, Charge Technologists or similar persons, are acquainted with any safety or health hazards which may be encountered by the workers in the course of their service, and that workers are familiar with the use of all devices or equipment provided for their protection;

Conduct operations in such a way as to ensure, so far as is reasonably practicable, that persons who are not in the employ of Shared Health are not exposed to risks to their safety or health arising out of, or in connection with activities in his/her workplace;

Consult and co-operate with the workplace safety and health committee where such a committee exists, regarding the duties and matters with which that committee is charged under the Workplace Safety and Health Act;

Consult and co-operate with the worker safety and health representative where such a representative has been designated, regarding the duties and matters with which that representative is charged under the Workplace Safety and Health Act;

Co-operate with any other person exercising a duty imposed by the Workplace Safety and Health Act, or the regulations;

Ensure that all Shared Health workers are supervised by a person who:

is competent, because of knowledge, training or experience, to ensure that work is performed in a safe manner, and

is familiar with the Workplace Safety and Health Act and the regulations that apply to the work performed at the workplace.

3.2 Duties of the Supervisor

Every supervisor shall, so far as is reasonably practicable,

Take all precautions necessary to protect the safety and health of a worker under his or her supervision,

Ensure that a worker under his or her supervision works in the manner and in accordance with the procedures and measures required by the Workplace Safety and Health Act and the regulations, and

Ensure that a worker under his or her supervision uses all devices and wears all clothing and personal protective equipment designated or provided by the employer or required to be used or worn by the Workplace Safety and Health Act or the regulations;

Advise a worker under his or her supervision of all known or reasonably foreseeable risks to safety and health in the area where the worker is performing work;

Co-operate with any other person exercising a duty imposed by the Workplace Safety and Health Act or the regulations; and

Comply with the Workplace Safety and Health Act and the regulations.

3.3 Duties of the Worker

Every worker, while at work shall:

Take reasonable care to protect his or her safety and health and the safety and health of other persons who may be affected by his or her acts or omissions at work;

At all times, when the nature of his or her work requires, use all devices and wear all articles of clothing and personal protective equipment designated and provided for his/her protection by his/her employer, or required to be used and worn by him by the Workplace Safety and Health regulations;

Consult and co-operate with the workplace safety and health committee, where such a committee exists, regarding the duties and matters with which that committee is charged under the Workplace Safety and Health Act;

Consult and co-operate with the worker safety and health representative, where such a representative has been designated, regarding the duties and matters with which that representative is charged under the Workplace Safety and Health Act;

Comply with the Workplace Safety and Health Act and the regulations; and

Co-operate with any other person exercising a duty imposed by the Workplace Safety and Health Act or the regulations.

3.4 Rights

All Shared Health staff have the following rights within the workplace:

Right to Participate in the day-to-day detection, evaluation and elimination/reduction of workplace hazards.

Eg: Participate in workplace inspections, sit on Safety Committees ask questions, and provide input

Right to know any hazards that his/her work may place them in and steps to protect the health and safety of a worker

Eg: review of JHA and Safe Work Procedures, SDSs, SOPS.

Right to Refuse if you believe the equipment, device, or environment will likely endanger your safety and health or that of others. Eg: is told to perform high hazard duty (decanting of liquid nitrogen) and person has not been trained to handle or given appropriate PPE to perform duty

Right to Protection from Discrimination or Punishment when exercising your safety and health rights.

Eg: not allowed to attend a safety meeting after reporting an incident.

Section 4 – Training

4.1 **It is the responsibility of supervisors to ensure that:**

All personnel have received sufficient introduction and training on specific equipment, procedures and materials in the laboratory and DI areas where they will be working

All training is documented with the documentation maintained for all personnel.

In addition to site specific training, the supervisor is responsible for ensuring that new personnel are oriented and made aware of emergency and safety procedures including, but not limited to, emergency evacuation routes, emergency or safety procedures specific to the workplace as well as departmental safety policies and procedures and applicable policies and procedures included in the Diagnostic Safety Manual and the Shared Health,Health and Safety Policies. Supervisors are to ensure that all new personnel have successfully completed all applicable training **prior** to beginning work in the workplace.

It is the responsibility of the supervisor to ensure that all training of all personnel is **documented and maintained** throughout the employment of the worker on site and within their personnel file. Courses taken through Medialab are electronically tracked, live training needs to be documented in the staff persons personnel file.

4.2 **Initial Safety Orientation training may include but not limited to:**

This training maybe delivered through in-person training or through Medialab.

Shared Health General Occupational & Environmental Safety and Health Orientation

Shared Health Transportation of Dangerous Goods (Modules #1-5)

Shared Health International Air Transportation Association (IATA) (Modules #1-6)

Shared Health Fire Safety

Shared Health Routine Practices

Shared Health PPE Instruction

Shared Health Spill Clean Up (Acids, Bases, Solvents)

Shared Health Bloodborne Substance Spill Training

Shared Health Formaldehyde Awareness

Shared Health Provincial Healthcare Violence Prevention Program (Units #1-6, determined by job duties)

Shared Health WHMIS (2015)

Shared Health Pleats Plus N95 Respiratory Donning and Doffing

Shared Health Talking Back-Back Care Awareness

Section 5 - Incidents/Near Miss Reports

5.1 Incident Reporting

All incidents and near misses are to be reported to the Shared Health EHS Department via the Work Related Injury/Near Miss Report form **(Intelex:** F70-10-07). In order to meet regulatory requirements, these forms are to be submitted to Shared Health EHS Department within 24 hours of the occurrence with the exception of serious incidents which are to be called into Shared Health EHS Department and area Supervisor immediately. Serious Incidents are those that meet at least one of the following criteria:

- if a worker is killed;
- an injury resulting from electrical contact
- produces unconsciousness as a result of a concussion;
- fracture of his or her skull, spine, pelvis, arm, leg, hand or foot;
- involves amputation of a leg, arm, hand, foot, finger or toe;
- third degree burns
- Permanent or temporary loss of sight
- A cut or laceration that requires medical treatment at a hospital as defined in *The Health Services Insurance Act*, or
- Asphyxiation or poisoning or that involves the collapse or structural failure of a building, structure, crane, hoist, lift, temporary support system or excavation, an explosion, fire or flood, an uncontrolled spilled or escape of a hazardous substance, or the failure of an atmosphere supplying respirator.

- Employees should seek first aid immediately if required, at or near the location of the injury if safe to do so.

- If there is any health concern following an incident, the employee shall notify the supervisor to initiate follow up which may include medical assessment and/or surveillance.

- If there is any time loss (missed work after the day of initial injury/incident) as a result of the incident it must be reported to Shared Health EHS Department, WCB and the Supervisor.

5.2 Incident Investigation

Many lessons can be learned from incidents and near misses. Incident investigation is an important component of the continuous improvement of safety practices and procedures. However, to be effective, the active participation of supervisors and workers alike is essential. Investigations are intended to uncover *contributing factors* and *root causes*, which may not be immediately evident upon initial review of the incident. It is essential that the scene of an incident is preserved so that a thorough and accurate investigation can be performed.

Scenes of serious incidents must *legally be* preserved. Steps may be taken to avoid the creation of an additional or more serious hazard. Once permission is given from the Manitoba Department of Labour Workplace Safety and Health Officer and, if applicable, law enforcement personnel the scene may be released to resume operations. Shared Health, Health and Safety Department must be notified and conduct an investigation in correlation with the Co-Chair(s) of the Health and Safety Committee or designate at the site.

In order to thoroughly investigate an incident, consider the following strategies:

- *Consider both why it happened and why the situation wasn't prevented or detected before it became an incident or near miss*
- *Continue to ask "why" until you drill down to details that can no longer be broken down*

Consider all possible contributing elements. The following categories should be considered:

- *Personnel (e.g. personnel appropriately trained? competent?);*
- *Equipment (e.g. was equipment operating appropriately? maintenance up to date?);*
- *Methods (e.g. were procedures appropriate for the application and were they being followed appropriately?);*
- *Environment (e.g. housekeeping, lighting, physical condition of the workplace); and materials (e.g. hazardous materials involved, personal protective equipment).*

Section 6 - Workplace Hazardous Materials Information System

The Workplace Hazardous Materials Information System (WHMIS) is a legislated program by the Workplace Safety and Health Act (W210 10/02) and Regulation (217/2006) that is applicable to all Shared Health staff and students who work in areas where hazardous materials are used. The purpose of this legislation is to ensure that everyone in a workplace is provided with the information needed to identify hazardous materials and to take the appropriate precautions when

working with these materials. WHMIS accomplishes this through the use of warning labels, Safety Data Sheets (SDS) and training on how to use the information provided.

For further information on WHMIS please refer to the WHMIS 2015 & WHMIS 2015 Training Workbook JA70-70-26.

6.1 Labels

The label is the primary source of hazard information. The requirements for label content are dependent upon whether the container is from a supplier or a workplace, and whether the hazardous material is a laboratory product, a sample for analysis or neither

6.1.1 Supplier Labels

A supplier label is required for containers from the supplier however there is no set format. Supplier labels must contain the following information in both English and French must be clearly and prominently displayed on the container, easy to read and to be in contrast with other information on the product or container. Information required on a supplier label:

WHMIS 1988 (old)	WHMIS 2015
Product identifier	Product identifier
Supplier identifier	Supplier identifier
Symbol	**Pictogram (red border)**
Risk phases	**Hazard statement**
N/A	**Signal Word**
Precautionary measures	Precautionary measures
First Aid statement	Part of precautionary measures
Hatched border	N/A

Supplier labels for materials sold in a container with less than 100 mL do not require risk phrases, precautionary measures or first aid measures to be included.

6.1.2 Workplace Labels

A workplace label must be provided on a vessel once it is decanted from the supplier vessel. A workplace label must contain the following information:

- Product identifier or name
- Precautionary measures (may include pictograms)
- Reference to the SDS

6.1.3 Laboratory Labels

For supplies originating from a laboratory supply house that are to be used solely in a laboratory, and that are supplied in quantities of less than 10 kg, a laboratory label is permitted which is to contain the following information:

- Product identifier or name
- Risk phrases

- Reference to SDS
- Precautionary measures
- First aid measures
- Laboratory supplies transferred to a container other than the original, and for use only in the laboratory where the transfer took place; need to be labelled with the product identifier only.

6.2 Safety Data Sheets (SDS)

Safety Data Sheets (SDSs) are summary documents that provide information about the hazards of a product and advice about safety precautions. SDSs are usually written by the manufacturer or supplier of the product. In some circumstances, an employer may be required to prepare an SDS (e.g., when the product is produced and used exclusively in that workplace).

SDSs provide more detailed hazard information about the product than the label. They are an important resource for workplaces and workers to help you learn more about the product(s) used. Use this information to identify the hazards of the products you use and to protect yourself from those hazards, including safe handling and emergency measures.

SDSs tell users what the hazards of the product are, how to use the product safely, what to expect if the recommendations are not followed, how to recognize symptoms of exposure, and what to do if emergencies occur.

6.3 Training

Training is required to provide detailed instruction on the site specific procedures necessary to carry out work safely, as well as provide the basis for proper interpretation of hazard information provided on labels and SDS. This training should be completed and reviewed annually, along with the applicable documentation for same being completed. Training can take place either in person, or via computer based training (Medialab: 70-70-26 WHMIS 1988 & 2015)

6.4 Understanding Hazard Warning Information

6.4.1 WHMIS Symbols

The classes of controlled chemical products and their corresponding symbols or pictograms, as well as general characteristics and handling precautions are outlined in Table 1

Table 1 – Summary of WHMIS classes, their associated characteristics, proper handling and storage procedures.

WHMIS 1988	WHMIS 2015	Description	Precautions
Class A: Compressed Gas 	**Gas Cylinder** 	• Gas under pressure • Heat may cause container to explode • Container may explode if dropped	• Handle with care • Store in a designated area • Keep away from heat

Class B: Flammable & Combustible 	**Flame** 	• Potential fire hazard • May burn at low temperatures • May burst into flame spontaneously • May cause fire when exposed to heat, sparks, flames or friction	• Keep away from heat sources • Never smoke near it • Store in a designated area • Keep away from oxidizers
Class C: Oxidizing 	**Flame over Circle** 	• Poses fire or explosion risk in presence of flammable & combustible materials • May burn skin or eyes upon contact	• Keep away from flammable & combustible materials and away from any source of ignition
ClassD1: Immediate & Serious toxic effects 	**Skull** 	• May be fatal if inhaled, swallowed or absorbed through skin • May burn skin or eyes upon contact	• Avoid contact, use proper protective equipment • Use in well-ventilated area • Wash immediately on contact
Class D2: Other Toxic effects 	**Exclamation mark**  **Health Hazard** 	• Poisonous, but not immediately dangerous to health • Repeated exposure may cause death or permanent injury • May be a skin irritant or sensitizer • May cause cancer, birth defects or sterility	• Avoid contact, use proper protective equipment • Use in well-ventilated area • Wash immediately on contact • Store in designated area
Class D3: Biohazardous 	**Biohazardous infection material** 	• May cause serious disease resulting in death or illness	• Handle with care—Avoid contamination • Use in designated areas • Use protective equipment

Class E: Corrosive 	**Corrosion** 	• Causes serious skin & eye irritation upon contact • Prolonged contact causes severe tissue damage • May eat through metal	• Avoid skin or eye contact • Use proper protective equipment • Wash immediately on contact • Store in designated areas
Class F: Dangerous Reactive 	**Exploding Bomb** 	• Very unstable • May react with water to release toxic or flammable gas • May explode as a result of shock, friction or temperature increase • May undergo vigorous polymerization	• Keep away from heat • Do not shake or jar, open carefully • Requires careful storage and handling • Store in a designated area

http://www.ccohs.ca/oshanswers/chemicals/whmis_ghs/pictograms.html, **March 2017…**

6.4.2 Toxicological Properties: LD50 and LC50

Exposure to hazardous materials can occur by:

- Absorption;
- Ingestion;
- Inhalation, or
- Injection

LD50 and LC50 values are commonly used measurements for the toxicity of a substance.

LD50 (Lethal Dose 50) is the amount of a substance that, when administered by a defined route of entry (e.g. oral or dermal, etc.) over a specified period of time, is expected to cause the death of 50% of a population. The LD50 is usually expressed as weight of test substance per kilogram of body weight (mg/kg or g/kg)

LC50 (Lethal Concentration 50) is the concentration of a substance in air or water (depending on the test population) that, when administered by inhalation over a specified period of time, is expected to cause the death in 50% of a population. The LC50 is usually expressed as parts of test substance per million parts of air/water (ppm) for gases and vapours, or as milligrams per litre or cubic metre of air (mg/L or mg/m3) for dusts, mists and fumes.

Note that the lower the LD50 or LC50, the more toxic the material. For example sodium chloride (table salt) has an LD50 (oral, rat) of 3000 mg/kg and sodium cyanide has an LD50 (oral, rat) of 6.4 mg/kg

6.4.3 Exposure Values (TWA, STEL, CEILING)

Exposure values are established concentrations that, if not exceeded, will not generally cause adverse health effects to the person exposed. Exposure values can be expressed as the following:

- ***TWA (8 hour Time Weighted Average)***: average concentration to which most workers can be exposed during an 8 hour workday, day after day, without adverse effects.
- ***STEL (Short Term Exposure Limit)***: maximum average concentration to which most workers can be exposed over a 15 minute period, day after day, without adverse effects.
- ***Threshold Limit Value - CEILING (TLV - C)***: the concentration that must never be exceeded (applies to many chemicals with acute toxic effects).

6.4.4 Flash Point

Flash point is the lowest temperature at which a liquid produces enough vapour to ignite ***in the presence*** of an ignition source. **The lower the flash point of a substance, the greater the fire hazard.** Common laboratory solvents such as acetone, toluene, acetonitrile and methanol all have flash points that are below room temperature.

6.4.5 Autoignition Temperature

Autoignition temperature is the temperature at which a material will ignite, ***in the absence*** of an ignition source. **The lower the autoignition temperature of a substance, the greater the fire hazard.**

6.4.6 Flammable Limits

Flammable or explosive limits are the range of concentrations of a material in air that will burn or explode in the presence of an ignition source. Explosive limits are usually expressed as the percent by volume of the material in air:

LEL (lower explosive limit) or LFL (lower flammable limit): lowest vapour concentration that will burn or explode if ignited. Below this limit the concentration of fuel is too "lean" for ignition, i.e., the mixture is oxygen rich but contains insufficient fuel

UEL (upper explosive limit) or UFL (upper flammable limit): highest vapour concentration that will ignite. Above this limit, the mixture is too "rich" for ignition.

The flammable range consists of concentrations between the LEL and the UEL

Table 2 – Flash points, lower explosive limits, autoignition temperatures and exposure limits of several flammable or combustible laboratory solvents

Solvent	Flash Point * (°C)	LEL * (% by volume)	Autoignition temp** (°C)	TWAEV * (ppm)
acetic acid, glacial	39	4.0	427	10
acetone	-18	2.5	465	250
acetonitrile	5.6	3.0	524	20
diethyl ether	-45	1.9	160	400
ethanol, absolute	13	3.3	363	1000
ethyl acetate	-4.4	2.0	426	400
methanol	11	6.0	464	200
n-pentane	-49	1.5	260	120
toluene	4.4	1.1	422	100

TWAEV – 8 Hour Time Weighted Average Exposure Value
LEL – Lower Explosive Limit
*NIOSH Pocket Guide to Chemical Hazards, NIOSH publication number 2005-151
** Corresponding MSDS

Pathogen Safety Data Sheets

Pathogen Safety Data Sheets (PSDSs) (previously titled Material Safety Data Sheets for infectious substances) are technical documents that describe the hazardous properties of a human pathogen and recommendations for work involving these agents in a laboratory setting. These documents have been produced by the Public Health Agency of Canada (the Agency) as educational and informational resources for laboratory personnel working with these infectious substances. Please note that work involving pathogens in Canada may require compliance with international, national, and provincial laws and guidelines…

Below is a link to the Public Health Agency of Canada PSDSs site.
http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php

Section 7 - Hazard Identification and Control

A workplace hazard is any equipment, procedure, material, environment or situation that may cause personal injury or illness, or environmental or property damage.

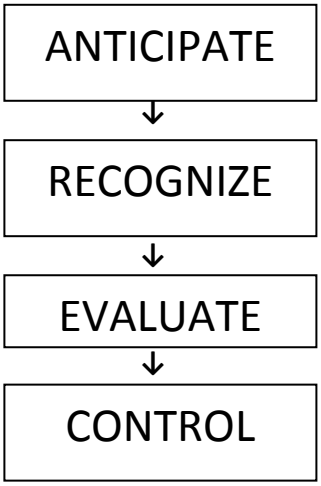
To identify workplace hazards a Job Hazard Analysis (JHA) needs to be completed. JHA is a systematic means of identifying, assessing and prioritizing workplace hazards for each job classification and address those hazards before they result in workplace injury or illness by implementing preventive or control measures.

Templates can be found in Intelex: F70-10-02A.

Shared Health will ensure that existing and potential workplace hazards are identified and that measures are taken to eliminate, reduce, or control those hazards in compliance with the Act by:

- Completing JHAs for all job classifications;
- Maintaining records of all completed JHAs; and
- Establishing procedures to review all JHAs as required by the Act and sustain the JHA Program. Shared Health reviews and signs off on all JHAs on an annual basis.

Management of hazards can effectively be accomplished through the following process:

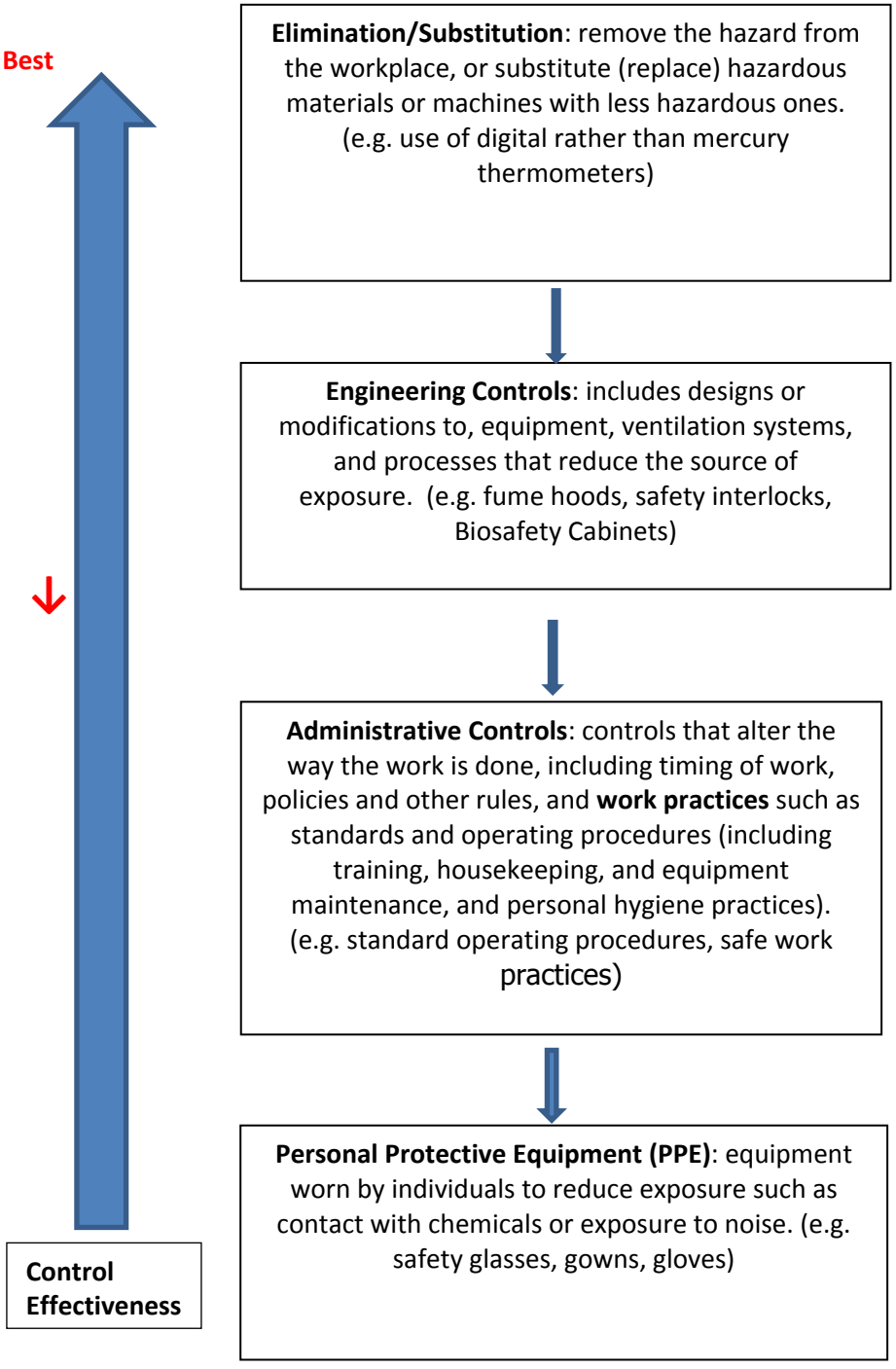


Every effort should be made to **anticipate** hazards during the design stage of work in order to minimize the hazards that need to be managed. Workplace hazards are to be identified and evaluated based on the degree of risk and exposure using tools such as:

- Review of the experiment or process and the planned safety precautions;
- Detailed inspection and/or testing of the hazard;
- Physical observation by trained individuals;
- Investigations of near misses;
- Conducting interviews with workers;
- Reviewing records such as operating manuals, methods, injury reports or minutes of Joint Health and Safety Committee meetings

Once the assessment of the hazard has been completed, appropriate control measures are to be implemented as appropriate to the situation. Below are control strategies, listed in order of effectiveness. The best controls are those that are mistake proof, being effective independent of the worker, e.g. safety interlocks on centrifuges that prevent the lid from being opened until the rotor has stopped spinning. Management of hazards will often involve a combination of the following strategies

These methods are also known as the "hierarchy of controls" because they should be considered in the order presented (it is always best to try to eliminate the hazard first, etc.).



7.1. Safe Work Procedures (SWPs):

- SWPs will be developed by the department manager, or person assigned such task, in conjunction with OH&S as interim measures when Engineering, other Administrative and Personal Protective Equipment (PPE) controls have not been implemented (i.e. due to waiting for funding, work order to be completed, etc.), or as permanent measures in combination with other controls.
- SWPs will be completed as identified by the JHA. Templates for SWP's will be found in Intelex: F70-10-02B.
- SWP's will be reviewed/updated, and signed off, on an annual basis by all staff.

Section 8 - General Laboratory Safety

8.1 Good Laboratory/ Work Practices / General Safety

- Lab work requires focus and undivided attention to ensure both that accidents are prevented and that proper actions are taken in the event of an emergency.
- Know and understand the hazards, safe handling and operating procedures of the materials, equipment and methods being used. Review SDSs, equipment manuals and standard operating procedures as applicable.
- The use of personal audio devices is strictly prohibited as these may disrupt concentration as well as prevents recognition of an emergency alarm, call for help, etc.
- Report missing labels to laboratory supervisors. Never use substances of unknown identity.
- Consult your supervisor before proceeding with any aspect of your procedures that you are unsure of (e.g. safe handling of material, operation of equipment, technique etc.).
- Mouth pipetting is strictly prohibited.
- Avoid storage of personal belongings (e.g. bags, coats, etc.) in the lab except in designated areas free of hazardous materials.
- Never "sniff test" any substance within any lab or DI area.
- Running, horseplay and practical jokes are prohibited.
- Report accidents and near misses promptly to your supervisor.

8.2 Routine Practices

Routine Practice Precautions and Standard Precautions are to be observed throughout all work areas. These practises will ensure that all staff are able to prevent contact with blood and other potentially infectious materials. **All body fluids are considered potentially infectious.**

- Employees wash their hands immediately or as soon as possible after removal of gloves or other personal protective equipment and after hand contact with blood or other potentially infectious materials.
- Hands are washed between all patient contacts, *before eating, drinking, smoking, applying cosmetics or lip balm, or manipulating contact lenses and after using lavatory facilities.*
- Facilities for hand washing are provided and are separate from those used for washing equipment or for waste disposal. Where this option is not available, thorough cleaning of the sink and surrounding area with an intermediate disinfectant after chemical/biohazard waste disposal is required before hand washing is allowed.

- Antiseptic hand cleaner or towelettes are used whenever clean running water is not readily available; however, they are not used as a substitute for hand washing and hands must be washed with soap and water as soon as feasible.

Wearing gloves does NOT mean you do not have to wash your hands! Hands hygiene must always be performed when gloves are removed.

4 Moments of Hand Hygiene

1. Before initial patient/resident/client (PRC) or PRC environment contact.

2. Before aseptic or clean procedure.

3. After body fluid exposure risk.

4. After PRC or PRC environment contact.

For further information, please consult your ***Regional Health Authority - Infection Prevention and Control Manual. This manual will be followed in all instances as it pertains to Infection Prevention and Control within all departments in all facilities.***

8.3 Housekeeping

Good housekeeping practices are essential in every workplace; however they become especially important in the laboratory and technical environment where spills from broken reagent containers, sample bottles, reaction vessels, patient samples, etc., can create unnecessary exposures to potentially hazardous biological and chemical substances.

Laboratory and DI personnel are responsible for ensuring that their work spaces are kept as clean as the work allows.

Supervisors are responsible for ensuring the overall cleanliness of the work areas. The following housekeeping points will help lead to a neat, organized, efficient and, most importantly, safe work environment. Ensure that:

- Dirty glassware or measuring vessels are cleaned on a regular basis and is not allowed to accumulate in sinks, on benches or in surrounding areas;
- Reagents are stored appropriately when not in use;
- Old or unused samples and reagents are disposed of in a timely manner as per site hazardous and biohazardous waste policies;
- Storage of materials or equipment does not obstruct aisles, electrical panels, fire extinguishers, safety showers, eye wash stations or other emergency equipment;
- Items are kept away from the edge of bench tops and shelves so they cannot easily be knocked off;
- Stored items, do not project beyond the front of shelf or counter limits;
- Storage of large, awkward, heavy or breakable items on high shelves is avoided;
- Apparatus used infrequently is stored appropriately when not in use;
- Equipment no longer used is recycled or appropriately disposed;
- Electrical cords, hoses, and air lines are secured;

- If the Creutzfeldt-Jakob virus is suspected or confirmed, soaking the affected area with a 1 to 2.5 solution of one molar of fresh Sodium Hypochlorite solution for four hours is recommended. *(for further information on Prions/CJD, refer to section 9.7.1)*
- Ensure that equipment that is contaminated is decontaminated before servicing or shipping and is decontaminated according to the manufacturer's recommendations.
- Equipment or bins, pails, cans, and other similar receptacles intended for reuse are inspected and decontaminated immediately upon visible contamination;
- Broken glassware is not picked up directly with the hands. It is handled by using mechanical means, such as a brush and dust pan, tongs, or forceps;
- Blood or other potentially infectious specimens are placed in a closable, leak proof container and labelled or color-coded before being stored or transported. If outside contamination of the primary container is likely, then a second leak proof container that is labelled or color-coded is placed over the outside of the first and closed to prevent leakage during handling, storage, or transport. If puncture of the primary container is likely, it is placed in a secondary container that is leak proof and puncture-resistant;
- Ensure that biohazard spills are decontaminated as soon as possible by absorbing the spilled material with disposable absorbent materials (e.g., paper towels or gauze pads), flooding or wiping the site with disposable towels soaked in disinfectant, then wiping the site with clean, dry paper towels or gauze pads, placing all contaminated items in a biohazard bag, and disposing of the bag according to the site biohazard disposal guidelines. Follow any spill cleanup guides that are available for further instructions;
- Cleaning and disinfection of all benches and work surfaces will take place daily, using an approved facility approved disinfectant and recorded;
- Cleaning of work surfaces that have had patient contact will be cleaned directly after the patient has left the area, or in the case of phlebotomy chairs, these are to be cleaned daily, unless blood or bodily fluids have been spilled. In this case, cleaning is to be completed immediately.

8.4 Food Storage and Consumption

Storage and consumption of food and/or drink (including water, chewing gum, cosmetics, lip gloss, etc.) within the laboratories and DI technical areas is strictly prohibited.

The use of laboratory equipment including, but not limited to, glassware, refrigerators, freezers, microwaves and other ovens etc., to store or prepare food is strictly prohibited.

Ice from laboratory ice makers is not to be consumed.

Food and drink are to be stored in areas marked "for food only".

All microwave ovens used for heating food shall be marked "for food only".

The Manitoba Workplace Safety and Health Regulations 217/2006*, in Section 4.15 states *"Eating prohibited in contaminated area - An employer must ensure that a worker does not eat or drink in a part of a workplace that is, or may be, contaminated by a hazardous substance."

8.5 Smoking/E-Cigarette

As per the Manitoba Non Smokers Health Protection Act, smoking is strictly prohibited in all Shared Health and health care facilities. Tobacco and e-cigarette products are not to be brought into the technical work areas.

8.6 Personal Hygiene

To prevent unforeseen accidents or exposures, the following points are to be followed to ensure that particular attention is paid to personal hygiene while working in the DI and laboratory areas:

- Long hair is to be tied back or otherwise secured. This is important to prevent chemical/biological exposures as well as to prevent the hair from becoming entangled in a moving part of equipment. This is also good practice to prevent contamination of research samples.
- Neck ties are to be removed or secured (preferably behind a lab coat).
- Avoid touching your face or hair while wearing gloves.
- Hands are to be washed thoroughly after removal of gloves and/or after working with hazardous materials as per the Glove Use Policy (70-20-06)
- Application of cosmetics or lip balm in the lab and DI areas is strictly prohibited.
- Dress code issues are to be followed as per Shared Health policy 70-20-05.
- Wearing of scented products in the workplace is to be avoided as per Shared Health policy 70-20-05

8.7 Personal Items in Laboratory and DI Areas

In order to mitigate the requirements of the Shared Health Infection Prevention and Control Guidelines, and abide by both College of American Pathologists (CAP) and Manitoba Quality Assurance Program (MANQAP) and the Canadian Biosafety Standard (CBS), 2nd edition, 2015, all personal items will remain outside of the labs at all times. The dangers of cross contamination of personal items are a risk that is unacceptable. Shared Health strives to ensure that their staffs are kept as safe as possible and practicable in light of the nature of laboratory and Diagnostic Imaging work. Cross contamination can occur from airborne particulates, droplets, prion exposure, etc. This contamination can be transferred out of the lab and into patient areas, and ultimately to the staff's home and family. Any contamination outside of hospital or Shared Health facilities is unacceptable under the guise of the Infection prevention and Control aspects of the workplace, and will not be allowed.

8.8 Working Alone

This section is to be used in conjunction with Shared Health Policy 70-10-02. This policy will assist the local staff the ability to custom design a work alone plan that will fit for their specific work location and situation. Job Hazard Analysis and Safe Work templates are available form staff/supervisor involvement to ensure that issues are mitigated prior to adverse issues occurring. It is not advisable to conduct laboratory or DI work alone. These situations present additional hazards to personnel as they may find themselves isolated and without help in the event of an emergency

In the event that a true working alone situation is warranted and following a hazard review of the work to be done as well as a review of hazards in the laboratory itself, the supervisor may allow tasks to be performed while working alone. The supervisor is to be made aware of dates, times and locations of all working alone situations. When working alone, laboratory personnel are encouraged to make arrangements to have someone checking with them regularly either in person or by phone.

The following circumstances are **examples** of situations where working alone situations are prohibited:

- Work involving acutely toxic substances (e.g. sodium cyanide);
- Work involving explosive substances (e.g. peroxides);

- Work involving the use of highly corrosive substances (e.g. hydrofluoric acid)

8.9 Unattended Procedures

Certain instrumentation configurations are designed to routinely operate unattended, e.g. auto-analyzers equipped with auto samplers, centrifuges, autoclaves etc. However non-routine, unattended laboratory procedures should be minimized. If a procedure is to be left unattended, prior review of the hazards with consideration of the materials and procedures being used is to be completed. Only procedures that are deemed to be safe if left unattended are allowed to continue without personnel present in the laboratory. The following are requirements for non-routine unattended laboratory procedures

- Unattended procedures are to be visited periodically and a sign posted outlining the procedure being used with the contact information of the person responsible for the work. The sign is to indicate the start date and time along with the expected completion date and time of the work.
- Unattended procedures using cooling water are to have hoses securely attached and the water adjusted to the minimum flow necessary. Ensure plumbing drains are clear before leaving the procedure.
- Unattended heating is only to be done using heating equipment that reliably maintains stable temperatures.
- If heating is being performed, flammable materials are to be removed from the area. This includes flammable hazardous wastes.

8.10 Violence Issues

Most people think of violence as a physical assault. However, workplace violence is a much broader problem. It is any act in which a person is abused, threatened, intimidated or assaulted in his or her employment. Workplace violence includes:

- ***Threatening behaviour*** - such as shaking fists, destroying property or throwing objects.
- ***Verbal or written threats*** - any expression of intent to inflict harm.
- ***Harassment*** - any behaviour that demeans, embarrasses, humiliates, annoys, alarms or verbally abuses a person and that is known or would be expected to be unwelcome. This includes words, gestures, intimidation, bullying, or other inappropriate activities.
- ***Verbal abuse*** - swearing, insults or condescending language.
- ***Physical attacks*** - hitting, shoving, pushing or kicking.

http://www.ccohs.ca/oshanswers/psychosocial/violence.html

Shared Health will take every reasonable effort to mitigate, eliminate or reduce all forms of workplace violence. Where it is not reasonably practicable to eliminate the risk of violence, actions and measures will be taken to control that risk.

For further information in regards to Violence Prevention please refer to:

- 70-10-29 –Violence Prevention Policy
- 70-10-30 –Violence Prevention Program for Healthcare Workers in Manitoba – Operational Procedure
- 70-10-31 - Violence Prevention Program – Risk Assessment Guidelines
- 70-10-35 – Provincial Violence Prevention- Outpatient Risk and Screening Tool
- A70-10-30A – Screening Tool for Violence Aggression
- A70-10-30B – Provincial Violence Alert Symbol

- PB70-10-30 – Violence Aggression and Responsive Behaviours – Information for Patients and Families

To understand requirements for the Violence Prevention Program training please refer to:

70-10-34 – Workplace Violence Program – Training

Media lab will have all related training modules for review.

8.10 Visitors in the Laboratory and DI areas

Due to the potential hazards present in laboratory and DI settings, to protect the integrity of the procedures, to comply with the statutes of the Personal Health Information Act (PHIA) and for security of the equipment and supplies contained within, visitors to laboratories and DI areas should be discouraged.

As per the Canadian Biosafety Standards (CBS - 2018), access to containment zones to be limited to authorized personnel and authorized visitors. In the event that visitors are granted access by the Supervisor or Manager, they will be escorted.

Careful consideration of the hazards is to be done prior to opening up a laboratory or DI area for the purposes of an open house. Should a laboratory or DI area be opened to the public, a representative of each department should be present at all times. Non laboratory/DI personnel are to be closely supervised and use appropriate protective measures (e.g., clothing, etc.) to ensure that they do not cause a hazard to themselves or to other staff.

Note that documented permission from a parent or guardian and departmental approval will be required for entrance of a minor into a technical work area, e.g. the "Take your kids to work" program. For further information please refer to Shared Health Policy 10-60-14 (Kids at Work Program – PHIA)

8.11 First Aid/CPR

A working knowledge of basic first aid is important for all laboratory personnel.

Hazardous materials such as chemicals and infectious material can harm us by entering our body in one of 4 ways: through ingestion, inhalation, contact with the skin or the eyes (mucous membranes), or injection.

The means of entry into the body will determine the most appropriate action to take when an accident occurs. Adequate planning and training is essential to be prepared for any exposure. The following points are general requirements for your workplace to be prepared for incidents requiring first aid:

- Refer to the Manitoba Regulation on First Aid (MR 217/2006 Part 5) for detailed information on workplace requirements.
- First aid kits should be available and appropriate for the work area. Kits should be immediately replenished as needed. ***First aid kits should include the following items:***
  A – General items
  (i) a recent edition of a first aid manual,
  (ii) a pair of impervious disposable gloves,
  (iii) a disposable resuscitation mask with a one-way valve,
  (iv) a disposable cold compress,
  (v) 12 safety pins,
  (vi) splinter forceps,
  (vii) one pair of 12 cm bandage scissors,

(viii) 25 antiseptic swabs,
(ix) waterless hand cleaner,
(x) waterproof waste bag;

B - Dressings - each of the following items must be sterile and individually wrapped in order to maintain sterility:
(i) 16 surgical gauze pads (7.5 cm squares),
(ii) 4 pads (7.5 cm X 10 cm, non-adhesive),
(iii) 32 adhesive dressings (2.5 cm wide),
(iv) 2 large pressure dressings,

C - Bandages:
(i) 3 triangular bandages (1 m each),
(ii) 2 conforming bandages (10 cm each),
(iii) 2 rolls of 2.5 cm adhesive tape,
(iv) 1 roll of 7.5 cm elastic adhesive bandage,
(v) 2 rolls of 7.5 cm tensor bandage.

- Emergency phone numbers should be posted. In most Shared Health locations, contact local paging and activate the emergency code "***Medical 25***", please refer to site specific requirements. Other emergency numbers include "911", local medical assistance, local fire service, spill response team and the **Poison Control Centre (204-787-2591).**
- Ensure that eye wash stations and safety showers are nearby (reachable within 10 seconds), and are not blocked by any obstruction. Flush eye wash stations and showers on a weekly basis; ensure that dates are recorded to ensure that they are working and to clear the lines of stale water and debris. The use of eyewash bottles is a suitable first aid measure to allow staff to get to a plumbed eyewash station – ***(See Appendix 2 for further information).***
- Sufficient staff, as per the Manitoba Workplace Safety and Health Regulations 217/2006 section 5.5(1-4), should be trained in basic first aid and cardiopulmonary resuscitation (CPR).

8.11.1 First Aid Procedures

The following are *general* first aid procedures, and may not be applicable, or appropriate for all situations. This information is for reference only to aid you in making a more complete first aid plan for your workplace.

- **REMAIN CALM**
- **ALWAYS READ THE CHEMICAL'S SDS** for specific first aid measures.
- If necessary, have someone contact emergency personnel. They should provide the following information: the location of the victim, the type of chemical involved, and the nature and extent of contact with that chemical. Stay with the victim until assistance arrives. Give responders all necessary information.
- Before proceeding with first aid, ensure the area is safe (i.e., no risk of fire, explosion, or further harmful chemical exposure to the victim or others – wear protective clothing if necessary).
- Administer the proper first aid. If necessary **AND** you are properly trained, perform AR (artificial respiration) or CPR if required. These methods should only be performed by trained individuals.
- For **Ingestion – Contact the local Emergency Department** or **Poison Control Centre (204-787-2591)** immediately, and have the chemical's SDS on hand. DO NOT administer another chemical in an attempt to neutralize the first one unless directed to do so by Poison Control. You may be instructed to dilute the chemical with water or induce vomiting.
- For **Inhalation –** Move the victim to fresh air immediately. Do not risk your own safety by staying

in an area with contaminated air – respirators may be necessary (only those trained in the use of respirators may use them). Monitor the victim's breathing. If the victim is breathing, loosen clothing around the airway. If breathing stops, or is ineffective, perform artificial respiration if properly trained.

- For **Eye Contact –** Flush the area with lukewarm water for *at least* 15 minutes using an eyewash station or portable bottles. If the chemical is a penetrating corrosive (see the SDS), up to 60 minutes of flushing may be needed. Help the victim hold the eyelids open and away from the eyes (try not to squint). Roll the eyes around to flush out all areas. **DO NOT** attempt to neutralize by adding another chemical unless instructed by Poison Control.

  If the casualty is wearing contact lenses: St. John Ambulance Canada recommends that you should not waste time trying to remove the contact lenses. Flush the eyes for at least 15 minutes or for as long as stated in SDS.

- For **Skin Contact –** (if the chemical is a dry solid, quickly brush off as much of the chemical as possible *before* flushing). Immediately flush the area with water for *at least* 15 minutes using the emergency shower, eyewash station, or sink. While flushing, remove contaminated clothing, jewellery, shoes, and equipment.

  DIPHOTERINE may be used if the lab stocks it.

- **DO NOT** be modest. Watches, rings, belts, and other constrictive accessories must also be removed before the affected areas swell up. Unless the eyes are affected, do not remove the safety goggles until all chemical has been washed from the face and hair.
- **DO NOT** attempt to neutralize by adding another chemical.
- **DO NOT** add lotions or ointments to the area. Protect the affected areas.
- Transport the victim to medical assistance as soon as possible. Have someone knowledgeable about the chemical and the incident accompany the victim to the Emergency Department. Bring the chemical's SDS.
- All (major or minor) chemical exposures should be followed up by trained medical professionals as soon as possible. A minor exposure to a small amount of a toxin can cause major life threatening situations. **The decisions on the severity of an exposure should only be made by a medical professional.**
- Complete the Work Related Injury/Near miss forms and submit to the EHSO.

8.11.2 CPR

Sufficient staff, as per the Manitoba Workplace Safety and Health Regulations 217/2006 section 5.5(1-4), should be trained in basic first aid and cardiopulmonary resuscitation (CPR).

CPR training is taught throughout the community. All laboratory/DI personnel are encouraged to attend CPR training. Do NOT attempt CPR if you are not qualified to do so.

For further information on CPR training, please contact the Shared Health Safety Department at 204-926-3710.

8.11.3 Airway Obstruction

For a conscious victim that is standing or sitting, the rescuer asks, "Can you speak?" If there is no response, you should:

- Use back blows followed by abdominal thrusts:
  - To do this support victim's upper body and help the person lean forward. Give up to 5 blows between the shoulder blades using the heel of your hand.
- If obstruction is not cleared, begin abdominal thrusts.

- Stand behind the victim with foot between the victim's feet for a solid position.

- Make a fist with one hand
- Place thumb side against victim's abdomen, in middle, slightly above navel and well below tip of xiphoid process (located directly below sternal notch)
- Grasp fist with other hand
- Pull fist inward/upward into victim's abdomen giving 5 sharp and forceful thrusts.
  If object is not removed repeat back blows and abdominal thrusts until either object is cleared or victim becomes unconscious.

For an unconscious victim, you should:

- place victim in supine position, face up
- Knee next to victim so your hands can be placed mid-chest.
- Place your hands in the centre of the upper chest and your shoulders directly over your hands. Keeping elbows locked.
- Give 30 compressions – Push hard- Push fast! Depress and release the chest rhythmically. Press heels of the hands straight down on the breastbone. The depth of the compression should be at least 5cm (2 inches).
- Open mouth and airway. Check the mouth, if you see the foreign object remove it if possible.
- Open airway and attempt to ventilate
- Continue with compressions until help arrives, victim begins to respond or medical helps takes over.

8.11.4 Bleeding

For a bleeding victim, apply direct pressure to victim's wound by placing your palm on a dressing directly over the injured site. Use a compress, or thick pad of cloth, if available, since it will absorb blood and enhance the clotting process. DO NOT REMOVE THE COMPRESS if bleeding continues; just add more cloth pads as needed. A pressure bandage may be applied to hold the pad in place. Elevate the wound if it is on the hand, arm, or leg, if there is no fracture.
Seek immediate medical attention.

8.11.5 Other

- Conscious poisoning victims should be referred immediately to the Emergency Department.
- Unconscious poisoning victims should be given artificial respiration and CPR, if indicated, until medical attention arrives.
- A convulsing victim should not be restrained. Loosen the convulsing victim's clothing and remove objects in the area to avoid injury.
- The signs of shock include pale or blushed skin, moist skin, rapid and faint pulse, increased breathing rate, weakness, and vomiting.

8.11.6 Care for the Shock Victim

- Keep Victim warm and place in best position for that person. Moisten lips if complaining of thirst. If in doubt about the victim's injuries, keep the victim lying flat. Some of the signs of shock include pale or

blushed skin, moist skin, rapid and faint pulse, increased breathing rate, weakness, and vomiting.

- If the victim has a head injury, keep them steady and support the victim in the position found.
- Contact the Emergency Department (ED) for immediate medical care. (Call appropriate emergency code as applicable).
- For a fracture, prevent any movement of the victim's injured parts. Contact (ED) or call the appropriate emergency code "***Medical 25***" for further instructions.

8.11.7 Burns

There are three general classifications of burns, which refer to the depth of skin damage. First-degree is least severe. Third-degree shows deep tissue destruction. Contact the Emergency Department or call the appropriate emergency code "***Medical 25***" for immediate medical care for third-degree burns.

- For any first or second degree burns, submerge affected part in cool water. If it is a chemical burn, assist the victim in removing clothing and flush with shower for a minimum of 15 minutes.

Escort an injured employee to the ED or call the appropriate emergency code "***Medical 25***" or site specific protocols.

Work Related Injury/Near Miss report and the SDS (if applicable) should accompany the employee to the ED.

For all instances as listed above, complete the Injury/Near miss forms and submit to the EHSO.

Report any serious accidents to the EHSO. Serious injuries must be reported to the Manitoba Department of Safety and Health as required by law. This reporting function will be completed by the EHSO and an investigation regarding the incident will occur as soon as possible thereafter.

Section 9 - Personal Protective Equipment

Personal Protective Equipment (PPE) is to be used according to the hazards presented in the specific work area as determined by the Job Hazard Analysis and the area Supervisor. Work areas should be clearly labelled as to the personal protective equipment required, to ensure clear communication to any individual entering the area. Personal protective equipment is not to be used in place of engineering controls such as fume hoods or Biological Safety Cabinets (BSC), but is to be used diligently to provide supplemental protection.

This section provides minimum standards for personal protective equipment.

9.1 Eye and Face Protection

This section is to be used in conjunction with the Shared Health Policy 70-20-02 *Eye and Face Protection* and the Regional Infection Prevention and Control guidelines. Canadian Standards Association (CSA) approved eye protection is to be worn by students, employees and visitors in all areas where hazardous or unknown substances (either chemical or biological) are being stored, used or handled, where there is a risk of splash, projectiles or air borne particles or where there is harmful radiant energy. All eye and face protection should comply with standard CSA Z94.3, Eye and Face Protectors and CSA Z94.3.1, Selection, Use, and Care of Protective Eyewear.

- As per your Job Hazard Analysis (JHA), areas that require eye protection should have a minimum eye protection of approved safety glasses with permanent side shields. Safety glasses are designed to protect against impact and do not provide significant splash protection. Therefore safety glasses should only be worn in cases of light work not involving significant volumes of liquids. Depending on the type of protective eye and face equipment selected, prescription eye glasses may be worn underneath; safety glasses can also have prescription lenses.
- Goggles are to be worn when there is a risk of splashing a hazardous material. Indirect or non- vented

goggles are preferred.

- Eye protection is to provide adequate impact and splash resistance appropriate for the work being done.
- Ultraviolet (UV) protective eyewear is required where there is risk of exposure to UV light.
- Face shields are to be used if an explosion or significant splash hazard exists such that there is a need to provide further protection to the face.
- *Optimally*, face shields are to be used in conjunction **with** primary eye protection (safety glasses or goggles depending on the hazard).
- Full size shields that can be placed directly in front of the hazard may also be used to provide additional protection to the entire body. *Optimally*, these too, are to be used in conjunction with goggles, lab coats, etc.
- Shared Health Policy 70-20-02 *Eye and Face protection* addresses the issue of wearing contacts in the laboratories. Please refer to that policy for further direction. Contact lenses themselves do not provide eye protection. Further information regarding the wearing of contact lenses in laboratory situations may be found at the following websites:
  - Canadian Centre for Occupation Health and Safety – OSH Answers: http://www.ccohs.ca/oshanswers/prevention/contact_len.html
  - CDC NIOSH – Contact Lens Use in a Chemical Environment: https://www.cdc.gov/niosh/docs/2005-139/pdfs/2005-139.pdf

- Eye and face protection may be reused, provided that it is appropriately decontaminated after coming in contact with infectious material or toxins. Used disposable eye and face protection is considered contaminated **waste**.

9.2 Hand Protection

9.2.1 Selection of Gloves

Gloves are to be used to provide protection against chemical or biological hazards and exposure to extreme temperatures, abrasions or lacerations. Table 3 provides a general guideline to describe appropriate hazard based selection of gloves.

Latex gloves will not be the primary glove of choice as per the *Latex Glove Policy* 70-20-15.

9.2.4 Use and Care of Gloves

The following guidelines should be considered when using gloves:

- Gloves should be inspected for damage prior to use. Any sign of deterioration, such as holes, tears or discoloration, should prompt immediate replacement of the gloves.
- Gloves should be of an appropriate fit and thickness to allow for the required tactile sensitivity.
- Gloves should be an appropriate length so as to provide adequate protection of the arm.
- Gloves should be removed by pulling the gloves inside out to prevent exposure to any contaminants during removal.
- Gloves are to be removed prior to touching computers or phones, opening doors or otherwise contacting items that would be expected to be free of contamination (either biological or chemical).
- Wash hands thoroughly after removal of gloves.
- Never reuse disposable gloves.
- Reusable gloves should be stored and maintained in such a way as to prevent exposure (e.g. in a Ziploc bag) and should be stored within the technical work area.
- Manufacturer's instructions are to be followed as applicable.

Table 3 – Guide to Hazard Based Glove Selection

HAZARD	DEGREE OF HAZARD	PROTECTIVE MATERIAL	
Abrasion	Severe	Reinforced heavy rubber, staple reinforced heavy leather	
	Less Severe	Rubber, plastic, leather, polyester, nylon, cotton	
Sharp Edges	Severe	Metal mesh, staple reinforced heavy leather, Kevlar™, aramid steel mesh	
	Less Severe	Leather, terry cloth (aramid fiber)	
	Mild with delicate work	Lightweight leather, polyester, nylon, cotton	
Chemicals and bodily fluids	Risk varies according to the chemical, its concentration, and time of contact among other factors. Refer to the manufacturer or product (M)SDS.	**Dependant on chemical.** Examples include: Natural rubber, neoprene, nitrile rubber, butyl rubber, PTFE (polytetrafluoroethylene), Teflon™, Viton™, polyvinyl chloride, polyvinyl alcohol, Saranex™, 4H™, Barricade™, Chemrel™, Responder™, Trellchem™	
Cold		Leather, insulated plastic or rubber, wool, cotton	
Electricity		Rubber insulated gloves tested to appropriate voltage (CSA Standard Z259.4 M1979) with leather outer glove	
Heat		Greater than 350°C	Zetex™
		Up to 350°C	Nomex™, Kevlar™, heat resistant leather with linings
		Up to 200°C	Nomex™, Kevlar™, heat resistant leather, terry cloth (aramid fiber)
		Up to 100°C	Chrome tanned leather, terry cloth
General Duty		Cotton, terry cloth, leather	
Product Contamination		Thin film plastic, lightweight leather, cotton, polyester, nylon	
Radiation		Lead lined rubber, plastic or leather	

9.2.2 Chemical

No one glove material is appropriate for protection against all potential chemical exposures as the permeation rate (rate at which the chemical seeps through the glove material) of the different glove types varies significantly with the chemical in question. Consultation of the SDS along with consideration of the usage will provide guidance in determining an appropriate glove. Table 4 provides some basic information about selecting gloves suitable for various chemical applications.

The following links provide more detailed information regarding the proper selection of a glove material based on the specific chemical(s) being handled

- Ansell Chemical Resistance Guide: https://www.ansellpro.com/download/Ansell_8thEditionChemicalResistanceGuide.pdf https://www.ansellpro.com/specware/guide.asp
- Best Manufacturing Company's Chemrest: http://www.chemrest.com/

Table 4 – Characteristics, Advantages, Disadvantages and Uses of Selective Chemical Resistant Glove Materials

TYPE	ADVANTAGES	DISADVANTAGES	FOR USE WITH:
Natural rubber latex ***(not a preferred type due to allergy issues)***	Low cost, good physical properties, dexterity	Poor against oils, greases, organic solvents. May cause allergic reactions.	Bases, acids, alcohols, dilute aqueous solutions. Fair vs. aldehydes, ketones.
Natural rubber blends	Low cost, dexterity, generally better chemical resistance than natural rubber.	Physical properties often inferior to natural rubber. May cause allergic reaction.	Bases, acids, alcohols, dilute aqueous solutions. Fair vs. aldehydes, ketones.
Polyvinyl chloride (PVC)	Low cost, very good physical properties, average chemical resistance.	Plasticizers can be stripped.	Strong acids and bases, salts, aqueous solutions, alcohols, oils, greases and petroleum products.
Neoprene	Average cost, average chemical resistance, average physical properties, high tensile strength, high heat resistance.	Poor vs. chlorinated hydrocarbons	Oxidizing acids, alcohols, anilines, phenol, glycol ethers, solvents, oils, mild corrosives
Nitrile	Low cost, excellent physical properties, dexterity	Poor vs. chlorinated organic solvents, many ketones	Oils, greases, aliphatic hydrocarbons, xylene, perchloroethylene, trichloroethane. Fair vs. toluene.
Butyl	Good resistance to polar organics, high resistance to gas and water vapour	Expensive, poor vs. hydrocarbons, chlorinated solvents	Glycol ethers, ketones, esters, aldehydes, polar organic solvents
Polyvinyl alcohol (PVA)	Resists broad range of organics, good physical properties.	Very expensive. Water sensitive, poor vs. light alcohols, acids and bases.	Aliphatic and aromatic hydrocarbons, chlorinated solvents, ketones (except acetone), esters, ethers

Fluro elastomer (Viton®)	Good resistance to organic and aromatic solvents. Flexible.	Extremely expensive. Poor physical properties. Poor vs. some ketones, esters, amines	Aromatics and aliphatic hydrocarbons, chlorinated solvents, oils, lubricants, mineral acids, alcohols.
Norfoil, Silver Shield™, 4H™	Excellent chemical resistance.	Poor fit, stiff, easily punctures, poor grip.	Use for Hazmat work. Good for range of solvents, acids and bases.

9.2.3 Blood and Bodily Fluids

No one glove material is appropriate for protection against all potential bodily fluid exposures as the permeation rate (rate at which the biological product seeps through the glove material) of the different glove types varies significantly with the bodily fluid in question. Table 5 provides some basic information about selecting gloves suitable for various blood and bodily fluids. If a staff person or patient is sensitized to a particular glove product, use another glove type to ensure protection for yourself and the patient. For further information, please refer to Shared Health *Glove Usage Policy* 70-20-06 and Shared Health *Latex Gloves Policy* 70-20-15. The Shared Health EHS staff can also be consulted as needed.

Table #5 Blood and Bodily Fluid Glove selection Chart

Blood and Bodily Fluids

1) ***Natural Rubber Latex*** (NRL) Gloves - Only wear gloves that have low allergen levels to minimize the risk of sensitivity. NRL gloves are close fitting, do not impair dexterity and can reseal when punctured. These gloves are not prone to splitting, have much lower leakage rates than vinyl, and also offer better protection against viruses than vinyl. NRL gloves offer good sensitivity and are comfortable to wear. Unfortunately, these types of gloves are in short supply due to the prevalence of allergy issues associated with them.
Utilize other types of gloves as a first choice.

2) ***Nitrile*** (acrylonitrile) Gloves - A high quality nitrile glove is a good alternative for latex sensitive individuals. Nitrile gloves provide an excellent biological barrier and are effective when handling some chemicals. Nitrile gloves must always be used when handling gluteraldehyde and cytotoxic samples. Nitrile gloves are coloured so they can be clearly identified in an emergency and also their use can be monitored.

3) ***Tactylon*** (multipolymer synthetic styrene-ethylene-butadine-strene) Gloves -
These gloves are similar in elasticity and strength to NRL but are resistant to oxidative forces which adversely affect natural rubber latex. Tactylon gloves contain no NRL proteins, accelerators or processing chemicals that are known allergens. These gloves break down very quickly when in contact with non-solidified methacrylates i.e. bone cement.

4) ***Neoprene*** (polychoroprene) Gloves - This material is a synthetic elastomer.
These gloves will offer effective protection against viral penetration and the risk of permeability from certain chemicals such as aldehyde disinfectants. Neoprene gloves have been shown to have equivalent strength and properties to good quality NRL gloves and are suitable for individuals sensitized to NRL proteins.

5) ***Vinyl*** (polyvinyl chloride – pvc; synthetic co-polymer) - Vinyl gloves have a lower tensile strength than NRL and therefore are more prone to splitting. The material shows an increased permeability to blood borne viruses, making these gloves unsuitable for handling blood and bloodstained fluids. Vinyl gloves are relatively rigid, inflexible and prone to leaking (leakage rates of up to 63% have been reported). These gloves are inexpensive and therefore may be suitable for use in areas where there is a low biohazard risk, e.g. activities such as routine cleaning or brief superficial contact, which would not stress the glove. Sensitivity to these

gloves has been recognized.

6) ***Polythene*** (ethylene co-polymer/plastic) - These gloves have heat sealed seams which predisposes them to splitting; they are thin and have a tendency to tear. Polythene gloves are often ill-fitting, making dexterity difficult. This does not comply with expert guidance on personal protective equipment. These gloves should not be used when contact with blood and body fluids is likely. To avoid misuse polythene gloves should not be kept in a clinical area.

If a department needs to use these gloves for a specific purposes consult with the infection control staff or the EHSO.

9.3 Body Protection – Lab Coats and Aprons

Impermeable lab coats and long pants are to be worn whenever hazardous chemicals or biological substances are being used or handled.

- Lab coats with snaps are preferred over lab coats with buttons to allow for quick removal of the clothing in the case of an emergency.
- Lab coats must have the buttons or snaps fastened at all times while working in the lab.
- Lab coats should be approximately knee length and cover the arms to the wrists to protect the skin and person clothing from exposure to hazardous materials.
- Lab coats that fit closely to the body and have cuffed sleeves help prevent dragging and catching of clothing during laboratory work.
- Lab coats are to be stored in the laboratory area to prevent biological or chemical contamination of non-lab areas.
- Lab coats are to be cleaned regularly within the regular facility laundry service and are to be laundered separately from all other clothing. **Under no circumstances should lab coats be taken to the staff person's home for laundering**.
- Lab coats should be worn according to the facility policy/practice guidelines for suitability for wear outside of the lab.

Aprons should be worn in addition to lab coats in situations where there is an elevated splash hazard or the risk of injury following a splash is high. Synthetic rubber aprons should be worn when working with large volumes (i.e. greater than four litres) of concentrated inorganic acids e.g. HCl, H2SO4. The use of aprons alone is discouraged as they provide inadequate protection of the arms.

Coveralls are generally not recommended in laboratory situations where flammable or corrosive liquids are being handled because of their potentially difficult removal should contamination occur.

Shorts, skirts, skorts, Capri pants, leggings or the like are strictly prohibited in the laboratory as they do not provide protection of the lower legs as per Shared Health *Dress Code Policy* 70-20-05.

9.4 Respiratory Protection

This section is to be used in conjunction with Shared Health *Respiratory Protection Program Policy* 70-20-11. There are several types of respiratory protection that are appropriate for use in a Laboratory/DI setting depending on the work being performed. The use of a respirator should only be considered when permanent engineering controls are inadequate or non-functional (e.g. emergency spill situations). Users must be registered in the local respirator program and appropriately trained and fitted prior to using a respirator. Fit testing is required for all respirators and is provided by the local Health & Safety Departments or the Shared Health EHSO and must be completed every two years. Contact the Shared Health Safety Department or your Supervisor for more information. Fit testing will be conducted as per Shared Health *Respiratory Protection Program Policy* 70-20-07.

- **Disposable dust masks** are to be used when nuisance quantities of non-toxic dust are generated from the material(s) being used.
- **Surgical masks** and many types of dust masks offer little protection from airborne pathogens, infectious aerosols, or aerosolized toxin, but will protect mucous membranes of the nose and mouth from spills and splashes. These masks are not intended to be used more than once.
- An **N95 respirator** is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles. The N95 respirator protects the users from inhaling airborne hazards. It can filter out 95% of airborne particles that are 0.3 microns or larger. These types of respirators are one time use only and must be NIOSH approved.

- **Half (1/2) Respirator** (Air Purifying Respirators) have a rubber face seal which fits over the nose and under the chin. The respirator is fitted with cartridges which purify the air as the wearer breathes. Different types of cartridges are available for different types of air contaminants.

- **Full face Respirator** (Air Purifying Respirators) work on the same principal as the half-mask respirators described above. The facepiece extends around the entire face, covering the eyes, nose, chin and mouth. Full face respirators provide a better seal and therefore, more protection `than half-mask air-purifying respirators. They also protect the eyes and face from irritating vapors, mists, and splashed chemicals.
- For situations where the air contains unacceptable or unknown concentrations of vapours or fine airborne particles, either an air purifying or supplied air respirator is to be used. These respirators are to be chosen and maintained with appropriate fit testing and monitoring as required in Section 6 of the Workplace Safety and Health Regulations 217/2006 and conform to standard CSA Z94.4, Selection, Use and Care of Respirators.
- Respirators are to be stored such that they do not accumulate dust, (i.e. in a plastic bag, stored in a drawer or box that allows sufficient ventilation to prevent growth of bacteria or mould). Respirators should be labelled with the name of the user. When being used, detection of an odour is confirmation that the respirator is either not providing a good fit or that the filter cartridges have expired. For the cartridges with an end of life indicator (ELF), either odour or ELF will dictate the change out frequency.

A best practice is to date and change out unsealed respirator cartridges every 12 months.

9.5 Footwear

Closed toed, safe shoes constructed of a resistant material (preferably leather) are required while in all technical work areas. Steel toed, chemical resistant safety shoes may be warranted in specific cases as determined by the work area supervisor. Sandals do not provide adequate protection and are not to be worn in any Shared Health technical work area situation. High heeled shoes are strongly discouraged as they increase the potential for tripping or falling. Staff that are attending technical work areas on an infrequent basis are to wear a safe closed toe shoe as per the Shared Health Policy 70-20-05 (Dress Code).

Foot protection should comply with Canadian Standards Association (CSA) standard CSA-Z195, *Protective Footwear,* where applicable.

9.6 Hearing Protection

Equipment such as grinders or homogenizers in laboratories may warrant the use of hearing protection. Hearing protection may consist of ear plugs or ear muffs depending on the amplitude and frequency of the noise. Hearing protection must be worn in areas where the eight hour time weighted average noise level is greater than 85 dB. In cases where hearing protection is required, routine audiometric surveillance is conducted by EHS. Contact EHS for more information and/or to initiate surveillance.
Please note that noise surveys will/have been conducted in all technical work areas in all Shared Health

facilities. The results of these surveys are either available via a safety committee member, or through the Shared Health EHSO. Further information is available at Shared Health *Hearing Protection Program*, Policy 70-20-08.

9.7 Bloodborne Pathogens

- All procedures that involve blood or bodily fluids require the use of personal protective equipment. As a minimum, gloves and lab coats must be used in all areas where blood or bodily fluids are collected or tested. Where possible, used needles and other sharps should not be recapped or re-sheathed. As per the Workplace Safety and Health act, Safety Engineered needles will be used so far as reasonably practicable (WSH Act Section 45.1(1)(a). Needles and sharps are disposed of in impervious disposable containers located near the point of use. These disposal containers will be discarded, in an appropriate manner, at the 3/4 mark as indicated on the exterior of the container.
- All procedures involving blood or other bodily fluids are performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances. For example, blood specimens are opened using an impervious splashguard square or plastic stopper remover to minimize contamination of skin and clothing. Biological Safety Cabinets are also available for this procedure and should be used whenever possible. All specimens that are centrifuged are spun in closed tubes, within in sealed centrifuge buckets, in a closed centrifuge with the lid firmly latched to reduce the risk of infection by spattering. Plastic shields or boxes may also be used to reduce splashing.
- Needles are not to be used for sampling unless no alternative method exists (e.g., blood culture bottles).
- All patient specimen containers should be clean and dry on the outside containers and have a secure lid. All specimens are transported in a secondary container (e.g., impervious plastic bag) with the requisition attached to the outside (preferably in the pouch on the side of the specimen bag). This prevents leakage during handling, processing, storage, transport, or shipping. If the specimen could cause a puncture, then a puncture-resistant secondary container is used. Specimens transported in syringes with needles should not be accepted. If specimens are transported via a pneumatic tube system, the primary and secondary containers are tested in the system to ensure that they remain leak proof. Some specimens, such as CSF, should never be sent via a pneumatic tube system (please refer to specific discipline SOPs for specimen acceptance). If they are received broken or in a fashion that shows leakage, follow the local protocol for infectious materials.
- Unfixed or unstained slides are considered infectious and transported via a secondary container.
- Laboratory surfaces are made of impervious materials to facilitate disinfection.
- Each laboratory's SOPs further delineate precautions and actions.

9.7.1 Prions/CJD

Prions are small, proteinaceous infectious particles that are generally accepted to be the cause of a group of progressive neurodegenerative diseases in humans and animals known as **transmissible spongiform encephalopathies (TSEs)**.

Prion proteins are extremely heat stable, able to bind with high affinity to metal surfaces, and can persist for long periods in the natural environment. The most likely route of transmission to personnel handling infectious prions is through accidental inoculation or ingestion of infected tissues. TSEs are unique due to the long incubation times (up to 30 years) before disease symptoms appear. Examples of TSEs in animals include bovine spongiform encephalopathy (BSE), scrapie, and chronic wasting disease (CWD). Examples of TSEs in humans include Creutzfeldt-

Jakob disease (CJD), variant Creutzfeldt-Jakob disease (vCJD), Gerstmann-Straussler-Scheinker syndrome, fatal familial insomnia, and kuru. Some prions are **zoonotic pathogens**, such as the BSE prions.

Samples that have been labelled as "***Suspect CJD***" are to be handled in the same manner that any potentially hazardous sample. Standard Precautions are adequate. Gloves, lab coat, eye coverings (when required) are to be worn.

In the care of patients diagnosed with human prion disease, Standard Precautions are adequate. However, the human prion diseases in this setting are not communicable or contagious. There is no evidence of contact or aerosol transmission of prions from one human to another.

All suspected CJD autopsies are considered "brain only" cases, so the Neurology lab will not receive any tissue other than the brain. All formalin-fixed tissues containing human prions are to be handled utilizing extreme care in a BSL-2 facility using BSL-3 practices. The main precaution to be taken by lab staff working with prion-infected or contaminated material is to avoid accidental puncture of the skin. Persons handling contaminated specimens should wear cut-resistant gloves where possible.

- If accidental contamination of unbroken skin occurs, the area should be washed with detergent and abundant quantities of warm water (avoid scrubbing); brief exposure (1 minute to 1N NaOH or a 1:10 dilution of bleach) can be considered for maximum safety.
- Needle sticks or lacerations: gently encourage bleeding; wash (avoid scrubbing) with warm soapy water, rinse, dry and cover with a waterproof dressing.
- Further treatment (e.g., sutures) should be appropriate to the type of injury.
- Report the injury according to normal procedures for your hospital or healthcare facility/laboratory.
- Splashes into the eye or mouth: irrigate with either saline (eye) or tap water (mouth); report according to normal procedures for your hospital or healthcare facility/laboratory.

Unfixed samples of brain, spinal cord, and other tissues containing human prions should be processed with extreme care in a BSL-2 facility utilizing BSL-3 practices.

Additional Considerations:

Prions are resistant to normal decontamination procedures and processes, including moist heat from conventional autoclaving, irradiation, and chemical inactivation (e.g., formalin, alcohols). These processes can marginally reduce infectivity, but few (e.g., incineration, repeated alkali autoclaving at pH 13) are highly effective at eliminating infectious prions.

Combinations of physical and chemical treatment processes where possible, are recommended to decontaminate equipment, reusable materials, and waste products that are not suitable for incineration, as they can achieve greater prion inactivation efficacy than treatment with chemical agents alone.

CJD tissues can be treated with formic acid. These can then be treated as routine specimens. When this process is utilized, BSL-3 practices in the Neurology Lab are still required as a precaution.

The following are considerations for the decontamination of prions:

- **For, tissue waste, excrement, and some disposable laboratory materials**: Any disposable objects are added to the autopsy waste that is picked up by Stericycle for incineration. Stericycle will provide pick up of the autopsy CJD waste and the liquid CJD waste.
- **For reusable instruments**: All reusable equipment are to be bleached. Large items are kept wet for 1 hour with concentrated bleach or 48 hrs with bleach at a 1:3.5 dilution or 1:2.5 dilutions (depending on concentration of bleach) for smaller items. These items are all sequestered and stored and are used with

CJD cases only (**SOP 170-100-29**).

- **For wastewater**: Create a mixture of bleach with liquid water waste to a concentration of 1:3.5 if using concentrated (7.25%) bleach. If the bleach is not concentrated (5.25%) the ratio is 1:2.5 bleach to waste. Let the mixture sit for 48 hrs. After that time period, pour it down the drain with copious amounts of water (**SOP 170-100-29 section 4.0, "treatment of waste**"). All other components of liquid waste (alcohol, xylene, formalin, formic acid) are picked up by Stericycle for treatment off site.

For specific handling of Prions or CJD related bio samples, it is recommended that a review of Intelex, Section 170-100 (Neuropathology) should be reviewed more extensively.

9.7.2 Phlebotomy

Latex free tourniquets used for phlebotomy are single use. All Shared Health staff and students **MUST** Wear lab coats and use gloves during all phlebotomy procedures.

Needle holders are single use and discarded along with the safety needle in a sharps container.

Phlebotomy trays are decontaminated when visibly contaminated with blood or other materials and routinely on a weekly basis and documentation of same is to be maintained and kept.

Phlebotomy chairs are to be cleaned daily, unless blood or bodily fluids have been spilled. In this case, cleaning is to be completed immediately after the patient has departed.

9.7.3 Haematology

Sealant used for hematocrit tubes is used once and not reformed for reuse.

Hemocytometers and Sedimentation racks are decontaminated with locally approved disinfectant after use.

Used tubes should be discarded appropriately after use.

9.7.4 Microbiology

Each site that performs microbiological functions has specific tasks and safety precautions for the various procedures that each performs. The listing below is not comprehensive. Please refer to your local site operating procedures *Clinical Microbiology Laboratory Safety Manual* 120-10-40 for a complete listing. If questions regarding microbiological safety processes arise, please consult your Biological Safety Officer (BSO), Supervisor or Technical Director.

- All contaminated culture plates, tubes, slides, etc., are discarded in closed biohazard bags and disposed of in the biohazard container.
- All counters are disinfected with locally approved disinfectant before and after work.
- Used gowns are discarded into labelled laundry bags after use.
- Tubes and plates containing cultures are carried to and from the incubators, biological safety cabinets, and other locations in racks and baskets to avoid dropping.
- The work area of the biological safety cabinet is decontaminated with a locally approved disinfectant before and after work.
- All contaminated material and reusable items are autoclaved before being disposed of or washed. The autoclave is monitored and verified with a sterilization check system.
- All mould-like fungi are manipulated within a biological safety cabinet.

For a complete listing, please refer to the Clinical Microbiology Safety Manual 120-10-40 located in Intelex

9.7.5 Chemistry

Sample probes may deliver a fine spray of sample. Sample probes are covered by a shield recessed within a reservoir or contained by a hood. The equipment is to be decontaminated at the end of each shift with the locally approved disinfectant and as per the manufacturer's recommendations. Waste from analyzers is considered contaminated and should not be discarded in the sink.

Contaminated needles and other contaminated sharps are not recapped or removed except where no mechanical alternative is feasible and the medical procedure requires it (e.g., blood gas analysis)

Only when recapping is absolutely necessary, should it be accomplished by use of a mechanical device or one-handed (scoop) technique.

Disposal of contaminated materials is divided into the categories listed below

- **Contaminated needles:** Placed into the sharps container. If recapping is performed, a one-handed scoop technique is used. These are to be treated as a biohazard and disposed of appropriately.
- **Contaminated waste:** Radioactive waste is placed into radioactive waste (radioactive) RIA containers. Geiger counter readings are then taken and recorded onto the appropriate forms before removal of the radioactive waste.
- **Contaminated glass:** Tubes that have been used for dilutions or analysis are placed into broken glass containers.
- **Contaminated syringes:** Syringes are placed into biohazard containers (e.g., blood gas samples).
- **Contaminated samples:** Samples are stored as per the retention policy. Samples of blood are treated in the same manner as contaminated needles. (Biohazard). Urine is discarded in a sink and flushed with water.

  Cytotoxic samples: Samples are placed in the cytotoxic waste containers and disposed of as per site specific procedure.

9.7.6 Blood Bank/Transfusion Medicine

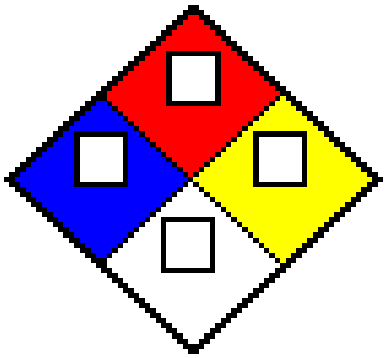
Tubing, if returned to the blood bank with the needle attached, is heat-sealed, clamped or tied, cut, and discarded in a sharps container.

Section 10 - Emergency Procedures

Each lab or chemical storage room is to have a completed laboratory hazard and emergency contact sign as per the NFPA 704 – Hazard Rating System.(Figure A) posted on the outside of the laboratory door. Laboratory and wet processing DI supervisors are responsible for ensuring that the information on the signs is accurate and for ensuring that the signs are posted. Placard template can be found in Intelex *NFPA Label*, F70-10-26.

The National Fire Protection Association (NFPA 704) system uses a diamond-shaped diagram of symbols and numbers to indicate the degree of hazard associated with a particular chemical or material. These diamond- shaped symbols are placed on containers of chemicals or materials to identify the degree of hazard associated with the chemical or material

The diagram identifies three color-coded categories of hazard for each material:



- Health hazard (blue sections),
- Flammability (red sections),
- Reactivity (yellow sections),
- Other hazard information (white section).

Hazard severity is indicated by a numerical rating that ranges from:
Zero (0) indicating a minimal hazard, to Four (4) indicating a severe hazard.

The degrees of hazard in each of these categories are given as follows:

Health - The degree of health hazard of a chemical or material is based on the form or condition of the material, as well as its inherent properties (NFPA ratings). The degree of health hazard of a material should indicate the degree of personal protective equipment required for working safely with the material:

- **A rating of 1** is for **slightly hazardous (toxic) materials which require** only minimal protection (for example, safety glasses and gloves) in addition to normal work clothing to work with safely.
- **A rating of 2** is for **moderately toxic or hazardous materials which require** additional PPE or equipment (e.g. chemical goggles, lab/work smock and local ventilation) in addition to that required for less toxic material. Consult the SDS for specific health hazard and proper PPE to use with this material.
- **A rating of 3 or 4** is for **highly to extremely toxic (deadly) material (and any carcinogen, mutagen, or teratogen)**. These materials will require specialized equipment (e.g. respirator (or exhaust hood), full face shield, rubber apron, specialized gloves, handling tongs, etc.) beyond that required for moderately toxic material. You must consult the SDS and/or other safety information to determine the hazard (acute or chronic) and the proper PPE and engineering controls to safely use of these materials.

Flammability - The flammability hazards deal with the degree of susceptibility of the material to ignite and burn. The form or condition of the materials, as well as their properties, affects the extent of the hazard. Many hazardous materials such as acetone and gasoline have a flash point (ignition temperature) far below freezing and will readily ignite with a spark if the vapour concentration is sufficient. A low rating of **1** is for material with a flash point **above 200F** while more hazardous ratings of **2, 3, and 4** are for materials with **respective flash point below 200, 100 and 73 F**. (NFPA ratings)

Reactivity - The reactivity hazards deal with the potential of a material or chemical to release energy. Some materials are capable of rapid release of energy without any catalyst, while others can undergo violent eruptive or explosive reactions if they come in contact with water or other materials. Generally this rating is used to indicate the potential to reactive if the material is heated, jarred, or shocked. A low rating of **1** indicates a **material that is normally stable but may be reactive if heated**. The more hazardous ratings of **2, 3, and 4** indicate a **material is capable of violent reaction, shock/rapid heating and detonation respectively** (NFPA ratings)

Other Hazard Information - An open space at the bottom of the NFPA diagram can be used to indicate additional information about the chemical or material. This information may include the chemical or material's radioactivity, proper fire extinguishing agent, skin hazard, its use in pressurized containers, protective equipment required, or unusual reactivity with water. For example, the usual signal to indicate unusual reactivity with water is the letter "**W**" with a long line through the center. Similarly the words **ACID, COR** (corrosive), **RAD** (radiation), **OXY** (oxidizer), **Rad** (radioactive), **CARC** (carcinogen) or other abbreviations may be used. A full explanation guide is available in Figure B.

The following shows a summary of the NFPA rating system used for labelling secondary containers of chemicals

Figure A – NFPA Labels

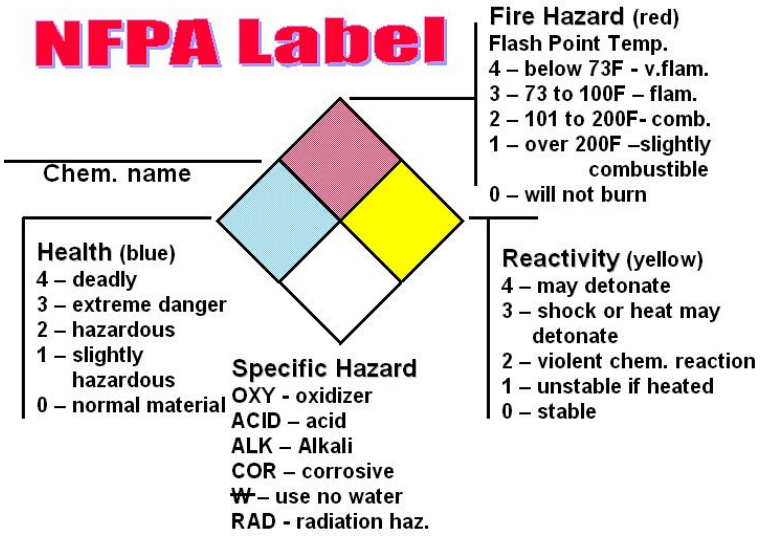
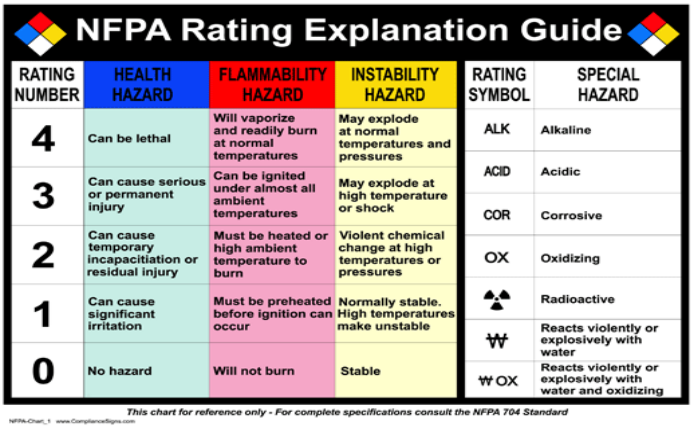


Figure B – NPFA Rating Explanation Guide



NFPA Rating Explanation Guide

RATING NUMBER	HEALTH HAZARD	FLAMMABILITY HAZARD	INSTABILITY HAZARD
4	Can be lethal	Will vaporize and readily burn at normal temperatures	May explode at normal temperatures and pressures
3	Can cause serious or permanent injury	Can be ignited under almost all ambient temperatures	May explode at high temperature or shock
2	Can cause temporary incapacitiation or residual injury	Must be heated or high ambient temperature to burn	Violent chemical change at high temperatures or pressures
1	Can cause significant irritation	Must be preheated before ignition can occur	Normally stable. High temperatures make unstable
0	No hazard	Will not burn	Stable

RATING SYMBOL	SPECIAL HAZARD
ALK	Alkaline
ACID	Acidic
COR	Corrosive
OX	Oxidizing
	Radioactive
W	Reacts violently or explosively with water
W OX	Reacts violently or explosively with water and oxidizing

This chart for reference only - For complete specifications consult the NFPA 704 Standard

10.1 Training/Work Area Orientation

As part of orientation, it is the supervisor's responsibility to ensure that all individuals are familiar with the use and locations of the following equipment *in all areas* in which they will be working:

- Fire extinguisher
- Eye wash station
- Safety shower
- Evacuation alarm (as applicable)
- Emergency routes and exits
- First aid kits
- Spill kits
- SDS

Personnel responsible for or working within a laboratory or DI area are required to participate in fire extinguisher training. This training is offered through the local site and or via computer based training (Medialab 70-70-09).

10.2 Emergency Equipment

10.2.1 Emergency Showers and Eyewash Stations

Emergency (safety) showers and eyewash stations are the primary methods for decontamination after exposure to a hazardous substance. Treatment in the first 15-20 seconds following an exposure is critical to prevent serious injuries, particularly when working with a corrosive substance. See *Appendix 1* for further information

- Design and construction of eyewash stations and emergency showers are to meet the requirements in Workplace Safety and Health Regulations Part 21 – (Emergency Washing Facilities) and the American National Standards Institute (ANSI) standard Z358.1 2004.
- Eyewash stations and emergency showers are to be readily available and easily accessible for each laboratory, i.e. accessible within less than 10 seconds. Personal

eyewash equipment, such as squeeze bottles, can support but not replace proper eyewash stations. The first few seconds following an eye injury are often critical to keeping injury to a minimum. A personal eyewash unit may be kept in the immediate vicinity of employees working in a potentially hazardous area. The main purpose of these units is to supply immediate flushing. With this accomplished, the injured individual should then proceed to a plumbed or self-contained eyewash and flush the eyes for the required 15-minute period.

- Eyewash stations and emergency showers are to be unobstructed at all times.
- Emergency showers and eyewash stations should have additional signage to prominently display their location.

- Eyewash stations and showers are to be activated at least once a week to verify operation and flush the pipes. Full inspections of eyewash stations and emergency showers shall be completed annually by the local maintenance or facilities staff.

  Documentation of inspections is required on Emergency Eyewash Shower Maintenance Checklist, F70-10-12.

- Any non-functional emergency shower or eyewash station is to be reported to the local supervisor and the local maintenance or facilities staff for immediate repair or replacement.

10.3 Emergency Procedures Planning

It is the laboratory or DI supervisor's responsibility, in conjunction with senior management and site facilities, to consider and plan for possible emergency situations including those discussed below. These plans are to be documented and effectively communicated to all other personnel and are to provide specific information related to the emergency procedures of the work areas with consideration of the particular materials, equipment, samples, procedures, personnel, etc. Supervisors are responsible for ensuring that there are appropriate evacuation procedures for persons with disabilities

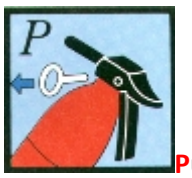
All staff and students are to participate in emergency drills as applicable and respond to all fire alarms by promptly following emergency procedures and evacuating the building as required. Elevators are not to be used during an evacuation. Buildings that have been evacuated may only be re-entered after the approval of a local Fire Prevention Officer, Fire Chief or Department Incident Commander.

10.3.1 Fires (Code RED)

Despite comprehensive preventative measures, fires may occur. In the case of fire:

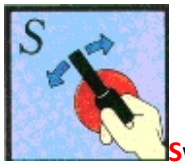
- Call 911 or the local emergency number (access paging system for Code RED) or site specific number.
- Locate a fire extinguisher appropriate for the type of fire.
- If you have been trained, try to extinguish the fire if you can do so without putting yourself or others at undue risk.
- Position yourself between the fire and the exit, so that you always have a route out of the area.

Utilize the acronym P.A.S.S.

- 

Pull the pin.
- 

Aim the extinguisher nozzle or hose at the base of the flame.
- 

Squeeze the trigger.
- 

Sweep. Using a sweeping motion, extinguish the fire.

- Remember that portable extinguishers contain only enough material for 8-12 seconds depending on their size.
- If the fire is larger than you feel that you can safely manage, activate the local fire procedures/ alarms and evacuate.
- Liaise with emergency responders to ensure that all relevant information is communicated.
- Seek medical attention if required.

If your clothing catches on fire:

- **Stop**
- **Drop** to the floor
- **Roll** to smother the flames
- If available, move to the safety shower and rinse with copious amounts of water
- Seek medical attention

If another person's clothing catches on fire:

- Assist them in the **Stop, Drop and Roll**
- Assist in smothering the flames by covering them in a fire blanket, if available, clothing or other appropriate item

Fire safety is discussed in more detail in Section 11

10.3.2 Chemical Contact

For skin contact:

For a small, easily accessible area of the skin, e.g. the hand (Refer to the SDS)

- Proceed to the nearest sink/ eyewash station or shower.
- Remove contaminated clothing and jewellery
- Rinse for at least 15 minutes (If site stocks Diphoterine: this can be used for phenol or corrosive and irritant materials)
- Seek medical attention if required. Provide applicable SDS to medical personnel
- Report incident to supervisor and complete Work Related Injury Near Miss form F70-10-07

For a large or inaccessible area of skin: (Refer to the SDS)

- Remove contaminated clothing and jewellery
- Go to the nearest emergency shower
- Rinse for at least 15 minutes
- Seek medical attention if required. Provide applicable SDS to medical personnel
- Report incident to supervisor and complete Work Related Injury Near Miss form F70-10-07

For contact with the eyes: (refer to the SDS)

- Go to the nearest eyewash station
- Rinse for at least 15 minutes
- If wearing contact lenses, remove them as quickly as possible, while continuing to flush
- Hold your eyelids open with your fingers
- Roll your eyeballs, so that water can flow over the entire surface of the eye
- Lift your eyelids frequently to ensure complete flushing
- Cover the injured eye with dry sterile gauze pads
- Seek medical attention. Provide applicable SDS to medical personnel and report the incident to supervisor and complete Work Related Injury Near Miss form F70-10-07

EHSO is to be contacted for follow up after any chemical contact.

10.3.3 Cuts and Needlestick Injuries

First aid treatment for minor scrapes, scratches, cuts, or needlestick injuries include the following:

- Apply gentle, direct pressure with a clean cloth or bandage to stop bleeding. If bleeding profusely, elevate injury above the level of the heart.

- Clean the wound with running water. Clean surrounding area with mild soap and running water, removing any dirt.

- Cover with a bandage or gauze square attached on all sides with adhesive tape. Avoid removing blood soaked bandages as this could damage a fresh clot – add additional bandages over top of the originals if necessary.

- Complete Work Related Injury Near Miss Form F70-10-07.

- *Medical attention beyond first aid is required for*:
  - o Deep cuts that may require stitches.
  - o Wounds caused by dirty or soiled objects to determine whether or not tetanus immunization is necessary.
  - o Wounds caused by an object that has contacted blood or body fluids to determine if immunization or post-exposure prophylaxis is required (see Occupational Health Unit if available or attend Emergency).
  - o Any injury that doesn't show signs of healing or you notice redness, swelling, warmth or drainage.
  - •Complete Work Related Injury Near Miss Form F70-10-07.

- For more serious lacerations:

- Attempt to stop the bleeding by elevating injured area above the level of the heart and applying direct pressure with a clean bandage or cloth. Seek medical attention.

- Immediately report the incident to the Supervisor and EHSO.

EHSO is to be contacted for follow up after injury.

10.3.4 Poisoning

Over exposure to toxic substances can occur through inhalation, absorption, ingestion or injection. When assisting a victim of poisoning:

- Call for medical assistance ("**Code 25**" - as applicable) for serious poisoning
- Ensure that the area is safe to enter before attempting to aid the victim
- If safe to do so, move the victim away from the contaminated area and provide first aid as required
- Contact the Poison Control Centre at 911 or 1-855-7-POISON (76-4766) for further instructions
- Provide emergency medical personnel with the (M)SDS for the toxic substance
- Always ensure that the victim receives medical attention, even if the exposure seems minor

EHSO is to be contacted for follow up after any work related chemical exposure

10.3.5 Power Failure

Supervisors should consider the consequences of prolonged loss of power to equipment, including refrigerators, freezers or other diagnostic equipment in each workspace. Any refrigerators or freezers containing flammable materials that require storage below room temperature must:

- Be connected to the backup power supply

Or

- Have an alternate refrigerator or freezer identified such that these materials can be transferred for continued safe storage
- Emergency procedures for such refrigerators/freezers should be posted on the refrigerator or freezer itself
- As well, in the event of a power failure, fume hood/biological safety cabinet ventilation may be lost or reduced. See Section 10.3.11

10.3.6 Domestic Water Interruption

In the event of a domestic water interruption:

- Notify local facilities or maintenance staff.
- Stop all work with or near hazardous materials until water is restored. Loss of water translates to inoperable emergency showers, eyewash stations and sinks.

10.3.7 Flooding

All personnel should be aware of the location of the water shutoff(s) for their work areas. All personnel should ensure that electrical plugs, power bars etc. are not stored directly on the floor for protection against flooding.

- Stop source of flood if possible (e.g. turn off tap, shut off water supply to the area etc.). If the source is unknown, contain flooding if possible.
- If the source of the flooding is unknown, the flood is uncontrollable, or damage is sustained, contact local facilities or Maintenance staff.
- If at any time you feel that your safety is being compromised, evacuate the area and immediately contact the Supervisor/Charge Technologist and Regional Manager (as applicable).

10.3.8 Chemical Spills

It is important that you respond to spills only if you are trained in proper spill response, are comfortable and confident in the proper procedures for cleaning up the spill, can clean up the spill safely and the spill is considered “incidental”.

See Section 12 for detailed information on training, spill kits, spill classification, response and reporting requirements.

10.3.9 Biological Spills

All biological spills will be handled in a safe manner, with the appropriate precautions in accordance with the local facility’s operating procedures. For further information, see the Shared Health Blood Borne Spill Clean Up procedure 70-20-12.

Having a pre-assembled biological spill kit on hand that contains all items needed to contain and clean up a spill will facilitate timely and effective spill response.

Spill Inside a Biological Safety Cabinet – refer to Clinical Microbiology Safety Manual 120-10-40 Section 2.7.3.3
Spill Inside a Centrifuge - refer to Clinical Microbiology Safety Manual 120-10-40 Section 2.7.3.3

10.3.10 Natural Gas Leak

All personnel should be aware of whether or not their work area is supplied with natural gas, and if so where shutoff(s) are located for the area so that it can be turned off in the event of a leak. If a natural gas leak is suspected:

- Turn off the gas supply, if accessible
- Evacuate the area
- Notify building occupants (may involve activating the evacuation alarm)
- Notify the local facilities or maintenance staff
- Contact the Supervisor/Charge Technologist and Regional Manager (as applicable)

10.3.11 Fume Hood/Biosafety Cabinet Malfunction

In the event that fume hoods or Biosafety cabinets become non-functional or when the alarm sounds:

- Stop conducting any work requiring fume hood/Biosafety cabinet ventilation
- Ensure that all containers in the fume hood/Biosafety cabinet are capped/sealed appropriately
- Close sash
- Notify other personnel of the malfunction
- Contact supervisor and facilities or maintenance staff
- If an odour begins to accumulate, all personnel are to evacuate the area until ventilation is restored
- If a hazardous leak of chemical, vapours or biohazardous aerosols has resulted, activate the evacuation alarm and evacuate the building

10.3.12 Moving of Patients during Evacuations (Code Green)

Code green events are few and far between, but all staff must be able to attend to patients if an event occurs. Any time that a code green event is announced, all staff will ensure that all patients in the area are attended to immediately.

- If a treatment procedure is taking place, discontinue the procedure and prepare to evacuate the patient.
- In a confident tone, ensure that you communicate to the patient the issue at hand.
- Ensure that the patient understands what is going on and leave the area along with the patient to the nearest exit or designated collection area.
- If a patient is ambulatory, walk with the patient to the nearest collection point.

- If the patient is bedridden, ensure that two staff move the patient to the nearest collection point and have one staff person wait with the bedridden patient.
- **Never leave a patient alone.**
- **In all cases, follow the local facility code GREEN guidelines.**

10.3.13 Emergency Notification of Staff with Disabilities

There is a real danger of staff with a disability will be forgotten or not involved in emergency drills and procedures due to their impairment. Supervisors are to ensure that any staff person with a disability is involved with all emergency drills and planning. This involvement is crucial to the disabled staff person. Any staff member that is disabled in any fashion will ensure that they notify the Supervisor/Charge technologist so that proper planning for evacuation can take place. Supervisors/Charge Technologists must ensure that a person is assigned to "buddy up" with the disabled person in the event of alarm so that proper assistance can be given to the person with the disability. The disabled staff person is responsible to ensure that they follow all emergency direction given by the "buddy" to ensure that they are removed from the emergency situation.

Section 11 - Fire Safety

Fire is a very possible emergency situation that can occur in the workplace. It is imperative that all reasonable precautions are taken to ensure that fires are prevented and that there is an understanding of the types of fires, how fires begin, how they are sustained and how they are controlled. Ensure that the local fire department is well acquainted with the workplace, and the hazards present. As a MANQAP requirement, the local fire safety plan (CODE RED) as well as fire extinguisher training shall take place annually with all staff. (For compliance with this requirement, please review the computer based *Fire Safety Training*, located in MEDIALAB 70-70-09.)

11.1 Emergency Planning

All workplaces must comply with all applicable sections of the Manitoba Fire Code including having a fire safety plan (MFC Section 2.8). This type of plan can be used as the basis for developing all emergency plans. The following points must be part of a fire safety emergency plan:

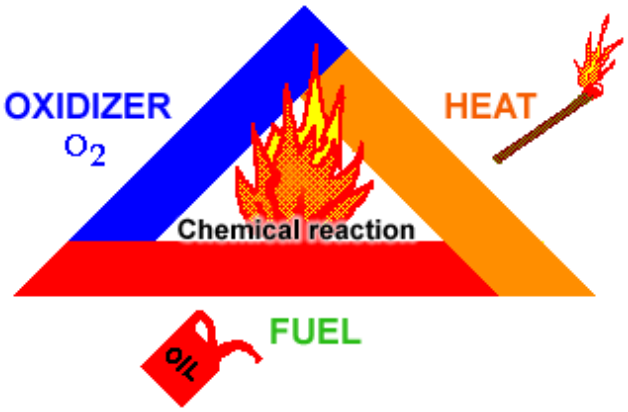
- All personnel must be trained on the proper procedures for when a fire occurs, including how to contact the fire department, and how to use fire extinguishers.
- An evacuation plan, to be followed when the alarm sounds, should be created, instructed to all personnel, and clearly posted on all floors.
- The location, type, and operation of all fire emergency systems should be outlined in a document with diagrams.
- Supervisory staff should be designated and trained for special fire safety duties.
- Special arrangements for the assisted evacuation of physically challenged persons should be made (see Emergency Notification of Staff with Disabilities).
- Fire drills should be performed as often as outlined in the Manitoba Fire Code (section 5.5.3.1)
  - A minimum of once every 3 months for laboratories
  - False alarms can also be used as a drill. Ensure that you record the date, time and staff involved in each event and maintain that information with your safety files. (A *Fire Drill Log* is available at F70-10-10.)

- Sprinklers, fire extinguishers, and other fire suppression tools should be present, *and should be compatible with the chemicals used and stored in the workplace* (i.e. water sprinkler systems should not be present in areas where water reactive chemicals are used and stored). Ensure good working order of all fire suppression tools. Only staffs that are trained in the use of fire suppression tools should use them.
- Local authorities should regularly inspect automatic sprinklers, fire extinguishers, and outdoor fire hydrants.
- An emergency safety shower should be easily accessible (reachable within 10 seconds), and can be used to extinguish personnel who have caught fire. Fire blankets can also be made available for staff use.
- All fire drills shall be documented with the time of alarm, date and staff in attendance. These documents must be available in the work area for inspection as requested.

11.2 Fire Triangle

Fire can be described using the fire triangle

Figure B – Fire safety triangle



Fire cannot begin or be sustained without the three ingredients pictured above and therefore the removal of any one of these items leads to the basis of fire control

11.3 Classes of Fires and Extinguishers

There are five main classifications of fire:

Fire Extinguisher Fire Type		
 	Combustible materials such as wood, paper, cloth, and some plastics.	Pressurized water, foam, or multipurpose dry chemical (ABC-rated) ***(Green)***
 	Flammable or combustible liquids, fats or grease	Foam carbon dioxide, ordinary (BC-rated) dry chemical, multipurpose dry chemical (ABC-rated) or halon/halotron (***Red)***
 	Energized electrical equipment	Carbon dioxide, ordinary (BC-rated) dry chemical, multi-purpose dry chemical (ABC-rated) or halon/halotron (***Blue)***
 	Combustible metals, sodium, potassium	Specially designated dry powder extinguishing agents ***(Yellow)***
 	Cooking Oils and Fats	Foam carbon dioxide, ordinary (BC-rated) dry chemical, multipurpose dry chemical (ABC-rated) or halon/halotron (Red)

11.3.1 Fire Procedures

Fight the fire only if you are trained to do so and safety to do so, are familiar with firefighting techniques, equipment, and procedures.

Always account for chemical compatibility when extinguishing any fire. **Some information about firefighting can be found on the chemical's SDS.** Choosing the wrong extinguisher can make the fire worse. When pre-planning, contact your EHSO, Safety Officer or local fire authority for assistance with your extinguisher selection.

Do not use a fire extinguisher not suited for the specific type of fire (e.g. do not use an ordinary (BC-rated) dry chemical extinguisher on a class A fire.

Ensure that all extinguishers are maintained in accordance with Manitoba Fire Code Section 6.2.

If a fire condition exists, have someone notify the local fire department and activate the local fire protocols **(Code Red).**

The type of fire extinguisher used to control the fire is dependent on the type of fire itself. Extinguishers are rated A, B, C, and D or combinations thereof. Each work area should have access to an ABC rated extinguisher. All work areas using combustible metals are to have a D rated extinguisher.

Fire extinguishers should be conspicuously located with additional signage to prominently display the location of the extinguisher. Fire extinguishers should be located near the exit(s) of the laboratories and DI areas, be unobstructed and easily accessible at all times.

Any use of a fire extinguisher must immediately be reported to local Fire Prevention or Maintenance Services so that the extinguisher can be recharged or replaced. An appropriate notification to the Supervisor, Regional Director and EHSO is also required.

11.4 Maintenance and Inspection of Fire Extinguishers

Fire extinguishers are to be maintained and inspected in accordance with the Manitoba Fire Code section 6.2 and National Fire Protection Association (NFPA) 10, ***Portable Fire Extinguishers***. Local facilities are responsible for annual inspections of fire extinguishers. While the work area supervisor is to ensure that monthly checks are performed, the responsibility for performing these monthly checks may vary depending on departmental and facility policies. Monthly fire extinguisher inspection forms can be found on Intelex:

- *Monthly Fire Extinguisher Inspection Procedure and Maintenance Log - ABC* 70-10-26,
- *Monthly Fire Extinguisher Inspection Procedure and Maintenance Log - CO2* 70-10-27,
- *Monthly Fire Extinguisher Inspection Procedure and Maintenance Log – Water*, 70-10-28.

Documented monthly checks are required to ensure that:

- the location of the fire extinguisher is conspicuous
- the unit does not appear or feel empty
- the locking pin is intact and sealed
- the pressure is within the correct range, if a pressure gauge is present
- there is no obvious physical damage, corrosion or leakage
- the nozzle is not clogged or leaking; and
- the area around the fire extinguisher is clear of obstructions

Any deficiencies are to be reported the local Supervisor or Charge Technologist

Section 12 - Chemical Spill Prevention and Preparedness

Prevention of chemical spills is the most important aspect of a chemical spill response program. However all personnel should be trained in spill cleanup procedures and be prepared to respond should a spill occur, following the site specific Code Brown procedures.

12.1 Training

It is the responsibility of the supervisor to ensure that lab personnel are trained in appropriate chemical spill response specific to the chemicals contained within their work area. Training should be documented and refreshed on at least an annual basis. If assistance is required, please contact the EHSO.

12.2 Spill Kits

Each work area using hazardous chemical materials shall have easy access to a chemical spill kit that is prominently located, readily visible and identifiable. A spill kit may be shared between work areas, provided that all personnel are aware of its location and it is easily accessible at all times. Exact contents of a spill kit should be based on the hazardous properties of the materials present. **Table 6** lists the recommended minimal requirements for spill kits.

Table 6 – Minimum Requirements for Chemical Spill Kits

Item	Characteristics and/or Recommended Quality
Universal Chemical Absorbent Pads and/or Universal Chemical Absorbent Powder (silica free)	• High absorption capacity • Chemically inert • Good for all chemicals -Acids, including hydrofluoric acid -Bases -Flammable liquids -Formaldehyde -Organic peroxides
Plastic Scoop	▪ Polypropylene
Large Polyethylene Bags	▪ Strong composition ▪ Leak proof ▪ To be used as pail liners
Gloves	▪ Nitrile/Silver shield combination preferred ▪ At least 2 pairs
Chemical Goggles	▪ Splash resistant ▪ At least 2 pairs
20 L Plastic Pail with Lid	▪ Labelled as “SPILL KIT” ▪ To contain spill equipment ▪ When emptied to be used as disposal container for contaminated absorbents ▪ Leak proof
Plastic Dust Pan and Broom	▪ Polypropylene bristles

Other items to you may want to add to your chemical spill kit, depending on the hazards present in the lab are:

- disposable Tyvek® suits; protective shoe covers
- synthetic rubber aprons;
- duct tape;
- pH paper;
- hazardous waste tags;
- specific neutralization mixtures and
- appropriate sized respirators with Multi Gas cartridges

When using acid or base neutralization mixtures, be prepared for heat generation and sputtering of the liquid.

Table 7 – Examples of Neutralization Mixtures Available for Spill Response

Neutralizer Type	Examples
Acid Neutralizers	▪ Sodium bicarbonate ▪ Neutrasorb (colour change once neutralized) ▪ Spill XA ▪ Calcium carbonate (for hydrofluoric acid spills)
Caustic Neutralizers	▪ Citric acid powder ▪ Neutracit 2 (colour change once neutralized) ▪ Spill XC
Solvent Neutralizers (reduce vapours and increase flashpoint)	▪ Activated charcoal ▪ Solusorb ▪ Spil lXS ▪ Spilfyter vapour suppressor kit

If mercury or mercury compounds are present in the work area (including mercury in thermometers), a mercury spill kit shall be available. Table 8 lists the recommended contents for a mercury spill kit. Where possible, it is suggested that mercury containing devices be removed and replaced with devices that do not contain mercury.

Table 8 – Mercury Spill Kit Contents

Item	Characteristics and/or Recommended Quality
Sulphur powder or commercially available mercury amalgamation powder	▪ Effectively amalgamates mercury and suppresses vapours
Mercury vapour suppression spray	▪ Prevents further mercury vaporization
Mercury decontamination liquid, wipes or sponges	▪ For surface decontamination
Aspirator	▪ Could be a Pasteur pipette and bulb
Disposal container with lid	▪ Preferably plastic
Mercury indicator powder (optional)	▪ Indicates presence of mercury ▪ Good for suspected contamination issues and for use after clean-up

An inventory list must be included on/in spill kits to allow for easy inspection. Inspections should be performed at minimum quarterly during and documented on a year basis on the Spill Inventory Control sheet. Inspections should include verifying contents and ensuring that supplies are not expired and in good condition. An inventory control log is listed at F70-10-22.

12.3 Spill Classification

Complex spills – Complex spills are those which involve chemicals or quantities of materials in excess of those outlined in **Table 9**, and require further assistance for cleanup (**Code Brown**):

Table 9 – Guidelines for the Classification of a Complex Spill

Material	Quantity
Air and water reactive materials	Any quantity
Flammable liquids	Greater than 4 L
Combustible liquids	Greater than 4 L
Non - flammable organic liquids	Greater than 4 L
Concentrated acids	Liquids greater than 1 L Solids greater than 1 kg
Concentrated bases and alkalis	Liquids greater than 1 L Solids greater than 1 kg
Mercury	Greater than 30 mL
Oxidizers	Liquids greater than 1 L Solids greater than 500 g

Highly toxic, highly malodorous materials (e.g. phenol, mercaptoethanol, hydrofluoric acid)	Liquids greater than 100 mL Solids greater than 50 g
Low hazard material	At the discretion of work area personnel
Compressed gas leaks	If the leak cannot be stopped by closing the valve on the gas cylinder.
Radioactive materials	See Radiation Safety Guide for proper procedures for radioactive spill response.
Formaldehyde	Greater than 500 ml

The above table provides guidelines for quantities only. Other considerations for classifying a spill as complex include whether or not respiratory protection is required and whether any personal injuries have been sustained. Work area personnel should never attempt to clean up a spill if they have not been trained in the proper chemical spill response or are unsure of the proper procedures.

Incidental Spills – These are minor spills not meeting the requirements of a complex spill that can be responded to by trained work area personnel.

12.4 Spill Response

Complex Spill Response

Evacuate the work area, close doors, restrict the area, and notify others in the area of the spill.

Contact the facility operator, or utilize the overhead paging system to call for a **"Code BROWN"**, giving the location, type and quantity of spill

If safe to do so:

- Attend to injured or contaminated personnel.
- If a flammable material is involved, turn off ignition sources (i.e. shut off power to area, turn off Bunsen burners, etc.).
- Restrict or contain the flow of the spilled liquids.
- Activate emergency alarm if there is an immediate risk to the safety of other people in the building.
- Be available to provide technical information to emergency responders' e.g. chemical identity, SDS, identity of other equipment and hazardous materials in the lab.

If it is a complex mercury spill, note that regular vacuum cleaners shall not be used for cleanup of mercury in any situation as they will create harmful mercury vapours.

Incidental Spill Response

- Attend to injured or contaminated personnel.
- If a flammable material is involved, turn off ignition sources.
- Restrict the area and notify others in the lab of the spill.
- Select and don all appropriate PPE. It is essential to properly protect yourself.

Promptly attend to the spill according to Table 10. If unsure of the proper clean up procedure, contact your supervisor and the SDS for guidance. The EHSO is also available to provide guidance.

Table 10 – Response Procedures for Incidental Chemical Spills

Material	Procedure
Acids, liquid	▪ If available, neutralize with sodium bicarbonate or commercially available acid neutralizer working from the outside in. ▪ Using scoop, mix thoroughly to ensure neutralization. ▪ pH paper can be used to test completeness of neutralization. Commercial neutralizers often change colour to indicate neutralization. ▪ Add more neutralizer if necessary. ▪ Proceed as per general liquid spill clean-up.
Caustics, liquid	▪ If available, neutralize with citric acid or commercially available caustic neutralizer, working from the outside in. ▪ Using scoop, mix thoroughly to ensure neutralization. ▪ pH paper can be used to test completeness of neutralization. Commercial neutralizers often change colour to indicate neutralization. ▪ Add more neutralizer if necessary. ▪ Proceed as per general liquid spill cleanup.
Solvents	▪ If available, suppress vapours with activated charcoal or commercially available solvent neutralizer working from the outside in. ▪ Using scoop, mix thoroughly. ▪ Proceed as per general liquid spill cleanup.
General liquids	▪ Encircle with universal chemical absorbent pads, socks or powder. ▪ Cover the spill with universal chemical absorbent pads or powder. ▪ Allow liquid to be absorbed. ▪ Once absorbed, transfer to garbage bags using scoop and/or dust pan if necessary. ▪ Label bag appropriately with hazardous waste disposal tag and complete hazardous waste disposal form.
Mercury	▪ Contain the spill. ▪ If available, spray mercury suppression spray into immediate air space. ▪ Push all mercury beads together. (do not use bare hands – contamination issue) ▪ Using the aspirator, transfer mercury beads to plastic disposal container. ▪ Label disposal container appropriately with hazardous waste disposal tag and complete local hazardous waste disposal form. ▪ Cover spill area with mercury amalgamation powder. ▪ Allow mercury amalgamation powder/mercury spill to solidify (form amalgam). ▪ Use dust pan and broom or scoop to transfer amalgam into disposal container. ▪ Decontaminate area with mercury decontamination liquid, wipes or sponges. ▪ Transfer all wipes, sponges, gloves etc. used in cleanup to plastic bag, label with hazardous waste disposal tag and complete local hazardous

Material	Procedure
	waste disposal form.
General solids	▪ If there is concern about harmful dust generation, encircle and cover the spill with universal chemical absorbent powder. ▪ Transfer to garbage bags using scoop and/or broom and dust pan. ▪ Label bag with hazardous waste disposal tag; complete local hazardous waste disposal form.
Compressed Gas/Cryogenic Liquid Leaks	▪ Turn off cylinder valve. ▪ If possible transfer cylinder to fume hood. ▪ Check for leaks using a non-reactive detergent solution or commercial leak detection solution. If leak is obvious omit this step. ▪ If leak continues, and gas is inert, evacuate lab and surrounding area and treat as a complex spill. If gas is toxic, flammable or corrosive, activate the emergency alarm, evacuate the building and treat as a complex spill. ▪ N.B. Depending on the room size and the amount of gas, an oxygen deficient atmosphere may develop. Take particular care to ensure your safety.
Hydrofluoric Acid (as applicable)	▪ Ensure protective clothing including an appropriate respirator is worn and that the HF antidote is readily available. ▪ Slowly apply solid calcium carbonate working from the outside in. ▪ After the acid is absorbed, mix thoroughly with plastic scoop to ensure neutralization. ▪ Use pH paper to test completeness of neutralization. ▪ Add more neutralizer if necessary. ▪ Proceed as per general liquid spill cleanup.
Formaldehyde	▪ Ensure that an appropriate respirator is donned. ▪ Contain the spill. ▪ Neutralize contaminated area using Polyform F at a 1:1 ratio. Let stand for 20 minutes. ▪ Transfer to garbage bags using scoop and/or broom and dust pan. ▪ Label bag with hazardous waste disposal tag; complete local hazardous waste disposal form. ▪ Wash area with soapy water.

For specific information on spill response, please refer to the Spill response procedures contained within the Health & Safety Section of Intelex:

70-40-05 Spill Clean Up – Acid
70-40-06 Spill Clean Up - Base
70-40-07 Spill Clean Up - Solvents
70-40-08 Spill Clean Up - Formalin

Section 13 - Fume Hoods and Biological Safety Cabinets

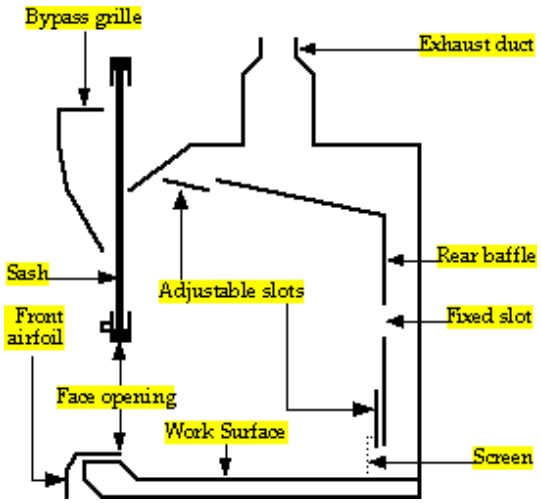
Fume hoods and biological containment cabinets are critical pieces of laboratory equipment and, if used and maintained properly, are the most common and effective engineering controls in place to protect laboratory personnel against exposure to hazardous materials.

13.1 Chemical Fume Hoods

All work involving hazardous chemicals should be performed within an appropriate chemical fume hood or ventilation system. Below is a diagram of a typical fume hood system. See Figure 1.

A typical fume hood is a cabinet with a moveable front sash (window) made out of safety glass. A properly used and properly functioning fume hood exhausts hazardous gases, dusts, mists, and vapors from a confined location and helps protect workers from inhalation exposure.

Figure 1 – Diagram of typical fume hood system



All ventilation systems should be engineer-designed. The following points should be noted when choosing a new ventilation system, or when determining if current ventilation systems are adequate:

Local exhaust systems are preferred over general dilution. They allow less contaminant to be released into the work area. General dilution should only be used when local exhaust systems are not practical. Operational costs for general dilution are usually much higher

Ventilation systems should be evaluated regularly to ensure their effectiveness. Testing of the units should be carried out as per the manufacturer's recommended testing schedule, or the applicable standards of the province. **All ventilation and exhaust systems must be checked regularly (Preventative Maintenance Program), serviced and certified annually.**

General Dilution

Exhaust intakes should be placed near the point of contamination if possible.

Air supply and exhaust systems should be placed so that airflow moves from the supply, past the worker, through the zone of contamination, and into the exhaust. This orientation will reduce the amount of chemicals that can enter the worker's breathing zone.

Outlets discharging exhaust should be far away from any outside air intakes or windows. Exhaust should be discharged high above the roofline. The recirculation of contaminated air must be prevented.

Local Exhaust Systems

A contaminant's point of entry into a local exhaust system is known as a *hood.* Two types of hoods exist: enclosing and exterior. Enclosing hood systems completely or partially enclose the process or source of contamination. Exterior hoods are located adjacent to the source of contamination and do not enclose it. Enclosing hoods are more effective at removing contaminant, and should be used whenever feasible. Enclose a process releasing hazardous chemicals as much as possible.

The hood should be oriented so that contaminated air is removed close to the point of release. Do not place the hood near the floor assuming the contaminant is "heavier than air."

Contaminated air should be drawn away from the individual, rather than past the individual's breathing area.

Ventilation airflow should be sufficiently high as to effectively remove the contaminant. This will depend on many factors, including the speed at which the contaminant is released, the physical properties of the chemical, and the motion of the surrounding air. Commonly used airflows, like those used in chemical laboratories, are 80-120 fpm (feet per minute). For prevention of fire, the Manitoba Fire Code requires an exhaust rate of at least 18 cubic metres per hour per square metre of room area, with a minimum of 250 cubic meters per hour. Prevention of toxic exposure may require higher airflow rates. Your ventilation rate must be sufficiently high to reduce the exposure down to the action level (50 percent of the OEL) for that chemical.

Ventilation systems must be constructed of compatible materials. Some chemicals, such as perchloric acid, require a special dedicated fume hood.

Strong air currents (cross currents) can disrupt the movement of air into the hood, and should therefore be eliminated or minimized. Common sources of cross currents include freestanding fans, open windows and doors, and poorly placed supply air ducts.

The recirculation of contaminated air **must** be prevented.

Ensure the ventilation system is working properly before each use.

All ventilation and exhaust systems must be checked regularly (Preventative Maintenance Program), serviced and certified annually. This includes inspection of pulleys, belts, alignment, flexible connections, dampers and operation of the fan as well as greasing of fan and motor bearings as applicable. Parts are replaced as required.

If a problem with fume hood ventilation is identified, contact your local supervisor.

13.3 Proper Use of Fume Hoods

Chemical fume hoods are the primary source of protection against hazardous materials. In order for these critical pieces of equipment to be effective, the user is to:

- Ensure the ventilation exhaust system is operational and that the face velocity is acceptable for the intended use
- Minimize the sash opening for maximum protection
- Avoid storing chemicals/equipment in the fume hood/cabinet as this restricts the air flow
- Flammable solvents/reagents are not to be stored in the fume hood/cabinet
- Avoid blocking the baffle(s); place equipment upon legs if possible to maintain effective airflow
- Work a minimum of 10 cm into the fume hood/cabinet
- Never work in a fume hood/cabinet that is in alarm
- Have an indication of the performance of the fume hood/cabinet, e.g. a continuous flow meter, alarm etc.
- Ensure that all waste, reagents, solvents and samples are sealed when not being used
- Ensure that all permanent equipment is mounted appropriately
- Ensure that all electrical connections are outside of the fume hood/cabinet
- Ensure that the fume hood/cabinet is kept clean, uncluttered and tidy
- Ensure that sinks are protected from chemical spills, i.e. that in the event of a spill, it cannot go down the drain
- Always close the sash when not in use

Some ventilation systems within Shared Health are designed such that the exhaust will be reduced if sensors indicate that there is no use, i.e. all the sashes are closed, or after a specified time. While this is an important energy conserving initiative, it requires the participation of the fume hood users to be safe and successful. Closing the fume hood sash is critical for this system to work. As well, it is critical that no one mistakenly works in a fume hood that has had its exhaust ventilation reduced. ***These units must be certified by an accredited agency on an annual basis. Documentation must be maintained and affixed to the equipment's exterior.***

13.2 Biological Safety Cabinets

Biological Safety cabinets are designed to protect people and the environment from contamination by microorganisms as well as prevent contamination of the samples/cultures within the cabinet. The units have high efficiency particulate air (HEPA) filters to clean the supply and exhaust air. ***These units must be certified by an accredited agency on an annual basis. Documentation must be maintained and affixed to the BSC exterior.***

Generally, biological containment cabinets should not be used for chemicals as they may have lower face velocities, recirculate the air within the cabinet leading to potential of vapour accumulation, and consist of filters that are not suitable for the collection of chemical vapours.

Please refer to Shared Health Biological Safety Cabinet Operation and Maintenance 100-10-44 for detailed information regarding the operation and proper use of BSCs.

Section 14 - Specific Chemical Hazards

All chemicals used in the Shared Health laboratories and DI areas should be used with the utmost caution according to best practices. There are certain chemicals or classes of chemicals, however that require specific handling precautions that are described briefly in the following sections. It is beyond the scope of this manual to address the hazards and precautions of all of the chemicals that may be found in the Shared Health work areas as well as delve into the details of the hazards of the chemicals mentioned. For further information regarding the toxicity, safe handling and use of specific chemicals, the appropriate SDS or references such as the following should be consulted:

- NIOSH Pocket Guide to Chemical Hazards, https://www.cdc.gov/niosh/npg/
- Bretherick's Handbook of Reactive Chemical Hazards https://www.elsevier.com/books/brethericks-handbook-of-reactive-chemical-hazards/urben/978-0-12-372563-9

14.1 Flammables

Flammable materials present a serious hazard to all personnel. Steps are to be taken to ensure appropriate use, handling and storage

- Ensure containers are grounded appropriately when transferring liquid from one container to another
- Ensure that potential ignition sources are identified and removed from the area surrounding the flammable material

Work areas that store, use or handle flammable or combustible liquids are to conform to section 4.1.1.1 (4) and Section 5.5 “Laboratories” of the Manitoba Fire Code. See section 15.4 for more information

Note that due to the highly flammable nature of diethyl ether, diethyl ether extractions are to be performed only in facilities with additional fire suppression systems and ventilation, as well as intrinsically safe wiring.

14.2 Oxidizers

Oxidizers are capable of igniting flammable and combustible material even in oxygen deficient atmospheres as well as increasing the intensity of a fire by adding to the oxygen supply and causing ignition and rapid burning of normally non-flammable materials. Oxidizers can also:

- React with other chemicals, causing a release of toxic gases
- Decompose and liberate toxic gases when heated
- Burn or irritate skin, eyes, breathing passages and other tissues

14.2.1 Solids

Solid oxidizing agents have the ability to form explosive mixtures with common materials such as sugar, charcoal, starch, sawdust and sulphuric acid. Examples of solid oxidizers include metallic:

- chlorates;
- perchlorates; (these are especially dangerous and their use should be avoided)
- nitrates;
- chromates; and
- Permanganates

14.2.2 Liquids

Liquid oxidizers are often strong acids as well, making them powerful corrosives. Examples include:

- *Perchloric acid*. Use of perchloric acid should be avoided if possible. If its use is necessary, it must be done by personnel trained in specific handling procedures. Work involving concentrated perchloric acid is to be performed in specialized, dedicated chemical fume hoods. Note that anhydrous perchloric acid and perchlorate crystals which may form around the cap of the container are shock sensitive explosives.
- *Nitric acid*
- *Chromic acid*
- *Sulphuric acid*

Personal protective equipment when working with these compounds should include a face shield, goggles, synthetic rubber apron, lab coat and synthetic rubber gloves.

14.2.3 Use of Oxidizers

When using or storing oxidizers in the laboratory, the following precautions to take include the following:

- Keep away from flammable and combustible materials
- Keep containers tightly closed unless otherwise indicated by the supplier
- Store strong oxidizers in inert, unbreakable containers. The use of corks or rubber stoppers is not permitted
- Mix and dilute according to the supplier's instructions
- Dilute with water to reduce the reactivity of solutions
- Wear appropriate personal protective equipment
- Ensure that oxidizers are compatible with other oxidizers in the same storage area
- Reaction vessels containing oxidizers shall not be heated with oil baths

14.2.4 Peroxygen Compounds

These are chemically unstable compounds including peroxides, hydroperoxides, and peroxyesters that are violently reactive to oxygen. Some peroxygen compounds decompose slowly at room temperature, but rapidly at elevated temperatures. However, others decompose readily at room temperature and therefore must be refrigerated. Organic peroxides can violently explode when subjected to heat, friction, shock, spark, oxidizing and reducing agents or light. These compounds are very difficult to control in a fire due to their ability to generate their own oxygen upon combustion. Peroxygen compounds can seriously irritate the skin and eyes upon contact.

- Special consideration should be taken when using any compounds that have the capability of forming peroxides. The following are compound types that can be expected to form peroxides upon prolonged exposure to light or air:
- Ethers
- Aldehydes, ketones
- Compounds containing benzyllic, or allylic hydrogens
- Compounds with a vinyl or vinylidene group

The following is a partial list of compounds that will form peroxides and create a significant peroxide hazard on concentration:

Table # 11 Peroxide formation

Acetyl	p-Dioxane
Cumene	Divinyl acetylene
Cyclohexane	Ethylene glycol dimethyl ether
Cylclooctene	Isopropyl ether
Cyclopentane	Methyl acetylene
Cyclopentene	Methyl cyclopentane
Decahydronaphthalene (Decalin)	Methyl i-butyl ketone
Diacetylene	Tetrahydrofuran (THF)
Dicyclopentadiene	Tetrahydronaphthalene (Tetralin)
Diethylene glycol dimethyl ether (Diglyme)	Vinyl ethers
Diethyl ether	Vinylidene
Di-isopropyl ether	Vinylidene chloride

14.2.4.1 Use, Handling and Storage of Peroxygen Compounds

Specific precautions to take when using, handling and storing peroxygen or peroxide forming compounds include the following:

- Purchase and use only the minimum amount required
- Mark the receipt date on the container
- Mark the date the container was opened on the container
- Dilute solutions with inert solvents such as aliphatic hydrocarbons. Avoid the use of aromatic solvents, such as toluene, which can initiate the decomposition of some peroxides
- Avoid preparing peroxide solutions with volatile solvents as losses of solvent due to evaporation can cause unwanted concentration of peroxides

- Dispense quantities as required. Do not return unused materials to stock container
- Do not use metal spatulas
- Do not use glass containers with ground glass or metal lids. Use polyethylene containers with screw cap lids
- Store and use away from heat, ignition sources and light
- Store at the lowest temperature that is above the freezing point of the solution and that will not affect the solubility of solution. This will minimize the rate of decomposition of the peroxides
- Dispose after one month of the container being opened or if unopened, by the expiry date
- Treat any visible solids around the cap or in the container of peroxygen or peroxide forming liquids with extreme caution as they could be explosive
- Ensure that solutions are free of peroxides before concentration using the tests described below
- If concentration is necessary, avoid evaporating to dryness
- Use a shield when evaporating or distilling any peroxide forming compounds

14.2.4.2 Testing for Peroxides

Commercially available peroxide test strips can be purchased from laboratory supply companies. These allow a simple and quick determination of whether peroxides are present in a solution

Alternatively the following colourimetric test can be performed

Step 1 Prepare a 5 % (w/v) potassium iodide or sodium iodide aqueous solution. (5 g of KI or NaI per 100 mL of water)

Step 2 Add a couple of drops of iodide solution prepared above to ~ 2 mL of glacial acetic acid

Step 3 Add ~ 2 mL of the solution in question to the ~ 2 mL of glacial acetic acid/iodide solution

Step 4 Yellow indicates a low concentration of peroxide (<0.01 %). Brown indicates a high/hazardous concentration of peroxide (> 0.01%)

Note that this test method **should not** be applied to solutions that may contain inorganic peroxides.

14.3 Corrosives

Corrosive chemicals are commonly found in laboratories as solids, liquids and gases. These materials have the ability to damage tissue at the site of contact.

14.3.1 Corrosive Liquids

Corrosive liquids can be particularly hazardous as they act rapidly upon contact. Examples of common corrosive liquids are:

- Strong acids (chromic acid, hydrochloric acid, nitric acid, etc. Hydrofluoric acid may be fatal through inhalation, absorption or ingestion and causes extensive, deep and painful burns. ***Avoid use if possible***.)
- Strong bases (aqueous sodium hydroxide, potassium hydroxide, ammonia, etc.)
- Strong dehydrating agents (phosphorus pentoxide, calcium oxide, etc.)
- Strong oxidizing agents (peroxides, etc.)

14.3.2 Corrosive Solids

Inhalation of corrosive dusts presents a particular hazard as the point of contact and the tissue at risk, particularly the airways and lungs, is internal, creating an injury that may be difficult to treat and heal. Examples of corrosive solids are lithium oxide, sodium sulphide and phenol.

14.3.3 Corrosive Gases

Corrosive gases enter the body through inhalation as well as being readily absorbed through dissolution in skin and eye moisture. Typical examples are listed below:

- Ammonia
- Hydrogen chloride
- Hydrogen fluoride – inhalation, absorption or ingestion may be fatal. Causes extensive, deep and painful burns. ***Avoid use if possible***, however if its use is unavoidable, personnel are to be specifically trained in its use and emergency response procedures and have immediate access to calcium gluconate gel. Contact EHSO for more information.
- Formaldehyde
- Bromine
- Chlorine
- Phosgene
- Sulphur Dioxide

14.3.4 Use and Handling of Corrosives

Specific precautions to take when using or handling corrosive materials include the following:

Ensure that acids are always added to water and not vice versa

Be prepared for heat generation upon diluting or dissolving in water

Ensure that all work is completed in a chemical fume hood with adequate ventilation

Personal protective equipment is to include:

- Lab coat
- Goggles
- appropriate gloves

- when working with volumes greater than 4L, a synthetic rubber apron

14.4 Highly Reactive Materials

Reactive materials are used for various purposes in the lab, often because of their reactive properties. Particular care must be taken to ensure the safe handling, use and storage of these sensitive chemicals.

14.4.1 Water Reactives

The following situations may occur with water reactive chemicals upon contact with water:

- Liberation of heat (causing potential ignition of the chemical itself or nearby flammable material)
- Release of flammable, toxic, or oxidizing gas
- Release of metal oxide fumes (applicable to water reactive metals)
- Formation of corrosive acids

Table # 12 Examples of water reactive materials include:

Alkali metals including lithium, sodium and potassium	Alkylaluminums including triethylaluminum
Silanes	Magnesium
Aluminum chloride	Phosphorus
Phosphorus pentachloride	Phosphorus pentasulphide
Lithium aluminum hydride	Aluminum chloride
Ferrous sulphide	Maleic anhydride
Sodium borohydride	Acetyl chloride
Chlorosulphonic acid	Phosphoryl trichloride
Silicon tetrachloride	Stannic chloride
Sulphur chloride	Sulphuryl chloride
Thionyl chloride	Titanium tetrachloride.

Care must be taken to ensure that water reactive chemicals are handled and stored away from sinks, water baths or other sources of moisture

14.4.2 Pyrophorics

Pyrophoric chemicals are those which ignite spontaneously upon contact with air. Pyrophorics must be handled within glove boxes and stored in such a way as to prevent exposure to air, e.g. storage under an inert gas or under kerosene

Table #13 Examples of Pyrophorics include:

Boron	Chromium*
Calcium*	Diborane
Cobalt*	Diethylzinc
Dichloroborane	2-Furaldehyde
Iron*	Lead*
Manganese*	Nickel*
Phosphorus*	Phosphine
Cadmium*	Titanium*

Finely divided metals form a pyrophoric hazard.

14.4.3 Explosives

Explosives are regulated by the Canadian Explosives Act and corresponding regulations along with the Manitoba Fire Code. Specific requirements when handling explosives are described below:

- Storage locations for explosive materials are to be placarded in accordance with the Canadian Explosives Act.
- Quantities of explosive materials are to be minimized with all additional material disposed of upon completion of the activity.
- Written safety instructions and emergency procedures are to be prepared and must include at least the following information:
    - location of storage and use areas
    - methods to control a fire emergency safely and efficiently
    - contact information

14.4.3.1 Picric Acid

Picric acid (2,4,6-trinitrophenol) is a reagent once found in many Shared Health labs being used in microscopy and as a component in some biological specimen preserving solutions. When dehydrated, picric acid itself is a dangerous explosive. When in contact with metal, highly shock sensitive picrate salts can be formed. The following guidelines are for the storage and handling of picric acid:

- Picric acid must be stored in water.
- Containers of picric acid are to be inspected at least every 6 months and distilled water added to the containers as necessary to ensure that the picric acid never dries out.
- Containers and lids for storage of picric acid or solutions of picric acid are not to be of metal construction.
- Metal spatulas are never to be used to remove material from its container.
- Always wipe the neck of the bottle, and the cap with a wet cloth before returning to storage.
- If a container of dry picric acid is discovered, it is not to be touched and EHSO is to be contacted immediately to arrange for safe disposal.

14.5 Cryogenic Materials

Cryogenics are very low temperature materials such as dry ice (CO2(s)), liquefied air, nitrogen, helium, oxygen, argon and neon. The following hazards are associated with the use of cryogenics:

- Asphyxiation due to displacement of oxygen (for materials other than liquefied air and oxygen).
- Freezing and fracturing of materials from extreme cold.
- Frostbite.
- Explosion due to pressure build up; and
- Condensation of oxygen and fuel, such as hydrogen or hydrocarbons, resulting in explosive mixtures.

The following are precautions for handling cryogenics:

- Control ice buildup.
- Use only approved low pressure containers equipped with pressure relief devices. Lunch box Thermos bottles are not acceptable.
- Protect skin and eyes from contact; wear eye protection and insulated gloves.
- Wear safety goggles when breaking large pieces of dry ice or using mixtures of dry ice and solvent.
- Wear a face shield when removing dry ice from condensers due to the possibility of rupture from pressure build-up.
- Use and store in well ventilated areas. Alarmed oxygen sensors are required in areas where the volume of gas could result in the displacement of oxygen to a level lower than what is tolerable by people, thereby causing an asphyxiation hazard.
- Keep away from sparks or flames.
- Use materials resistant to embrittlement (e.g. rubber tubing).
- Watches, rings, bracelets or other jewellery that could trap fluids against flesh should not be worn when handling cryogenic liquids.
- To prevent thermal expansion of contents and rupture of the vessel, ensure containers are not filled to more than 80% of capacity.
- Never store dry ice in a refrigerator/freezer (especially deep chest freezers). Dry ice will sublimate at -78°C and could asphyxiate the person opening the equipment.

For further information, please see Shared Health *Cryogenic Materials Policy* 70-10-06

14.6 Designated Substances

14.6.1 Mercury

Elemental mercury, inorganic mercury salts and organic mercury compounds have the potential to cause serious acute or chronic toxic effects from the various routes of exposure.

- Containers are to be stored sealed with the cap/lid along with electrical tape, parafilm or an equivalent.
- All use and storage is to be in a well ventilated area.
- Any skin or eye contact is to be rinsed with copious amounts of water and medical attention is to be sought immediately.

See section 12, Table 10 for spill clean-up procedure

Where possible, replace all mercury containing devices with safer alternatives

14.6.2 Isocyanates

Various isocyanates have been determined to cause severe allergic reactions in certain individuals. Sensitization may also occur such that the allergic reaction becomes progressively worse with each exposure and occurs with exposures to very small amounts of the material. Reactions may include anaphylactic shock which can be fatal and hence requires immediate medical treatment. All laboratories, solutions or samples containing isocyanates should be clearly marked as containing such. Where possible, replace these chemicals with safer alternatives.

14.6.3 Benzene

Benzene is a highly flammable, carcinogenic solvent that has severe effects on the blood and blood forming organs. All use of benzene should be performed in a fume hood. If practical, the use of benzene should be substituted with another appropriate solvent, such as toluene.

14.7 Other Toxic Materials

Some other chemical materials warrant mentioning specifically because of their hazards and/or extensive usage. Their primary hazards are identified below:

- Ethidium bromide – known mutagen.
- Chloroform – relatively potent anaesthetic, suspected carcinogen.
- Cyanides/Nitriles – acutely toxic. If use is unavoidable, personnel are to be specifically trained in its use and emergency response procedures and have immediate access to a cyanide exposure treatment kit. Contact the EHSO for more information.
- Hydrogen sulphide – acutely toxic. Attacks the respiratory system. Highly flammable
- Formalin/Formaldehyde – Confirmed carcinogen.

Section 15 - Compressed Gases

15.1 Hazards of Compressed Gases

Compressed gases are inherently hazardous due to the high pressure inside the cylinders. Knocking over an unsecured, uncapped cylinder of compressed gas can damage the cylinder valve resulting in a rapid release of gas that can transform a cylinder into an uncontrollable rocket or pinwheel and cause serious injury or damage. Poorly controlled release of compressed gas in the work areas can burst reaction vessels, cause leaks in equipment and hoses or result in runaway chemical reactions. Compressed gases may also have flammable, oxidizing, dangerously reactive, corrosive or toxic properties. Inert gases such as nitrogen, argon, helium and neon can displace air, reducing oxygen levels in poorly ventilated or restricted areas and cause asphyxiation. See Section 14.5 for information regarding cryogenic liquids.

15.2 Handling and Transport of Gas Cylinders

The following points describe safe handling and transport guidelines for gas cylinders

- Return unlabelled cylinders unopened to the supplier. Colour coding does not provide sufficient identification.
- When cylinders are not in use or are being transported, regulators are to be removed and the protective cap is to be attached.
- A cylinder cart is to be used for transporting cylinders. Cylinders are to be chained or strapped to the cart.
- Ensure that propane tanks designed for outdoor use are not stored or used indoors.
- Label empty cylinders clearly with either “EMPTY” or “MT”.
- Never bleed a cylinder completely empty; leave a residual pressure of at least 25 psi to prevent contamination or “suck back”.
- Do not lubricate regulators. The mixture of lubricant and oxidizing gases could be explosive.
- Do not expose cylinders to high temperature extremes.
- Do not force, lubricate or modify cylinder valves in any way.
- Cylinders containing flammable gases are to be grounded to prevent accumulation of electrostatic charge.
- Never expose skin or clothing to compressed gas flow as high velocity gas could penetrate the skin leading to serious injury.

To use a cylinder:

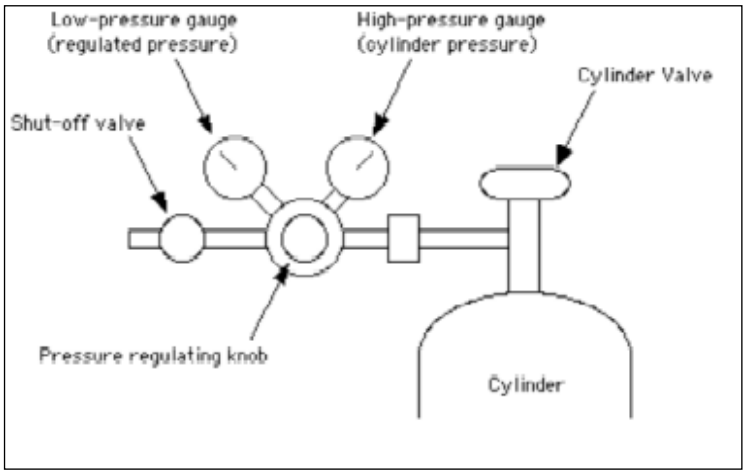
- Ensure the pressure regulating valve (adjusting screw) is closed.
- Open the cylinder valve slowly.
- Open the pressure regulating valve to the desired pressure.

To shut off the gas:

- Close the cylinder valve.
- Open the pressure regulating valve to relieve the pressure.

15.3 Regulators

Figure 2 – Schematic diagram of compressed gas cylinder and regulator



Verify that the regulator is appropriate for the gas being used and the pressure being delivered. Regulators are not universal and have to be chosen based on the gas and cylinder being used. Compressed Gas Association (CGA) connector numbers are to be the same on the regulator and cylinder valve

- Label all regulators appropriately and do not use interchangeably with different gases
- Do not rely upon the pressure gauge to indicate the maximum pressure ratings; check the regulator's specifications
- Do not use adaptors or Teflon tape to attach regulators to gas cylinders. Regulator inlet connections are designed to fit the outlet connection of the cylinder valve for a particular gas. Gas tight connections are made using metal to metal seals which can be weakened or plugged through the use of Teflon tape

For further information, please review ***Transport of Compressed Gas Cylinders*, 70-10-13**.

15.4 Leaks

See information regarding natural gas leaks in Section 10.3.10

15.5 Storage of Gas Cylinders

Storage of gas cylinders is regulated through the Manitoba Fire Code Section 5.5.5.3. Proper storage room/locations for compressed gas cylinders are available in each RHA facility that meets the requirements of the Fire Code. Only cylinders that are in use are to be located in the laboratories.

- Storage areas are to be conspicuously labelled as such.
- All gas cylinders are to be securely supported in an upright position using suitable racks, straps, chains or stands. Cylinders should be secured at ~⅔ of their height.
- All cylinders are to be protected from mechanical damage
- Cylinders of flammable gases are to be segregated from oxidizing gases (e.g. oxygen stored separately from hydrogen). See Table 14.
- Cylinders are to be well removed from doors, aisles, stairs and elevators

- Cylinders with a height of less than 46 cm can be secured in specialized racks.

15.5.1 Segregation of Gas Cylinders

As with other chemicals, certain compressed gases are incompatible with each other. The following table describes the segregation required for compressed gases

Table # 14 – Compressed gas segregation system

COMPRESSED GAS CYLINDER SEGREGATION AND STORAGE PLAN				
	Flammable compressed gases	Oxidizing compressed gases	Non-flammable Toxic compressed gases	Non-flammable, Non-Toxic compressed gases
Flammable compressed gases	Yes	No	No	Yes
Oxidizing compressed gases	No	Yes	Yes	Yes
Non flammable Toxic compressed gases	No	Yes	Yes	Yes
Non-flammable, Non-Toxic compressed gases	Yes	Yes	Yes	Yes

Table # 15 Table 14 colour explanation

Examples:	
Flammable compressed gases	methane, propane, acetylene, hydrogen
Oxidizing compressed gases	oxygen, bromine, chlorine
Non-flammable Toxic compressed gases	carbon monoxide, hydrogen sulphide
Non-flammable, Non-Toxic compressed gases	helium, nitrogen, air, carbon dioxide, argon

For further information, please see Shared Health *Management of Compressed Gas Cylinders 70-40-02*

Section 16 - Chemical Handling and Storage

Because of limited space, good housekeeping practices, waste disposal costs and the desire to minimize hazardous materials within the work areas, where possible, it is essential to procure only what is needed in terms of reagents, solvents, etc. rather than buying in bulk where possible.

16.1 Chemical Inventory

All chemicals in every work area should be accounted for annually, on internal documentation. All staff should be aware of the location of these documents and be able to pass them on as required. This accounting system is necessary to be able to efficiently communicate the contents of each lab to emergency first responders and to ensure that proper inventory control is achieved for each lab

- Upon receipt of a new chemical, enter information into a sub inventory applicable to the laboratory
- Update inventory as a chemical is depleted or disposed
- Audit inventory on an annual basis to ensure that it is up to date

A Chemical Inventory Log is located at F70-10-16

16.2 General Transport Practices

Use a cart when transporting several containers or containers that are large, awkward or heavy. Carts should either have high edges for containment or chemicals should be in secondary containers.

Carry glass containers in bottle carriers or another suitable, leak resistant, robust secondary container.

Transport off-site requires compliance with federal Transportation of Dangerous Goods regulations.

See Section 19 for further information.

16.3 General Storage Practices

Ensure that storage shelves are sturdy and secured to the wall or floor.

Ensure that storage shelves have anti roll lips or that other appropriate measures are taken to ensure chemicals cannot easily fall off shelves.

Store large containers on lower shelves.

Avoid storage above eye level.

Window sills, heaters and ledges are not to be used as storage areas.

Avoid storage on the floor unless the chemical container is in its original shipping carton and packing or the container is an approved safety can. Containers stored on the floor can be easily knocked over spilling contents.

Inspect chemicals in storage regularly to ensure that:

- There are no leaks.
- Caps and containers are in good condition. Look for signs of discoloration, bulging and pressure build up.
- Outside of containers are kept free of spills and stains.
- Containers are properly labelled.

16.4 Storage of Flammables and Combustibles

Flammable liquid – a liquid having a flash point below 37.8°C and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8°C as determined by ASTM D323, "Vapour Pressure Petroleum Products (Reid Method)"

Combustible liquid – any liquid having a flash point at or above 37.8°C and below 93.3°C

Storage of flammable and combustible liquids in the laboratory is regulated by Section 5.5.5.2 of the Manitoba Fire Code. Maximum quantities listed below are for single labs (i.e. single fire compartments with a minimum fire resistance rating of one hour).

- Ensure that there is no more than 1 litre of working flammable materials (Class 1) on the open bench at a time for storage. All other flammable agents need to be stored in

an appropriate flammable cabinet.

- Ensure that all additional flammable material is stored in approved flammable storage cabinets. As per the Manitoba Fire Code Section 5.5.5.1 (2), flammable liquids and combustible liquids stored in such cabinets shall not exceed the quantity permitted for one cabinet.
- Ensure that flammable materials requiring storage conditions at refrigerated temperatures are stored in refrigerators/freezers designed and certified for this purpose. **Household refrigerators are never to be used to store flammable liquids.**
- Storage containers are to be less than 5 L unless they are safety containers conforming to ULC/ORD-C30 which must be less than 25 L.
- All storage containers shall remain closed when not in direct use.

16.4.1 Approved Flammable Storage Cabinets

To be approved for storage of flammables, cabinets must conform to at least one of the following standards:

- Conform to ULC-C1275, "Storage Cabinets for Flammable Liquid Containers"
- Conform to ULI 1275, "Flammable Liquid Storage Cabinets"
- Be Factory Mutual (FM) Research Approved; **or**
- Be listed as meeting NFPA 30

Flammable storage cabinets need to be either actively vented to the outdoors or be capped with the plugs supplied with the cabinet itself. While it is recommended that flammable storage cabinets are not vented, venting is acceptable provided that the design maintains the integrity of the cabinet and complies with Manitoba Fire Code article 5.5.4.2

16.4.2 Flammable Liquid Transfer

Shared Health staffs are regularly exposed to the risk of injury when working with or in proximity to flammable liquids. The chemical and physical properties are highly variable depending on the specific product, and the flash point may range from approximately - 22 to + 90 deg. C. Several factors must be considered when transferring flammable liquids. Static electricity may be generated when two dissimilar materials pass closely by each other, including flowing liquids and gases, as in the case of transferring flammable liquids. Accumulated static electricity may discharge, producing an electric arc, and provide an ignition source. These units have various capacities and also eliminate the use of open unapproved containers. Only use equipment tested and approved by recognized agencies such as Underwriters Laboratories Inc. (UL), Factory Mutual Engineering Corporation (FM) and National Fire Protection Association (NFPA) shall be used to transfer N.F.P.A. Class 1 flammable liquids inside buildings.

Ensure that you review the SDS and all other safety information regarding the flammable substance that you are decanting. Grounding or bonding may be required to work safely. When in doubt, contact your Supervisor or the EHSO for further information.

16.5 Chemical Segregation

It is critical that chemicals are stored according to a predetermined storage system to ensure that incompatible chemicals are not stored in close proximity to each other. Storage systems that account for necessary segregation are acceptable provided that they are clearly documented and understood by Shared Health personnel. It is suggested that solvents/reagents etc. be labelled according to the storage system used to allow for continuous, easy and proper storage. A representative chemical segregation

system is described on the following page.

Chemical Compatibility Chart*

	Acids, inorganic	Acids, oxidizing	Acids, organic	Alkalis (bases)	Oxidizers	Poisons, inorganic	Poisons, organic	Water - reactives	Organic solvents
Acids, inorganic			X	X		X	X	X	X
Acids, oxidizing			X	X		X	X	X	X
Acids, organic	X	X		X	X	X	X	X	
Alkalis (bases)	X	X	X				X	X	X
Oxidizers			X				X	X	X
Poisons, inorganic	X	X	X				X	X	X
Poisons, organic	X	X	X	X	X	X			
Water-reactives	X	X	X	X	X	X			
Organic solvents	X	X		X	X	X			

* LBNL ES&H Manual, Chapter 45, "Chemical Hygiene Safety Plan", Work Process K, Table K-1

X = incompatible materials (must segregate)

= compatible materials

Incompatibility Table (16) Consult the SDS in all cases.

16.6 Partial List of Incompatible Chemicals

The following is a list of specific individual chemical incompatibilities, extracted, with permission, from the American Chemical Society's *Chemical Safety Manual for Small Businesses.* This incompatibility information is for general information only and is not considered to be complete. Consult each chemical's SDS.

Table # 17 Chemical Incompatible Table

Acetic acid	Chromic acid, nitric acid, hydroxyl compounds, ethylene glycol, perchloric acid, peroxides, permanganates
Acetylene	Chlorine, bromine, copper, fluorine, silver, mercury
Acetone	Concentrated nitric and sulfuric acid mixtures
Alkali and alkaline earth metals (such as powdered aluminum or magnesium, calcium, lithium, sodium, potassium)	Water, carbon tetrachloride or other chlorinated hydrocarbons, carbon dioxide, halogens
Ammonia (anhydrous)	Mercury (e.g. in manometers), chlorine, calcium hypochlorite, iodine, bromine, hydrofluoric acid (anhydrous)
Ammonium nitrate	Acids, powdered metals, flammable liquids, chlorates, nitrites, sulfur, finely divided organic combustible materials
Aniline	Nitric acid, hydrogen peroxide
Arsenical materials	Any reducing agent
Azides	Acids
Bromine	*See chlorine*
Calcium oxide	Water
Carbon (activated)	Calcium hypochlorite, all oxidizing agents
Chlorates	Ammonium salts, acids, powdered metals, sulfur, finely divided organic or combustible materials
Chromic acid and chromium	Acetic acid, naphthalene, camphor, glycerol, alcohol, flammable liquids in general
Chlorine	Ammonia, acetylene, butadiene, butane, methane, propane (or other petroleum gases), hydrogen, sodium carbide, benzene, finely divided metals, turpentine
Chlorine dioxide	Ammonia, methane, phosphine, hydrogen sulfide
Copper	Acetylene, hydrogen peroxide
Cumene hydroperoxide	Acids (organic or inorganic)
Cyanides	Acids
Flammable liquids	liquids Ammonium nitrate, chromic acid, hydrogen peroxide, nitric acid, sodium peroxide, halogens
Fluorine	All other chemicals
Hydrocarbons (such as butane, propane, benzene)	Fluorine, chlorine, bromine, chromic acid, sodium peroxide
Hydrocyanic acid	Nitric acid, alkali
Hydrofluoric acid (anhydrous)	Ammonia (aqueous or anhydrous)
Hydrogen peroxide	Copper, chromium, iron, most metals or their salts, alcohols, acetone, organic materials, aniline, nitromethane, combustible materials
Hydrogen sulfide	Fuming nitric acid, oxidizing gases
Hypochlorites	Acids, activated carbon
Iodine	Acetylene, ammonia (aqueous or anhydrous), hydrogen
Mercury	Acetylene, fulminic acid, ammonia

Nitrates	Acids
Nitric acid (concentrated)	Acetic acid, aniline, chromic acid, hydrocyanic acid, hydrogen sulfide, flammable liquids, flammable gases, copper, brass, any heavy metals
Nitrites	Acids
Nitroparaffins	Inorganic bases, amines
Oxalic acid	Silver, mercury
Oxygen	Oils, grease, hydrogen: flammable liquids, solids or gases
Perchloric acid	Acetic anhydride, bismuth and its alloys, alcohol, paper, wood, grease, oils
Peroxides, organic	Acids (organic or mineral), avoid friction, store cold
Phosphorus (white)	Air, oxygen, alkalis, reducing agents
Potassium	Carbon tetrachloride, carbon dioxide, water
Potassium chlorate	Sulfuric and other acids
Potassium perchlorate (*see also chlorates*)	Sulfuric and other acids
Potassium permanganate	Glycerol, ethylene glycol, benzaldehyde, sulfuric acid
Selenides	Reducing agents
Silver	Acetylene, oxalic acid, tartaric acid, ammonium compounds, fulminic acid
Sodium	Carbon tetrachloride, carbon dioxide, water
Sodium nitrite	Ammonium nitrate and other ammonium salts
Sodium peroxide	Ethyl or methyl alcohol, glacial acetic acid, acetic anhydride, benzaldehyde, carbon disulfide, glycerine, ethylene glycol, ethyl acetate, methyl acetate, furfural
Sulfides	Acids
Sulfuric acid	Potassium chlorate, potassium perchlorate, potassium permanganate (similar compounds of light metals, such as sodium, lithium)
Tellurides	Reducing agents

16.8 Containment

Care should be taken to ensure that chemicals/reagents/samples/solutions etc. are stored such that the risk of spills is minimized

- Primary storage containers should be of a composition such that they are able to maintain their structural integrity, under normal storage and use, throughout the lifespan of the material they are holding.
- Purchase materials in safety coated glass bottles if available. These are glass bottles that are covered in a thin plastic coating that is slip and impact resistant. These bottles are designed to contain liquid in the event that the glass is broken.
- *Secondary containment should be used in all storage locations*. This is containment in addition to the primary container to prevent release of material to the environment in the event that the primary container fails. Over packs, spill trays etc. are examples of secondary containment.

Section 17 - Hazardous Waste Disposal

Disposal of hazardous waste is regulated through the provincial departments of Sustainable

Development - Conservation and Water Stewardship. Hazardous wastes are never to be flushed down the drain or left to evaporate in a fume hood as methods of disposal. Not only is this practice illegal, but it can harm the environment, lead to dangerous reactions, create immediate and future hazards for lab and trades personnel, as well as damage the drainage system

The disposal of chemicals is another aspect of hazardous material management where chemical compatibility is of high importance. Careless disposal practices, such as pouring all chemicals down the drain, or all into a large drum to be later buried in a landfill, may be harmful to humans and is environmentally unsound. Containers of waste must be adequately labeled as to their contents. For information on the proper disposal of hazardous materials consult the SDS.

If in doubt, label and package all reagents and chemicals that are outdated or no longer required, ensuring that an inventory and associated SDS are included in that inventory. Contact the RHA maintenance or facility management staff person to arrange for a Hazardous Disposal company to remove the accumulated chemicals. If procedures are currently used by a specific RHA, follow those guidelines.

For further information, contact your Supervisor, Charge Technologist, or EHSO.

A summary of unacceptable discharges can be found in Table 18

Table 18 – Summary of Unacceptable Discharges to Sanitary Sewers

Matter of any type, temperature or in any quantity which may: • be or become a health and safety hazard to any person, animal, property or vegetation; • cause sewage effluent, sludge or compost to contravene Provincial regulations; • be harmful to the sewage works; or • Interfere with the proper operation of sewage works or treatment.
Solid or viscous substances in such quantity or size that may cause obstruction to flow of sewer including but not limited to ashes, bones, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastics, wood, ungrounded garbage, animal guts or tissues, paunch manure, whole blood or the product of any garbage grinder.
Sewage or uncontaminated water with a temperature greater than 65°C.
Sewage with pH less than 5.5 or greater than 9.5.
Sewage containing the following in any amounts: • dyes or colouring materials which may discolour the sewage works effluent; • items that may cause offensive odours including hydrogen sulphide, carbon disulphide, reduced sulphur compounds, amines or ammonia; • water immiscible liquids; • fuel; • PCBs; • pesticides; • severely toxic material; • waste radioactive material (except where discharge is being done in accordance with a license from the Canadian Nuclear Safety Commission); • hauled sewage; • waste disposal site leachate; and • hazardous wastes (including acute hazardous waste chemicals, hazardous industrial wastes, hazardous waste chemicals, ignitable wastes, pathological wastes, PCB wastes, reactive wastes)

17.1 Packaging and Labelling Requirements

The waste generator is responsible for providing appropriate waste containers as well as ensuring that all hazardous waste is packaged and labelled appropriately. The safety of the housekeeping, materials management staff and hazardous waste contractors depends on the waste containers maintaining their integrity, and the waste being accurately identified. The following should be followed when disposing of Hazardous Wastes:

- Incompatible materials are not to be combined in a single waste container.
- Chemical liquid waste containers are not to be filled beyond approximately 75% of their capacity to allow for vapour expansion.
- Container materials must be compatible with the contained wastes (e.g. hydrofluoric acid is not to be stored in glass containers; corrosives are not to be stored in metal containers).
- Containers are to be in good condition.
- Wastes are to be identified appropriately (e.g. biohazard bags are not to be used for chemical wastes if no biohazard exists).
- Non-hazardous wastes are to be segregated from hazardous wastes to avoid unnecessary expenses.
- Hazardous waste is to be disposed of regularly, i.e. not accumulated.
- Hazardous waste is to be clearly labelled with the identity of the waste as well as the waste generator. This will be accomplished by carefully completing the local hazardous waste documentation (as required).
- If reusing bottles, ensure that there is only one identifier on the bottle.

17.2 Chemical Waste

Hazardous chemical waste is picked up regularly by a hazardous waste contractor. If you have waste for disposal:

- Complete a local hazardous waste disposal form, as applicable, tag and attach to waste containers

  The following information is required:

  - Contact name, phone number/email, signature;
  - Building number, room number, waste location;
  - Chemical composition (No abbreviations. Abbreviations may be meaningless to those transferring waste, hence full chemical names are required.);
  - Quantity, container description;
  - Form number; and
  - Hazards, physical state, pH if required

17.2.1 Unknown Waste

Waste of unknown composition will not be picked up by the hazardous waste contractor. It is the responsibility of the Supervisor or Charge Technologist to appropriately identify or categorize the “unknown”.

If professional assistance is required to identify or categorize “unknowns”, the resulting charges will be the responsibility of the waste generator.

17.2.2 Explosive Waste

Explosive waste will not be picked up during the regular, scheduled hazardous waste removal. To make arrangements for the disposal of explosives, contact your local facilities management.

17.3 Biohazardous Waste

Dispose of according to local protocols.

17.4 Radioactive Waste

See local Radiation Disposal Policies for details.

Complete radioactive hazardous waste disposal form and attach to waste containers.

Complete the form which includes the following information:

- Contact name, phone number/email, signature
- Building number, room number, waste location
- Radionuclide, scheduled quantity, total activity, activity concentration
- Chemical composition (no abbreviations permitted)
- Quantity, container description
- Form number; and
- Hazards, physical state, pH if required

17.5 Sharps Waste

Sharps are to be separated from regular waste streams to prevent unnecessary needlestick injuries and/or lacerations. Appropriate containers are supplied to all Shared Health sites and they should be sealed after filling **¾ full**. The unit should then be sealed, removed for the waste stream and replaced.

17.5.1 Broken Laboratory Glassware

Clean broken glassware including Pasteur pipettes, and broken laboratory glassware, is to be separated into an appropriately marked glass waste container. These containers are available by contacting your local Supervisor or Regional Manager.

Contaminated broken glassware is to be handled as contaminated and segregated from the regular waste stream. Separate containers should be available for contaminated wastes such as blood collections sets, contaminated glassware, plastic etc.

17.5.2 Syringes, Needles, Scalpels and Blades

Dispose in appropriate “Sharps” containers

When container is **¾ full**, autoclave according to CCME guidelines (**#**) for biomedical waste (i.e. 120°C at 105 kPa for more than 60 minutes). If autoclaving is not possible, the container will be transferred to a biohazardous waste pick up site

Complete hazardous waste disposal form and attach it to the container

(**#**) Code of Practice for the Management of Biomedical Waste in Canada, Canadian Council of Environment

Ministers (CCME), 1990

Section 18 - Equipment and Procedures

Many pieces of equipment can be hazardous if not used and maintained appropriately. Personnel should be trained on applicable equipment prior to using the equipment. General safety precautions for a selection of apparatus are provided in the following sections. Specific operational instructions provided in manufacturer's instruction manuals and standard operating procedures are to be followed. These manuals/procedures should be located with the equipment or be otherwise easily accessible. Maintenance of or repairs to any laboratory equipment should only be performed by competent personnel trained and qualified to perform such work. Safety devices on any equipment should never be disabled.

18.1 Acid/Base Baths

Acid and base baths, often used to clean glassware are very corrosive, with the potential to cause significant injury to the personnel using them. Consideration should be given to substituting an acid/base bath with a bath prepared with a laboratory grade detergent.

- When preparing or handling acid or base baths, ensure that personal protective equipment includes a synthetic rubber apron, safety goggles, a face shield and long synthetic rubber gloves. When in doubt, follow the established Safe Work Practises.
- Prepare the bath in a fume hood by first adding cold water, to which a measured amount of acid or base is slowly added
- Take particular care to prevent splashing during the loading or unloading of the bath
- When removing items from the bath, empty any residual liquid back into the bath and rinse thoroughly with water
- Dispose of the spent bath in accordance with hazardous waste disposal procedures

18.2 Autoclaves

Overview: Infectious material and toxins, together with associated waste (e.g., petri dishes, pipettes, culture tubes, and glassware), can be effectively decontaminated in either a gravity displacement autoclave or a pre-vacuum autoclave. Gravity displacement autoclaves allow air to escape through the bottom of the chamber as steam displaces it from above. In order for this system to function efficiently, care should be taken to ensure that the valves remain unobstructed and that the chamber is not overfilled.

Pre-vacuum autoclaves remove air from the chamber by employing a vacuum before letting saturated steam enter the autoclave chamber (except during liquid cycles). Pre-vacuum autoclaves resolve the air entrapment problems that are often encountered in gravity displacement autoclaves.

Autoclaves can be designed with a single door or with double doors.

Double-door autoclaves are installed on the containment barrier, typically in high containment zones, to facilitate the decontamination and movement of waste and other contaminated material out of the containment zone. The effectiveness of decontamination by steam autoclaving is dependent on the temperature to which the material is subjected as well as the length of time it is exposed. Proper operation, loading, and monitoring of autoclaves are critical to ensure decontamination is achieved.

For further information please refer to lab specific documents for autoclaving or refer to your Charge Technologist, Supervisor or Shared Health Safety Department.

Autoclaves present potential burn and explosion hazards and need to be used with the utmost care

Autoclaves must have a certificate of inspection prior to use and are inspected on a regular basis thereafter. Inspections are completed by a the Manitoba Department of Labour Mechanical Inspector

The inspection certificate is to be posted in a conspicuous location near the autoclave itself

Autoclaves are to be serviced regularly. Service visits are to be documented (e.g. on a tag or in an equipment logbook.)

Inspections and tests are to be performed by trained, qualified personnel

Autoclaves are to be equipped with a safety/pressure release valve set at or below the maximum pressure of the autoclave

Appropriate PPE is to be worn when loading or unloading an autoclave:

- Heat insulating gloves;
- Goggles and a face shield if a splash hazard exists;
- Splash apron; and
- Closed toed shoes

Oils, waxes, certain plastics, flammable materials, radioactive materials and samples containing substances that may emit toxic fumes are not to be autoclaved

Glassware is to be of borosilicate composition and checked for inspected for cracks prior to autoclaving. Ensure that any plastic containers to be put into the autoclave are suitable for high temperature, high pressure conditions, e.g. polycarbonate, PTFE and most polypropylene items. Metal trays are also acceptable

Ensure that lids to all containers are loosened to prevent pressure build-up during heating and a vacuum upon cooling

Ensure that containers of liquid are no more than 2/3 full

Use secondary containment to prevent spillage i.e. put items in trays that will sufficiently catch spills should they occur

When unloading the autoclave:

- Ensure that the autoclave has depressurized prior to opening door
- Stand to the side of the autoclave, away from the door and crack open the door approximately 1” to allow steam to escape and pressure within liquids and containers to normalize
- Open the door and carefully remove the items from the autoclave, transferring them to a safe location where they can cool completely. Superheated liquids can ‘bump” when they are removed from the autoclave causing a spray of boiling liquid if proper containers aren’t used

If the autoclave becomes non-functional, label it as such and initiate maintenance/repairs as appropriate and in accordance with department policies

18.3 Centrifuges

Safe use of centrifuges requires proper maintenance and operation. Failed mechanical parts or improper operation can result in release of projectiles, hazardous chemicals and biohazardous aerosols. Maintenance and repairs are only to be performed by trained, qualified personnel. All maintenance is to be documented. To preserve your safety, sample integrity and equipment:

- Ensure that centrifuges have an interlocking device that will prevent both the lid from being opened when the rotor is in motion and the centrifuge from starting when the lid is open.

- Ensure that centrifuge tubes are free of hairline cracks, stress lines and chipped rims prior to use.
- Ensure that tube materials are chosen such that they provide the necessary chemical resistance and speed rating.
- Avoid over filling tubes.
- Cap or stopper centrifuge tubes.
- Use sealed centrifuge buckets (safety cups) or rotors that can be loaded and unloaded in a biological safety cabinet or chemical hood as appropriate.
- Decontaminate the outside of the cups/buckets and rotors before and after centrifugation, as required.
- Inspect the "o" rings on rotor lids regularly and replace if cracked or dry. Never operate a centrifuge if the rotor lid is missing its "o" ring.
- Ensure that the centrifuge is properly balanced. Load the rotor with samples arranged symmetrically. Opposing tubes must be of equal weight. If necessary, use "water blank" tubes to balance sample tubes of unequal weight. Do not use sight or volume to conclude that tubes are balanced. Use an electronic scale to balance tubes.
- Ensure that the prescribed speed limitations of the rotor or centrifuge are never exceeded.
- Unless fitted with a suitable exhaust system, do not centrifuge materials capable of creating flammable or explosive vapours.
- Remain with the centrifuge until it has reached its programmed speed.
- Abort the run immediately if you hear abnormal vibration, whining or grinding noises. Check the rotor lid and ensure that samples are balanced.
- Ensure that the rotor and centrifuge are cleaned according to manufacturer's instructions. Never use abrasive cleaners.
- Rotors are easily damaged. Never use metal tools to remove tubes or clean.
- As a part of a preventative maintenance procedure, for each rotor, record speed and run time in a logbook such that rotors can be downgraded and discarded as appropriate. This information should be recorded and maintained in appropriate files.
- If centrifuge is connected to a vacuum pump ensure that the pump exhaust is connected to a trap.
- If biohazardous materials are being centrifuged and the centrifuge is connected to a vacuum pump, ensure that a HEPA filter is installed between the centrifuge and the vacuum pump.

18.4 Glassware

Proper use of glassware can prevent many injuries in the laboratory:

- Use only the right size and type of glassware for any given operation.
- Ensure that glassware is in good condition prior to use (i.e. no cracks, chips, significant scratches).
- Discard broken glassware in appropriate containers.
- Cut glass tubes/tubing by scoring using a file or equivalent. Cover the glass with a piece of cloth and break at the score over a piece of cloth/paper to catch any pieces.
- Wear leather or other cut resistant gloves when inserting glass tubing into a stopper or flexible tubing. Fire polish tubing ends and lubricate the glass to make connections easier.

- Ensure that stopper holes are appropriately sized and carefully insert tubing by gently twisting back and forth.
- Wear appropriate gloves when removing glass tubing from flexible tubing or a stopper. If difficult, carefully cut with a scalpel blade or other appropriate glass cutter. Ensure that cuts are made away from the body.
- Ensure glassware is stored away from the edges of benches such that it cannot be easily knocked down.
- Where possible, replace glassware with appropriate plastic and plastic compounds that will not break if dropped.

18.5 Heating Baths

Heating baths are designed to heat materials to a constant temperature. They may be filled with a variety of materials including water, mineral oil, sand, glycerine and paraffin or silicone oils, depending on the bath temperature required. Bath temperatures may be as high as 300ºC. The following are precautions for heating baths:

- Locate on a stable surface, away from flammable and combustible materials including wood and paper.
- Ensure bath has cooled before relocation.
- Ensure baths are equipped with controls that will turn off the power if the temperature exceeds a pre-set limit.
- Ensure that the thermostat is set well below the flash point of the heating liquid in use.
- Equipped with a non-mercury thermometer to allow a visual check of the bath temperature.
- Do not fill over 2/3 full.
- Take care to not allow water to get into oil baths as violent splattering may result

Steams baths are often safe alternatives for heating because they provide a consistent temperature that will not exceed 100°C. However, care must be taken to prevent scalding due to dermal exposure to the steam or steam lines

Water baths are the most common bath found in the laboratory. When using a water bath:

- Clean regularly; a disinfectant, such as a phenolic detergent, can be added to the water.
- Avoid using sodium azide to prevent growth of microorganisms; sodium azide forms explosive compounds with some metals.
- Decontamination can be performed by raising the temperature to 90 degrees C or higher for 30 minutes once a week.
- Unplug the unit before filling or emptying.

18.6 Ovens, Hot Plates and Heating Mantles

Ovens are commonly used in the lab to evaporate water from samples, provide a stable elevated temperature environment and dry glassware. Heating mantles are used to heat reaction or sample solutions in round bottom flasks or reaction vessels, and hot plates are used to heat various general laboratory solutions. Bunsen burners are not to be used to heat reaction, sample or general laboratory solutions. The following precautions should be followed to ensure their safe use:

- Ensure that laboratory ovens and hot plates are designed such that they prevent contact between flammable vapours and heating elements/spark producing components.
- Avoid heating toxic, even mildly volatile materials in an oven unless it is continuously vented outdoors.

- Glassware that has been rinsed with an organic solvent is to be rinsed with distilled water or equivalent before being placed in an oven for drying.
- Hot plates or ovens whose thermostat fails are to be removed from service until repaired. Heating devices whose temperature unknowingly rises above that required could create significant fire hazards.
- Heating mantles are to be used in conjunction with a variable autotransformer and care is to be taken not to surpass the maximum voltage of the mantle as recommended by the manufacturer.
- Discontinue use of any heating mantle whose heating elements have become exposed.
- When using any heating source, remain with the heating device to ensure that accidental issues are avoided.

18.7 Ultraviolet Lamps

Exposure to ultraviolet light (UV) may result in serious and painful injury to the eyes or skin depending on the specific wavelength of the light to which the individual is exposed, the intensity of the light and the duration of exposure.

- Conspicuously label all UV lights sources with the following warning (or equivalent) **"Warning – this device produces potentially harmful UV light. Protect eyes and skin from exposure."**
- Ensure that the UV light source is shielded.
- Ensure that appropriate PPE is worn and is sufficient to protect the eyes and skin. PPE should at least include UV resistant glasses, gloves and a lab coat.
- Depending on the situation, shielding of the equipment itself or work area may be warranted.

For further information, please see Shared Health Ultraviolet Radiation Policy, 70-10-20,

Section 19 - Transportation of Dangerous Goods (TDG)

TDG is a classification system to regulate dangerous goods when in transit by ground transportation methods. The TDG Act and Regulations are administered at the federal level by the Transport Canada.

Staff that are required to package for transport any materials that meet the criteria for the TDG Act (*Biological Substances Category A Infectious Substance, for Biological Substances Category B Infectious Substances and Exempt Human Specimens*) are required to be licensed to current standards.

Training for TDG is available on Medialab:

- 70-70-01 Module #1
- 70-70-02 Module #2
- 70-70-03 Module #3
- 70-70-04 Module #4
- 70-70-05 Module #5

Training for IATA is available on Medialab:

- 70-70-12 Module #1
- 70-70-13 Module #2
- 70-70-14 Module #3
- 70-70-15 Module #4
- 70-70-16 Module #5
- 70-70-17 Module #6

For more detailed information on TDG please refer to the TDG and IATA manuals located at your site, or contact Shared Health Safety Department for a copy.

19.1 Biological Substance Category 1A (UN2814 – Virus & Bacteria)

There must a primary, secondary and tertiary containment of the materials

- The primary receptacle (which will accept the infectious materials) **must** be watertight (this will include a leak proof seal).
- This receptacle will also have an absorbent packing material around the infectious material vessel.
- The primary receptacle will also be labelled with an appropriate specimen ID label or patient ID as required.
- The primary receptacle **must** have an absorbent packing material for liquids wrapped around the vessel. If multiple primary receptacles are placed in a single secondary packaging, they **must** be either individually wrapped or separated so as to prevent contact between them

The secondary packing **must** also be watertight, with a cap to prevent the primary receptacle from moving excessively.

- The secondary packing will also list all infectious materials contained within

The outer packing must be of a rigid material with proper labelling which will include:

- Infectious Substance label (100mm x 100mm)
- Proper Shipping Name and UN number
- Shipper and Consignee Identification
- Package Orientation mark
- UN Package Certification mark

TDG shipping documents – 2 copies to go with the container in a plastic sleeve on the outside of the outer packaging materials. (1 copy must be retained by the lab)

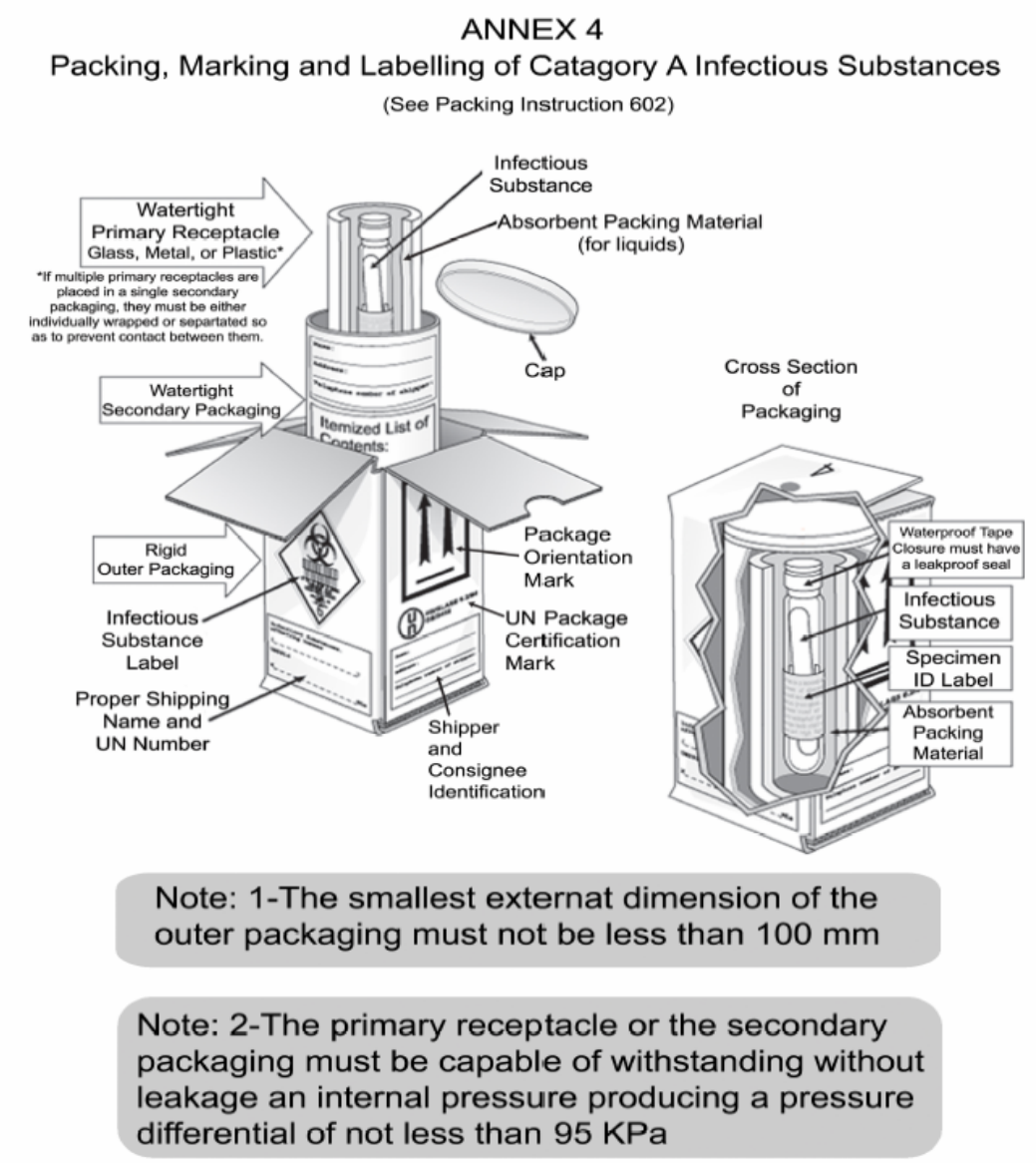
It is important to note that the primary or secondary receptacle must be capable of withstanding, without leakage, an internal pressure producing a pressure differential of not less than 95KPa

For a complete list of items included in the UN2814, please consult the**:** REGULATIONS AMENDING THE TRANSPORTATION OF DANGEROUS GOODS REGULATIONS**,** *APPENDIX 3, GUIDE TO CATEGORY A AND CATEGORY B ASSIGNMENT*

This listing can be found at:

- http://canadagazette.gc.ca/partII/2008/20080220/html/sor34-e.html

See **Annex 4** for further information



19.2 Biological Substances Category 1B (UN3373 – Virus, Bacteria & Fungi)

There must a primary, secondary and exterior rigid packing material for all substances categorized as Category B Infectious Substances

- The primary receptacle (which will accept the infectious materials) **must** be watertight (this will include a leak proof seal).
- This receptacle will also have an absorbent packing material around the infectious material vessel.
- The primary receptacle will also be labelled with an appropriate specimen ID label or patient ID as required.
- The primary receptacle **must** have an absorbent packing material for liquids wrapped around the vessel. If multiple primary receptacles are placed in a single secondary packaging, they

must be either individually wrapped or separated so as to prevent contact between them.

The secondary packing will be leak proof or sift proof. A sealed plastic bag is acceptable

- The outer packing which will have a cushioning material within must be of a rigid material with proper labelling which will include:
- Biological Substance, Category B along with Package Mark with the UN label 3373 (100mm x 100mm)
- Name, Address, Telephone Number of a person responsible or air waybill

For a complete list of items included in the UN3373, please consult the: **REGULATIONS AMENDING THE TRANSPORTATION OF DANGEROUS GOODS REGULATIONS**, ***APPENDIX 3, GUIDE TO CATEGORY A AND CATEGORY B ASSIGNMENT***

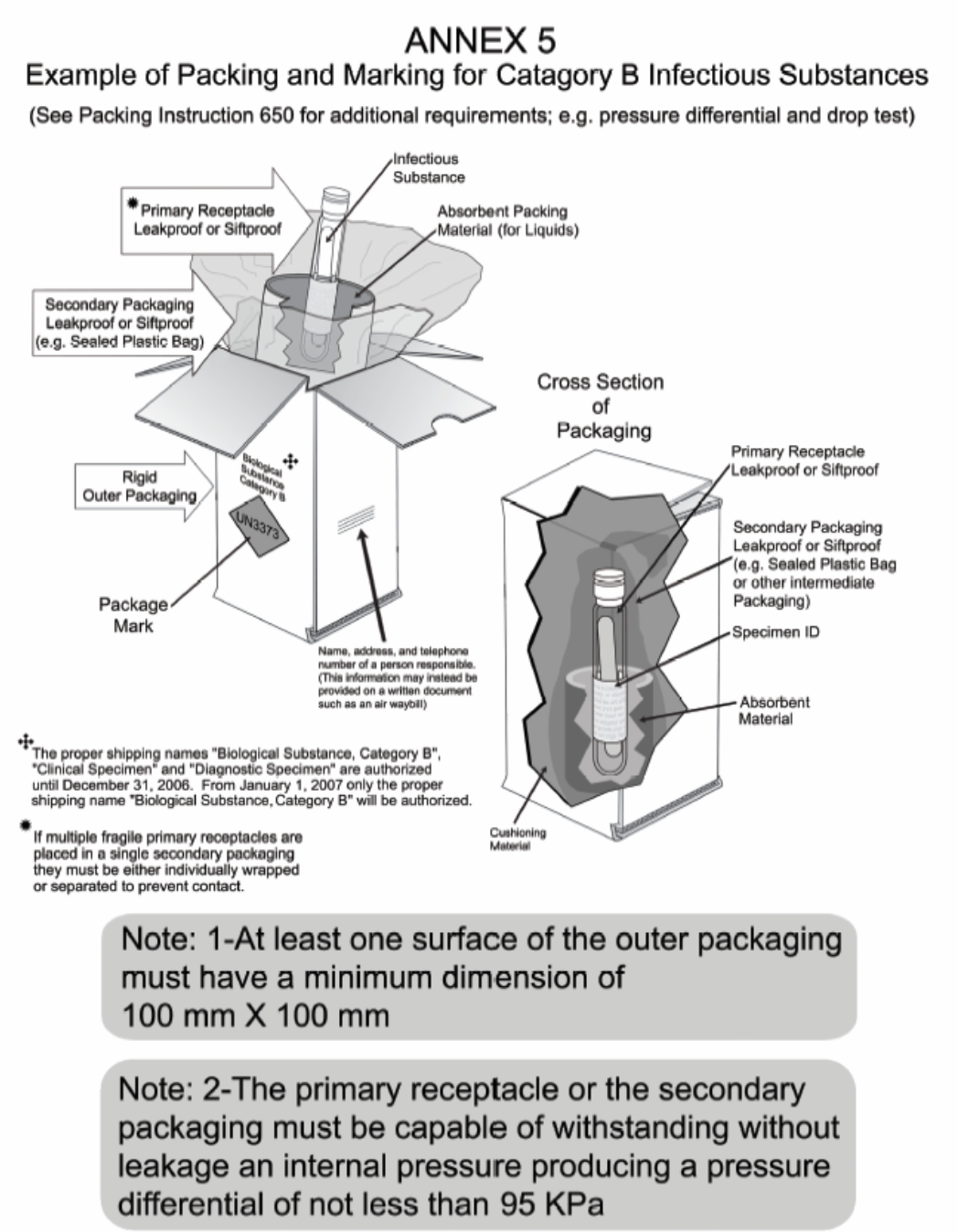
This listing can be found at:

- http://canadagazette.gc.ca/partII/2008/20080220/html/sor34-e.html

It is important to note that the primary or secondary receptacle must be capable of withstanding, without leakage, an internal pressure producing a pressure differential of not less than 95KPa.

For the safety of yourself and others*, DO NOT REMOVE THE ABSORBENT MATERIALS* from the bottom of the shipping containers. These are an important safety component to the shipping receptacle.

See **Annex 5** for further information



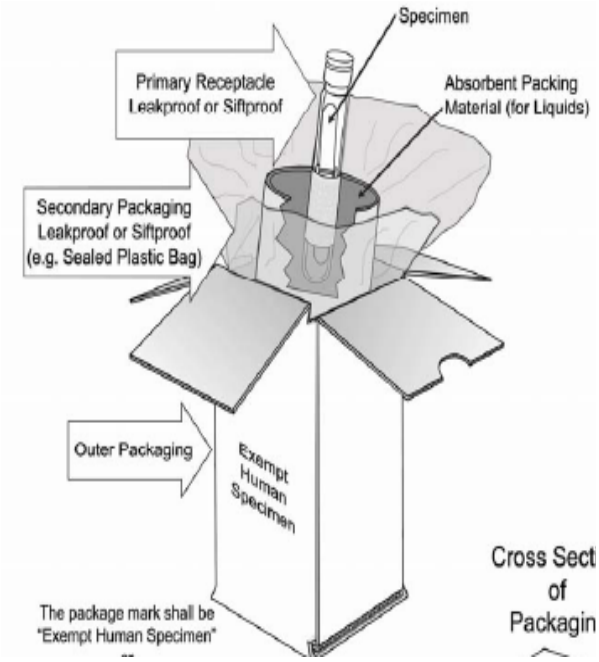
19.3 Exempt Human Specimens

Patient samples that fall under the category of "*Exempt Human Specimens*" are required to have specific packaging in order to transport them safely.

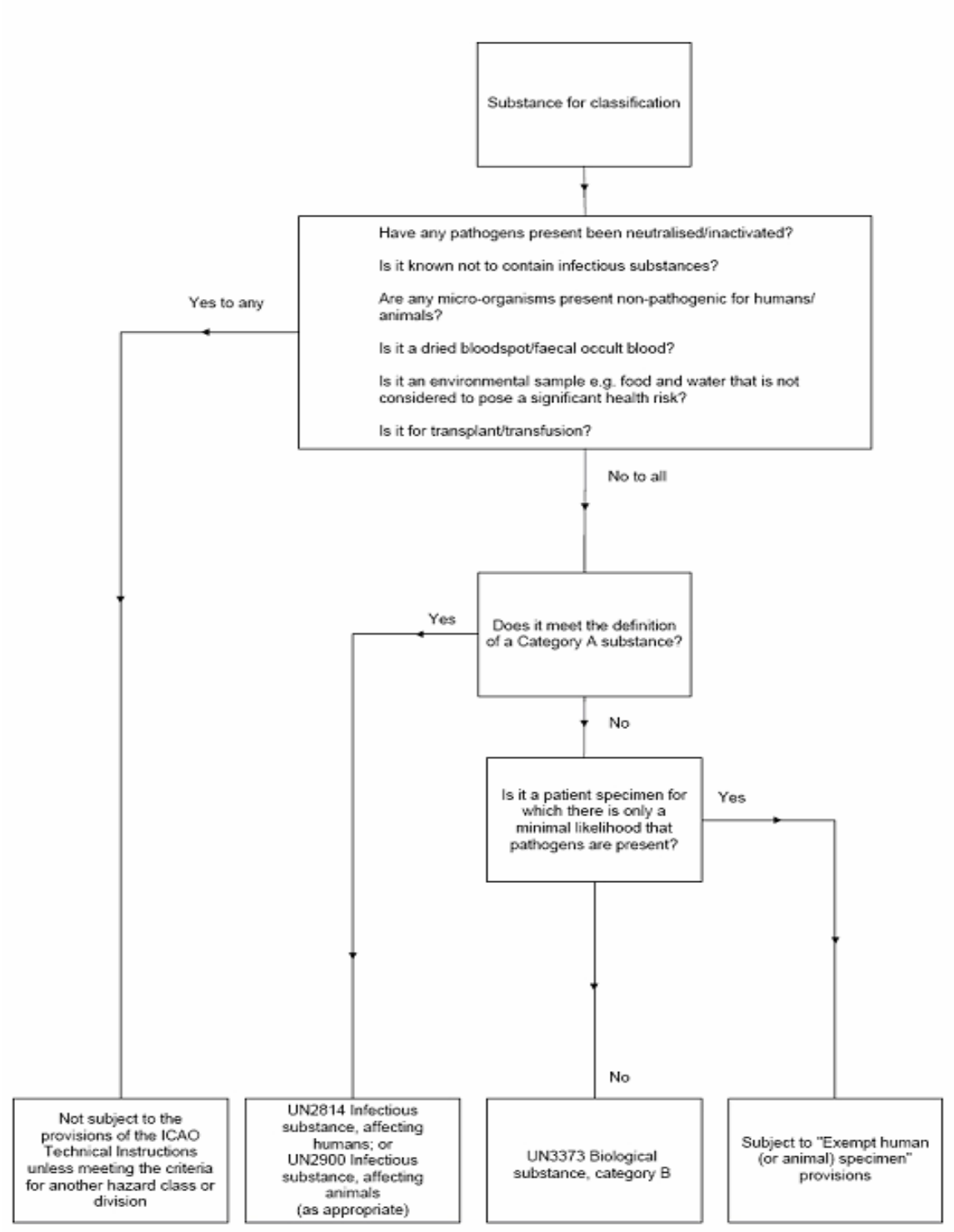
- The specimen must be contained within a primary leak proof or sift proof receptacle, with an absorbent packing material suitable for liquids, placed inside a secondary packing material which is also leak proof/sift proof.
- The outer packaging shall have the label "*Exempt Human Specimen*" in bold letters visible to the carrier

Note: The "*Exempt Human Specimens*" is a permanent sticker on the transport coolers. It is acceptable to have the label displayed when returning empty transport coolers to the sending laboratory.

Examples of Packing and Marking for Exempt Human Specimens



The decision tree (below) is also supplied to guide staff through the process of the requirement for Transportation of Dangerous Goods category selection.



Section 20 - Physical Hazards

20.1 Electrical

Electrical hazards have been mentioned in relation to specific equipment in Section 18; however one needs to be aware of general electrical safety practices. Please also refer to Shared Health ***Electrical Extension Cord Usage Policy 70-10-03***

Any electrical equipment purchased, regardless of voltage, must be approved as indicated by the presence of a field approval mark from the Canadian Standards Association (CSA), Electrical Safety Authority (ESA), or an equivalent field approval mark acceptable under the Electrical Safety Code, i.e. Manitoba Hydro (MH), Underwriters Laboratories (UL) or the local authority having jurisdiction (RHA facility electrician).

- All equipment is grounded by the use of a three-prong plug. Dual prong plugs are acceptable if they have been accepted by the local Electrician, Electrical Technician or Maintenance Services.
- All electrical equipment should be checked annually using the ***Checklist for Annual Electrical Safety F70-10-23*** located in Intelex. ***(Documentation of checks is required - MANQAP).***
- Three-to-two plug conversion adapters are prohibited.
- Electrical cords are to be unplugged by holding the plug cap and not by pulling on the cord.
- As per the Manitoba Electrical Code, use of ground fault interrupter circuits is required in receptacles located within 1 meter of all sinks.
- Employees are expected to notify their supervisor if any frayed wires or other electrical problems are encountered.
- Ground-fault interrupter circuits are to be used around wet areas.
- All employees are encouraged to know the location of emergency power sources.

The procedure for securing malfunctioning clinical equipment and restoring the equipment to proper functioning is as follows:

- Equipment is to be taken out of service immediately and reported to the Charge Technologist or Supervisor.
- Designate equipment that is inoperable. Place date, time, problem, and contact person on the equipment.
- Call plant operations (if applicable) to report malfunctioning equipment.
- Do not use the equipment until it has been re-evaluated/repaired.
- Test the equipment prior to using to ensure that it is in proper working order. If questionable as to whether it is working properly, call plant operations (if applicable) for verification.
- Check inspection due date prior to use to ensure that equipment has been inspected within the recommended time interval.

If an electrical fire occurs, do the following:

- Disconnect the source of electricity if possible.
- Pull the fire alarm box and report the exact location of the fire.
- Use the appropriate fire extinguisher present in the area (electrical fires are Class C fires). Do not use a type A (liquid fire) extinguisher on an electrical fire.

If shock injury occurs, do the following:

- Do not touch the person until the source of electricity is disconnected, or use a non-conductive material to free the victim (such as plastic or wood).
- Call for assistance (Code 25 or Code Blue as applicable) immediately.
- Cover the victim with a blanket and lower the victim's head. If trained, use cardiopulmonary resuscitation (CPR) as needed until the medical assistance arrives.

If an electrical burn occurs, do the following:

Disconnect the source of electricity.

Call for assistance (Code 25) and/or refer the victim to the Emergency Department immediately. All injuries and incidents should be documented for further review and investigation and reported to the EHSO.

20.2 Machine Guarding

Injuries can occur from contact with rotating or moving parts as well as pinch points found in various mechanical equipment and instrumentation found throughout Shared Health work areas.

- All personnel are to be aware of emergency shut-offs for all equipment.
- **Manufacturer installed guards and safety interlocks are not to be removed or modified without written approval from the Supervisor**. Safe guards should only be removed to perform servicing, repairs, tests, cleaning, maintenance or adjustments to the equipment that cannot be done with the safe guard in place. If removed, alternate protective measures should be in place (e.g. lock out procedure). This documentation is to be maintained and include the reason the modification is required.
- Other equipment containing moving or rotating parts or pinch points not equipped with manufacturer installed guards is to be appropriately guarded so as to protect the operator.

Section 21 - Ergonomics

Introduction

Awkward postures, excessive forces, high repetition and contact stresses can all lead to ergonomic related injuries. All personnel should be aware of their body positioning and take precautions to ensure proper design and set up of work to minimize the risk of injury.
Various interventions can be included into the workspace to minimize repetitive stress and strain injuries (RSSI). The most common of these interventions include adding ergonomic floor mats to a workspace area. Specific types of mats for laboratories, phlebotomy areas, DI areas and others can be provided on an as needed basis. Please keep in mind that specific types of mats will be provided for areas that hold special risks to health and safety of staff, such as the Microbiology labs.
If assistance is required for an ergonomic assessment, please contact the EHSO.

An assessment form is located at F20-100-11 (Ergonomic Symptoms Survey Checklist)

Moving patients is a task that mainly DI staff will undertake. There are instances whereby Lab staff will need to move patients. It is the responsibility to ensure that applicable staffs are trained in proper lifting/transferring techniques so that staff can avoid injury. Several bulletins have been provided to all lab/DI areas in 2010 to assist with the training and reminder process.

For further information you can refer: ***Talking Back – Back care awareness – 70-70-25*** on Medialab.

Please ensure that training documentation is available for all staff that is involved in lifting/transferring.

Section 22 – Radiation Safety

Radiation safety for all staff that employed by Shared Health, falls under the guise of the existing Diagnostic Imaging team. Items such as ALARA, Safety Code 35, etc. are covered by this group. The results of the teams work can be located within the Intranet, under the Diagnostic Imaging header.

For further information, please refer to 130-10-07 Radiation Protection Manual on Intelex.

Section 23 - Appendix

23.1 Emergency Eyewash Equipment

Accidental exposure of the eyes to chemical substances in any form can result in irritation, temporary or permanent vision impairment, or blindness. The provision of engineering controls and personal eye protection that minimize the possibility of eye exposure to harmful chemical substances is the best protection against eye injury in the workplace. To supplement these, the availability of proper emergency equipment for the treatment of eyes exposed to hazardous substances is an essential safety precaution.

Under the Workplace Safety and Health Act, an employer is required to provide approved emergency eyewash equipment, in conjunction with effective eye protection programs in any workplace where

there is a risk of eye injury from exposure to hazardous chemical substances. Such emergency eyewash equipment must meet the requirements identified in the American National Standards Institute (ANSI) Standard for Emergency Eyewash and Shower Equipment Z358.1. ANSI approved emergency eyewash equipment is designed to function quickly and effectively under a set of typical circumstances. When a person's eyes are accidentally exposed to a hazardous chemical substance, the following is likely to occur:

- A degree of panic may set in and the person will not always think or react in a clear fashion;
- Vision is immediately impaired, so that the person cannot clearly see where they are going or what they are doing;
- Assistance may not be immediately available

Regardless of the situation or circumstance, emergency treatment must be available immediately. Every second lost could lead to permanent damage. Proper emergency eyewash equipment could save someone's eyesight.

Requirements:

- Capable of being quickly located and operated; and
- Capable of being fully activated in one second or less and shall be used without requiring the use of the operators hands and designed to remain on until intentionally shut off.
- The eyewash unit shall be in an accessible location as close to the hazard as possible, and require no greater than 10 seconds to reach.
- The eyewash unit shall be identified with a highly visible sign. The area around or behind, or both, shall be painted a bright color.
- The water in the eyewash station shall be potable (drinkable).
- Tepid water temperature in units must not exceed 38 degrees C (100 degrees F).
- A controlled flow of water must be provided to both eyes simultaneously at a velocity low enough not to be injurious to the user.
- There shall be no sharp projections anywhere in the operating area of the unit.
- Nozzles shall be protected from airborne contaminants. The removal of such protection shall not require a separate motion by the operator when activating the unit.
- Water nozzles shall be positioned between 83.8 cm (33 inches) and 114.3 cm (45 inches) from the floor.
- Plumbed eyewash and shower units shall be activated weekly to flush the line and verify proper operation. Self-contained units shall be inspected according to manufacturers' specification.
- All employees who may be exposed to eye injury shall be instructed in the proper use of emergency eyewash units. ***Training documents on use of Emergency Eyewash and Showers can be found on Intelex: F70-70-25 & F70-70-26.***

Note: ***Personal eyewash equipment, such as squeeze bottles, can support but not replace proper eyewash stations. The first few seconds following an eye injury are often critical to keeping injury to a minimum. A personal eyewash unit may be kept in the immediate vicinity of employees working in a potentially hazardous area. The main purpose of these units is to supply immediate flushing. With this accomplished, the injured individual should then proceed to a plumbed or self-contained eyewash and flush the eyes for the required 15-minute period. Safety Data Sheets (SDS) should be consulted for additional recommendations. Approved eyewash units may be part of eye-face wash and/or emergency shower units. Depending on the types of hazards present, these options may be preferable to single purpose eyewash units.***

Section 24 - References and Additional Reading

American Chemical Society (ACS). *Chemical Safety Manual for Small Businesses*, *2nd Edition*, Washington, DC, 1992

American Conference of Governmental Industrial Hygienists (ACGIH). *TLVs and BEIs: Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,* Cincinnati, 2015

American Conference of Governmental Industrial Hygienists (ACGIH*). Industrial Ventilation: A Manual of Recommended Practice, 22nd Edition*, Cincinnati, 1995

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National Institute for Occupational Safety and Health (NIOSH). *Recommendations for Chemical Protective Clothing: A Companion to the* ***NIOSH Pocket Guide to Chemical Hazards,*** 1997

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United Nations Environmental Program. *Storage of Hazardous Materials: A Technical Guide for Safe Warehousing of Hazardous Materials*, Paris, 1990

Young, J.A. *Improving Safety in the Chemical Laboratory: A Practical Guide,* John Wiley and Sons Inc., New York, 1987

College Of American Pathologists (CAP)

Manitoba Quality Assurance Program – Manitoba College of Physicians and Surgeons (MANQAP)
PHAC
Public Health Agency of Canada – (PHAC)

Internet

Manitoba Labour, Workplace Safety and Health Branch; www.gov.mb.ca/labour/safety

Canadian Centre for Occupational Health and Safety (CCOHS); www.ccohs.ca

Canadian Standards Association (CSA); www.csa.ca

National Institute for Occupational Safety and Health (NIOSH; US); www.cdc.gov/niosh/homepage.html

Occupational Safety and Health Administration (OSHA; US); www.osha.gov

University of McGill Laboratory Safety Program; www.mcgill.ca

CSMLS; http://www.csmls.org/english/english.htm

University of Victoria; http://ohs.uvic.ca/labsafety/index.html

St. Boniface General Hospital; http://www.sbgh.mb.ca/

Winnipeg Health Sciences Centre; www.hsc.mb.ca

University of Manitoba;
http://www.umanitoba.ca/admin/human_resources/ehso/chembio_safety/index.html

Winnipeg Regional health Authority; www.wrha.mb.ca

Safework Manitoba; https://www.safemanitoba.com/Pages/default.aspx

Canadian Nuclear Safety Commission; http://nuclearsafety.gc.ca/eng/acts-and-regulations/acts/index.cfm

Oklahoma State Environmental Health and Safety; https://ehs.okstate.edu/