

2011

Handbook of Occupational Hazards and Controls for Staff in Central Processing

**Government
of Alberta** ■



Credits

This document has been developed by the Government of Alberta and derived as a profession-specific summary of information contained in the five volumes of Best Practices in Occupational Health and Safety in the Health Care Industry. Full text of these documents can be found at <http://www.employment.alberta.ca/SFW/6311.html>

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Occupational Health and Safety Hazards and Controls for Personnel in Central Processing

Introduction

As part of the Alberta Healthcare Initiative, a series of Best Practice documents were produced by Alberta Employment and Immigration – Workplace Health and Safety to better acquaint healthcare workers with workplace hazards and appropriate control measures. Five documents have been produced; each developed with the input of a multidisciplinary stakeholder group. The documents are available on the Alberta Employment and Immigration website <http://www.employment.alberta.ca/SFW/6311.html> as follows:

Overview of Best Practices in Occupational Health and Safety in the Healthcare Industry Vol. 1

http://www.employment.alberta.ca/documents/WHS/WHS-PUB_bp009.pdf

Best Practices for the Assessments and Control of Biological Hazards Vol. 2

http://www.employment.alberta.ca/documents/WHS/WHS-PUB_bp010.pdf

Best Practices for the Assessments and Control of Chemical Hazards, Vol. 3

http://www.employment.alberta.ca/documents/WHS/WHS-PUB_bp011.pdf

Best Practices for the Assessments and Control of Physical Hazards, Vol. 4

Best Practices for the Assessments and Control of Psychological Hazards, Vol. 5

In an effort to focus the hazard assessment and control information for specific healthcare professions, a series of short summaries of relevant information have been produced using excerpts from the five best practice documents. Readers are directed to the original documents for more details and more comprehensive information. *Please note that hyperlinks are provided to reference documents for the convenience of the reader. These links are functional at the time of first availability of this document but, due to the changing nature of web information, may not be functional at a later date. The Government of Alberta does not assume responsibility for updating hyperlinks.*

This document focuses on hazards and controls in Central Processing (CPD), sometimes called by other names including Central Supply or Central Sterile Supply (CSD, CSSD or CSR).

Hazard Assessment Process

Central Processing workers may be exposed to a variety of workplace hazards in the course of performing their functions. The type and degree of exposure is dependent upon the type of Central Processing and its location (e.g., in communities and retail establishments, in hospitals, etc.). A key component of a health and safety program is to identify and assess hazards and determine appropriate controls. A systematic approach to hazard assessment includes the following steps:

1. List all work-related tasks and activities
2. Identify potential biological, chemical, physical and psychological hazards associated with each task.
3. Assess the risk of the hazard by considering the severity of consequences of exposure, the probability that the exposure will occur and the frequency the task is done.
4. Identify the controls that will eliminate or reduce the risk. The hierarchy of controls should be followed. This means that engineering controls are the most effective, followed by administrative controls (such as training and rules), followed by personal protective equipment (PPE).
5. Implement the controls for each hazard.
6. Communicate the hazard assessments and required controls to all workers who perform the tasks.
7. Evaluate the controls periodically to ensure they are effective.

Potential Hazards and Recommended Controls

The following charts summarize potential hazards for Central Processing workers and recommended controls to reduce the risk of exposure to the hazards.

Biological Hazards and Controls

In this section the most commonly encountered biological hazards in Central Processing and methods to control them are presented. Employers should carefully evaluate the potential for exposure to biohazardous materials in all tasks and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments. Please note, this is not

designed to be an exhaustive treatment of the subject, but is rather an overview summarizing the most frequently encountered biological hazards in Central Processing.

Note:

The following chart provides basic information about control strategies for commonly occurring biological hazards. Administrative controls are based on the risk assessment. Worker education and good communication processes are important administrative controls. Any PPE selected must be based upon the risk assessment of the task and the environment in which it is used. All legislation related to the selection and use of controls must be followed.

Potential Hazards	Summary of Major Control Strategies		
	Engineering	Administrative	PPE
Exposure to bloodborne pathogens through needle stick or other sharps injuries	Engineered needle stick prevention devices; availability of sharps containers for disposal; vaccines	Safe work procedures for equipment decontamination; compliance with all infection prevention and control practices; immunization program; worker education	PPE based on the risk assessment may include protective clothing, gloves, eye and face protection
Exposure to bloodborne pathogens or pathogens transmitted in body fluids or secretions to mucous membranes by contact with contaminated surfaces	Restrict access to Central Processing to authorized personnel only and require that all visitors must be escorted; vaccines	Safe work procedures for equipment decontamination; compliance with all infection prevention and control practices; immunization program; worker education	PPE equipment based on the risk assessment may include protective clothing, gloves, eye and face protection
Exposure to Creutzfeldt-Jakob disease	Disposable and dedicated surgical equipment whenever possible	Develop specific work procedures; educate employees in the specific hazard	PPE based on the risk assessment may include protective clothing, gloves, eye and face protection
Exposure to environmental biological contaminants from ventilation systems, water or food	Maintenance of ventilation systems; early spill clean-up; preventive maintenance of ventilation systems and water supply systems with regular testing to ensure proper functioning; early detection and remediation of mould	Infection prevention and control practices related to building maintenance and food preparation; protocols for construction and renovation projects that reduce contamination; worker education	Use of proper PPE when cleaning contaminated environmental surfaces, including gloves, respiratory protection, and eye protection

Notes about controls for biological hazards

Exposure to biological hazards may occur for any personnel in Central Processing as a result of contact with contaminated items and equipment. Controls include any mechanisms to reduce the potential for exposure to infectious agents on contaminated materials and the immunization of all workers against infectious diseases to which they may be exposed.

Engineering Controls

In the hierarchy of controls, the highest level of control is directed at the source. From an occupational health perspective, the highest level of control may be engineering controls such as proper design and maintenance of facilities, engineered needle stick prevention devices, and effective biological waste containment also contribute to minimizing the transmission of infectious agents. Engineering controls, once designed and implemented, are not under the control of the worker, but are directed at the source of the hazard.

Safe Needle Devices

Safe needle devices have built-in engineering features that assist in preventing injuries during and after use of the device. Examples of safe needle devices that have built-in engineering features include:

- Needleless connectors for IV delivery systems
- Protected needle IV connectors
- Needles that retract into a syringe or vacuum tube holder
- Hinged or sliding shields attached to syringes
- Self-blunting phlebotomy and winged steel needles
- Blunt tip suture needles

While some engineered safe needle devices have been available for some time, new engineered safe needle devices continue to be introduced for the healthcare industry. Sharps disposal containers assist in protecting health care workers (HCWs) from injuries when handling and transporting waste sharps. The CSA standard *Z316.6-07 Evaluation of Single-use and Reusable Medical Sharps Containers for Biohazardous and Cytotoxic Waste* should be consulted when selecting sharps containers.

Restricted access

Access to Central Processing work areas should be restricted to those personnel authorized to work in the area. Areas where contaminated items are cleaned and sorted are physically separated from areas where sterile supplies are handled.

Decontamination¹ of facilities and materials

Decontamination is a term used to describe procedures that remove contamination by killing microorganisms, rendering the items safe for disposal or use. Sterilization refers to the complete destruction or removal of all microorganisms by chemical or physical means, usually to provide sterile items for use. All contaminated materials must be decontaminated before disposal or cleaning for reuse. The choice of method is determined by the nature of the material to be treated. Disinfection refers to the destruction of specific types of organisms but not all spores, usually by chemical means. Disinfection is a means of decontamination. Surfaces must be decontaminated after any spill of potentially infectious materials and at the end of the working day. Work areas and pieces of equipment may also require decontamination (i.e., prior to servicing, maintenance, between patients, transfer to other settings or reassignment). Sterilization of equipment and supplies is a critical function of Central Processing. Ensuring the proper maintenance and functioning of the sterilization equipment is an engineering control that ensures adequate decontamination of contaminated items.

General ventilation

General ventilation systems serving buildings must be maintained regularly and inspected for conditions that could adversely affect air quality provided to work spaces. Accumulations of water that could stagnate in humidification systems or drip trays may become sources of potential biological contamination of air handling systems that need regular monitoring and inspection.

Biohazardous organisms may be carried through general ventilation systems, potentially distributing them to other workspaces in a facility. Ultraviolet germicidal irradiation units, and or HEPA filtration media incorporated into air handling systems may be warranted for special circumstances.

Mould growth in the indoor environment can be affected by relative humidity levels, which is a function of some general ventilation systems. High relative humidity levels may contribute to an increase in the growth of some moulds and lead to condensation developing on surfaces. Control of indoor relative humidity levels is an important factor in preventing mould growth.

¹ This section was modified from Laboratory Safety: CSMLS Guidelines, sixth edition; Gene Shematek & Wayne Wood; Canadian Society for Medical Laboratory Science; 2006.

Administrative Controls

The next level of controls includes administrative controls. Because it is not always possible to eliminate or control the hazard at the source, administrative controls are frequently used for biological hazards in healthcare. Administrative controls focus on ensuring that the appropriate prevention steps are taken, that all proper work procedures are documented, that personnel in Central Processing are trained to use the proper procedures, and that their use is enforced. Administrative controls include policies and procedures that establish expectations of performance, codes of practice, staff placement, required orientation and training, work schedules, and occupational health programs in which baseline immune status is recorded and immunizations are provided.

A comprehensive management system considers the continuum of infection prevention and control efforts across all sites and operations. It includes attention to patient as well as and worker safety. A comprehensive system should include the following components:

- A process that ensures comprehensive hazard assessments are conducted for all sites and tasks and appropriate controls are identified
- An infection prevention and control (IPC) plan with clear designation of roles and responsibilities
- Consistent standards for the cleaning, disinfection and sterilization of equipment, procedures, and policies including Routine Practices, Additional Precautions, hand hygiene policies and facilities, communication protocols, decontamination of clothing and dedicated clothing
- Adequate staffing to comply with OHS and IPC policies and procedures; work scheduling
- Biomedical waste handling procedures and policies
- Supporting systems that include Engineering/Physical Plant, Housekeeping, Materials Management and Facilities Planning to ensure:
 - Adequate housekeeping and waste management services
 - Appropriate processes for cleaning, decontamination, disinfection and sterilization of equipment
 - Purchasing processes to include consideration of safety factors
- A comprehensive surveillance and monitoring plan
- Record keeping and regular reporting of outcomes

Administrative controls related to the prevention of exposure to biological hazards include the development and implementation of infection prevention and control guidelines, including equipment decontamination and safe work procedures. It must be assumed by all Central Processing staff that any contaminated item may pose a risk of exposure to infectious disease and all items should be handled accordingly.

Surfaces must be decontaminated after any spill of potentially infectious materials. Specific written protocols must be developed and followed for each decontamination process. Personnel in Central Processing must be trained in all decontamination procedures specific to their activities and should know the factors influencing the effectiveness of the treatment procedure.

Chemical Disinfectants

Chemical disinfectants are used to decontaminate surfaces, reservoirs of infectious material, and to clean up spills of infectious material. The choice of chemical disinfectant must be made carefully based on:

- Types of organisms, suspected or known
- Items or surfaces to be decontaminated
- Hazards posed to the HCW by the disinfectant
- Cost of disinfectant
- Corrosiveness of disinfectant
- Shelf life and required dilution of disinfectant
- Material which inactivates the disinfectant

In many cases, the choice of disinfectant for specific uses may be standardized in the organization and made after evaluation by IPC and OHS professionals. Reusable instruments that have been disinfected with chemical disinfectants must be thoroughly rinsed to remove residues of disinfectant.

Considerations in the use of chemical disinfectants

- As much as possible, know what the possible contaminants are.
- Choose the disinfectant carefully. More than one may be required. Keep in mind the items to be disinfected, and the properties and limitations of the various available disinfectants. If more than one disinfectant is required, ensure that those selected are chemically compatible.
- Follow the manufacturer's directions for making the proper dilutions of the disinfectants.
- The effective life of disinfectants can vary depending on the formulations and the conditions of usage. Follow the manufacturer's directions.
- The effective exposure time that the disinfectant must be in contact with the contaminant will also vary with conditions of usage. Often overnight exposure may be recommended to ensure effective decontamination.

- Understand the health and safety hazards that may be posed by a particular disinfectant and ensure appropriate precautions are taken. Wear disposable gloves when using any disinfectants. Wear other personal protective equipment or clothing as necessary, depending upon the disinfectants. Consult Material Safety Data Sheets for details.
- HCWs with particular sensitivities to specific disinfectants should avoid using those disinfectants.
- Perform tests of the disinfectants to ensure effective disinfection.

Spill response procedures

The efficient and effective control of a biological spill requires that all staff members are trained in and have practiced the established spill response techniques. The materials and supplies that are necessary for spill clean-up and decontamination must be readily available to ensure timely spill response. Written spill response procedures should outline spill response actions and roles. The actual procedure used will vary with the size of the spill and the location of spill (including materials, equipment or environmental surfaces affected). All spill responses should be documented as incidents.

A biological spill kit should contain:

- Biological liquid solidifying agent
- Disinfectant - small quantities, made fresh daily if phenolics or hypochlorites (such as bleach)
- Forceps for picking up broken glass
- Paper towels, swabs, disposable and heavy-duty gloves
- Metal or polypropylene (autoclavable) dust pan
- Heavy-duty polyethylene bags
- High efficiency particulate respirators, shoe covers or rubber boots and full protective clothing if large spills may occur

Training

Training in biological hazards and controls should be provided to all health care workers (HCWs). All HCWs must understand the facility's IPC and OHS programs as they relate to their job duties. For newly hired HCWs, all relevant IPC and OHS policies and procedures must be provided before they start work. To ensure that HCWs understand and apply this information to their jobs, specific training should also be provided to address job-specific biological hazards. Periodic refresher training to reinforce policies and procedures and introduce any new practices will benefit all HCWs. Competency assessments should be provided for all training, and training records should be maintained.

HCW immunization and health surveillance

An immunization policy and program is a proactive mechanism to reduce risk of communicable diseases for HCWs. Each healthcare organization should have an immunization and health surveillance program in place that is appropriate to the size and type of workplace. Immunization and health surveillance programs should include:

- Education about vaccine-preventable diseases
- Risk assessment to determine the need for immunization or surveillance based on potential exposure
- Administration of immunizations (or referral for immunizations, as appropriate)
- Documentation and follow-up of any baseline health assessments, communicable disease status and immunizations

Ideally, the immunization and surveillance programs should provide easy, authorized access to HCW immune status records for follow up of exposure incidents and outbreaks. In some cases, immunizations or baseline testing may be required prior to commencement of work.

Post-exposure follow-up management

Post-exposure management includes management of HCWs exposed to, colonized by, or infected with microorganisms; an outbreak management process for exposures and/or HCWs who are symptomatic or colonized with infectious disease; and access by Occupational Health professionals to utilize medical assessment and diagnostic services for timely follow-up for HCW exposures.

Personal Protective Equipment (PPE)

Personal protective equipment such as gloves, respiratory protection and eye protection should be used based on the risk assessment. PPE is often used in conjunction with other controls (engineering and administrative) to provide additional protection to workers. The primary types of PPE are designed to protect the worker from infectious disease by breaking the chain of infection at the “portal of entry or exit” of the microorganisms. This means that all PPE is designed to reduce exposure via specific routes of transmission. Gloves, gowns and other protective clothing reduce exposure through the dermal (skin) contact route and help contain the microorganisms to the work environment.

Gloves

Gloves are the most common type of PPE used for tasks performed in Central Processing. Gloves are made from a variety of materials including latex, nitrile, neoprene, copolymer, and polyethylene and are available in various levels of thickness. When dealing with infectious materials, gloves must be waterproof. Latex gloves should be avoided due to the risk of latex allergy unless there is a demonstrated safety requirement for latex to be used. The Canadian General Standards Board (CGSB) certifies medical gloves, which is a key factor in selecting gloves for use in healthcare. The choice of gloves must often balance the needs for

protection and dexterity. While thicker gloves (or double gloves) may appear to provide greater protection, it may make tasks more difficult and increase the exposure risk. In Recommendations for Canadian Health Care and Public Service Settings², it is noted that the “*Selection of the best glove for a given task should be based on a risk analysis of the type of setting, type of procedure, likelihood of exposure to blood or fluid capable of transmitting bloodborne pathogens, length of use, amount of stress on the glove, presence of latex allergy, fit, comfort, cost, length of cuffs, thickness, flexibility, and elasticity.*”

Safe Practices for Glove Use³

- Wear medical gloves when there is a risk of contact with blood, body fluids or substances, mucous membranes, open wounds or skin lesions.
- Wear gloves that are certified by the CGSB.
- Wear gloves if you have any cuts or lesions on your hands or if you have dermatitis affecting your hands.
- Avoid latex gloves and powdered gloves to reduce sensitization or allergic reactions.
- Ensure that the gloves fit properly.
- Inspect gloves for holes or tears, discarding any damaged gloves.
- Put gloves on just before beginning the task, and remove them promptly when finished and before touching any environmental surfaces.
- Work from “clean to dirty” (touching clean sites or surfaces before dirty or contaminated ones).
- Do not touch your face or adjust PPE with contaminated gloves and avoid touching uncontaminated items such as light switches, telephones, etc. while wearing gloves.
- Change gloves when they become soiled and during lengthy procedures.
- Remove gloves carefully according to the IPC guidelines and dispose of them properly.
- Wash hands before using and after removing gloves.
- Never reuse or wash single-use disposable gloves.

PPE is required when there is the potential for exposure of the face to splashes or sprays of infectious material. The selection of eyewear depends upon the tasks being conducted. Types of eye protection include safety glasses, goggles, visors, face shields and

² Recommendations for Canadian Health Care and Public Service Settings; found at <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23s3/index.html>

³ Modified from information provided in Preventing the Transmission of Blood Borne Pathogens in Health Care and Public Service Settings. Found at <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/97vol23/23s3/index.html> (See Supplement)

table mounted barrier shields. Regular prescription eyewear and contact lenses are not considered effective as PPE. Safety eyewear should fit the wearer, be clean and well maintained and stored. If necessary, goggles may be fitted with prescription lenses or worn over glasses. Face shields should cover the forehead, extend below the chin, and wrap around the side of the face. Masks protect the mucous membranes of the nose and mouth from exposure to large droplets that may contain infectious materials. Masks are commonly used to contain droplets at the source (for example, the HCW or patient with a cough). Masks should fully cover the nose and mouth and fit snugly.

The Difference between a Surgical or Procedure Mask and a Respirator

Surgical or Procedural Masks	Respirators (i.e. NIOSH approved N95)
<ul style="list-style-type: none"> • Surgical Masks are <u>not</u> designed to seal tightly against the HCW's face or certified to prevent inhalation of small droplets/particles. • When the HCW inhales, contaminated small droplets can pass through gaps between the face and surgical mask. 	<ul style="list-style-type: none"> • A fit-tested NIOSH approved respirator provides a proper seal at the HCWs face, forcing inhaled air to be pulled through the filter material and not through gaps between the face and the respirator.
<ul style="list-style-type: none"> • Surgical masks provide a physical barrier for protection from splashes of large droplets of blood or body fluids. • Surgical masks are used for several purposes including: <ul style="list-style-type: none"> ○ Prevention of accidental contamination of patients wounds with pathogens normally present in mucus or saliva ○ Placed on sick patients to limit spread of infectious respiratory secretions to others ○ Protection from splashes or sprays of blood or body fluid ○ Assist to keep HCWs contaminated hands from contacting their own mucous membranes. 	<ul style="list-style-type: none"> • Respirators are designed to reduce HCW's exposure to airborne contaminants. • Fit tested NIOSH approved respirators are used when required, based on hazard assessment.

**Adapted from OSHA (2007) Guidelines on Preparing Workplaces for an Influenza Pandemic*

Chemical Hazards and Controls

This section will provide a brief overview of selected chemicals used in healthcare workplaces. This is not a textbook and will not delve into details about each chemical. Rather it will present information about health effects, and suggested “best practices” for controlling exposures. **Note that this list is not extensive or all-inclusive.** While some of these chemicals are relatively common, several are used in very specialized areas or processes. In the control column, E, A and P are used to designate Engineering, Administrative and PPE controls. These controls are briefly summarized and the reader should link to the references provided for additional information. The proper choice of control measures must be based on a risk assessment for the specific tasks being performed. Safe work practices are administrative controls necessary for working with all harmful substances and educating workers in the practices is vital. Safe work procedures should be designed to:

- Limit the worker’s exposure time
- Reduce contact with the substance through any route of exposure to the worker
- Ensure safe disposal of substances and disposable equipment that comes into contact with harmful substances
- Ensure safe handling and decontamination of reusable equipment
- Require the use of all designated controls

Worker education is critical for safely handling harmful substances.

General Resources – Chemical Hazards

For more information about specific chemical hazards, consult the following resources:

NIOSH Pocket Guide to Chemical Hazards (<http://www.cdc.gov/niosh/npg/>).

CCOHS Cheminfo (<http://ccinfoweb.ccohs.ca/>).

Alberta Workplace Health and Safety Bulletins (<http://employment.alberta.ca/SFW/136.html>).

Chemicals used for cleaning and disinfection

Chemical (category or group)	Common Uses and Examples	Exposure and Health Effects Information	Controls	For more information:
<p>These are examples of chemicals, uses, health effects and controls. For each chemical used in the workplace, specific information MUST be consulted to determine controls based on what the product is used for, how it is used and the environment it is used in. This may be found on MSDSs, information provided by the manufacturer or supplier, or other sources. Individual reactions to chemicals must also be considered in determining appropriate controls.</p>				
<p>Alcohol hand sanitizers</p>	<p>Hand hygiene when water is not available and hands are not visibly soiled</p>	<p>May cause skin dryness. Product is flammable.</p>	<p>A- Appropriate storage of product (away from ignition sources and incompatible products). Provision of hand cream to soothe hand dryness.</p>	<p>http://www.ottawa.ca/residents/health/emergencies/pandemic/hand/faq_gel_en.html</p> <p>http://employment.alberta.ca/documents/WHS/WHS-PUB_fex002.pdf</p> <p>http://www.municipalaffairs.alberta.ca/documents/ss/STANDATA/fire/fcb/97fcb026.pdf</p>
<p>Detergents</p>	<p>Cleaning a variety of surfaces</p>	<p>Possible eye, skin, and respiratory irritants. Some products may cause allergic dermatitis or contain sensitizers such as nickel or limonene. May react with other products to create hazardous products.</p>	<p>E- Substitution with less harmful product. Properly designed and maintained ventilation systems. Automatic diluting machines.</p> <p>A- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures. WHMIS program and maintenance of MSDSs. Worker education. Accommodation for sensitized workers or those with health issues,</p> <p>P- Gloves and eye protection.</p>	<p>http://www.hercenter.org/hazmat/cleaningchems.cfm</p> <p>http://www.museo.unimo.it/ov/fdrEdete.htm</p>
<p>Low Level Disinfectants</p>	<p>Chlorine compounds, alcohols, quaternary ammonium salts, iodophors, phenolic compounds,</p>	<p>Most are eye, skin, and respiratory irritants, particularly when concentrated. Some products may produce sensitization. Toxic effects depending on nature of chemical. May</p>	<p>E- Substitution with less harmful product. Properly designed and maintained ventilation systems. Automatic diluting machines. Closed systems.</p> <p>A- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures. WHMIS program and maintenance of</p>	<p>http://ehs.virginia.edu/biosafety/bio-disinfection.html</p> <p>http://www.cdc.gov/niosh/topics/chemical.html</p> <p>http://cms.h2e-online.org/ee/hazmat/hazmatconcer</p>

	hydrogen peroxide used widely for disinfection; usually prepared and used in low concentrations.	react with other products to create hazardous products.	MSDSs. Worker education. Accommodation for sensitized workers or those with health issues. P- Gloves and eye protection.	n/steril/ http://www.mtpinnacle.com/pdfs/disinfectant-selection-guidelines.pdf
Ethylene Oxide	Sterilization of medical devices. Exposure to ethylene oxide when removing items from the EtO sterilizer, moving items from the sterilizer to the aerator, and changing bottles of EtO gas.	Skin, eye and respiratory irritant. Toxic effects. Classified as a suspected human carcinogen. Reproductive effects. May cause skin sensitization. May cause frostbite by skin contact. Inhalation exposure may result from improper aeration of Ethylene Oxide chamber or equipment malfunctions.	E- Substitution with less harmful product. Ensure processes adequately allow for ventilation of chambers. Local exhaust ventilation. Use of closed processes. Preventive maintenance on process equipment. Facility design. Leak alarms. A- Safe work procedures including emergency release procedures. Provision of sufficient time for aeration. WHMIS program and maintenance of MSDSs. Worker education. Control access to work area and process equipment. Continuous air monitoring in work and equipment service areas. Routine exposure monitoring. Accommodation for workers who are sensitized or may have health issues. P- Gloves, protective clothing (butyl apron), safety glasses, and appropriate respirator when changing cylinders or when engineering controls are insufficient.	http://www.cdc.gov/niosh/89115_52.html http://www.osha.gov/SLTC/etools/hospital/central/central.html#ExposureetoEthyleneOxideGas
Glutaraldehyde	High level disinfection of medical devices. May also be used in tissue processing	Contact allergen, may cause occupational asthma and respiratory and skin sensitization. Ceiling Limit OEL exists. Strong skin and respiratory irritant. May react with other products to create hazardous products.	E- Substitution with less harmful product. Properly designed and maintained ventilation systems. Local exhaust ventilation. Enclosed processes. A- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures including spill procedures. WHMIS program and maintenance of MSDSs. Worker education. Routine exposure monitoring. Accommodation for	http://www.osha.gov/Publications/3258-08N-2006-English.html http://www.osha.gov/SLTC/etools/hospital/hazards/glutaraldehyde/glut.html http://www.cdc.gov/niosh/docs/2001-115/ http://www.sustainablehospitals.org/

			sensitized workers or those with health issues, P- Gloves, eye protection, face protection, and chemical-resistant protective clothing. Respirators for use in the event of spills. Respirators if engineering controls are insufficient.	cgi-bin/DB_Index.cgi.
Hydrogen Peroxide	Sterilization of medical devices and surfaces	Skin, eye and respiratory irritant. Oxidizer. May react with other products to create hazardous products. Fire hazard.	E- Substitution with less harmful product. Properly designed and maintained ventilation systems. May require local exhaust ventilation. Enclosed processes. A- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures. WHMIS program and maintenance of MSDSs. Worker education. Accommodation for workers who are sensitized or may have health issues. P- Gloves, eye protection and chemical-resistant protective clothing. Respiratory protection based on risk assessment.	http://www.cdc.gov/niosh/npg/npgd0335.html
Ortho-phthalaldehyde (OPA)	High level disinfection of medical devices. Replaces glutaraldehyde containing disinfectants.	Eye and respiratory irritant and skin sensitizer. May cause skin discoloration. May react with other products to create hazardous products.	E- Properly designed and maintained ventilation systems. May require local exhaust ventilation. Enclosed processes. A- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures including disposal and spill procedures, and keeping soaking containers closed at all times. WHMIS program and maintenance of MSDSs. Worker education. Control access to work area. Exposure monitoring. Accommodation for sensitized workers or those with health issues, P- Gloves, eye protection, face shield and chemical-resistant protective clothing.	http://www.mtpinnacle.com/pdfs/Cydex.pdf http://www.aspji.com/us/supports/material-safety-data-sheets http://www.sustainablehospitals.org/cgi-bin/DB_Index.cgi

<p>Soaps and waxes</p>	<p>General cleaning and floor maintenance</p>	<p>May cause skin and eye irritation. Some waxes may be a respiratory irritant if ventilation is insufficient. May react with other products to create hazardous products.</p>	<p>E- Elimination of waxes. Substitution with less harmful product. Design and maintenance of ventilation systems. A- Practice to purchase products in ready to use concentrations to minimize handling. Safe work procedures. Scheduling of floor care activities to reduce exposure to workers in the area, particularly those with sensitivities. WHMIS program and maintenance of MSDSs. Worker education. P- Gloves and eye protection when skin or mucous membrane contact is possible.</p>	<p>http://www.hercenter.org/hazmat/cleaningchems.cfm</p>
<p>Alcohols</p>	<p>Disinfection for some surfaces and as a reagent in some procedures</p>	<p>Skin, eye and respiratory irritant. Flammable. Central nervous system depressant.</p>	<p>E- Substitution with less harmful products. Maintain adequate general ventilation. Enclosed and automated processes. Grounded and bonded transfer equipment. A- Purchase of products in small quantities with the highest dilution that is appropriate for the task. Safe work procedures including spill procedures. Appropriate storage of products to decrease exposure and reactions. Maximum storage volumes allowed based on flammability and container material. Maintenance of an inventory of products and removal of unused products. WHMIS program and maintenance of MSDSs. Worker education. P- Gloves and eye protection depending upon the products used, concentration and tasks. Respiratory protection based on hazard assessment</p>	<p>http://www.ee.byu.edu/cleanroom/solvent_safety.phtml</p> <p>http://www.cdc.gov/NIOSH/NPG/np_gd0359.html</p> <p>http://employment.alberta.ca/documents/WHS/WHS-PUB_fex002.pdf</p>

Other chemicals and substances

Chemical	Common Uses; Examples	Exposure and Health Effects Information	Controls	For more information:
<p>These are examples of chemicals, uses, health effects and controls. For each chemical used in the workplace, specific information MUST be consulted to determine controls based on what the product is used for, how it is used and the environment it is used in. This may be found on MSDSs, information provided by the manufacturer or supplier, or other sources. Individual reactions to chemicals must also be considered in determining appropriate controls.</p>				
Compressed gases	Commonly used for patient treatment i.e. oxygen, nitrous oxide. Also commonly used in maintenance activities. Ethylene oxide is used for sterilization.	Asphyxiation, anaesthetic effects. Toxicity is dependant on chemical products. Other hazards include explosions, fire hazards, flying projectiles, and release of gas. Cryogenic gases may also cause skin damage through freezing.	<p>E- Substitution with less harmful product. Adequate ventilation. Proper storage of cylinders.</p> <p>A- Appropriate store of products to decrease exposure and minimize fire and explosion hazards. Safe work procedures including transportation. WHMIS program and maintenance of MSDSs. Worker education. Good housekeeping.</p> <p>P- PPE based on hazard assessment.</p>	<p>http://www.ccohs.ca/oshanswers/chemicals/compressed/compress.html</p> <p>http://www.ccohs.ca/oshanswers/prevention/comp_gas.html</p> <p>http://www.chem.ubc.ca/safety/safety_manual/hazard_chem_gases.shtml</p>
Latex	Used in gloves, medical devices, some respirators, elastic bands, balloons, etc.	Exposure can produce irritant contact dermatitis, allergic contact dermatitis, and allergic responses including immediate hypersensitivity and shock.	<p>E- Substitution with less harmful product. Properly designed and maintained ventilation systems.</p> <p>A- Purchasing controls to limit latex containing materials from entering facility. Safe work procedures. Education of workers in the nature of the hazard, hand washing after glove removal, proper glove donning and removal. Work reassignment for workers with latex allergies to areas where latex is not present. As per hazard assessment.</p>	<p>http://www.worksafebc.com/publications/health_and_safety/by_topic/asets/pdf/latex_allergies.pdf</p> <p>http://www.ccohs.ca/oshanswers/diseases/latex.html?print</p>
Mercury	Metallic mercury may be found in thermometers,	Exposure is through inhalation of vapours, ingestion and skin absorption. Skin	<p>E- Elimination of mercury containing equipment. Substitution with less harmful product. Enclosed mercury sources. Properly designed and</p>	<p>http://employment.alberta.ca/documents/WHS/WHS-PUB_ch003.pdf</p> <p>http://www.cdc.gov/niosh/npg/npgd0</p>

	pressure gauges (manometers), other medical devices and dental fillings, etc.	sensitizer. Corrosive as liquid. Target effects to the nervous system, kidneys, cardiovascular and eyes.	maintained ventilation systems. Local exhaust ventilation may be required. A- Safe work procedures including spill procedures. Education of workers in the nature of the hazard. Purchasing controls to restrict mercury containing materials from entering facility. Monitoring of the work environment following a spill. Good hygiene practices. Appropriate storage of products to decrease exposure. P- Protective clothing, gloves, eye and face protection, and respiratory protection based on hazard assessment.	383.html http://www.mtpinnacle.com/pdfs/MERCURY-USE-%20HOSPITALS-AND-CLINICS.pdf
Personal care products, scents and fragrances	A wide range of products including personal care items such as shampoos, soaps, perfumes, creams, deodorants, etc. Also contained in, cleaning products.	May cause a variety of mild to severe symptoms. Allergic, asthmatic and sensitive workers may experience reactions.	E- Elimination of scented products. Substitution with less harmful products. Properly designed and maintained ventilation systems. A- Development, implementation and enforcement of scent-free policies. Signage in work areas where affected workers work. Worker education.	http://www.ccohs.ca/oshanswers/hs/programs/scent_free.html

In this section the most commonly potential chemical exposure hazards encountered by personnel in Central Processing and methods to control them are presented. Employers should carefully evaluate the potential for exposure to chemical hazards in all tasks performed in Central Processing and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments. Please note, this is not designed to be an exhaustive treatment of the subject, but is rather an overview summarizing the chemical hazards most frequently encountered by personnel in Central Processing.

Note:

The following charts taken from Volume 3 – Best Practices for the Assessment and Control of Chemical Hazards in Healthcare provide basic information about control strategies for commonly occurring chemical hazards related to tasks performed in Central Processing. The selection of controls must be based on a risk assessment of the tasks and environment. Worker education and good communication processes are critical administrative controls. All legislation related to the assessment of hazards, selection and use of controls must be followed

Potential Chemical Hazards	Summary of Major Control Strategies		
	Engineering	Administrative	PPE
Exposure to glutaraldehyde or other cold sterilants for disinfecting surgical instruments	Substitution with less harmful product. Maintain adequate general ventilation. Local exhaust ventilation. Enclose processes.	Safe work procedures including spill procedures. Worker training.	Chemical-resistant gloves, eye protection, face protection, and chemical-resistant protective clothing. Respirators for use in the event of substantial spills. Respirators if engineering controls are insufficient.
Exposure to ethylene oxide (EtO) when removing items from the EtO sterilizer, moving items from the sterilizer to the aerator, and changing bottles of EtO gas.	Substitution with less harmful product. Maintain adequate general ventilation. Ensure processes adequately allow for ventilation of chambers. Perform preventive maintenance on process equipment. Consider facility design.	Safe work procedures including emergency release procedures. Control access to work area and process equipment. Continuous air monitoring in work and equipment service areas.	Chemical-resistant gloves, protective clothing (butyl apron), and appropriate air purifying respirator when changing cylinders.
Exposure to mercury from contact with accidental spills during the repair, cleaning or processing of mercury-containing equipment			
Exposure to latex from contact with latex gloves	Substitution with less harmful product. Maintain adequate general ventilation.	Purchasing controls to limit latex containing materials from entering facility. Educate workers in the nature of the hazard, hand washing after glove removal, proper glove	

		donning and removal. Periodic screening of workers.	
Exposure to a variety of disinfecting and cleaning agents in routine cleaning activities	Maintain adequate general ventilation. Automatic diluting machines.	Purchase in ready to use concentrations to minimize handling. Worker education. Safe work procedures. WHMIS program and maintenance of MSDSs.	Gloves and eye protection.

Notes about controls for chemical hazards

Engineering Controls

Many engineering controls are available for controlling the hazard at the source and along the path of transmission. For chemical hazards, common engineering controls include the following.

- Elimination
- Substitution
- Local exhaust ventilation
- General ventilation (only appropriate for non-toxic chemicals)
- Isolation/enclosed processes
- Proper chemical storage
- Facility design

For personnel in Central Processing, chemical exposures may be limited by ensuring the facilities well designed, have effective ventilation, adequate storage for any chemicals used and have easily cleanable surfaces.

Elimination

Elimination of a hazardous chemical from the healthcare workplace is always desirable but not always possible. For example, treatments and diagnostic reagents must still be prepared and administered, disinfectants are required when biological hazards are present and cleaning solutions are necessary to maintain hygienic conditions. In some cases, exposures can be eliminated by transferring specific processes or activities to another facility, or areas within a facility where better controls are available.

Substitution

Some chemicals used in the healthcare environment are chosen based on tradition or cost. In recent years, efforts have been made to find less hazardous alternatives to some of the chemicals commonly used. This is also the case where environmental legislation requires a change in product or process used.

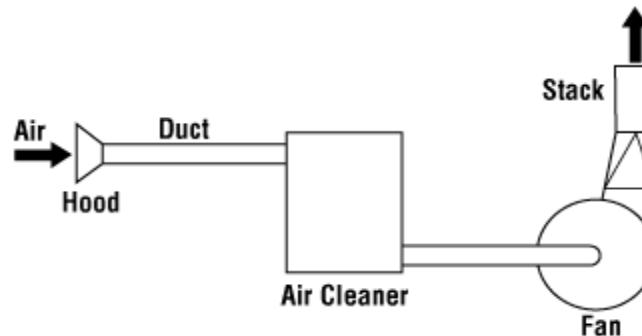
Some examples of substitution of chemical hazards in healthcare:

- Replacing mercury-containing devices (manometers, thermometers) with non-mercury containing alternatives
- Using accelerated hydrogen peroxide-based disinfectants instead of glutaraldehyde
- Using hydrogen peroxide-based cleaners rather than chlorine-based cleaners
- Substitution of ethylene oxide with other sterilants

When substituting a chemical for one that is currently in use, it is critical to ensure that the new chemical does not have properties that may make it more toxic or more flammable, etc.

Local Exhaust Ventilation

The most common engineering control used in healthcare to minimize exposure to chemicals in the air is local exhaust ventilation (LEV). LEV captures contaminants at the point where they are released or generated and mechanically removes them before workers can inhale them. The following figure⁴ outlines the major components of a basic local exhaust ventilation system.



Air containing contaminants is drawn through ductwork or tubing by means of a fan, removing it from the work environment and then expelling it to a safe location. Prior to being expelled, the air is sometimes decontaminated through filters.

⁴ From CCOHS Publication *OSH Answers – Industrial Ventilation*; found at <http://www.ccohs.ca/oshanswers/prevention/ventilation/>. Used with permission.

Local exhaust ventilation is used with ethylene oxide sterilization. It is used at the sterilizer door and at the drain to collect ethylene oxide emissions. In addition, pressure relief valves are often present in medium to large sterilizers. Design of the sterilizer and choice of location are key engineering controls. Rear exhaust systems are preferred in large sterilizers.

All local exhaust systems must be inspected and maintained according to the manufacturer's instructions to ensure that they are functioning properly.

Isolation/Enclosed Processes

Isolating the source or location of the hazard helps to reduce exposure. Isolation of the sterilization and aeration process and restricting the number of personnel may reduce the number of workers who can potentially be exposed.

Early warning sensor systems

Sensors should be located in areas where ethylene oxide emissions can occur. These typically include near the front of the sterilizer, the sterilizer equipment room, and in the compressed gas tank area. The sensors are designed to provide audible/visual warning of potential exposures and prompt emergency action on the part of the Central Processing staff.

Chemical Storage

An often-neglected engineering control is the proper storage of chemicals. Chemicals must be stored properly to reduce risks of fire and explosion, chemical reactions, and worker exposure. Chemical storage must consider local fire regulations that specify the types and quantities of specific chemicals that may be stored. Organizations should reduce the risks related to chemical storage by ensuring that only quantities of chemicals and sizes of containers that are necessary for the tasks are purchased and stored. The temptation to save money by purchasing large quantities should be discouraged, as these quantities have more stringent storage requirements and are often more difficult (and expensive) to dispose of than to purchase.

Some major reasons why chemicals are stored improperly include:

- An initial decision (when the area is designed) to purchase small quantities of chemicals that is later reversed for economic reasons, leading to the purchase of larger quantities that exceed the storage capabilities of the area.
- Lack of space to accommodate storage facilities.
- “Shared” storage facilities, with no one designated as responsible for ensuring proper storage.
- Confusion as to how to store chemicals that have more than one hazard.
- Lack of training/knowledge of chemical composition and reactivities.
- Bad habits related to convenience.
- Lack of a well thought out chemical storage plan.

Administrative Controls

Policies and procedures, training

As administrative controls, policies and procedures should be in place to ensure that there are safe work procedures for storing and using chemicals and discarding chemical wastes appropriately. Personnel in Central Processing may come into contact with a number of chemicals used for disinfection. Workplace Hazardous Materials Information System (WHMIS) training should be provided to all personnel in Central Processing. In addition, emergency call lines that provide expertise and advice regarding toxic chemicals should be made available.

WHMIS Program

A WHMIS program is an administrative control to reduce the risk of exposure to chemicals in the workplace and is a legal requirement for all employers who use controlled products in Alberta. To be effective, a WHMIS program must be relevant to the workplace, presenting information and training specific to the chemicals that are used in the workplace. The components of WHMIS include having current Material Safety Data Sheets for all products in the workplace, ensuring all products are appropriately labelled and ensuring that all workers are instructed on how to use the chemicals safely.

Exposure follow-up – emergency response equipment

Two types of exposure follow-up are considered as administrative controls. The first is the provision of appropriate emergency response equipment to reduce the impact of the exposure. The second is the medical follow-up for workers who have had a

chemical exposure. In the first case, emergency response equipment for personnel in Central Processing sometimes refers to emergency eyewashes and drench hoses that can provide sufficient water to dilute the contaminant before it can cause extensive damage. Wherever chemical exposure could pose a hazard to eyes and skin, emergency wash devices are required. Appropriate signage that is easily visible must be provided to indicate where the eyewashes are kept. Of critical concern from a worker safety as well as environmental impact perspective is the emergency response plan for ethylene oxide leaks or spills. The plan should be comprehensive, documented, and all workers should be trained in all aspects of the plan. The plan should include a designation of roles and responsibilities, what should be done when an early warning alarm sound, when evacuation may be necessary, what personal protective equipment must be used, and what the follow-up should be.

Medical follow-up of the exposed worker

A worker who has had a chemical exposure may require medical follow-up. Guidelines are available to provide information on the treatment and monitoring of workers with exposure to specific chemicals.

Health Surveillance and Medical Monitoring in the Workplace

Health surveillance encompasses two types of individual health assessments. The pre-placement assessment considers the worker's personal health status as it relates to potential workplace exposures. It is useful to identify if workers have any allergies or sensitivities to products that they may need to work with. Another form of health surveillance is the on-going monitoring of workers who may be exposed to certain chemicals or substances in the workplace. An occupational hygiene program should provide for routine monitoring on a periodic basis for ethylene oxide and glutaraldehyde in Central Processing areas.

Chemical Waste Handling and Disposal

Chemical wastes must be addressed with a good waste management system. Municipal and or Provincial codes address appropriate disposal requirements and aim to reduce contamination, possible injuries, illness or reactions related to chemical and radioactive exposures.

Additional considerations for reducing risk of exposure

It is prudent to be aware of the need for modification of the work environment, conditions or required PPE for workers who may be medically vulnerable to the effects of some substances. Higher risk workers may include pregnant workers, workers with allergies or those who are sensitized to certain chemicals. Some common approaches to accommodate these workers include temporary reassignment to areas or tasks where the exposure potential is eliminated; work scheduling to reduce the amount of exposure, and changes to the PPE to accommodate limitations.

Personal Protective Equipment

Personal protective equipment (PPE) is considered the lowest level of protection in the hierarchy of controls. This reflects the reliance on proper selection, fit, use and maintenance of the equipment by the organization and individual HCWs. PPE is often used in conjunction with other controls (engineering and administrative) to provide additional protection to workers. PPE is designed to protect the worker from exposure to chemicals by blocking access to the route of entry into the body. Gloves, aprons and other protective clothing reduce exposure through the dermal (skin) contact route. Eye and face protection reduce exposure through skin and mucous membrane contact. Respirators reduce exposure to the respiratory system.

Gloves

The most frequently used PPE by Central Processing staff to prevent exposure to chemicals is gloves. When choosing gloves, the following must be considered:

- The nature and concentration of the chemicals
- The amount of time the gloves will be exposed to the chemical
- Dexterity required to perform the task
- Extent of protection needed (to wrist or higher)
- Decontamination and disposal requirements

Rules for glove use for chemicals^{5,6}

- Wear the appropriate gloves for the task when needed; for reusable gloves, follow the manufacturer's guidelines for care, decontamination and maintenance. Choose gloves resistant to holes and tears.
- Ensure gloves fit properly and are of the appropriate thickness to offer protection; ensure adequate supplies of gloves in appropriate sizes.
- Avoid using latex gloves (due to latex allergies).
- Do not use worn or defective gloves.
- Wash hands once gloves have been removed.
- Disposable gloves must be discarded once removed. Do not save for future use.
- Dispose of used gloves into the proper container. Have separate disposal locations for gloves contaminated with chemicals which pose a toxic hazard if mixed.

⁵ OSH Answers- Chemical Protective Clothing – Gloves; <http://www.ccohs.ca/oshanswers/prevention/ppe/gloves.html>

⁶ Glove Use in Laboratories; University of Florida Chemical Hygiene Plan; <http://www.ehs.ufl.edu/Lab/CHP/gloves.htm>

- Non-disposable/reusable gloves must be washed and dried, as needed, and then inspected for tears and holes prior to reuse.
- Remove gloves before touching personal items, such as phones, computers, pens and one's skin.
- Do not wear gloves into and out of areas. If gloves are needed to transport anything, wear one glove to handle the transported item. The free hand is then used to touch door knobs, elevator buttons, etc.
- Do not eat, drink, or smoke while wearing gloves. Gloves must be removed and hands washed before eating, drinking, or smoking.
- If for any reason a glove fails, and chemicals come into contact with skin, remove the gloves, wash hands thoroughly and obtain first aid or seek medical attention as appropriate.

Eye and Face Protection

For most HCWs who use chemicals, goggles or face shields are necessary. In most cases, goggles are considered re-usable. All reusable PPE must be properly decontaminated and maintained. Selection of protective eyewear should take into account:

- Level of protection required
- Comfort of the wearer
- Secure fit that does not interfere with vision or movement
- Ease of cleaning and disinfection
- Durability
- Compatibility with prescription glasses and other PPE that must be worn at the same time (e.g. respirators)

Respirators

According to the Alberta Occupational Health and Safety Code 2009⁷, there is a duty to provide and use respiratory protective equipment (RPE) when a hazard assessment indicates that a worker may be exposed to airborne contaminants or exposed to an oxygen deficient environment. Employers are required to use engineering and administrative controls before using RPE (respecting the hierarchy of controls). Respirators may be required to protect HCWs from exposure to chemicals by inhalation. Respirators used by those responding to an ethylene oxide leak or spill emergency should wear a positive-pressure self-contained breathing apparatus. When respirators are required based on the hazard and risk assessment, a respirator program must be in place. The program requires that workers are trained on the selection, use and maintenance of respiratory protection equipment and that they are properly fit-tested.

⁷ Alberta OHS Code 2009, Part 18 – Personal Protective Equipment

Respiratory Protective Equipment (RPE)

Employers must determine the degree of danger presented by respiratory hazards and whether workers need to wear RPE if workers are, or may be exposed to, an airborne harmful substance. The employer must consider the nature and the exposure circumstances of the harmful material. If a hazard assessment identifies the need for RPE, the specific legislated requirements are outlined in the *OHS Code, Part 18*.

Some of the requirements include:

Training

- Employers must ensure that all workers receive appropriate education, instruction or training with respect to hazards that they may be exposed to and procedures and controls used to reduce exposure.

Code of Practice

- If respiratory equipment is used at a work site, an employer must prepare a written code of practice governing the selection, maintenance and use of the RPE.

Approval of Equipment

- Employers must ensure that RPE required at a work site is approved by NIOSH or another standards setting and equipment testing organization, or combination of organizations, approved by a Director of Occupational Hygiene.

Effective Face Seal

- Employers must ensure that RPE that depends on an effective facial seal for its safe use is correctly fitted in accordance with CSA standard Z94.4-02 or a method approved by a Director of Occupational Hygiene.

OHS Act, Section 33 and OHS Code, Part 18

Protective Clothing

Chemical protective clothing is available as gowns, aprons, uniforms, coveralls, foot covers and full body suits. The choice of protective clothing relies on an accurate hazard assessment. Should protective clothing become contaminated with a chemical or damaged, the clothing must be removed and handled according to organizational procedures (disposal or proper decontamination). Residual chemicals such as acids on clothing may continue to present an exposure hazard. Workers must not wear clothing that is contaminated with chemicals home, as this may pose a danger to themselves and others.

Worker Decontamination

If a worker is contaminated by a harmful substance at the worksite, the employer must ensure that only those items that have been properly decontaminated or cleaned are taken from the worksite by the worker.

Physical Hazards and Controls

There are many potential physical hazards to which personnel in Central Processing may be exposed. The nature of the work may pose ergonomic hazards, the potential for slips, trips and falls, cuts, and electrical hazards.

In this section the physical hazards most commonly encountered by personnel in Central Processing and methods to control them are presented. Employers should carefully evaluate the potential for exposure to hazards for all tasks performed in Central Processing and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments.

Note:

The following chart provides basic information about control strategies for commonly occurring physical hazards in Central Processing work. The selection of controls must be based on a risk assessment of the tasks and environment. Worker education and good communication processes are critical administrative controls. All legislation related to the assessment of hazards, selection and use of controls must be followed.

Potential Physical Hazards	Summary of Major Control Strategies		
	Engineering	Administrative	PPE
Ergonomic hazards associated with computer use or workstation design	Ergonomically designed workstations, chairs and equipment. Incorporate adjustable workstation to accommodate shared use by employees of various sizes.	Adjustment of workstation and chair to fit user. Worker education regarding ergonomic hazards and control strategies. Self assessment tools to assist workers in identifying and controlling risk factors. Safe work procedures. Early reporting of signs and symptoms of ergonomic concerns. Stretches and micro-breaks. Purchasing standards for ergonomically designed computer workstations, chairs and equipment. Ergonomic assessments. Maintenance of workstations, chairs	

		and equipment.	
Ergonomic hazards associated with awkward and sustained postures, pushing, pulling, reaching, and repetition and compression forces	Design workstations so that packaging and equipment is in easy reach and elbows can be kept by the worker's side. Consider height adjustable work surfaces. Provide ergonomic carts with large and low resistance casters. Consider sit-stand stools, anti-fatigue matting, foot rails or foot rests, and the appropriate height of work surfaces. Ensure the edges of work surfaces are smooth and rounded to minimize compression forces.	Safe work procedures. Worker education and awareness sessions. Instruct workers to minimize sustained overhead reaching and to avoid leaning on hard sharp surfaces. Arrange packaging and equipment in easy reach. Early reporting of signs and symptoms of ergonomic concerns. Stretches and micro-breaks. Job rotation and job enlargement. Purchasing standards for ergonomically designed equipment, carts and wagons. Maintenance program for equipment and carts.	
Falling hazards associated with slips, trips and falls	Install slip resistant flooring. Design stairwells according to accepted safety standards. Ensure adequate lighting.	Perform regular maintenance on flooring, stairwells, hallways, handrails, etc. Inspect ladders prior to use. Worker education. Implement a spill cleanup program that includes prompt spill cleanup, use of warning signs, etc. Maintain good housekeeping practices and minimize clutter and tripping hazards.	Appropriate footwear with gripping soles and good support.
Cuts from sharp instruments, including medical instruments and scissors	Avoid use of sharps when not required. Replace sharps with Safety Engineered Medical Devices. Proper storage of sharps.	Worker education. Safe work procedures.	
Noise from equipment and machinery in noisy work areas, or from operation of noisy machinery or tools	Substitution with quieter equipment or processes. Alteration of machinery to reduce noise at the source or along path including modification, isolation and maintenance.	Noise Management program. Worker training. Audiometric testing. Assess noise levels and perform routine exposure monitoring. Preventative maintenance program. Signs notifying of noisy areas.	Hearing protection devices.
Exposure to environmental heat when working in hot indoor	Equipment maintenance, portable ventilation devices.	Worker education about the effects of heat exposure. Communication	Light-weight clothing if possible.

environments (autoclave/heat sterilizer rooms)		system in case of emergency. Work-rest cycles. Work scheduling to avoid long periods of exposure to heat. Provision of water.	
Burns from handling recently heat-sterilized equipment	Work process design to manage equipment turnover. Work area design. Automated processes.	Worker education. Safe work procedures.	Heat-resistant gloves. Protective clothing including arm protection as required by hazard assessment.
Burns related to contact with steam from autoclaves	Equipment maintenance, local exhaust (canopy) ventilation over autoclave door. Interlock system preventing opening of autoclave until specific temperature is reached. Proper autoclave carriers. Alarm systems on autoclaves.	Worker education. Safe work procedures, including proper loading and unloading of autoclave, loosening of caps before autoclaving, allowing sufficient standing time before removing items.	Heat-resistant gloves, rubber apron, and rubber sleeve protectors.
Fire, projectiles, or physical injury if compressed gas cylinders used for a variety of procedures and maintenance activities are damaged, dropped or mishandled	Install protective valve caps when cylinder is not in use if the cylinder is equipped with a means of attaching caps. Secure and restrain cylinders.	Safe work procedures that includes use, care, maintenance, storage and transport. Worker training.	PPE based on hazard assessment and type of compressed gas. Protective footwear for impact hazard when handling large cylinders.
Electrical hazards arising from use of electrical cords and appliances	Ground fault circuit interrupters when used close to water sources.	Safe work procedures that include use of electrical cords, power bars and appliances that includes facility approval requirements. Worker training.	

Notes about controls for physical hazards

Engineering Controls

Ergonomic hazards

Engineering controls are recognized as the most effective category of hazard controls. Examples of general engineering controls that apply to biomechanical hazards include:

- Change the process through automation to eliminate the hazard.

- Use handling equipment (e.g. lifts, hoists, etc.) to reduce manual handling.
- Modify the design of workstations, hand tools, equipment, etc. to reduce the hazard.
- Provide ergonomically designed equipment and furniture – The goal is to purchase and provide equipment and furniture that will support ergonomically correct work postures and behaviours.
- Provide adjustable equipment, including height-adjustable work stations.
- Use anti-fatigue mats in workstations requiring standing.
- Design workstation layout and arrange equipment to minimize biomechanical risk factors. For example, frequently accessed equipment and materials should be located in easy reach (and located to minimize awkward postures).

Trips, Slips and falls

In order to prevent slips, trips and falls in healthcare, organizations should implement a multifaceted prevention program. A key prevention strategy is the installation of proper flooring, maintenance practices and appropriate cleaning and care. The immediate clean up of liquid and contamination on walking surfaces is essential in controlling the hazard as well as the use of signs to identify potentially slippery walking surfaces.

- Put a spill plan in place for areas that are prone to moisture and spills. Use absorbent mats at entrances. Ensure appropriate spill cleanup equipment is available at key locations where sudden spills of food, beverages or bodily fluids are likely to occur.
- Ensure stairways in new facilities are designed safely (see National Building Code and local jurisdictional building codes).
- Utilize non-slippery surfaces on the whole steps or at least on the leading edges.
- Provide adequate lighting in stairways (at least 50 lux).
- Use angular lighting and colour contrast to improve depth perception.
- Providing adequate storage space to minimize the storage of equipment in hallways.
- Keeping hallways clear of obstructions.
- Using cord covers over electrical cords, as necessary.
- Providing well designed stools that have slip resistant surfaces and a stable, strong base.

Cuts

The most effective controls to reduce cuts are engineering controls. Common engineering controls include substitution of medical sharps with safety engineered medical devices (SEMDs)

- Substitution of a sharp instrument with a less sharp alternative (e.g. engineered sharps injury prevention devices)
- Isolation of the process
- Machine guarding to prevent direct contact with moving parts
- Area design to reduce likelihood of exposure (including having sufficient room to work safely, designated locations for storage of knives and other sharp instruments, etc.)

- Safety utility knives
- Safety cutters as bag and box openers
- Interlock systems that do not permit the operation of equipment unless the guards are engaged
- Equipment selection and maintenance

Noise

In Section 217 of the OHS Code, new work sites, equipment, work processes or significant alterations and renovations must be designed and constructed in such a way that continuous noise levels do not exceed 85dBA or are as low as reasonably achievable. Reducing noise by design and other engineering controls can be very effective; in some cases eliminating the need for personal protective equipment and noise management programs. The hierarchy of hazard controls must be applied in the control of noise hazards for all worksites (OHS Code, Part 2).

Focus Box

Four primary methods of controlling noise by engineering control methods are.⁸

Substitution - replace noisy equipment, machinery or processes with quieter ones;

Modification - modify the way equipment operates so that it generates less noise. This may include installing a muffler, reducing equipment vibration by dampening or bracing, improved lubrication, balancing rotating parts or operating equipment at a lower speed. Alternatively, the area itself can be modified. Reverberation, for example, can be reduced by covering walls with sound absorbing materials;

Isolation - this may involve isolating workers from a noisy area by having them work in an enclosed room. Examples of this approach include:

- (a) segregating noisy areas with sound barriers and partitions;
- (b) isolating noisy equipment by placing it in an enclosure; and
- (c) using sound absorbent material and covers over noisy equipment; and

⁸ Alberta Employment and Immigration: *Alberta OHS Code (2009) Explanation Guide*; <http://employment.alberta.ca/SFW/3969.html>

Maintenance - malfunctioning or poorly maintained equipment generates more noise than properly maintained equipment. Noise control equipment must also be properly maintained to be effective.

Engineering controls may require specialized expertise from professionals such as acoustical engineers. Workers who work with the equipment or process play an important role by providing input when considering engineering controls.

Burns

Engineering controls to prevent burns are aimed at reducing contact with hot surfaces or steam. These include effective workplace design (that limits traffic in hot areas, reduces proximity to hot surfaces, provides sufficient space to work and move around hot equipment, etc.), shielding, process changes, local exhaust ventilation for the removal of steam, interlock systems that prevent opening autoclaves or sterilizers until a cooler temperature is reached, mechanical devices (tongs, etc.) for manipulating hot items, temperature and pressure relief valves, and reducing hot water temperatures.

Pressure

Compressed gas cylinders are designed to safely hold their contents during regular use and the demands expected to be placed on them. Regulators, fittings and delivery systems must likewise meet manufacturers' requirements.

Protective valve caps are an engineering control to protect the valve head from damage when the cylinder is not in use. If the cylinder has a valve cap, the cap should always be placed on cylinders when the cylinder is not expected to be used for a period of time, such as for a work shift. All cylinders must be restrained from tipping by means of racks, chains, strap or other suitable means. Metal racks and chains are preferable to fabric straps, which may burn and tear during a fire.

Electrical Hazards

All electrical rooms and vaults must be guarded from unauthorized access. Warning signs must be placed on doors warning employees of the electrical dangers as well as only authorized workers are permitted in these rooms. Electrical services need to be guarded by means of locked enclosures and/or elevating them away from where workers can reach them.

Insulation protects workers from contact with electricity. All equipment, wiring and cords must be maintained and used in a manner that keeps electrical insulation intact.

Electric appliances and equipment are protected from overloading by means of electric overloading devices such as fuses or circuit breakers. Although these devices will stop the flow of current when too much current flows through them, they are intended to protect equipment but not workers. All overloading devices must be of sufficient ratings. Replacing fuses or circuit breakers with overloading devices that trip at a higher current than specified is a dangerous practice as is replacing overloading devices with a conductor. Ground fault circuit interrupters (GFCIs) are safety devices that will interrupt the flow of current by monitoring the flow of current to and from the device. GFCIs are important engineering controls that should be used in wet environments and to power tools and equipment outdoors.

Another important engineering control is grounding. Grounding of electrical equipment refers to creating an electrical path to earth (ground). Grounding provides some protection to equipment operators if there is a fault in the equipment or insulation that energizes the equipment housing; electricity would flow to ground rather than through the worker. Grounding for equipment that is plugged into electrical receptacles can be identified by the third prong on the electrical plug. Similarly electrical cords commonly have a third prong on the plug end. The third prong that facilitates grounding must not be removed or defeated. The housings of all equipment should be suitably grounded. Some electrical cords for tools or other equipment do not have a third grounding prong. This equipment is double insulated, meaning that it has been designed with additional insulating considerations to prevent the housing of the device from becoming energized. Such a device will be labelled with the term “double insulated” or with a symbol comprised of a square box within another square box.

Mechanical Hazards

Safeguards prevent workers from contacting dangerous machine motions by means of a physical guard, distance, or other mechanism that stops the machine from operating when the worker attempts to access dangerous machine areas. Guards, which are physical barriers that cover dangerous machine areas, are usually the preferred method of safeguarding. Guards must be durable enough to withstand conditions that are placed on them and must not be easily removed by operators. Generally, tools must be used to remove guards unless the machine is protected by other means.

Safeguarding devices are other means of engineering controls. These devices stop a machine from operating if an operator attempts to access dangerous machine parts. Safeguarding devices can be of various types including laser or light curtains that sense a person’s body or hands, or interlocks that automatically deactivate a machine when a guard is removed.

The choice of guards, safeguarding devices or other methods of control is largely dependent on the nature and function of the equipment. New equipment that is brought into Central Processing should be equipped with adequate safeguards as its design and

manufacture must meet current requirements of safety standards. However, older equipment may be in use in facilities that does not incorporate sufficient safeguards and this machinery may require additional safeguarding upgrades.

Fire Hazards

Engineering controls include a variety of fire prevention and fire suppression strategies. Fire detection and control equipment includes smoke or heat alarms, automated sprinkler systems, workplace design to ensure safe and effective egress, fire doors, emergency lighting, appropriate chemical storage, use of fire retardant materials, construction in compliance with the Alberta Fire Code and the Alberta Building Code.

Administrative Controls

Ergonomic hazards

Controls that focus on how work is performed and organized are administrative controls. Administrative controls include policies, procedures, work practices, rules, training, and work scheduling. Additional recommended administrative controls are listed below.

- Establish ergonomic purchasing standards for tools, equipment and office furniture.
- Conduct user trials to test new equipment and tools with input from workers.
- Maintain equipment, workstations and tools to optimize their operation.
- Develop work practices to reduce biomechanical hazards.
- Provide training programs to educate workers regarding biomechanical risk factors, signs and symptoms and safe work practices (including proper lifting methods).
- Provide self assessment tools to identify and control biomechanical hazards.
- Perform ergonomic assessments to identify hazards and implement controls.
- Implement job rotation designed to move workers between jobs that utilize different muscle groups.
- Use job expansion to integrate a variety of tasks that utilize different muscle groups and address repetition and mental demands.
- Optimize work shift scheduling to minimize extended work hours and overtime.
- Design break schedules to reduce biomechanical hazards.
- Use micro-breaks to give the body a chance to change posture and recover.
- Encourage monitoring and early reporting of the signs and symptoms of musculoskeletal injuries (MSIs).

Trips, Slips and falls

Administrative controls to prevent slips, trips and falls include:

- Selection of proper flooring
- Education of workers and enforcement of the use of proper footwear
- Timely clean-up of any spills
- Conduct frequent inspections of walking surfaces
- Eliminate the use of extension cords that may pose tripping hazards
- Keep aisles and hallways free of clutter
- Safe work procedures

Cuts

Administrative controls widely used to reduce the potential for cuts include

- Educating workers
- Using safe work procedures
- Choosing the appropriate tool
- Restricting access to work areas
- Placing signs and warnings in hazardous areas, and
- Safely disposing of all sharps, including broken glass

Noise

If workers are exposed to excess noise, a noise management program is required by the OHS legislation. Excess noise means noise that exceeds the limits specified in section 218 of the OHS Code. An effective program includes all elements that are required by the Code and employee participation in the program's development and implementation. For work areas where noise levels exceed 85 dBA, signs must be placed at entrances to inform workers of the noise hazard and the requirement to use noise control methods, specifically by wearing hearing protection devices. Management must actively enforce the use of hearing protection. Workers must be educated in the noise management program including the identification of noise sources, hazards presented by noise, control methods, their audiometric test results and the use, care and limitations of hearing protection. Education must be provided to workers upon hire and on an on-going basis.

Audiometric testing must be performed for workers who are exposed to excess noise levels above 85 L_{ex} and levels in Table 1, Schedule 3 of the Code. Other forms of administrative controls include reducing the length of workers' exposure time to noise and rotating workers through areas where noise is present.

Burns

To prevent burns, administrative controls include worker education, established safe work practices, assessment of work area to identify potential sources of burns, and equipment maintenance programs.

Pressure

Compressed gas cylinders must be handled, maintained and stored carefully to prevent cylinders from falling or a gas release. Proper transportation of cylinders must also be considered whether it be by vehicle or within a work area by use of a hand cart or other means. A safe work procedure should be developed for the use, transport, storage and maintenance of compressed gas cylinders in the workplace. Some key compressed gas safe work practices are detailed below:

What are basic safe practices when working with compressed gases?⁹

- Read the MSDSs and labels for all of the materials you work with.
- Know all of the hazards (fire/explosion, health, chemical reactivity, corrosivity, pressure) of the materials you work with.
- Know which of the materials you work with are compressed gases and check the label, not the cylinder colour, to identify the gas.
- Store compressed gas cylinders in cool, dry, well-ventilated areas, away from incompatible materials and ignition sources. Ensure that the storage temperature does not exceed 52°C (125°F).
- Store, handle and use compressed gas cylinders securely fastened in place in the upright position. Never roll, drag, or drop cylinders or permit them to strike each other.
- Move cylinders in handcarts or other devices designed for moving cylinders.
- Leave the cylinder valve protection cap in place until the cylinder is secured and ready for use.
- Discharge compressed gases safely using devices, such as pressure regulators, approved for the particular gas.
- Never force connections or use homemade adaptors.
- Ensure that equipment is compatible with cylinder pressure and contents.
- Carefully check all cylinder-to-equipment connections before use and periodically during use, to be sure they are tight, clean, in good condition and not leaking.
- Carefully open all valves, slowly, pointed away from you and others, using the proper tools.

⁹ CCOHS; *OSH Answers – How Do I Work Safely with Compressed Gasses?; July 8, 2008;*
http://www.ccohs.ca/oshanswers/prevention/comp_gas.html

- Close all valves when cylinders are not in use.
- Never tamper with safety devices in cylinders, valves or equipment.
- Do not allow flames to contact cylinders and do not strike an electric arc on cylinders.
- Always use cylinders in cool well-ventilated areas.
- Handle "empty" cylinders safely: leave a slight positive pressure in them, close cylinder valves, disassemble equipment properly, replace cylinder valve protection caps, mark cylinders "empty" and store them separately from full cylinders.
- Wear the proper personal protective equipment for each of the jobs you do.
- Know how to handle emergencies such as fires, leaks or personal injury.
- Follow the health and safety rules that apply to your job.

Electrical Hazards

Central Processing should develop a written electrical safety program that addresses all aspects of electricity use. CSA Z32 *Electrical Safety and Essential Electrical Systems in Health Care Facilities* outlines guidelines of an electrical safety program. Some elements of an electrical safety program include:

- Education of staff who operate equipment
- Inspection, testing and maintenance of electrical equipment
- Design and management of electrical installations

Extension cords are used in many applications and should only be used for temporarily supplying power. Extension cords are not to replace permanent wiring. Other considerations to follow when using extension cords include:

- Protect cords from damage; do not allow vehicles to drive over cords.
- Never keep an extension cord plugged in when it is not in use.
- Do not use a damaged extension cord.
- Extension cords and most appliances have polarized plugs (one blade wider than the other). These plugs are designed to prevent electric shock by properly aligning circuit conductors. Never file or cut the plug blades or grounding pin of an extension cord.
- Do not plug one extension cord into another. Use a single cord of sufficient length.

Hazard assessments should guide the development of work procedures to assess and control electrical hazards.

Mechanical Hazards

Written safe work procedures and policies for machinery should outline operator responsibilities, work practices, maintenance procedures, removal of guards and training requirements. For hazardous machinery, policies should also specify the requirements of

workers' clothing to fit closely to the body and to prohibit jewellery and unrestrained long hair that can become entangled in machines, resulting in serious injury. Equipment must only be operated by trained and authorized users which management must enforce.

Machinery should be regularly inspected to identify potential conditions that could result in an equipment failure or conditions that could contribute to an injury. Where applicable, preventative maintenance must also be performed. Machinery controls must be clearly identified. Signs that indicate that the removal of guards can result in an injury and to alert workers of machinery that starts automatically should be placed on machinery.

Fire Hazards

Administrative controls are widely used to ensure the maintenance of fire equipment and effectiveness of the response plan. Major aspects of the fire prevention and response plan include:

- Employee training
- Safe work procedures that minimize the potential for fires, including surgical fires
- Building design considerations
- Proper storage and use of chemicals and other materials, including bonding and grounding where required based on quantity and class of liquids
- Ensure flammable chemicals are not used near an ignition source
- Development of evacuation plans/routes
- Designated roles and responsibilities in a fire response plan
- Routine inspection for potential fire hazards
- Availability and maintenance of fire response equipment, including the appropriate numbers and types of fire extinguishers
- Availability and maintenance of alarm systems
- Regular fire drills (including evaluation and identification of opportunities to improve)
- No smoking policy
- Use of approved equipment and appliances only
- Hot work permits
- Contractor orientation to include fire hazard information and fire response plan.

Personal Protective Equipment Controls

Trips, Slips and falls

The use of appropriate footwear in Central Processing is essential to prevent trips, slips and falls. Workers should be required to wear flat shoes with non-slip soles. (To prevent chemical or biological exposure in the event of a spill, footwear should cover the entire foot and be of non-porous material.)

Cuts

PPE is available to reduce cuts. In choosing PPE, the dexterity required to do the task must be considered. When there is the potential for body contact with blades or other equipment that may cause cuts, protective clothing should be worn. Eye protection is important if there is any possibility that fragments of glass or other sharps may enter the eyes, and footwear must protect the wearer from accidental exposure to sharps. Gloves are usually required as PPE to protect workers from cuts. In some cases, full arm coverage is recommended. The selection of gloves depends on the nature of task. Cut-resistant gloves are available that are made from a variety of materials including Kevlar, Dyneema, HexArmor, stainless steel and wire mesh.

Noise

Hearing protection devices must be considered to reduce workers' exposure to noise when other control methods cannot control noise to acceptable levels. Properly fitted hearing protectors reduce noise from entering the workers' ears.

A variety of hearing protection devices is available to workers. Selection of a hearing protector that is best suited for a particular task is based on several factors including noise monitoring results, legislative requirements, other PPE that the worker may wear, fit of PPE, the environment, and worker comfort. Two primary types of hearing protection devices (HPDs) are ear plugs and ear muffs. HPDs must meet the requirements of CSA Standard Z94.2-02 *Hearing Protection Devices - Performance, Selection, Care, and Use* and is of the appropriate grade and class as detailed in Schedule 3 Table 2 of the OHS Code (2009). Proper selection and fitting of HPDs is crucial in protecting workers' hearing.

Burns

PPE is often used to prevent burns. Insulated gloves, protective clothing, foot protection, and eye/face protection should be chosen based on the hazard assessment. Pot holders and long oven mitts protect workers from burns or contact with hot surfaces.

Pressure

Personal protective equipment should be selected based on the hazards presented by the substance under pressure. Consult Material Safety Data Sheets for the specific products that are used. General PPE requirements for compressed gas cylinders may

include gloves if hands may be exposed to substances that may cause freezing and protective footwear protects the feet from a large cylinder that is inadvertently dropped.

Electrical Hazards

PPE is selected on the risk level that is presented by the electrical equipment that is worked on, voltage and the potential for arcs. CSA Z462 provides detailed selection criteria for PPE including body, hand, head, face, eye, and hearing protection. PPE must be approved or certified by agencies as required by the OHS Code.

Eye protection should be worn by all workers who work on energized equipment to protect from burns and flying particles. Face shields must be worn, based on the risk level presented to workers to protect from burns and flying particles.

Mechanical Hazards

PPE must be selected based on an assessment of the hazards arising from the operation and function of each piece of machinery. Where hazardous mechanical motions are present, loose clothing must not be worn and some PPE such as gloves can create additional hazards if they were to become entangled in moving machinery.

Psychological Hazards and Controls

Each department should systematically conduct hazard assessments for tasks performed workers and identify if and where the potential exists for psychological hazards. In this section, examples are provided of psychological hazards that may be encountered in any healthcare setting, and possible control measures will be suggested. Employers should carefully evaluate the potential for exposure to hazards in all areas and ensure that they have an effective hazard control plan in place. This information will be useful for inclusion into hazard assessments. Please note, this is not designed to be an exhaustive treatment of the subject, but is rather an overview summarizing the some of the reported psychological hazards in healthcare settings.

Note:

The following chart provides basic information about control strategies for commonly occurring psychological hazards. The selection of controls should be based on a risk assessment of the tasks and environment. Worker tolerance to stressors varies considerably. Most controls listed here relate to organizational controls, with some mention of personal controls that may be useful in controlling risk. Worker education and good communication processes are critical administrative controls. All legislation related to the assessment of hazards, selection and use of controls should be followed.

Potential Psychological Hazards or Effects of Workplace Stressors	Summary of Major Control Strategies		
	Engineering	Administrative	Personal
Abuse by clients or members of the public	Isolation areas for agitated clients. Furniture arrangement to prevent workers entrapment. Lockable washrooms for workers separate from client or visitors. Controlled access. Grating or bars on street level windows. Bright lighting in parking lots. Alarm systems and panic buttons. Video surveillance.	Management policies and procedures related to no tolerance of violence or abuse. Worker education in violence awareness, avoidance and de-escalation procedures. Well-trained security guards. Escort services to parking lots. Liaison and response protocols with local police. Policies related to control of keys. Working alone policies. Reporting procedures for incidents and near misses. Use of nametags.	Ability to request support. Use of counselling services.
Abuse by co-workers	Alarm systems and panic	Management policies and procedures	Assertiveness training.

	buttons. Video surveillance.	related to no tolerance of violence or abuse. Worker education in violence awareness, avoidance and de-escalation procedures. Well-trained security guards. Escort services to parking lots. Working alone policies. Reporting and investigation procedures for incidents and near misses.	Use of mediation and/or counselling services.
Hazards related to working alone	Communication devices. Restricted access. Workplace design considerations. Panic alarms. Bright lighting. Mirrors to facilitate seeing around corners or hallways, surveillance cameras.	Scheduling to avoid having workers work alone. Worker training. Working alone policies. Adequate security. Escort services to parking lots.	
Stress related to critical incidents		Training to increase awareness of signs and symptoms of critical incident stress. Critical incident stress team to respond to incidents. Communication and call procedures to mobilize team. Defusings and debriefings.	Development of support systems to assist in dealing with stress. Use of counselling services.
“Technostress” related to the introduction of new technology	Design of instruments or equipment with user-friendly features.	Selection procedures to ensure user-friendly technology choices. Provision of sufficient training for workers. Worker participation in selection and implementation of new technology. Provision of problem solving resources and support workers. Back-up plans in the event of failures. Change management strategy for introduction of new technology. Realistic expectations regarding use of communication technology. Limit use of technological monitoring of worker productivity. Setting and communication of priorities.	Self-education concerning new technologies. Time management strategies. Open communication about stress related to change. Healthy lifestyles. Setting realistic goals. Limiting the need to multi-task. Technology “time outs”. E - vacations.
Substance abuse as a response to excessive workplace stressors		Worker involvement in substance abuse policy and procedures development. Worker education about substance abuse. Training workers	Increase awareness of substance abuse signs and symptoms. Communication with

		and supervisors to recognize the signs of substance abuse. Procedures to limit individual access to narcotics. . Provision of counselling services and return to work plans.	counsellors. Report to family physician. Participate in treatment programs and return to work programs.
Depression, anxiety, sleep disorders, other mental illness as a response to excessive workplace stressors		Worker education about the signs and symptoms of depression, anxiety, sleep disorders, other mental illness. Elimination of workplace risk factors for depression, anxiety, sleep disorders, other mental illness. Provision of support services and programs. Benefit plans provision. Effective return to work programs.	Programs to maintain or build resilience or coping skills. Development of support system. Communication with family physician.
Hazards related to impacts of aging on workers		Management policies and procedures that ensure no age discrimination. Proactive policies to accommodate aging workers. Training opportunities for aging workers. Education for all workers on intergenerational communication. Aging workers as trainers/mentors. Flexible work arrangement. Job redesign to accommodate aging workers.	Healthy lifestyle. Use of client and material handling equipment. Adequate sleep. Awareness of potential side effects of medication.
Hazards related to shiftwork and hours of work	Work environment designed to improve alertness (and minimize drowsiness). Appropriate lighting levels. Lighting levels that are adjustable by workers. Appropriate thermal environment. Well lit, safe and secure working environment.	Management policies and procedures to address working hours and shift design. Worker involved in design of shift schedule. Limit hours of work and overtime. Shifts designed so workers get enough rest between shifts. Split shifts are avoided, if possible. Train workers and management in fatigue and shift work issues. Work shift schedules designed to minimize fatigue (e.g. maximum number of consecutive night shifts, forward rotation, etc.). Work designed so that critical tasks are not conducted at ends of shifts or "low points" in shift. Quality breaks are in place. Policies to encourage the	Appropriate sleep schedule and sleep environment. Strategies in place to promote sleep. Diet adjusted to accommodate shift schedule. Healthy lifestyle. Physical exercise. Safe plan for commute to work. Plan for family and friends. Use of stimulants and sedatives are minimized. Alertness strategies are utilized (e.g. bright

		reporting of concerns associated with fatigue. Thorough investigation of incidents and near misses with fatigue as a possible cause.	lighting levels, regular short breaks, communication with co-workers, etc.).
Stress related to work-life conflict		Management policies and procedures that support work-life balance (e.g. voluntary reduced hours, voluntary part-time work, phased in retirement, telecommuting, job sharing, paid and unpaid leaves, dependent care initiatives, etc.). Work designed to address workload and work demands issues. Reliance on paid and unpaid overtime is reduced. Supportive management culture. Work-life balance policies are communicated to workers. The use and impact of work-life balance policies is measured.	Time log used to track time. Work-life balance programs are utilized. Work activities are isolated from home time. Time is effectively managed. Days off are protected. Appropriate sleep habits. Social support system is in place.
Exposure to nuisance or irritating noise levels that may induce stress	Any engineering controls required to abate noise to allowable levels, if over PEL. Sound absorber panels. Personal communication devices rather than overhead pagers. Maintenance and repair of facility equipment, including the ventilation system. Lubrication of equipment with moving parts. Design considerations related to noise reduction in new/renovated facilities. Padded chart holders and pneumatic tube systems. Sound-masking technology.	Lower rings on telephones. Encourage use of soft-soled shoes. Worker education on noise levels created by various activities. Posted reminders to reduce noise. Purchasing decisions that take into account noise levels of equipment. Location of noisy equipment to more isolated areas. Work organization at nursing stations to reduce noise.	
Exposure to poor indoor air quality that may induce stress	Proper ventilation system design. Ventilation system maintenance activities. Isolation/segregation of work processes that may create contaminants.	Contractor requirements to reduce air contamination. Selection of low-pollutant cleaning chemicals. Cleaning schedules. Infection prevention and controls standards. Rules regarding the use of personal appliances that may	

impact HVAC operations. Procedures to report and investigate indoor air quality complaints. Worker involvement in indoor air quality investigation. Communication to enable frank and timely discussion of IAQ issues and what is being done to resolve them.

Selected notes about controls for psychological hazards

Potential psychological hazards and controls vary greatly in jobs, locations and organizations and are only briefly discussed here. Personal factors impact how stressors are viewed and addressed. A comprehensive discussion of causes and impacts of psychological stressors on workers and on the organization can be found in Best Practices for the Assessments and Control of Psychological Hazards – Vol. 5.

Program elements for preventing or controlling abuse towards workers in the workplace

Because the scope of abuse of workers is broad, with a wide range of potential internal and external perpetrators and a myriad of individual considerations, prevention of abuse of workers is multi-faceted. This list of prevention procedures and control techniques is not all-inclusive, but rather a sample of the complexities that should be considered in a program for Central Processing:

- Development, communication and enforcement of policies that indicate no tolerance for any form of violence, harassment, or abuse including bullying. Awareness sessions for all workers on abuse and violence in the workplace, reporting procedures and controls.
- Staff identification to reduce unauthorized access to areas – this includes a requirement of all workers to wear identification badges. It is suggested that information that is not necessary not be shown on the front to the badge to reduce risk to workers.
- Client guidelines and signage to emphasize that abuse will not be tolerated – this may include the preparation and dissemination of client information guidelines, in which client behaviour is discussed, the commitment to no tolerance for abuse against workers and the encouragement of mutual respect are covered.
- Working alone guidelines and communications protocols. Working alone guidelines are required by Alberta occupational health and safety legislation (OHS Code, Part 28), and must include a written hazard assessment as well as communication protocols for workers who must work alone.

- ❑ Alarm systems and emergency communication devices (panic buttons, etc.). Identification of workers or locations that should be provided with alarm systems and panic buttons should occur. Once any alarm systems are installed or provided, all workers should be trained on how to use them and how to respond to alarms.
- ❑ Identification and correction of high risk facility issues (e.g., isolated areas, parking lots, low lighting, no escape routes, etc.). There are many risk factors posed by the design of the facility. Central Processing should identify risk factors and work to reduce the risk in the areas. A checklist would be useful for departments to help identify facility issues contributing to worker risk.
- ❑ Training programs that include non-violent crisis intervention and assault management techniques.

Working alone

Working alone is addressed in the Alberta OHS Code 2009.

Controls required

Employers must, for any worker working alone, provide an effective communication system consisting of

- radio communication,
- and land line or cellular telephone communication, or
- some other effective means of electronic communication that includes regular contact by the employer or designate at intervals appropriate to the nature of the hazard associated with the worker's work.

If effective electronic communication is not practicable at the work site, the employer must ensure that

- the employer or designate visits the worker, or
- the worker contacts the employer or designate at intervals appropriate to the nature of the hazard associated with the worker's work.

Alberta OHS Code 2009, Part 28

Work-Life balance

An employer should strive to develop policies and programs that support work-life balance. The following is a list of general work-life balance policies and programs to consider:

- Flexible time arrangements including alternative work schedules, compressed work week, voluntary reduced hours / part-time work and phased in retirement
- Flexible work locations through the use of technology such as telecommuting and satellite offices
- Flexible job design through job redesign, job sharing

- Wellness programs
- Flexible benefits including paid and unpaid leaves for maternity, parental care giving, educational and sabbatical leaves
- Employer sponsored childcare and eldercare practice and referral services

A work-life conflict issue recognized in healthcare is often brought on by workload and work demands. Some strategies to reduce the impact of increased workloads and work demands include the following:

- Identify methods to reduce worker workloads. According to research, special attention is required for managers and professionals.
- Track the costs associated with understaffing and overwork (paid and unpaid overtime, increased turnover, employee assistance program use, increased absenteeism).
- Strive to reduce the amount of time workers spend in job-related travel.
- Reduce reliance on paid and unpaid overtime.
- Consider a “time in lieu” system to compensate for overtime.
- Develop norms regarding the use of technology (e.g. cell phones, PDA, laptops, email) outside of work time.
- Allow workers to say “no” to overtime without repercussions.
- Provide a limited number of days of paid leave per year for caregiver responsibilities (childcare and eldercare) and personal problems.
- Measure the use of work-life practices (e.g. job sharing, compressed work week, etc.) and reward sections of the organization with high usage. Investigate sections where usage is low.
- Increase supportive management. Specifically, organizations should increase the extent to which managers are effective at planning the work to be done, make themselves available to answer worker questions, set clear expectations, listen to worker concerns and give recognition for a job well done.

Shiftwork

The following guidelines will assist in reducing the psychological impacts of shift work.

Good Practice Guideline for Shift Work Schedule Design¹⁰

- Plan a workload that is appropriate to the length and timing of the shift.
- Strive to schedule a variety of tasks to be completed during the shift to allow workers some choice about the order they need to be done in.
- Avoid scheduling demanding, dangerous, safety-critical or monotonous tasks during the night shift, particularly during the early morning hours when alertness is at its lowest.
- Engage workers in the design and planning of shift schedules.
- Avoid scheduling workers on permanent night shifts.
- When possible, offer workers a choice between permanent and rotating shifts.
- Use a forward-rotating schedule for rotating shifts, when possible.
- Avoid early morning shift starts before 7 AM, if possible.
- Arrange shift start /end times to correspond to public transportation or consider providing transport for workers on particular shifts.
- Limit shifts to a maximum of 12 hours (including overtime) and consider the needs of vulnerable workers.
- Limit night shift to 8 hours for work that is demanding, dangerous, safety critical or monotonous.
- Avoid split shifts unless absolutely necessary.
- Encourage and promote the benefit of regular breaks away from the workstation.
- Where possible, allow workers some discretion over the timing of breaks but discourage workers from saving up break time for the end of the workday.
- In general, limit consecutive working days to a maximum of 5-7 days.
- For long work shifts (>8 hours), for night shifts and for shifts with early morning starts, consider limiting consecutive shifts to 2-3 days.
- Design shift schedules to ensure adequate rest time between successive shifts.
- When switching from day to night shifts (or vice versa), allow workers a minimum of 2 nights' full sleep.
- Build regular free weekends into the shift schedule.

¹⁰ Adapted from Government of the U.K; Health and Safety Executive; Managing shift work HSG256; 2006;
www.hse.gov.uk/pubns/priced/hsg256.pdf

For a more detailed discussion of controls to prevent or reduce psychological hazards, please consult Best Practices for the Assessments and Control of Psychological Hazards – Vol. 5.

APPENDIX 1 - Additional Resources

The following are useful references and links to relevant resource materials. For complete reference lists, please consult the Best Practice documents developed by Alberta Employment and Immigration available at <http://www.employment.alberta.ca/SFW/6311.html>

Alberta Employment and Immigration; *Audiometric Testing: Information for Employers and Workers* HS005; Revised January 2008; http://employment.alberta.ca/documents/WHS/WHS-PUB_hs005.pdf

Alberta Employment and Immigration; *Workplace Health and Safety Bulletin Noise in the Workplace* HS003; Revised December 2006; http://employment.alberta.ca/documents/WHS/WHS-PUB_hs003.pdf

Alberta Government legislation related to chemicals in the workplace may be accessed through the Government website at <http://employment.alberta.ca/SFW/307.html>

Alberta Human Resources and Employment; Workplace Health and Safety, *Respiratory Protective Equipment: An Employer's Guide*; Bulletin PPE001 – Breathing Apparatus; April 2005. http://employment.alberta.ca/documents/WHS/WHS-PUB_ppe001.pdf

Alberta OHS Code 2009, Part 18 – Personal Protective Equipment

Alberta Workplace Health and Safety *Preventing Violence and Harassment at the Workplace*, Bulletin VAH001, 2006, retrieved from <http://www.employment.alberta.ca/documents/WHS/WHS-PUB-VAH001.pdf>

BC Centre for Disease Control – A Guide for the Selection and Use of Disinfectants <http://www.mtpinnacle.com/pdfs/disinfectant-selection-guidelines.pdf>

Berger, E.; *Custom Earplugs – Frequently Asked Questions (FAQs)*; EAR; June 12, 2009; http://www.e-ar.com/pdf/hearingcons/Custom_Earplugs_v2.pdf

Bilsker, D., Gilbert, M., Myette, T.L., and Stewart-Patterson, C. *Depression & Work Function: Bridging the gap between mental health care & the workplace*; Retrieved from www.comh.ca/publications/resources/dwf/Work_Depression.pdf

Canadian Centre for Occupational Health and Safety, *OHS Answers: Fatigue* July 2007; Retrieved from www.ccohs.ca/oshanswers/psychosocial/fatigue.html

Canadian Centre for Occupational Health and Safety, *OSH Answers: OHS Legislation in Canada; Basic Responsibilities*: <http://www.ccohs.ca/oshanswers/legisl/responsi.html>

Canadian Centre for Occupational Health and Safety, *OSH Answers: OHS Legislation in Canada; Due Diligence:*
<http://www.ccohs.ca/oshanswers/legisl/diligence.html>

Canadian Centre for Occupational Health and Safety, *OSH Answers: OHS Legislation in Canada; Internal Responsibility System;*
<http://www.ccohs.ca/oshanswers/legisl/irs.html>

Canadian Centre for Occupational Health and Safety, *OSH Answers: Substance Abuse in the Workplace*, Retrieved from
www.ccohs.ca/oshanswers/psychosocial/substance.html

Canadian Centre for Occupational Health and Safety; *OSH Answers - Chemical Protective Clothing – Gloves;*
<http://www.ccohs.ca/oshanswers/prevention/ppe/gloves.html>

Canadian Centre for Occupational Health and Safety; *OSH Answers – Hearing Protectors*; July 25, 2007;
http://www.ccohs.ca/oshanswers/prevention/ppe/ear_prot.html

Canadian Centre for Occupational Health and Safety; *OSH Answers – How Do I Work Safely with Compressed Gasses?* Updated July 8, 2008; http://www.ccohs.ca/oshanswers/prevention/comp_gas.html

Canadian Centre for Occupational Health and Safety; *OSH Answers – Electrical Safety Basic Information*; updated June 1, 2000;
http://www.ccohs.ca/oshanswers/safety_haz/electrical.html

Canadian Centre for Occupational Health and Safety; *OSH Answers – Safety Glasses and Face Protectors;*
<http://www.ccohs.ca/oshanswers/prevention/ppe/glasses.html>

Canadian Centre for Occupational Health and Safety; *OSH Answers: Industrial Ventilation*; CCOHS -,
<http://www.ccohs.ca/oshanswers/prevention/ventilation/>

CDC/NIOSH, *Ethylene Oxide Sterilizers in Health Care Facilities – Engineering Controls and Work Practices*, July 1989
http://www.cdc.gov/niosh/89115_52.html

Centers for Disease Control and Prevention, USA; *Guideline for infection control in health care personnel*;
http://www.cdc.gov/ncidod/dhqp/gl_hcpersonnel.html

Gaines, B. R., *Adapting to a Highly Automated World*, , University of Calgary, retrieved from
<http://pages.cpsc.ucalgary.ca/~gaines/reports/MFIT/Trust/index.html>

Hauser, R., et.al; *A case-crossover study of transient risk factors for occupational acute hand injury*; Occupational and Environmental Medicine; April 4, 2004; accessed through Access My Library at http://www.accessmylibrary.com/coms2/summary_0286-21047461_ITM

Health Canada *Best Advice on Stress Management in the Workplace, Part 1*, 2001; retrieved from www.hc-sc.gc.ca/ewh-semt/pubs/occup-travail/stress-part-1/index-eng.php

Health Canada, *Best Advice on Stress Management in the Workplace, Part 2*, 2000 retrieved from <http://www.hc-sc.gc.ca/ewh-semt/pubs/occup-travail/stress-part-2/index-eng.php>

Health Canada; *Prevention and Control of Occupational Infections in Healthcare, An Infection Control Guideline*, CCDR, 28SI, 2002; <http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/02vol28/28s1/index.html>

NIOSH; *Alert Preventing Needlestick Injuries in Healthcare Settings*; 2000-108, November, 1999. <http://www.cdc.gov/niosh/docs/2000-108/>

OSHA; Hospital eTool – Central Supply Module; 08/07/2009; http://63.234.227.130/SLTC/etools/hospital/expert/ex_central.html

Provincial Infectious Diseases Advisory Committee (PIDAC); Ministry of Health and Long-Term Care; *Best Practices for Infection Prevention and Control Programs in Ontario In All Health Care Settings*; September 2008. http://www.health.gov.on.ca/english/providers/program/infectious/diseases/ic_ipcp.html

Roark, John, *The Proper Fit for PPE*, Infection Control Today Magazine, Nov. 2004. http://www.infectioncontrolday.com/articles/407/407_4b1topics.html

Top Article Directory List; *Give Them a Hand: Preventing Workplace Hand Lacerations*; <http://www.content4reprint.com/health/give-them-a-hand-preventing-workplace-hand-lacerations.htm>

WorkSafeBC; *Sound Advice- A Guide to Hearing Loss Prevention Programs*; BK12; 2006 Edition; http://www.worksafebc.com/publications/health_and_safety/by_topic/assets/pdf/sound_advice.pdf

WorkSafeBC; *Understanding the Risks of Musculoskeletal Injury (MSI)*; 2008; http://www.worksafebc.com/publications/Health_and_Safety/by_topic/assets/pdf/msi_workers.pdf

APPENDIX 2 - Learning Objectives for this Module

1. Understand the need for and the procedure for conducting hazard assessments and risk evaluations.
2. Identify significant biological hazards that may impact Central Processing workers.
3. Identify significant chemical hazards that may impact Central Processing workers.
4. Identify significant physical hazards that may impact Central Processing workers.
5. Identify potential psychological hazards that may impact Central Processing workers.
6. Identify the hierarchy of controls that should be implemented to control hazards in the workplace.
7. Identify engineering controls and describe how they work.
8. Provide examples of administrative controls.
9. Describe the important considerations when selecting personal protective equipment.
10. For each type of hazard, identify possible engineering, administrative and personal protective equipment controls.

APPENDIX 3- Test Your Knowledge

1. In what way can Central Processing staff be exposed to biological hazards?
2. What is meant by the “hierarchy of controls”?
3. Give 3 examples of engineering controls.
4. Give 3 examples of administrative controls.
5. Give 3 examples of personal protective equipment.
6. Describe some ergonomic controls for Central Processing workers.
7. What can be done to minimize cuts to Central Processing staff?
8. Name the five criteria for choosing the proper gloves to use.
9. Name the six criteria for selecting appropriate eye protection.
10. What controls can be put in place to reduce the risk of exposure to ethylene oxide.

Test Your Knowledge - Answers

1. Central Processing staff may be exposed to biological hazards through contact with contaminated items and materials or contaminated ventilation systems.
2. The hierarchy of controls refers to a preferred order of controls for implementation. The highest level is engineering controls, because these control the exposure at the source. The next level is administrative controls, which relies on worker compliance. The least effective and lowest level of control is personal protective equipment, because if the equipment fails the worker is likely to be exposed.
3. Local exhaust ventilation, alarm systems, preventive maintenance of equipment, safety engineered medical devices, segregated areas, automated procedures, ergonomically designed work stations, machine guarding, etc.
4. Training, policies, safe work procedures, restricted access, appropriate staffing, emergency response plans, signage, purchasing standards, etc.
5. Protective eyewear, gloves, lab coats, respirators, etc.
6. Adjustable furniture, storage design for surgical packs, anti-fatigue mats, workstation design, flow of work processes, etc..
7. Controls to reduce the occurrence of cuts include
 - a. Substitution of a sharp instrument with a less sharp alternative (e.g. engineered sharps injury prevention devices)
 - b. Isolation of the process
 - c. Machine guarding to prevent direct contact with moving parts
 - d. Area design to reduce likelihood of exposure (including having sufficient room to work safely, designated locations for storage of knives and other sharp instruments, etc.)
 - e. Worker education
 - f. Safe work procedures
 - g. Keeping sharp edges away from the body
 - h. Use of tools correctly
 - i. Restricted access to work areas
 - j. Safe disposal of all sharps, including broken glass.
8. Criteria for glove selection include:
 - a. The nature and concentration of the chemicals
 - b. The amount of time the gloves will be exposed to the chemical
 - c. Dexterity required to perform the task
 - d. Extent of protection needed (to wrist or higher)
 - e. Decontamination and disposal requirements
9. Criteria for the selection of eye protection include:

- a. Level of protection required
 - b. Comfort of the wearer
 - c. Secure fit that does not interfere with vision or movement
 - d. Ease of cleaning and disinfection
 - e. Durability
 - f. Compatibility with prescription glasses and other PPE that must be worn at the same time (e.g. respirators)
10. Substitution with another sterilization procedure, preventive maintenance program for sterilizers and aerators, safe work procedures including emergency leak or spill procedures; monitoring; education of workers in the nature of the hazard; availability of appropriate equipment and PPE, etc.

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