BIOSAFETY
SAFETY MANUAL

Includes:

(PC2) - Physical Containment,

(QC2) - Quarantine Containment,

General Laboratory

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Approved by	Faculty of EHSE, Workplace Health and Safety Committee
Chair signature	
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Developed using existing Charles Darwin University and Newcastle University documents and forms

Contents

Introduction

This manual contains information and procedures applicable to field work involving all staff, students and volunteers of Faculty of Engineering, Health, Science and the Environment (EHSE) at Charles Darwin University engaged in work within in the PC2 facilities.

This manual is to document safe operating practices required in order to achieve level 2 containment, and is the basis for training all laboratory personnel who wish to use the facility. Safety in the laboratory is an important part of your work at CDU and you must have read and understood the contents of this manual before you commence any work within the PC2 facilities.

The manual is arranged so that sections align with legislation, standards and industry-wide practices. Each section contains relevant information, ideas and suggestions of risk management in that topic and some references to other information or resources which you should peruse or use.

This manual should be seen as additional to any other Laboratory Safety information available or provided at Charles Darwin University. The information contained within this manual is comprehensive, but not exhaustive, and you may need to do further research/reading of other material to ensure all contingencies are covered.

This manual is applicable to any spaces for designated as approved for PC2 and Quarantine work in Building Yellow 2 and Yellow 3, Casuarina Campus.

This manual refers to a number of additional sources of information, including:

- Safety Data Sheets - This provides safety information about chemical substances and some biological agents in use. Available from supplier or ChemWatch
- Equipment folder - which contains operating manuals, procedures and test and maintenance records.
- Induction folder - which is a record of induction and training undertaken by personnel using the laboratory.
- Risk Management folder – which contains risk assessments/safe work procedures of procedures undertaken in the laboratory

These folders are located in the following areas;
Teaching lab Yellow 3.1.06
Tissue culture lab Yellow 2.2.34
Plant growth room Yellow 2.2.48
Biohazard lab Yellow 2.2.53
Research labs Yellow 2.2.53 & 2.2.54

This manual will be reviewed regularly, and at least annually, by the Faculty Workplace Health and Safety Committee s o that it remains up-to-date and aligned with current legislation.

Nature of Work

Yellow 2 has PC2 spaces accredited by Office of the Gene Technology Regulator (OGTR). These spaces are also certified QC2 spaces (Quarantine Containment – Level 2).

Work that may be undertaken (approval processes apply):

1. Genetic material - approved by Darwin Region IBC
2. Quarantine material – approved by Technical Services Manager
3. Pathogens of Risk Group 2 – approved by Faculty IBS
4. Human cell cultures and body fluids – approved by Faculty IBS
5. Non-PC2/QC2 work – must comply with these guidelines. Approved by Faculty IBS

Yellow 3 is a PC2 (Physical Containment level-2) facility, certified by the Faculty Institutional Biosafety Committee (IBC).

Work that may be undertaken (approval processes apply):

1. Pathogens of Risk Group 2 – approved by Faculty IBS
2. Human cell cultures and body fluids – approved by Faculty IBS
3. Non-PC2/QC2 work – must comply with these guidelines. Approved by Faculty IBS
4. EXEMPT AND/OR NLRD (Notifiable Low Risk Dealings) – OGTR approval required

The Laboratories

Appendix A provides an illustration of the laboratory configuration, equipment arrangements and location of emergency equipment. The following description should be read in conjunction with Appendix A.

Approvals

All work in PC2/QC2 spaces must be approved through the formal arrangements and on the approved forms.

Faculty of EHSE Workplace Health and Safety Committee is the approver of the work in the PC2/QC2 facilities. This will take the form of assessment/approval by a Biosafety committee as a sub-committee of the Faculty IBS. The Biosafety committee will comprise a group of knowledgeable persons who can competently assess the Biosafety risks and hazards and will usually have the following membership: Manager of Technical Services, research academic, teaching academic and any expert invited "guest" to provide the necessary information required to make a proper informed decision (e.g. mechanical engineer, specific scientific expert)

Contacts

Further information about the operation of the PC2/QC2 spaces can be obtained from the following people:

Name	Role	Contact No.
Natasha Lawrence	Chair – Faculty Workplace Health and Safety Committee	8946 7134
Himi Ibraham	Manager, Technical Services	0477391292
Martin Boland	Chair- Faculty IBC	8946 6360
Ellie Hayward	Senior Technical Officer	8946 6848
Lyn Lowe	Technical Officer – Yellow 3	8946 7537
Ellie Hayward/ Truc Nguyen	Teaching rep	8946 6881
Anna Padovan	Research rep	8946 6555

Access

Routine access is only provided to persons that have:

1. Completed the General Laboratory Safety Induction
2. Completed the PC2 Laboratory Induction (Appendix B)
3. Issued with the all required personal protective equipment
4. Have been authorised as a laboratory user by the area leader or their delegate.
5. Satisfied all the requirements of the Faculty IBS (including all paperwork and approvals) AND/OR the Darwin Region IBC
6. Satisfied all the requirements of DAFF (including all paperwork and approvals)

The laboratory shall be kept locked at all times when not in use. Only authorised persons shall be provided with a key or access card for the laboratory.

Where access is required for the purposes of maintenance or cleaning, this will only be provided to persons that have:

1. Completed the Cleaner/Maintenance Induction (Appendix C)
2. Demonstrated that they have any required personal protective equipment
3. Been authorised by Faculty IBS
4. Been authorised as a laboratory user by the Technical services manager or their delegate.

All records of inductions and authorised persons will be maintained by the facility/lab manager and retained in the Inductions folders in the relevant building.

Working safely is a condition of access to the PC2 facility. Repeated failure to observe safe working practices and procedures will result in the withdrawal of access privileges.

Training

During their time in the laboratory, users will be required to develop and ultimately demonstrate competence in the range of practices required to work safely in the laboratory. Appendix D provides a list of these competencies.

Timing of the training program and assessment will depend on the nature of the work undertaken, the current level of experience of the person and their need to work unsupervised. These records should also be kept in the Induction folder

Risk Management

Risk Management is the process of recognising situations that have the potential to cause harm to people or property, and doing something to prevent this from occurring or minimising the harm that may be caused. The risk management process consists of well-defined steps that lead to informed decisions about controlling the impact of risks. These steps are:

1. Hazard identification
2. Risk Assessment
3. Risk Control
4. Evaluation & Review

This manual covers each of these steps with regard to risks specific to Risk Group 2 microorganisms in the AS/NZS 2243.3 standard.

CDU has provided this Biosafety Safety Manual to assist researchers and students in continuously improving their ability to use biological hazards in a safe, effective manner, and also to conform to relevant legislation.

This manual and the procedures and processes contained within are an element of the risk management process at Charles Darwin University. To ensure the proper control of biological hazards at CDU you must always use the following process:

1. Identify the biological hazard and governing regulatory requirements.

When a biological hazard has been identified it must be recorded on your Laboratory/Facility Microorganism/Biohazard Register and Workplace Hazard and Risk Register. After identification of your biological hazard(s) you must determine what legislation is relevant to the biological hazard you will be using. The specific legislation will determine any additional, specific controls that may need to be implemented.

2. Assess the risk from the biological hazard using the risk grouping system from AS/NZS 2243.3

All biological hazards need to be assigned a risk group (1 – 4) using AS/NZS 2243.3 as the primary assessment tool. A risk assessment is to be conducted, covering 2.1.2(a-j) of AS/NZS 2243.3. If it is unclear which risk group an organisms or biological hazard belongs, to contact your supervisor to assist you. It is important to also check whether the biological agent is listed in Table 2, paragraph 3.2.6. If your agent is listed in this table, you must contact the Faculty Biosafety committee before bringing the agent into the University

3. Identify the containment facility level and containment controls based on the risk group of the organism or material

When working with biological hazards in a laboratory, animal house or any other facility, it is necessary to define the level of physical containment (PC 1 – 4). This is based on the risk group of the biohazard.

4. Conduct Risk Assessment using the approved CDU forms

Refer to Appendices in this Manual. There are 4 different physical containment levels ranging from PC1 to PC4. Each containment level corresponds directly to the 4 risk groups of biological hazards as set out in AS/NZS 2243.3. The higher the risk group rating, the higher the facility containment level required, and the higher the risk to laboratory workers and community. The level of physical containment that is identified will dictate the facility's structural requirements, containment equipment, work practices and PPE requirements that are necessary to work safely with the designated risk group. If it is unclear which level of physical containment is required, contact your supervisor to assist you. NOTE: No RISK GROUP 3 or 4 organisms or material will be approved.

5. Identify and obtain approval for use of the facility and the biological material through the appropriate authority – e.g. Faculty, Darwin Region IBC/OGTR, DAFF

6. Implement controls as per risk assessment and complete all relevant training

Hazard Identification

Pathogen Risk Groups

All microorganisms and pathogenic materials must be assessed against AS/NZ 2243.3:2010 to determine which risk group they fall into and subsequently which level PC lab is required for that work.

Microorganisms falling into Risk Group 2 in AS/NZS 2243.3:2010 present moderate individual risk, and limited community risk. They cause human, animal or plant disease but do not pose a serious risk because effective treatment and preventative measures are available and there is limited potential for spread.

For example, *Staphylococcus aureus* rarely causes life-threatening disease in a laboratory situation, and is a Risk Group 2 microorganism. *Human immunodeficiency virus (HIV)*, although potentially lethal, is also a Risk Group 2 microorganism (when not concentrated) because in normal laboratory circumstances the risk of transmission is low.

Classes of Genetic work

All work involving genetic work must be assessed against OGTR Guidelines to determine the hazard (class of dealing) and subsequently the level of PC lab required to conduct the work.

Classes of dealings involving Genetically Modified Organisms (GMOs)

Register of Micro-organisms

A register of all microorganisms must be kept at all times and must include the full scientific name, the nominal risk group, and the origin and storage location. Appendix E is a template register to be used for that purpose including their nominal risk group, origin and storage location.

Quarantine items are on a separate register.

Genetic materials are on a separate register.

Health Canada MSDSs for infectious organisms website: www.hc-sc.gc.ca/pphb-dgspsp/msds

Risk Assessment

Assignment of Risk Group

Microorganisms are classified according to their level of risk. This classification is based on factors such as:

- Pathogenicity - the resulting disease incidence and severity;
- The route of transmission - aerosol, ingestion or parenteral; (injection!)
- The target hosts - including issues such as required infectious dose, their immune status, etc;
- The concentration of organisms in the media being handled;
- Agent stability - its ability to survive over time or under standard disinfection regimes;
- The availability of effective prevention and treatment measures.

There are a number of sources of categorisation information. The primary reference is AS/NZS 2243.3:2010 *Safety in the laboratory Part 3 - Microbiology*.

Note that Risk Groups, and hence containment requirements, do not just depend on the microorganism, but may also be a function of the type of operations undertaken with it. For example, diagnostic blood samples can be handled under Level 2 containment conditions, but concentrated cultures of HIV must be handled under Level 3 conditions.

As a result, selection of risk control measures should be based on an assessment of the tasks to be undertaken and information about the pathogen(s) involved.

NOTE: All human specimens must be risk assessed for work at PC2 level.

Safety Information

Safety data sheets (SDS) or other safety information related to the microorganisms and chemicals are available in the SDS folder.

In addition, there are a number of on-line sources of safety information, including:

- Public Health Agency of Canada - Laboratory Biosafety and Biosecurity
  http://www.phac-aspc.gc.ca/lab-bio/index-eng.php

- Public Health Agency of Canada - Pathogen Safety Data Sheets and Risk Assessment
  http://www.phac-aspc.gc.ca/lab-bio/res/psds-ftss/index-eng.php
- Centre for Disease Control
  http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm

- Office of Gene Technology Regulator
  http://www.ogtr.gov.au/

- Quarantine – DAFF
  http://www.daff.gov.au/quarantine

- AS/NZS 2243.3:2010 *Safety in the laboratory Part 3 –Microbiology*

- ChemWatch - the chemical management system in use at Charles Darwin University. It allows access to Safety Data Sheets (SDS) database and manages chemical inventories/manifests. ChemFFX is the standard interface suitable for novice to intermediate users. ChemGold III is the advanced interface suitable for advanced users. Health, Safety and Environment run training sessions for CDU staff. For further information email Health, Safety and Environment or phone: 8946 6473.

Risk Control

Controlling risk must be done by applying the hierarchy of controls:

1) ***Elimination*** - does the work with the microorganism need to be done?
2) ***Substitution*** - can a microorganism in a lower Risk Group, or of lower overall risk, be used to do the work?
3) ***Isolation*** - can the microorganism be completely contained during the work?
4) ***Engineering*** controls - eg use a biological safety cabinet
5) ***Administrative*** controls - safe work procedures and practices - eg laboratory rules like no mouth pipetting. *Modify* the work system or process - eg use lower concentrations or smaller quantities.
6) ***Personal Protective Equipment*** is used - eg laboratory gowns, gloves.

Physical Containment of microorganisms represents a combination of engineering and administrative controls, coupled with the use of personal protective equipment. However, **elimination** and **substitution** should always be considered prior to starting work with a given pathogen.

Primary barriers to transmission of infectious agents are provided by enclosures such as biosafety cabinets and personal protective equipment. The laboratory facilities (or work area) provide a secondary barrier, which acts to contain the agent in the event of a failure of the primary barriers. The combination of primary and secondary barriers and work practices constitute the level of containment that must be used to keep the risk of exposure of laboratory workers and the outside environment to acceptable levels.

An important point that should not be overlooked is that the work practices are integral to the maintenance of these barriers. Laboratory equipment and design contribute to safety but only if they are used properly by people who are trained and, where necessary, supervised. It is critical that all laboratory users are trained in the correct use of personal protective equipment, in the monitoring of the facility and its equipment, and in the practices that should be followed while working in the laboratory.

All users and lab workers must be advised of all the controls needing to be implemented to control the risks. Document the controls as part of a carefully considered risk assessment on the approved form.

Engineering Controls

Biological Safety Cabinet (BSC)

Where there is the potential of generating aerosols containing infectious microorganisms the primary barrier of choice is the Class II Biological Safety Cabinet (Class II BSC).

There are several standards that apply to the design and use of these cabinets in Australia. Copies of the BSC manuals for the laboratory can be found in the Equipment folder in the facility.

BSCs should not be confused with other laminar flow benches or fume extractions systems. Class II BSCs are open-fronted, ventilated containment enclosures intended for work with Risk Group 2, 3 and 4 organisms that can be deactivated by a formaldehyde fumigation procedure. They are self- contained work-stations and operate independently of all other air-handling systems that may be present. The cabinets incorporate High Efficiency Particulate Arresting (HEPA) filters, which are the physical containment barrier that trap sub-micron particles such as microorganisms.

In Class II BSCs, an inflow of room air into a full-width grille at the base of the work opening creates an air barrier. A quantity of air, equal to that of the barrier air, (normally about 30% of the total airflow) is exhausted to the room via a HEPA filter. The rest is separately HEPA filtered, and recirculated within the work zone via vertical, downward laminar airflow, to provide product protection.

Class II cabinets therefore provide personnel, environment and product protection. However, because of the exhaust into the room, it is important to note that **the BSC is not suitable for handling materials containing volatile toxic or radioactive chemicals.**

Use of BSC

Points that should be noted about BSC operation include the following:

- Check that the BSC is "in test" before use – certification sticker should be on the BSC.
- All materials should be (externally) decontaminated before they are introduced to a BSC
- Keep 'clean' and 'dirty' materials separated inside the cabinet.
- Minimise rapid air movement near the cabinet opening, such as that caused by people walking past, to maintain the laminar air flow.
- Do not use Bunsen burners in Class II cabinets - use disposable loops or electric heating instead.
- Don't use centrifuges inside a BSC.
- Keep the front intake grilles clear.
- Keep the exhaust discharge clear (at least 60 cm) in order to allow free air flow and access for maintenance. Do not store items on top of top-exhaust cabinets.
- Before starting work at the BSC, adjust the laboratory stool to ensure that your:
    - Forearms remain parallel to the work surface most of the time;
    - Lower back is supported;
    - Head is upright;
    - Feet can reach the footrests.

Operating Instructions for the BSC in Yellow 3.1.05

ESCO Class II Cabinet

Using Sash Window

- The sash window should be fully closed when the cabinet is not in use. This helps keep the work zone interior clean
- The sash window should always be in the normal operating height at all times when cabinet is in use. Even if the cabinet is left unattended, and the blower is on, the sash window should never be moved from the normal operating height, unless during loading or unloading of materials/apparatus into cabinet.
- The alarm will be activated whenever the sash window is moved from the normal operating height.
- Whenever the sash is moved to the correct height from higher or lower positions, the light will automatically come on as a signal to the user.
- The sash window may be opened to maximum position for the purpose of loading/unloading of material/apparatus into the cabinet. When the sash window is fully opened the alarm will sound, this may be muted by pressing the MUTE button but, it will automatically sound again after 5 minutes to remind the user that it is not safe to work in the cabinet and the light will be turned on to facilitate cleaning

Turning on the BSC

1. Raise the sash to the indicated normal operational height (readystate). The lamp will turn on when the height is reached.
2. Turn on the fan by pressing the FAN button. Input Fan PIN if asked. This will start the warm up procedure (default: 3 minutes). All buttons are disabled during warm up period
3. The BSC is ready for work

Turning off the BSC

4. Turn off the fan by pressing the FAN button. Input the Fan pin if asked. This will start the post purge procedure (default:0 minutes)All buttons are disabled during post purge period.
5. Lower the sash to fully closed position (the display will show UV MODE).The sash can be lowered immediately after turning off the fan as it will not interrupt the post purge procedure.
6. Turn on the UV lamp (when present) to decontaminate the work area by pressing the UV button.
7. Leave the UV lamp on to make sure the decontamination is done effectively. The UV lamp can only be turned on after the post purge procedure is finished.

Operating Instructions for the BSC in Yellow 2.2.34a

Gelman Science Class II Cabinet

Turning on the BSC

1. Remove unnecessary items from the cabinet.
2. Run the cabinet with the UV lamp on for 10-15 minutes prior to use with the work opening cover in place.
3. Remove the work opening cover and wipe down the work zone surfaces with a suitable disinfectant.
4. Run the cabinet for at least 5 minutes so as to clear away any residual aerosols.
5. If necessary, use plastic backed, absorbent sheeting to reduce clean-up between procedures.
6. Plan work so as to place all materials in, or close to the cabinet and within easy reach of the operator.
7. Allow the cabinet to run for a further 5 minutes before use.

Turning off the BSC

At the end of work, leave the cabinet running and conduct the following procedures:

1. Transfer cultures to a container for storage or incubation
2. Disinfect and remove all unnecessary materials to reduce the potential for cross-contamination and interruption of airflows; cabinets are not designed for protracted storage of materials.
3. Wipe the work zone surfaces with fresh disinfectant solution.
4. Remove gloves for sterilization or disposal as contaminated waste.
5. Allow the cabinet to run for at least another 5 minutes.
6. Fit the work opening cover and run the UV lights for another 5 minutes.
7. The sump of the Class II cabinet should be cleaned weekly, or after any spill.

Operating Instructions for the BSC in Yellow 2.2.53

Clyde Apac Class II Cabinet

- Leave the mains power turned on at all times from the power point
- Remove the front cover
- To turn on cabinet
  a. Firmly press run button
  b. Firmly press light button
- To turn off cabinet
  a. Firmly press light button
  b. Firmly press run button
- Return front cover

Possible ERROR messages: Cabinet alarm is activated
EXHAUST LOW: turn cabinet off and then on again
POWER FAILURE: press boost button twice.

Turning on the BSC

1. Remove unnecessary items from the cabinet.
2. Run the cabinet with the UV lamp on for 10-15 minutes prior to use with the work opening cover in place.
3. Remove the work opening cover and wipe down the work zone surfaces with a suitable disinfectant.
4. Run the cabinet for at least 5 minutes so as to clear away any residual aerosols.
5. If necessary, use plastic backed, absorbent sheeting to reduce clean-up between procedures.
6. Plan work so as to place all materials in, or close to the cabinet and within easy reach of the operator.
7. Allow the cabinet to run for a further 5 minutes before use.

Turning off the BSC

At the end of work, leave the cabinet running and conduct the following procedures:

1. Transfer cultures to a container for storage or incubation
2. Disinfect and remove all unnecessary materials to reduce the potential for cross-contamination and interruption of airflows; cabinets are not designed for protracted storage of materials.
3. Wipe the work zone surfaces with fresh disinfectant solution.
4. Remove gloves for sterilization or disposal as contaminated waste.
5. Allow the cabinet to run for at least another 5 minutes.
6. Fit the work opening cover and run the UV lights for another 5 minutes.
7. The sump of the Class II cabinet should be cleaned weekly, or after any spill.

Westinghouse Class II Cabinet

Turning on the BSC

1. Remove unnecessary items from the cabinet.
2. Run the cabinet with the UV lamp on for 10-15 minutes prior to use with the black cloth in place.
3. Remove the black cloth after switching off the UV lamp and wipe down the work zone surfaces with a suitable disinfectant.
4. Run the cabinet for at least 5 minutes so as to clear away any residual aerosols.
5. If necessary, use plastic backed, absorbent sheeting to reduce clean-up between procedures.
6. Plan work so as to place all materials in, or close to the cabinet and within easy reach of the operator.
7. Allow the cabinet to run for a further 5 minutes before use.

Turning off the BSC

At the end of work, leave the cabinet running and conduct the following procedures:

1. Transfer cultures to a container for storage or incubation
2. Disinfect and remove all unnecessary materials to reduce the potential for cross-contamination and interruption of airflows; cabinets are not designed for protracted storage of materials.
3. Wipe the work zone surfaces with fresh disinfectant solution.
4. Remove gloves for sterilization or disposal as contaminated waste.
5. Allow the cabinet to run for at least another 5 minutes.
6. Fit the black cloth and run the UV lights for another 5 minutes.
7. The sump of the Class II cabinet should be cleaned weekly, or after any spill.

UV lamps in Biological Safety Cabinets

The BSC is fitted with germicidal ultraviolet (UV) lamps in the work zone. UV can be a useful adjunct to surface cleaning procedures, but should not be seen as a replacement for good cleaning technique.

- Laboratory gowns and safety glasses/face shield suitable for UV work must be worn at all times when UV is operating. All work opening covers should be in place whenever UV lamps are in use. Personnel exposed to UV radiation may suffer eye damage and erythema (sunburn).
- UV lamps should be used for 20 to 30 minutes at the beginning and end of work. They should not be left on for extended periods.
- UV radiation degrades nitrile, plastics and rubber products and organic coatings.
- UV is ineffective in dynamic air streams, on dried organic matter, and is not penetrating.

Radiation intensity reduces over time due to degradation of the lamps. Where the use of UV is a significant element of surface decontamination procedure, regular testing of lamp intensity should be conducted. This can be arranged by the Technical Services manager.

Testing & Maintenance of BSC

BSCs require inspection and testing of airflow and filter performance at least annually, as well as after modification (including filter changes) or relocation. Cabinets should also be tested if there is reason to suspect they are not operating correctly.

Testing and maintenance of biological safety cabinets is the responsibility of the Technical Service manager or delegate. Users should ensure that the BSC has a current test sticker on it prior to use. Records of testing are maintained in the Equipment folder. Because maintenance may require access to the 'dirty' side of the system, special decontamination procedures are used to ensure maintenance personnel are protected from the work usually conducted in the BSC.

Consult the technical services manager for testing and maintenance procedures.

Fume Cupboards

A fume cupboard is essentially a ventilated box with an adjustable work opening that is used to minimise exposure to chemical vapours. It provides extraction to remove any fumes produced within the box. It is designed to have laminar flow through the front opening, i.e. the flow is to be even and non-turbulent through the open face of the cupboard.

To obtain an even flow through the face of the fume cupboards, baffles are generally installed at the back of the cupboard. These baffles are set to extract the air from two or more heights across the back of the fume cupboard. If the openings provided by the baffles are blocked by items stored in the cupboard then the air-flow through the face of the cupboard can become uneven.

Whenever anything is placed within the fume cupboard it introduces turbulence. This means that the containment of fumes may be affected. If a fume cupboard is not used in the proper manner then there may be situations in which fumes escape out of the front of the fume cupboard towards the user instead of being drawn away from the user.

Unless the room is of sufficient size or appropriately ventilated a fume cupboard will not be able to draw sufficient air and will subsequently not function properly.

The following details need to be considered to ensure that the fume cupboard's performance is not compromised:

- Do not work within ten centimetres of the leading edge. The larger the item, the further back it needs to be within the fume cupboard to overcome the turbulence created.
- Do not place storage items behind the area you are working in. This is of particular importance where a Perspex screen or lead bricks are used for radioisotopes.
- Chemicals are not to be stored in fume cupboards.
- Minimise the amount of items used within the fume cupboard when working.
- The amount of flammable solvent placed in a fume cupboard should be minimised (and the subject of a risk assessment.
- Do not put large equipment, such as ovens, in the fume cupboard, as they block the baffles and produce regions of zero or low flow in the workspace.
- Always have the sash as low as possible during the work.
- Minimise traffic past the front of the fume cupboard as this can cause turbulence and result in fume escape.
- The laboratory doors near the fume cupboard should be kept closed during its use.
- The make-up air supply and room ventilation should be on whenever the fume cupboard is in use.

Fume cupboard performance should be checked every 6 months to ensure adequate face velocity (an average of >0.5 ms^{-1}) and laminar flow. This testing is arranged by CDU Technical Services through the Technical Services Manager. The cupboard should be checked to ensure is has a current test sticker prior to it being used. Records of testing are maintained in the Equipment folder in the facility.

Pipettes

Mechanical or electronic pipettes are to be used for all pipetting tasks. **Never pipette anything by mouth.**
Because pipette tips can pierce a biohazard bag, they should be treated as sharps: when possible do not remove them from the pipettes by hand and dispose of them in a sharps container at the bench.

The action of pipetting can form aerosols:

1. Pipette slowly, particularly when using pipettes for mixing, to avoid aspirating aerosol or liquid into the pipette body.
2. Where aerosol transmission is a risk, carry out pipetting operations in a BSC.
3. Filtered tips or filter plugs may be required to avoid sample cross-contamination.

Use and care of pipettes

General use instructions

- Never overwind the mechanism when setting the volume.
- Avoid bringing the body of the pipette into contact with the vessel you're pipetting from.
- Spray or wipe the body of the pipette over with disinfectant after use and store it upright.
- If infectious liquids are aspirated into the pipettes, do not continue to use the unit. Disassemble the unit in a BSC (wearing gloves) and decontaminate the components by soaking in disinfectant solution.

NOTE: Undergraduate students are to notify technical staff of all issues related to pipettes. DO NOT disassemble any pipettes.

Ergonomics and pipettes

Continuous use of pipettes has the potential to result in forms of occupational overuse syndrome. The following points should be observed in order to minimise the risk of this occurring:

- Make sure the laboratory stool height is adjusted so the pipette can reach the work with the forearm and wrist held in a straight line, parallel with the work surface.
- Arrange the work to ensure that it can be reached without stretching; minimise the amount of pipette travel.
- Break from pipetting regularly - at least 5 minutes every 30 minutes.
- When carrying out large numbers of transfers, use an electronic pipette in favour of a mechanical one.

Administrative Controls

General Laboratory Rules

1. Only authorised personnel can access the laboratory. Unauthorised persons will be requested to immediately leave the facility. Never give access to any person other than an authorised person.
2. Fully enclosed footwear must be worn at all times
3. Laboratory gowns/coats must be worn at all times
4. All items must be decontaminated before they leave the laboratory. Once something enters the PC2 space it cannot be removed unless it is decontaminated. **Do not bring in anything other than your practical manual into this space, especially not personal equipment like mobile phones, calculators, or pens.**
5. You will be provided with a Laboratory gown and have access to appropriate gloves. These items **MUST** be left in the laboratory at the conclusion of working session.
6. Eating, drinking, smoking, applying cosmetics and handling contact lenses is forbidden at all times in the laboratory. Storage of food items in the lab is prohibited unless they are used as part of experimental activities.
7. Long hair is to be tied back at all times
8. Pipetting by mouth is strictly prohibited. Always use the pipettes supplied.
9. Laboratory doors must be kept closed when work is in progress. Doors must be locked when facility is not in use.
10. All benches and equipment must be decontaminated at the end of each working session. Use the Virkon provided and/or decontamination solution specified by lecturer/technician.
11. All cultures, solutions and materials must be clearly identified including dates. Only self-adhesive labels are to be used to prevent moistening labels with the tongue.
12. Smelling/sniffing of any cultures is prohibited.
13. Gloves are to be removed as per the glove removal procedure outlined in this manual and placed in the Biohazard bin.
14. Wash your hands as per the hand washing procedure outlined in this manual before you leave the facility. Your safety, and that of others, depends on the level of your personal hygiene.

FAILURE TO ABIDE BY THE RULES WILL RESULT IN REMOVAL OF ACCESS TO THE FACILTY

Personal Hygiene

It is important that hands are washed correctly to minimise or prevent transmission of infectious agents. A suggested technique is as follows:

- Rinse your hands in warm running water.
- Apply about 5 mls (a squirt) of antibacterial product to the palm of the hand and rub the palms together to work up lather.
- Using the method shown on next page, wash both hands.
- Rinse under running water. Have the hands pointing down so that water drains from the fingers into the sink. This will remove the water and foam but the antibacterial soap will still be resident on the hands. Then pat your hands dry and turn the tap off with the paper towel.

Correct Application of an Alcohol Hand Rub

- Squirt onto the palm of the hand
- The hands must be rubbed together vigorously ensuring the alcohol comes in contact wth ALL surfaces - NOT just the palms or fingers!
- Pay particular attention to the tips of fingers, the thumbs and the surfaces between the fingers.
- Continue to rub the solution until it is evaporated and the hands are dry (10-15 seconds). Never wave hands to hasten drying. The 10-15 seconds of rubbing is crucial.

Hands should be washed:

- Before leaving the laboratory (***after*** removing laboratory gown).
- Between glove changes.
- Whenever you suspect contamination.

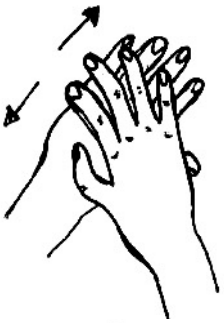
Hand Washing Technique

1.Move from the palms to the inside surfaces of the thumb changing from left to right hand

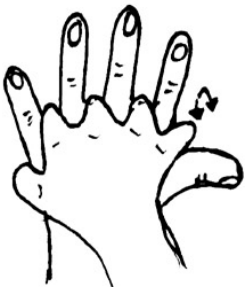
2. Intertwine fingers of both hands and work them back and forth to full length of fingers on each side.

3. Move over to the backs of the hands and then to the wrists giving it a few twists around the wrist.

4. From the wrist, move the hand on top over the backs of the fingers, including the thumb on the hand below.



5. Intertwine the fingers of both hands again to cover the webs of the fingers.



6. Rub the nails and fingertips back and forth over the palm of the opposite hand.

Personal Protective Equipment

Clothing & Footwear Requirements

It is a University requirement that **enclosed footwear must be worn at all times in the laboratory - no bare feet, thongs, or sandals at any time.** The main door of the laboratory indicates this requirement, which applies to any person entering.

Laboratory Gowns

Each person carrying out work in a PC2 designated area will be issued with a wrap-around laboratory gown. Gowns shall:

- Be worn at all times whilst working in the area.
- Be removed and hung on the coat rack **before** leaving the laboratory.
- Be laundered regularly, and when contamination is suspected.

Visitors to the laboratory will be provided with gowns when there is work being undertaken.

Laundry arrangements are managed through Technical Services. Contact Technical Services for more information.

Eye Protection

Safety glasses shall be worn at all times when work is conducted in the laboratory. Over-glasses will be provided to those who wear prescription spectacles.

Certain operations, such as handling cryogenic liquids and samples, and unloading autoclaves, require the use of a protective face shield.

Gloves

Gloves shall be worn:

- When required by a Safe Work Procedure and Risk Assessment
- When handling human blood and body fluids
- When handling any microorganism
- When working in a BSC

Gloves do not provide automatic protection. This is due to the fact that even new gloves may have their integrity compromised. Consider double-gloving.

Gloves shall be changed regularly, washing hands between changes.

The standard glove available in the laboratory is a latex examination glove. Latex gloves have been found to have the best integrity, greatest flexibility and sensitivity (allowing for dexterity) and least permeability. Allergic reactions to latex gloves, which range from mild skin irritation to anaphylactic shock, may be reduced by the use of non-powdered and low protein latex gloves. Alternatively, nitrile gloves can be used (which can also provide improved chemical protection).

Gloves shall be removed before leaving the laboratory or answering the telephone. Refer to the following glove removal procedure for approved technique to be used.

Instructions for the safe removal of contaminated gloves

1. Pull one glove near your wrist towards your fingertips until the glove folds over.

2. Carefully grab the fold and pull towards your fingertips. As you pull you are turning the inside of the glove outwards

3. Pull the fold until the glove is almost off.

4. To avoid contamination, continue to hold the removed glove. Completely remove your hand from the glove.

5. Slide your finger from your glove free hand under the remaining glove. Continue to slide your finger towards your fingertips until almost half of your finger is under the glove.

6. Turn you finger 180° and pull the glove outwards and towards your fingertips. As you do this, the first glove will be encased in the second glove. The inside of the second glove will also be turned outwards.

7. Grab the gloves firmly, by the uncontaminated surface (the side that was originally touching your hand). Release your grasp of the first glove you removed. Pull your second hand free from its glove. Dispose of the gloves into a bio-hazard bag.

Working Alone (this is for research staff and students only)

In general, working alone in a PC2 laboratory does not in itself increase the risk of being injured. In addition, Risk Group 2 microorganisms do not pose an immediate threat to the health of anyone exposed to them. For these reasons it is only work with Risk Group 3 or higher organisms that is considered of sufficient risk to preclude working alone.

The primary concerns with people working alone are:

- The possibility that they undertake activities without appropriate training or approvals, or without using standard practices.
- The increase in risk associated with persons actually being alone, particularly with regard to personal safety.
- The lack of access to the emergency response support, particularly first aid, in the event that the person is injured or requires medical attention.

The following issues therefore need to be considered when contemplating work after hours:

- The nature of the work.
- The capacity of the person to conduct it (that is, their experience and training).
- Additional risk factors, such as any medical conditions.
- The means of communication available – Note: CDU Security should be notified so that they are aware of persons present in the building.

Where after hours work is necessary, this should be authorised by Head of School, supervisor or Technical Services Manager or their delegate. When doing after hours work you must sign in /sign out the afterhours book for your area.

Work Procedures

Inoculating Loops

These should be sterile before and after use. To avoid spatter and aerosol generation whilst sterilising loops in a Bunsen flame, slowly draw the wire through the tip of the blue cone, starting at the base of the wire, and ending with the loop. The loop should be completely closed.

Note there is the potential to contaminate loop handles when taking samples from deep tubes. If this is likely to occur, handles should be decontaminated by standing in disinfectant solution. This can be avoided by using sample tubes and loop wires of appropriate lengths where possible.

Sharps

Sharps are essentially anything that has the potential to penetrate the skin, but are typically needles, scalpels, Pasteur pipettes and broken glassware. The main risk with using sharps is self- inoculation.

- Keep the use of sharps to a minimum.
- Do not bend needles or try to recap them after use.

- Use blunt cannulas where possible.
- Discard sharps into sharp containers.

Decontamination

For the safety of all laboratory users items used in conjunction with infectious material must be decontaminated when they are finished with. This is achieved by:

- wiping with a disinfectant
- Soaking in a disinfectant/sterilant/bactericide/viricide, or
- Autoclaving (pressure steam sterilising).

The choice of decontamination procedure will depend on the microorganisms involved, the presence of other materials (chemicals, radioisotopes, organic material, etc.) and the equipment to be cleaned.

Chemical disinfectants are used for routine decontamination and spills. It is important that a decontaminant is effective against the microorganisms being handled is selected and available before work commences. Table 1 is provided to assist with the selection of disinfectants.

Table 1 Disinfectant selection (a bold tick indicates that the disinfectant is preferred for the application/agent).

	Virkon	**Hypochlorite (bleach)**	**Alcohols**	**Formaldehyde (Gas)**	**QUATS**	**Iodophors**
Concentration	2%	1 – 5 %	70 -85%	5g/m^3	0.1 – 2%	0.5%
Contact time (mins)	10 -20	10 - 20	10 – 30	600 – 900	10 – 30	10 – 30
Effective against						
Vegetative bacteria	✓	✓	✓	✓	✓	✓
Bacterial spores	✓	✗	✗	✓	✗	✗
Lipophillic viruses	✓	✓	✓	✓	✓	✓
Hydrophilic viruses	✓	✓	✗	✓	✗	✗
Fungi	✓	✓	✗	✓	✗	✓
HIV	✓	✓	✗	✓	✓	✓
HBV	✓	✓	✗	✓	✗	✗
Applications						
Bench tops	✓	✓	✓	✗	✗	✗
Liquid disposal	✓	✓	✗	✗	✗	✗
Glassware	✓	✓	✓	✗	✓	✓
Instruments	✓	✓*	✓*	✗	✗	✗
Equipment (total decontamination)	✗	✗	✗	✓	✗	✗

*With care – some plastic and metal components may be affected by contact with these substances. Consult User Manual or technical staff for clarification prior to using

From Appendix B to Procedure 2.6.2 Biological Waste

Table 1. Disinfectants/Antiseptics used in PC2 laboratories

Disinfectant	Active Constituent	Recommended Concentration
MICROSHIELD CHLORHEXIDINE 2%	Chlorhexedine Gluconate 2% (equivalent to Chlorhexedine 11.3g/L) and Tartrazine	2.0% w/w
Virkon	Potassium peroxymonosulfate Sodium polyphosphate Sodium dodecylbenzenesulfonate	1% solution (1 tablet dissolved in 500 ml water)
Bleach (commercial)	Sodium hypochlorite	4% m/v (minimum)
Gel Hand Sanitizer	Ethanol	>70%

Important things to wipe daily include:

For students

- bench tops
- sink taps
- pipettes

For technicians

- Door handles
- Preparation area
- BSC
- Lab equipment including incubator doors and handles

Waste Management

Chemical, Biological and General Waste

The waste management procedures used by the School is defined in Technical Services Procedure **2.6 Waste Management** and related procedures: **2.6.1 Chemical Waste; 2.6.2 Biological Waste and 2.6.3 General Waste**

These procedures specify the treatment regime for each particular type of waste before disposal. Specific information on handling, storing and labelling requirements, as well as accidental containment measures are also given. Refer to the Flowchart at the end of Procedure 2.6 for an overview of the waste management process.

The bulk of the quarantine and potentially infectious biological laboratory waste of the School is disposed of after autoclaving on site via authorised waste management contractors.

To protect the community and the environment the following standard safety measures apply:

1. Waste must be **segregated, contained and properly packaged at the point of production**. This approach reduces double handling and minimises the risks associated with contamination and spillage/breakage;
2. Bags for disposal should be **sealed by laboratory staff** and not left open at the end of the day, nor left lying in laboratories where they can be inadvertently removed by cleaning staff;
3. **Quarantine or potentially infectious material** should not leave the laboratory until chemically treated and/or autoclaved;
4. All medical waste must be kept **separate** from the quarantine waste, until an appropriate waste bin is ordered;
5. Material, once autoclaved, should be placed in the appropriate bin for removal by a **specialised contractor**;
6. **Only** non-infectious waste can be disposed of in domestic waste.

No waste material is to be removed from the facility without the clearance of Technical Services Manager or delegate.

Quarantine and Deemed Quarantine Waste

For detailed waste management procedures related to Quarantine and Deemed Quarantine Waste, refer to 3.4 AQIS Dealing with Quarantine Material, and 5.7 Autoclaves & Sterilisation Guidelines.

Personal Safety and Waste Management

- Standard precautions should apply when handling all laboratory waste products.
- All types of biological waste are deemed to be potentially hazardous, either: infectious, pathogenic or toxic/mutagenic.
- The person generating the waste is responsible for the correct segregation and disposal of the waste material. Clean up your mess before leaving!

Protective clothing is mandatory for all laboratory personnel. Laboratory coats must be worn in PC2 areas **and left in them**. You should have your own labeled laboratory gown/coat. Laboratory coats should be removed when laboratory workers leave the 'work area', e.g. at meal or toilet breaks.

Disposable gloves must be worn when handling all biological waste products (i.e. quarantine, deemed quarantine, medical, and microbiological wastes),and while doing any bench laboratory work, except for when dealing with non-infectious museum specimens and plant material, microscope slides etc. Gloves should be removed on completion of laboratory tasks, when using a telephone or when performing any other office duties.

Hands should be washed with water and liquid soap disinfectant: e. g. Hibicleans, and properly dried with paper towel after removing laboratory coat and gloves. Hand washing before commencing office work is essential

Storage & Transport of biohazard waste containers

Storage:

All the biohazardous waste material produced by teaching and research facilities covered by this manual is stored, upon appropriate containment, in the caged area outside Building Yellow 2. Segregation ensures non-reactive, safe and secure storage.

Transport:

For transport between university campuses or to other locations, quarantine/infectious waste materials are to be placed in an inner container surrounded by absorbent padding and contained within a durable/resistant outer container. Please talk to the Technical Services manager or their delegate in Yellow 2.1.26 if you need to do this.

Unless permission is otherwise obtained, the Faculty of Engineering Health,Science and the Environment does not have AQIS clearance to use any imported biological products *'in vivo'*.

If you want to import any material from overseas please contact the Technical Services Manager Yellow 2.1.26 ext 6349 and they will help you with the AQIS web site to gain a permit.

Definitions:

***'In vitro'* –** *'*in glass': referring to a process or reaction carried out in a culture dish or test tube. *In vitro* use includes those procedures which do not involve direct or indirect exposure of the material or its derivatives to humans or animals.

Examples of *in vitro* use are:

- The use of media for bacterial culture (as long as the bacteria are not exposed to humans or animals);
- The use of cell lines (as long as either the cell lines or material associated with that cell line is not exposed to humans or animals).

'In vivo' - **'**in the living organism': is where biological product or its derivatives are directly or indirectly exposed to a living organism. Consequently, use in micro-organisms can be regarded as *in vitro* unless the treated microorganisms come in contact with animals. *In vivo* use includes those procedures which do involve direct or indirect exposure of the material or its derivatives to humans or animals.

Examples of *in vivo* use are:

- vaccine production where the vaccine will be used in animals or humans;
- use in laboratory animals or clinical trials in humans;
- the use of media to produce vaccines or other substances for use in animals or humans;
- the use of sera or albumin for embryo washing where the embryo is destined for implantation either in humans or animals;
- the use of biological material for the culture of organisms or in a cell line which will be exposed to animals plants or humans;
- the use of bovine pituitary extract in the production of skin grafts for experimental or clinical use in animals or humans.

Non-infectious waste

Non-infectious material, such as waste paper and plastic products, is collected in the waste bins lined with black plastic bags.

Infectious waste generated in the laboratory consists of several types, each of which has different disposal routes.

Sharps

All sharps are to be disposed of by placing them in the sharps containers which will be on the benches in the facility. When these reach 75% full they should be replaced. For replacement and removal of sharps containers contact Laboratory Manager or Technical Services

Vaccinations **(this is for research staff and students)**

The table below provides a list of Risk Group 2 pathogens where prophylactic vaccination is available and may be indicated.

Table 2 Vaccinations that are available for infectious agents; those shown in bold type are recommended for health care laboratory workers.

Bacteria	**Viruses**
Clostridium tetani	**Hepatitis B**
Corynebacterium diphtheriae	**Influenza (recent isolates)**
	Measles, Mumps, Rubella
Neisseria meningitidis	**Varicella**
Mycobacterium tuberculosis *	
Coxiella burnetii *	Vaccinia
Salmonella typhi *	Hepatitis A
	Polio**

*These should only be considered Risk Group 2 when present in clinical or food samples
**Work with wild polio virus is subject to additional restrictions imposed by the World Health Organisation.

Where any of these pathogens is be used in the laboratory, ***all*** personnel using the facility should be considered as candidates for vaccination.

Advice and vaccinations can be provided through the Faculty IBS/ medical practitioner, and the costs borne by the project funds. The vaccination provider will maintain records of vaccination. Many users will have received vaccinations for a number of the agents listed above. A vaccination record for each user (Appendix H) will be maintained by the user and Faculty IBS.

There may also be a recommendation for health surveillance, such as chest X-rays, serum sampling, etc. Work with pathogens may pose elevated risk to certain classes of people. Whilst the risks of exposure is the same for all persons who adopt the specified control measures, people who are more vulnerable to infection, such as those who are pregnant or diabetic or otherwise immuno- compromised, should notify and seek advice from the Biosafety committee if necessary.

Women of child bearing age need to be aware of the risks to an unborn child or themselves of exposure to certain microorganisms, such as: *Toxoplasma gondii; Listeria monocytogenes; Coxiella burnetii;* Rubella virus

References

1. Australian and New Zealand Standards
- AS/NZS 2243.3:1995 *Safety in laboratories. Part 3 – Microbiology*
- AS 2647:2000 *Biological Safety Cabinets - Installation and use*
- AS 2252.1: 1994 *Biological Safety Cabinets. Part 1: Biological Safety Cabinets (Class I) for personnel and environment protection*
- AS 2252.2: 1994 *Biological Safety Cabinets. Part 2: Laminar flow biological safety cabinets (Class II) for personnel, environment and product protection*
- AS 2243.8:2001 *Safety in laboratories Part 8 - Fume Cupboards*

- AS 4834:2007 *Packaging for surface transport of biological material that may cause disease in humans, animals and plants.*

2. Gene Technology Act 2000

3. Office of Gene Technology Regulator (OGTR)
http://www.ogtr.gov.au/internet/ogtr/publishing.nsf/Content/home-1

4. Quarantine Act 1908 and Quarantine Regulations 2000
http://www.daff.gov.au/aqis/quarantine/legislation/quarantine

5. Department of Agriculture, Fisheries and Forestry (DAFF) http://www.daff.gov.au/

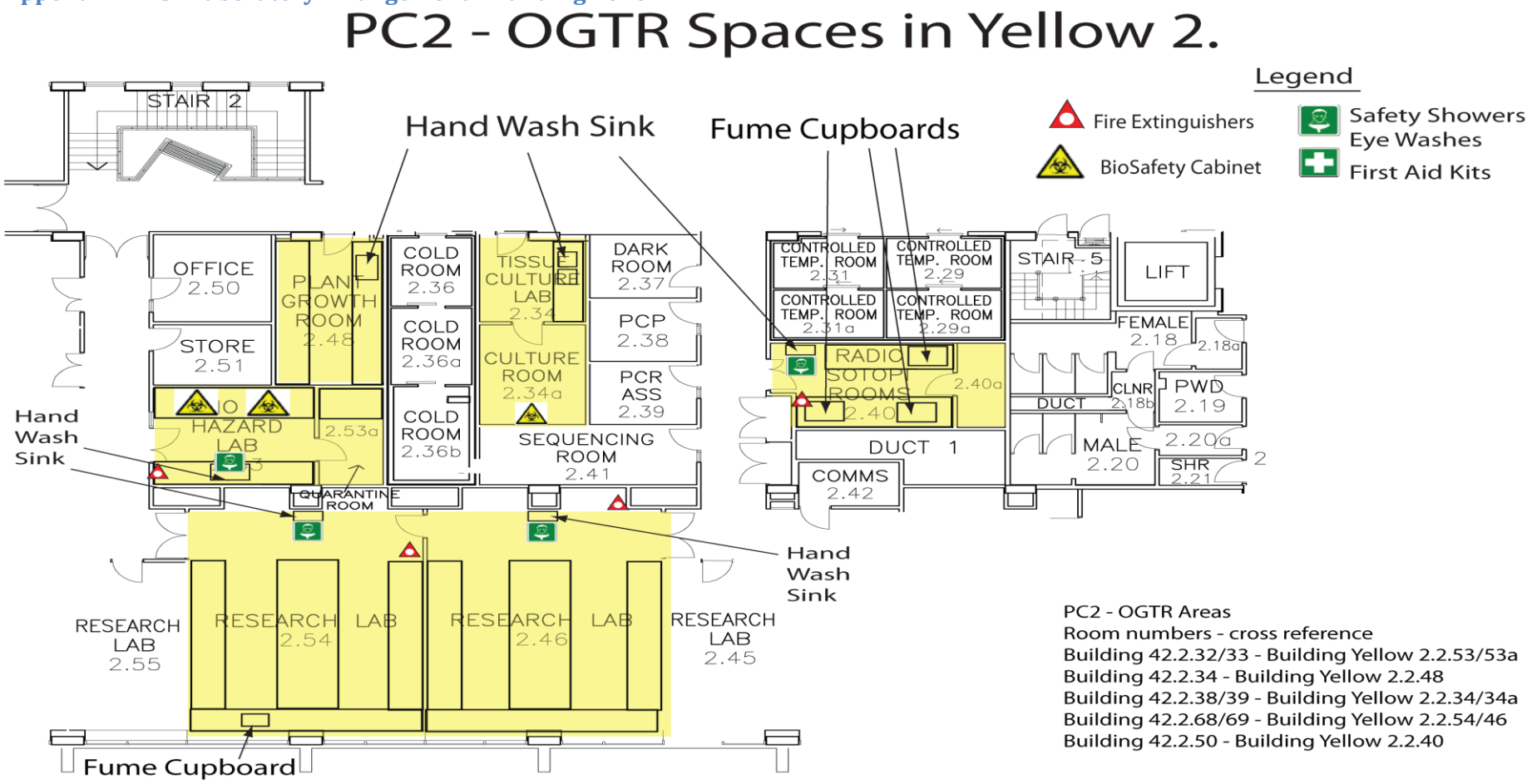
6. Second supplement to: Categorisation of biological agents according to hazard and categories of containment (4th Edition), 1995, Advisory Committee on Dangerous Pathogens, http://www.hse.gov.uk/hthdir/noframes/agents.htm

7. NIH Guidelines for research involving recombinant DNA molecules, 2001, National Institutes of Health, http://www4.od.nih.gov/oba/rac/guidelines/guidelines.html

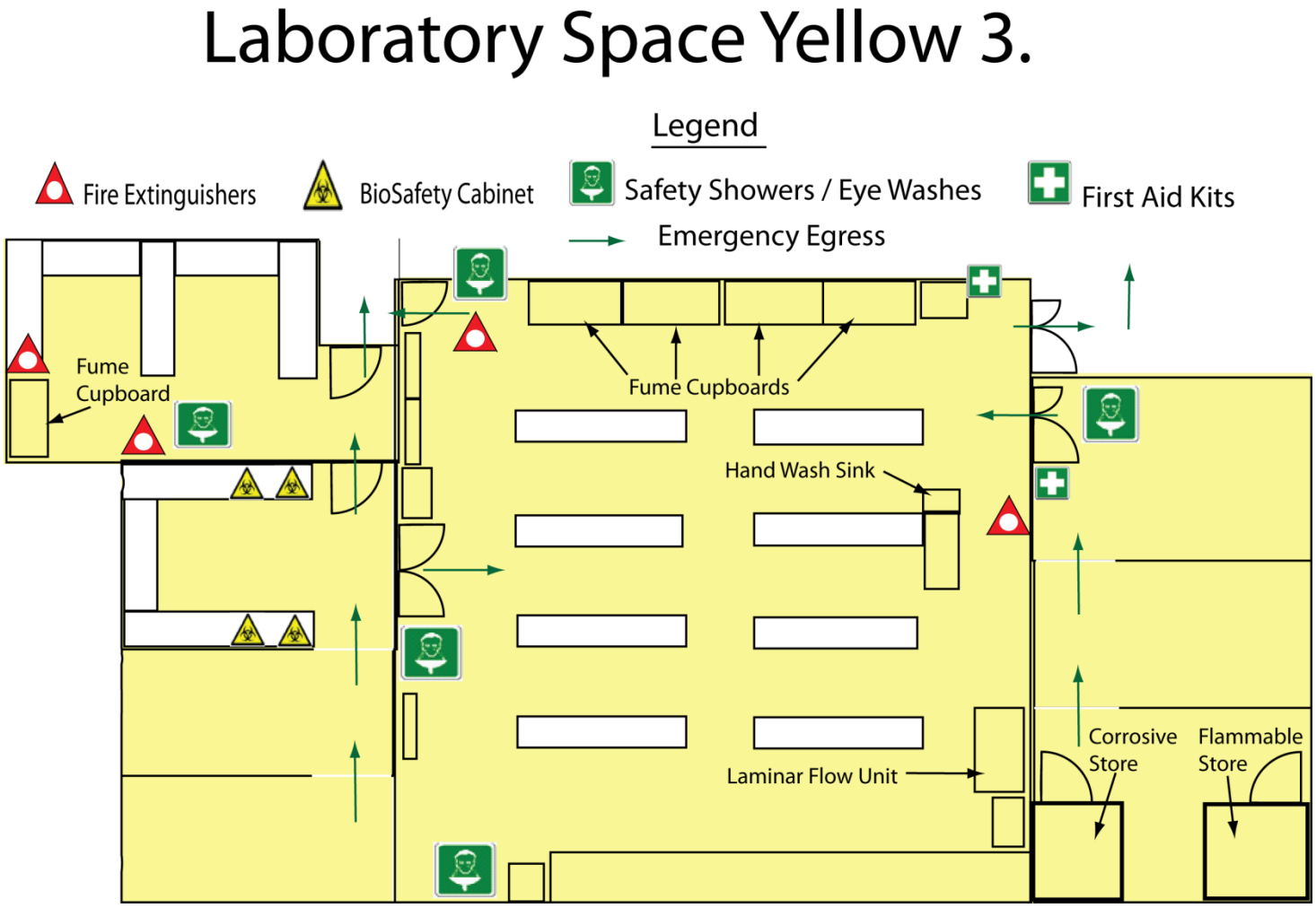
8. The Australian Immunisation Handbook, 7th Edition, NHMRC, 2000

9. Biosafety in Microbiological and Biomedical Laboratories (BMBL), 4th Edition, 1999, Centre for Disease Control and Prevention & National Institutes of Health
http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm

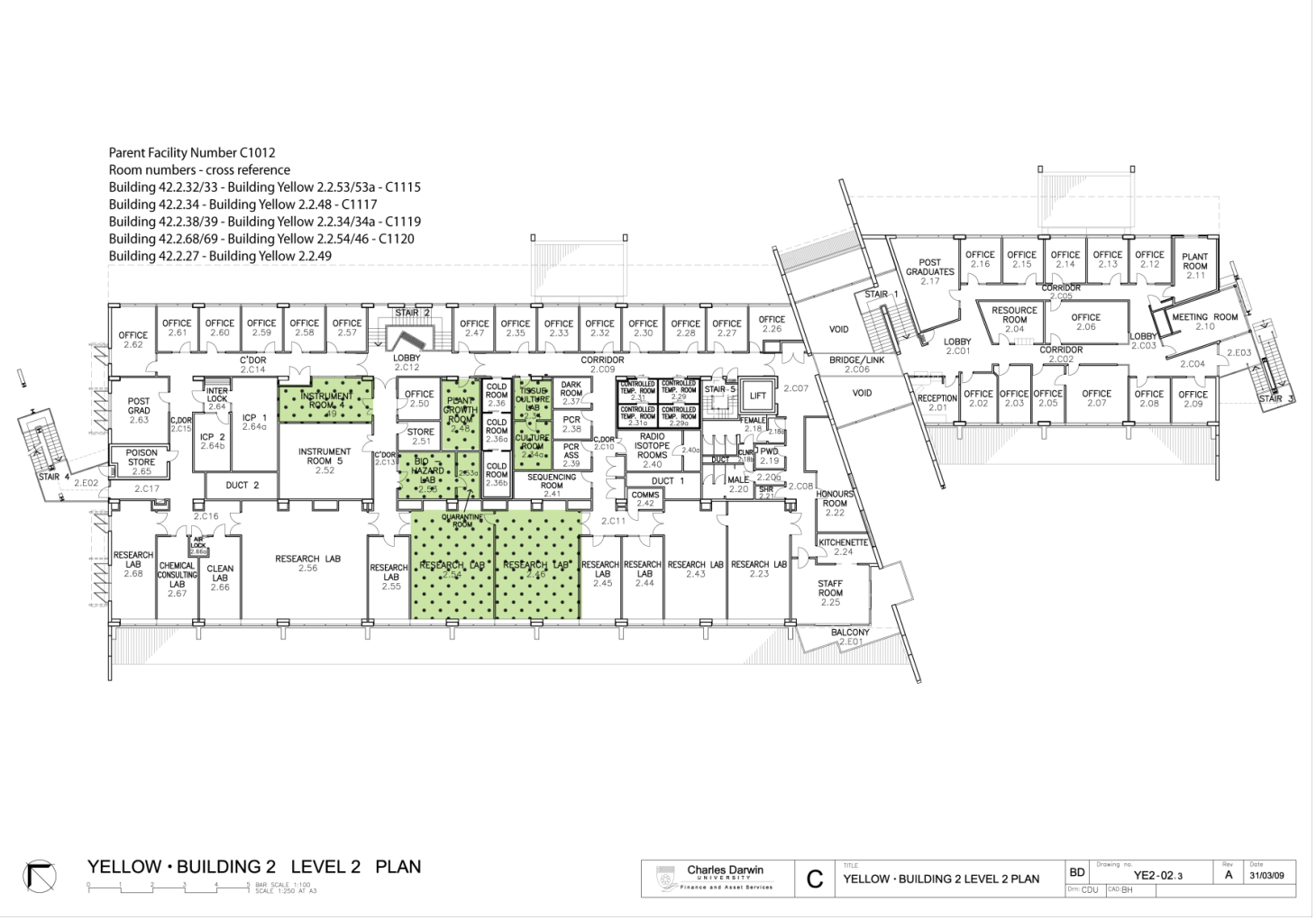
Appendix A PC2 Laboratory Arrangement – Building Yellow 2



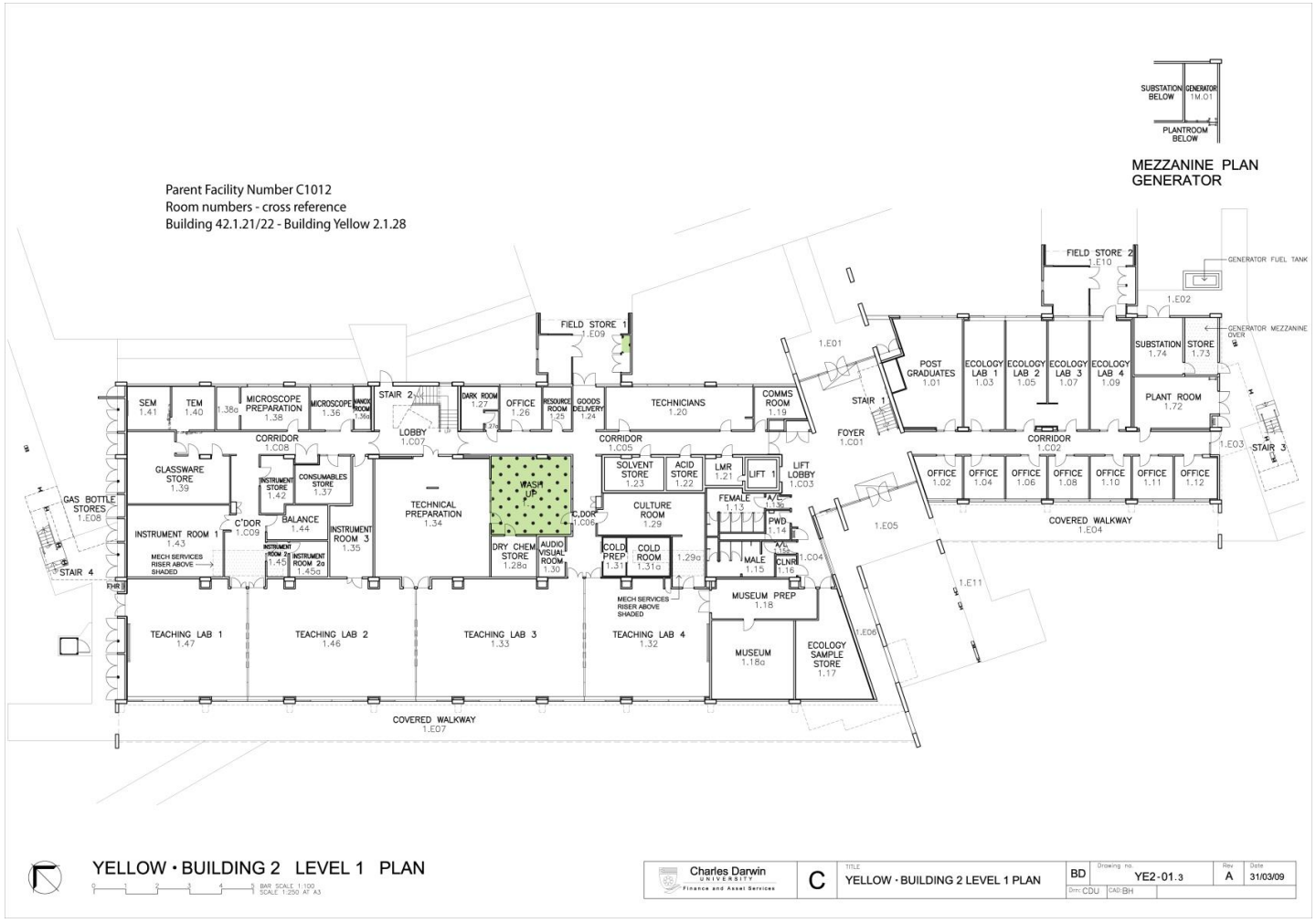
Appendix A PC2 - Laboratory Arrangement – Building Yellow 3



Appendix A Quarantine Containment QC2 - Laboratory Arrangement – Building Yellow 2 Level 2



Appendix A Quarantine Containment QC2 - Laboratory Arrangement – Building Yellow 2 Level 1



Appendix B Induction Checklist

This is designed as an aid to inducting new personnel into the safety practices to be followed in the laboratory facilities. All personnel should have access to the Biosafety Safety Manual, and be provided with explanations and demonstrations of its content. This shall occur **before** the person commences work in the laboratory.

Laboratory personnel are asked to verify they have received this information, and may be asked to confirm that they have understood it by way of questioning and demonstration. This checklist represents a record of induction, and should be kept in the Induction folder.

Room No(s)	
Supervisor	
Department	

Item	**Check**
Review the contents of the CDU Biosafety Safety Manual	
Laboratory Access requirements	
Location of fire fighting equipment	
Location of first aid kit	
Evacuation procedures	
Emergency eye wash and safety shower	
Location of safety documents: • Laboratory Safety Manual(s) • MSDS Folder • Equipment Folder • Risk Management Folder	
Personal Protective Equipment (issued): • Gown • Safety Glasses • Other_____	
Location of other personal protective equipment • Gloves • Respirator • Face shields	
Hand washing procedures (explained and demonstrated)	
Fume cupboard operation (explained and demonstrated)	
BSC operation (explained and demonstrated)	
Waste disposal procedures	
Other items	

User's Name: _____ Signature: _____ Date: _____

Inducted by: _____

Supervisor Acknowledgment: _____

Appendix C Cleaner/Maintenance Personnel Induction Checklist

This is designed as an aid to inducting personnel who require access to the laboratory for the purpose of cleaning or facility maintenance (including maintenance of BSCs) to ensure they are aware of existing hazards. All personnel should be provided with explanations and demonstrations of laboratory hazards. This shall occur **before** the person commences work in the laboratory.

Personnel are asked to verify they have received this information, and may be asked to confirm that they have understood it by way of questioning and demonstration. This checklist represents a record of induction, and should be kept in the Induction folder.

Room No(s)	
Supervisor	
Department	

Item	**Check**
Demonstrate facilities	
Laboratory Access requirements	
Location of fire fighting equipment	
Location of first aid kit	
Evacuation procedures	
Emergency eye wash and safety shower	
Location of safety documents	
Personal Protective Equipment requirements	
Hand washing procedures (explained and demonstrated)	
Waste disposal procedures	
Spill procedures	
Decontamination requirements	
Other items	

User's Name: _____ Signature: _____ Date: _____

Inducted by: _____

Supervisor Acknowledgment: _____

Appendix D Safety Training Plan and Assessment

Training element/competency	Date assessed	Check
WORK PRACTICES AND PROCEDURES		
Explain the rules about Laboratory access		
Select. explain and demonstrate the correct use of personal protective equipment		
Explain the use of other safety equipment & devices (pipettes, loops, etc.)		
List factors that may affect susceptibility, resistance or consequences of infection		
Outline the evacuation procedures including the location of fire fighting equipment, first aid kits, evacuation plans		
Demonstrate knowledge of the location of all safety documentation		
Explain and demonstrate hand washing procedures		
Outline waste disposal procedures		
Outline spill management procedures		
Explain the incident reporting procedure		
Explain the hazard of exposure of service personnel to biological materials		
Demonstrate knowledge of appropriate selection of decontamination protocols (chemicals, steam, UV radiation, etc.)		
REGULATORY – LEGISLATION, STANDARDS and GUIDELINES		
Demonstrate knowledge of relevant legislation (including Acts, Regulations)		
Demonstrate knowledge of relevant CDU policy/procedure/guidelines		
Interpret and apply the relevant OGTR Guidelines		
Demonstrate knowledge of the standards/guidelines that apply to the classification of biohazardous agents according to risk		

Training element/competency	Date assessed	Check
Demonstrate knowledge of the requirements applicable to Quarantine Containment		
Demonstrate knowledge of Primary and Secondary barriers		
APPROVALS		
Describe the role of and function of the Institutional Biosafety Committee		
Outline the procedure for getting approval for working in PC2 facilities		
Outline the procedure for getting approval for working in QC2 facilities		
LAB SKILLS AND EQUIPMENT		
Demonstrate the correct use of Class II Biosafety cabinets		
Describe the limitations other extractive equipment such as fume cupboards		
Demonstrate the correct use of autoclave		

User's Name: _____ Signature: _____ Date: _____

Completed by: _____

Supervisor Signature_____

Appendix E Register of Microorganisms

Laboratory:_____

Project: _____ Chief Investigator: _____

Microorganism	Risk Group	Location	Box No.	Culture No.	Source	Strain/Type	MSDS (Y/N)	Import Permit No.	Comment

Appendix F Microorganism Risk Management Form

Microorganism Summary - Hazard Identification & Risk Assessment

This should be completed for each disease-causing microorganism with reference to available safety data

Pathogen	Disease(s)	Transmission Routes (circle)	Standard Risk Controls (circle)	Infectious Dose	Disinfectant	Vaccination required?	Vaccinations completed?
		Aerosol Ingestion Inoculation	Gloves BSC Mask Sharps precautions				
		Aerosol Ingestion Inoculation	Gloves BSC Mask Sharps precautions				
		Aerosol Ingestion Inoculation	Gloves BSC Mask Sharps precautions				
		Aerosol Ingestion Inoculation	Gloves BSC Mask Sharps precautions				
		Aerosol Ingestion Inoculation	Gloves BSC Mask Sharps precautions				

Persons conducting the work	
Person conducting the assessment	

Appendix G Safe Work Procedure

Faculty/Division/Cost Centre ..... Location .....

Function/Activity .....

Procedure developed by ..... Approved by ..... Date .....

Personal Protective Equipment Required *(Please ☒ below to indicate the appropriate PPE required for function/activity.)*

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Activity *Steps in the process/task*	***Hazards Identified*** *What could cause an injury*	***Risk Score** *How harmful is it?*	****Controls** *What can be done to minimise the risk of injury?*	**Final Risk Score**

* Refer to attachment A ** Apply *Hierarchy of Control* refer Attachment A

Risk Matrix

STEP 1 Consider the CONSEQUENCES

Consider what could reasonably have happened as well as what actually happened.

Look at the descriptions and choose the one most suitable.

Consequence	Description
Major	Death or extensive injury
Moderate	Medical Treatment
Minor	First Aid Treatment
Insignificant	No Treatment

STEP 2 Consider the LIKELIHOOD

What is the likelihood of the consequence identified in Step 1 happening? Consider this without new or interim controls in place.
Look at the descriptions and choose the one most suitable.

Likelihood	Description
A	Is expected to occur
B	Could probably occur
C	Could occur, but only rarely
D	May occur, but probably never will

STEP 3 Calculate the RISK

1. Select the appropriate column for Step 1 on the matrix below.
2. Select the appropriate line for Step 2 rating.
3. Circle the risk score where the two intersect.

		CONSEQUENCE			
		Major	**Moderate**	**Minor**	**Insignif.**
LIKELIHOOD	**A**	**H**	**H**	**H**	**M**
	B	**H**	**H**	**M**	**M**
	C	**H**	**M**	**M**	**L**
	D	**M**	**M**	**L**	**L**

Hierarchy of Control

Determine appropriate controls to minimize the risk of injury with priority being the elimination of the hazard(s) contributing to the occurrence.

1. Elimination (remove the hazard)
2. Substitution (use an alternative)
3. Isolate (separation from hazard)
4. Redesign (change equipment or process)

5. Administration (change work practice)
6. Personal Protective Equipment (i.e. gloves, glasses, hearing protection)

Safe Work Procedure Action Plan

Recommended New Controls	Specific Action	Accountability	Target Date	Completion Date

Appendix H Record of Vaccination Form

Name: _____

Signature: _____ Date: _____

	Past Illness (circle)	Year of last childhood vaccination	Date of last vaccination (other)	Comments
Diphtheria				
Tetanus				
Polio				
Measles	Yes / No			
Pertussis	Yes / No			
Mumps	Yes / No			
Rubella	Yes / No			
Hepatitis A	Yes / No			
Hepatitis B	Yes / No			
Tuberculosis Mantoux Test	+ / -	Date of test		
BCG Vaccine (only if Mantoux -)				

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