Laboratory (PC2) Guidelines

Approval date	8 January, 2018
Adviser	Jennie Trinder | Director, Health, Safety and Wellbeing, Corporate Services | safety@griffith.edu.au |
Next scheduled review	2022
Document URL	https://www.griffith.edu.au/student-staff/health-safety-wellbeing/biosafety,-chemicals,-radiation
Description	University Guidelines for managing a Physical Containment Level 2 (PC2) Laboratory Facility.

Related Documents

Internal Documents

Work Health, Safety and Wellbeing Accountabilities
Guidelines for Chemical Management
Guidelines for the Safe and Sustainable Procurement of Chemicals
Chemical Risk Assessment Guide and *Chemical Risk Assessment Template*
Chemwatch GOLD FFX
Griffith University Guidelines for Animal Care and Use in Teaching and Research
Guidelines for Completing An Application Form
Animal Research Ethics Application Process – Quick reference guide
Scheduled Substance Management Plan
Gas Cylinder Change Over SOP

External Documents and Resources

Work Health and Safety Regulation 2011
How to Manage Work Health and Safety Risks, Code of Practice, December 2011
AS/NZS 2243.3:2010 Safety in laboratories Part 3: Microbiological safety and Containment
Gene Technology Act 2000
Gene Technology Regulations 2001
Approved Arrangements For 5.2—Biosecurity containment level 2 (BC2) Requirements—Version 3.0
Animal Care and Protection Act 2001
Animal Care and Protection Regulation 2012
NHRMC Australian code for the care and use of animals for scientific purposes 8th edition
NHMRC Guidelines to promote the wellbeing of animals used for scientific purposes
National Health Security Act 2007
The National Health Security Regulations 2008
National Health Security Amendment Commencement Proclamation
SSBA Standards and *SSBA Guidelines*
SSBA Fact Sheets
DECO Application for DSGL Assessment
Poisons Standard
Nanomaterial control banding tool worksheet
Australian Radiation Protection and Nuclear Safety Authority - Lasers

1. INTRODUCTION

This document is designed to assist Griffith University staff and research students in managing and operating a Physical Containment (PC) Level 2 Laboratory in a safe and compliant manner.

There are legislation and standards that need to be considered when managing a PC2 Facility. For instance under the *Gene Technology Act 2000*, the Gene Technology Regulator issues technical and procedural guidelines in relation to genetically modified organism (GMOs) and certification of facilities to specified containment levels. Similarly, the Department of Agriculture and Water Resources set out the requirements for the approval, maintenance and operation of an Approved Arrangement as well as the requirements for handling goods subject to biosecurity control. The AS/NZS 2243.3:2010 outlines the conditions when working with general microbiological organisms and diagnostic samples.

Further guidance is available from the Griffith University Health, Safety and Wellbeing website, the University Biosafety, Chemicals and Radiation Advisors and references listed in this document.

2. SCOPE

This document outlines the operational management requirements for the physical containment of Risk Group 2 microorganisms including GMOs, but also considers the chemical, radiation and other hazards commonly found in PC2 laboratories.

It should be noted that for higher risk facilities, such as a PC3 laboratories, additional requirements and work practices must be developed and implemented.

These guidelines are applicable to all managers, operators and users of PC2 laboratories at Griffith University.

These guidelines should be read in conjunction with the relevant legislation, standards, and other internal policies, guidelines and documented safe work procedures.

3. DEFINITIONS AND TERMS

Act: Legislation, or law, passed by the Parliament.

Biosecurity control is a series of measures designed to prevent the unintentional release and spread of a material in the environment and broader community

Containment: A combination of buildings, engineering function, equipment, and work practices to mitigate the risk associated with handling a hazardous agent.

Facility: a building or complex of buildings, designed for a specific purpose.

GSafe: Griffith University's online safety management system.

Hazard: A situation, agent or item that has the potential to cause harm. Hazards in a laboratory may include: noise, equipment, chemicals, electricity, radiation, or repetitive tasks.

Physical Containment: Procedures and structures designed to reduce or prevent the release of viable hazardous agents (including biologicals) into the outside environment.

Regulations: Subsidiary legislation that dictate how the provisions of an Act are applied. Facility users are required by law to meet the regulations that apply to their facility and activities.

Risk: The possibility that harm might occur when exposed to a hazard. This may be harm to a person (death, injury or illness), or harm to the wider community, or the flora, fauna and landscape in the environment.

Risk Control: Actions taken to eliminate health and safety risks so far as is reasonably practicable, and if that is not possible, minimising the risks so far as is reasonably practicable. Eliminating a hazard will also eliminate any risks associated with that hazard.

Risk Group: The degree to which a microorganism is considered pathogenic to humans varies, *i.e.* the risk associated with organisms varies. (**Table 1**).

Table 1: *Classification for microorganisms that are infectious for humans and animals based on the pathogenicity of the agent, the mode of transmission and host range of the agent, the availability of effective preventive measures, and the availability of effective treatment.*

Risk Group	Description
Risk Group 1 (low individual and community risk)	A microorganism that is unlikely to cause human or animal disease, or a microorganism that is unlikely to be a risk to plants, industry, a community or region and is already present and widely distributed.
Risk Group 2 (moderate individual risk, limited community risk)	A microorganism that is unlikely to be a significant risk to laboratory workers, the community, livestock, or the environment; laboratory exposures may cause infection, but effective treatment and preventive measures are available, and the risk of spread is limited. With respect to plants it is a microorganism that is a low to moderate risk to plants, industry, a community or region and is present but not widely distributed.
Risk Group 3 (high individual risk, limited to moderate community risk)	A microorganism that usually causes serious human or animal disease and may present a significant risk to laboratory workers. It could present a limited to moderate risk if spread in the community or the environment, but there are usually effective preventive measures or treatment available. For plants it is microorganism that is significant risk to plants, industry, a community or region and is exotic but with a limited ability to spread without the assistance of a vector.
Risk Group 4 (high individual and community risk)	A microorganism that usually produces life-threatening human or animal disease, represents a significant risk to laboratory workers and may be readily transmissible from one individual to another. Effective treatment and preventive measures are not usually available. A RG4 for plants is a microorganism that is highly significant risk to plants, industry, a community or region and is exotic and readily spread naturally without the assistance of a vector.

4. RESPONSIBILITIES

All staff, students and visitors have responsibilities and accountabilities for health and safety. All persons within the University shall:

- Cooperate and actively contribute to the health and safety of themselves and others within the workplace that may be affected by their acts or omissions.
- Follow all University, Head of School and manager policies, procedures and any safe work procedures.
- Risk assess and undertake all work/study activities in a manner which prevents personal injury or injury to others and any damage to property. Risk assessments must be documented an identified hazards controlled. Risk assessments should be added to GSafe.

- Report all incidents, hazards and near misses to the supervisor and log a report into GSafe as soon as possible after they occur or are identified. In addition, consider health monitoring of at-risk persons.
- Use safety and personal protective equipment as required.
- Be familiar with emergency or evacuation procedures and meet training requirements.
- Cooperate and comply with the University's injury and return to work plans.
- Implement and monitor a safe systems of work when dealing with microorganisms, including regulated material. Compliance with the University Biosafety Committee, and relevant regulators is also required.

More information on responsibilities of the various staff levels can be found in the *Work Health, Safety and Wellbeing Accountabilities* document on the Health, Safety and Wellbeing web site.

5. HIERARCHY OF RISK CONTROLS

Risks within the PC2 facility must be identified, assessed and appropriate controls applied. Controls are applied in an order known as a *Hierarchy of Risk Controls* (see Figure 1).

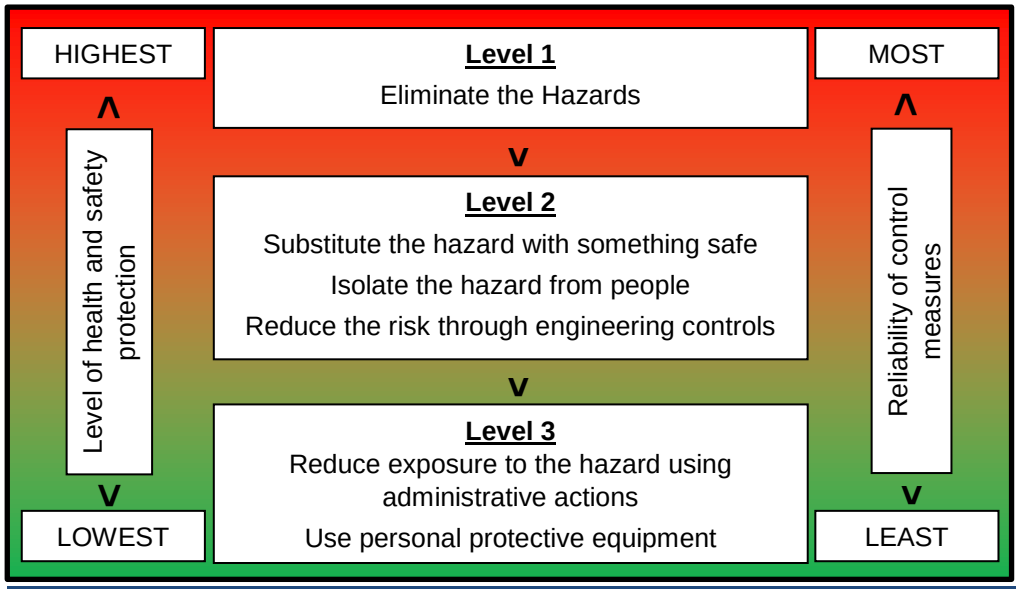

Figure 1. Hierarchy of Risk Controls (Adapted from *Safe Work Australia, How to Manage Work Health and Safety Risks, Code of Practice, December 2011*).

Elimination or substitutions are the recommended first steps in the application of risk controls to a hazard. However, elimination or substitution may not be possible as the hazard may be the focus of the teaching or research or an irreplaceable component of a process.

Physical Containment Level 2 facilities are designed to contain Risk Group 2 microorganisms as defined in *AS2243.3:2010 Safety in laboratories, Part 3: Microbiological safety and containment*. While this Standard describes containment of microorganisms the requirements described can also be applied to other hazards.

6. FACILITY INDUCTIONS AND TRAINING

The University has an obligation to ensure that all person working in a laboratory are appropriately trained. Training strategies combined with experience is normally required to build competence. Initially users must complete awareness training, followed by a facility induction; as well as training on specific work practices.

User training is one of the major Administrative controls applied in a PC2 Facility. Training should be focussed on building user competency. The first step is to provide users with an awareness of the risks and requirements of the laboratory. Awareness training should be done through completion of the online training modules, including:

- Annual Fire Safety;
- Health and Safety Induction;
- Manual Tasks/Ergonomics;
- Laboratory and Workshop Safety.
- General Biosafety;
- General Chemical Safety;
- Genetic Biosafety;
- Biosecurity;
- Gas Cylinder.

All laboratory users and visitors must receive a Facility Induction that should include:

- Emergency Response training;
- Waste Management Training, and;
- Training in spill clean-up procedures.

Subsequent to this users should receive training specific to the procedures they will be carrying out in the facility. The training should include a theory component, and a practical competency based component, *i.e.* the trainee should only be allowed to perform a task unsupervised when they can *demonstrate* competence to the trainer.

Visitors that will be working unsupervised for an extended period of time, e.g. visiting researcher, must complete all the training. Short-term visitors need only complete training commensurate with the activities that they will be undertaking, however instruction on emergency response procedures is required.

Contractors need to meet the induction and other requirements set-out by Campus Life. Location specific induction training, entry notifications and other requirements may also be stipulated for high risk areas. Any contractor that has not been fully inducted must be fully supervised in laboratories.

7. FACILITY MANUAL

It is recommended that each laboratory have a Facility Manual. The manual will assist in communicating the operational requirements of the specific facility to users. A manual should be:

- Based on an assessment of the hazards and risks in the Facility.
- Easy to understand and be divided into well-labelled sections.
- Accessible to all users of the Facility as a hard copy or digital copy, or a combination of both.
- Reviewed on a regular basis *or* when risk controls applied to a process or practice are found to be insufficient, *e.g.* when an incident occurs.
- Consideration should be given to included issues such as spill management, equipment, cleaning, contaminated materials and waste, transport, storage and disposal and signage in the manual.

8. STRUCTURE OF THE FACILITY MANUAL

Sections to include in a Facility Manual are suggested below to assist groups develop a manual suitable for their laboratory. A Facility Manual template is also available from the Health, Safety and Wellbeing website. The template is customisable, to suit the specific requirements of a user's laboratory.

8.1. Administration and Records

The Administration section of the manual should stipulate the laboratory record keeping requirements and where the records, project details and risk assessments applicable to the laboratory are located. Suggested items to reference in this section are:

- A list of staff, students and visitors authorised to work in the facility, including the date they completed a facility induction;
- Staff online and practical training records, or guidance on how to find the records in GSafe;
- Permits and/or Licences to carry out the work using regulated materials, such as gene technology licences, Radiation Use Licences and Import Permits;
- Risk assessments, or a list of Risk Assessment Reference Numbers if they in GSafe;
- Equipment maintenance, calibration and testing records;
- Sample inventories, storage and transfer records;
- Waste disposal records, and;
- Safety equipment testing records (*e.g.* eye wash stations) if this is the responsibility of the users of the facility.

This section may also include guidance which licences are required for the type of work being done in the facility. These licences and the types of material they apply to will be discussed in further detail in Section 9 of these guidelines.

8.2. Work Practices - General

It is important that a Facility Manual include details on what safe work practices are required within a facility. Standard operating procedures should be documented and available to all users.

It is suggested that a Facility Manual have a section of the normal work practices of the Facility. This section should include:

- Facility security, including appropriate entry and exit procedures;
- Rules around conducting technical and non-technical work in the laboratory;
- Personal protective clothing and equipment, and;
- Training requirements.

Note: More detailed work practices should be documented in the appendix as Standard Operating Procedures (SOP). SOPs should be brief and easy to use, but cover all the steps required to perform the specific task safely and efficiently. An SOP template is available from the Griffith University Health, Safety and Wellbeing website.

8.3. Emergency Procedures

Every building in the University has an emergency procedure. These should be included in the Facility Manual or refer to Campus Life procedures. Staff and students should be informed of

these procedures during their induction before they start work. Emergency procedures written in a PC2 Facility Manual should include, what to do in the case of, or the location of:

- Building Evacuation;
- Bomb Threats;
- Emergency Alarms and Emergency Door Releases;
- Fire Fighting Equipment;
- First Aid Equipment, and;
- Safety Showers and Eye Wash Stations.

Facility emergency equipment should be well signed and regularly maintained, or replaced, as appropriate. If you notice an issue with this equipment please log a request using the Griffith University Facility Assist portal. This is only available to staff, so laboratory based students are instructed to report this to their supervising staff member.

8.4. Housekeeping and Waste Disposal

Laboratory should be kept clean and free from clutter. Some aspects of cleaning may be the responsibility of Campus Life, *e.g.* general floor cleaning, but there will usually be aspects that are the responsibility of the laboratory users, *e.g.* work area cleanliness, and transfer of clinical waste to collection areas. The division of these responsibilities should be covered in the Facility Manual.

The waste disposal and cleaning procedures for some materials and processes are subject to regulatory requirements. Some requirements are general while others are highly detailed specifying disinfectant concentrations and contact times. Users should read the regulations that they are using and the conditions of their facility certification(s).

The basic areas that should be addressed in the manual include:

- Surface and equipment disinfection procedures, *e.g.* concentration of the disinfectant, how to mix it and the contact time;
- Sample and waste disposal procedures, *e.g.* steam sterilizer times, pressures and temperatures; and;
- Clean-up procedures for biological spills.

8.5. Equipment

Laboratories frequently contain a variety of equipment hazards. Staff and students should be trained on the correct use of equipment. This includes training on basic equipment such as microwaves and hot plates, as these have the potential to cause significant injury, *e.g.* super-heated liquids from a microwave causing a burn.

Suggested categories of equipment for a Facility Manual are:

- Safety cabinets and aerosol management equipment, *e.g.* Class II Biosafety Cabinets and Fume Cupboards;
- Heating devices, *e.g.* stirrer hotplates, water baths and microwaves;
- Electrophoreses devices. *e.g.* balances, tanks, and transilluminators (in particular those using UV light);
- Histology equipment, *e.g.* cryostats and sledge microtomes;
- Incubators and ovens;

- Cold storage units and equipment, *e.g.* Liquid Nitrogen dewars and -80°C freezers;
- Autoclaves and sterilising equipment, and;
- Centrifuges, with a focus on balancing loads and cleanliness.

This list is not exhaustive and each manual should be tailored to suit the laboratory.

The equipment should also be maintained in good working order, and, where required, be calibrated and its efficacy tested. Records of the maintenance and testing must be kept. These will assist in keeping the equipment in good working order and may be requirement of the facility certification.

8.6. Sample Storage and Transport

The transport and storage of many samples types is closely regulated. The requirements vary depending on the type of material and the applicable regulations. Some of the requirements are highly detailed, specifying storage conditions, transport protocols, disinfectant concentrations and contact times, while others are less prescriptive. Users should familiarise themselves with the conditions of their facility certification(s) and the applicable regulations.

With respect to storage and transport the manual should include:

- How to track (record) the samples and their movements;
- Transport packaging/handling procedures, *e.g.* container type and required labelling, and;
- Types of acceptable storage locations, and (if known) the actual locations.

8.7. General Chemicals

Laboratories regularly contain a range of chemicals, each with their level of risk. The Facility Manual should provide guidance on how to manage the chemicals commonly used in a PC2 laboratory. Griffith University has a number of tools and mechanisms in place to assist in managing chemical risks, including:

- Chemwatch GOLD FFX: an online database of chemicals and accompanying Safety Data Sheets (SDS), and manifest/register of chemicals;
- Guidelines for Chemical Management, available from the Health, Safety and Wellbeing website;
- A Chemical Risk Assessment Guide and Chemical Risk Assessment Template, to be used when assessing the risks from a combination of chemicals to be used in a process, and;
- Special approval controls during the purchase of chemicals.

Special approvers review chemicals purchased by laboratory users prior to an order being sent to a chemical suppliers. If it can be demonstrated the risk is controlled, *i.e.* by documented risk assessment, the order will be sent out; if not, the purchase will be rejected. More information can be found in the Guidelines for Chemical Management.

Some high risk chemicals and chemicals types may require specific permits or licences. These are discussed in sub-section 9.6 of section 9 *MATERIALS AND DEALINGS REQUIRING FURTHER AUTHORISATION*.

Chemicals should be labelled according to the Qld Code of Practice for labelling hazardous chemicals, commonly referred to as the Globally Harmonized System (GHS) of classification and labelling of chemicals. This should include pre-made GHS compliant sticky labels in the

manual for the commonly used chemicals, *e.g.* 80% v/v ethanol, can make compliance easier to achieve.

The Manual should provide guidance on the chemical cabinets in the facility, and what may be stored in them. The most common cabinet types in PC2 Laboratories at the university are:

- Flammable and Combustible Liquids, and;
- Corrosives.

8.8. Gas Cylinders

If managed incorrectly, gas cylinders pose a significant risk to users. The risks can be managed through proper handling, restraint and change over procedures. As such, appropriate training in cylinder handling and change over procedures is very important. All gas cylinder users should complete the Griffith online training module and receive practical training.

Users responsible for gas cylinder change overs should also complete the practical gas cylinder handling course. Contact the Griffith University Biosafety, Chemicals and Radiation team to obtain more information about this training. In addition the Gas Cylinder Changeover SOP for changing over a gas cylinder should be added to the Facility Manual.

8.9. Facility Fittings and Structure

PC2 laboratories are constructed to a specific Australian Standards to reduce the risk to the users, the public and the environment from the materials, *e.g.* bacteria or radiation, being used in the facility.

Users are not expected to know all the detail standards, but they should assist in ensuring the building is in good working order. If damage or issues are noticed to the building envelope, *e.g.* floors, walls, or the fittings and infrastructure (*e.g.* taps or air conditioning), it must be report on the Griffith University Facility Assist portal.

9. MATERIALS AND DEALINGS REQUIRING FURTHER AUTHORISATION

For a number of material types regularly used in PC2 laboratories, users are required to obtain a licence or permit. Regulations may also require the PC2 laboratory be assessed according to extra criteria and be certified.

As the time required to process an application for one of these permits or facility certifications varies from a few weeks up to four months, the application should be prepared and submitted well advance of the planned start date of the work.

The Facility Manual should include instructions on how to work with these materials in the “Work Practices” section of the Manual, or as Standard Operating Procedures (SOPs) attached to the Manual.

The external resources section at the start of this document contains links to a number of documents and web sites on the materials described below.

9.1. Gene Technology

Gene technology (in simple terms) refers to any technique used for the modification of genes or other genetic material in an organism. A number of techniques such as sexual reproduction, are excluded from this definition. A full definition, and exclusions, are provided in the Gene Technology Act and Regulations mentioned at the start of these guidelines. The use of gene technology and enforcement of the Act and Regulations is managed by Office of the Gene Technology Regulator (OGTR).

Accredited organisations, such the University, assist the OGTR by having an internal committee manage the approval of lower level licences. At Griffith University, the University Biosafety Committee (UBC) is responsible for evaluating and approving the lower level *Exempt Dealing* and *Notifiable Low Risk Dealing* gene technology licences. Higher level licences are evaluated by the UBC and then submitted to the OGTR for evaluation.

Users intending to use gene technology should review the information on the Griffith UBC web site and submit the required application forms via email to ubc@griffith.edu.au. The applications will then be sent for scientific review for evaluation by the UBC.

The use of gene technology may also require the laboratory be certified as an OGTR PC2 Facility. For more information on having a laboratory certified as an OGTR PC2 Facility contact ubc@griffith.edu.au.

9.2. Biosecurity Material

As Australia is free from a number of diseases and pests that could affect people, the natural environment or agricultural industries, some material is subject to biosecurity control.

The Federal Department of Agriculture and Water Resources (DAWR) requirements describe these measures and how they must implemented, including the penalties (some financial) of non-compliance. DAWR staff also perform inspections of biosecurity material and facilities.

Importing biosecurity material, or material subject to biosecurity control, requires a DAWR issued Import Permit. This is done via the DAWR online permit system BICON.

In addition, some material may be subject to *ongoing* biosecurity control and may only be used and stored in a DAWR Approved Arrangement (AA) site. Specific conditions apply to these AA sites.

If biosecurity material is to be imported or used in the Facility users should refer to the Griffith Health, Safety and Wellbeing website and then contact Griffith University Biosafety Chemicals and Radiation Advisors.

9.3. Animals

Working with animals in a laboratory presents its own risks and regulatory requirements. Risk control measures should address both acute and long term risks to users and designed to suit the species being studied. For example, the hazards associated with working with jellyfish are different from those associated with rodents.

In addition, there are regulations focussing on the welfare of the animal and are designed to reduce or eliminate any pain and suffering the animals may experience. The compliance associated with animal work is managed by the Griffith University Office for Research Animal Ethics Committee. Prior to starting any work with animals, either inside or outside a facility, users must:

- Complete the Office for Research online Animal ethics training modules, and;
- Obtain an animal ethics clearance (approval) from the Griffith University Animal Ethics Committee.

Further information about obtaining an animal ethics clearance can be found on the Office for Research website. Animal ethics clearances are evaluated by the Committee that meets on specific dates, applications should therefore be submitted well in advance of planned commencement dates.

9.4. Security Sensitive Biological Agents

The Australian Federal Government has developed a list of biological agents such as viruses, toxins and bacteria where their deliberate release has the potential to cause significant damage to human health, the environment and the economy. These are known as Security Sensitive Biological Agents (SSBAs).

The list of SSBAs can be found on the Federal Department of Health website. PC2 laboratory users wanting to use SSBAs should contact ubc@griffith.edu.au for guidance prior to using the material.

9.5. Defence Strategic Goods List

The export, supply, brokering or publishing of some goods, software or technology is restricted by the Department of Defence as it may be used for acts that endanger people, the environment and property. These items are maintained on the Defence and Strategic Goods List (DSGL) which is maintained by the Department of Defence.

A permit is required when exporting, supplying, brokering or publishing DSGL items, unless there is an exemption. Laboratory users can determine if their material is on the DSGL by using the Defence Department's online tool to search the DSGL or complete the Activity Questionnaire. If the material is on the DSGL, users should contact the Office for Research for further information.

9.6. Chemicals Requiring Special Approvals

Some of the risks associated with hazardous chemicals can be controlled through chemical purchasing procedures. However, PC2 laboratory users may also need to obtain extra approvals and/or complete a specialised risk assessment before using specific chemicals or chemical classes.

These are described in detail in the *Guidelines for Chemical Management*. Some are Griffith University approvals while others are from government regulators. Chemical types for which special approvals are required include:

- Scheduled Substances, found within the *Poisons Standard*, and;
- Prohibited and Restricted Carcinogens, as listed in the *Work Health and Safety Regulation 2011* (QLD).

Details about the Scheduled Substances can be found in the University's *Scheduled Substances Management Plan*, specifically, the ones requiring special approval are:

- Schedule 2 (Pharmacy Medicine);
- Schedule 3 (Pharmacist Only Medicine);
- Schedule 4 (Prescription Only Medicine or Prescription Animal Remedy);
- Schedule 7 (Dangerous Poison);
- Schedule 8 (Controlled Drug);
- Schedule 9 (Prohibited substance), and;
- Schedule 10 (Substances prohibited for sale, supply and use).

Some chemicals that could be used to make homemade explosives or toxic devices have been listed as Chemicals Of A Security Concern by the Federal Government. Further information on the chemicals in these lists and the requirements for their use are found in the *Guidelines for Chemical Management* and a national code of practice.

Chemicals purchased in the form of a nanomaterial (*i.e.* the chemical is a finely divided solid with a diameter less than or equal to 100nm) also require a special risk assessment be completed. The risk assessment should be carried out using the Workplace Health and Safety Queensland *Nanomaterial control banding tool worksheet.*

9.7. Ionising Radiation Sources and Lasers

In some PC2 laboratories, users may want to use sources of ionising radiation (*i.e.* radiation that can alter the chemical properties of the matter that it interacts with). This may include causing significant long lasting health effects in laboratory users.

Users will need to complete training appropriate for the type of source they will be using and obtain a radiation use licence. The use of these sources, *e.g.* radioactive phosphorus (^{32}P) or an x-ray unit, and the training requirements should be discussed with the Senior Advisor Health, Safety and Wellbeing - Chemicals and Radiation, prior to undertaking any work.

The handling and use of ionising radiation sources are covered in Radiation Safety and Protection Plans specific to each practice.

A laser is a device that can be made to produce or amplify electromagnetic radiation, primarily by the process of controlled stimulated emission. The 'light' generated by a laser may be either ultraviolet radiation (UVR), visible or infrared (IR) emissions.

Laser light is monochromatic (a single wavelength) and typically confined to a narrow beam which spreads only slightly with distance. Thus the energy carried by a laser beam is concentrated in a small area and can travel efficiently over large distances, giving laser radiation a far greater potential to cause injury than light from other sources.

As there are different types of lasers, the hazards arising from laser use will vary. However, the greatest risk is to the eyes and skin:

- The principal hazard associated with laser radiation is exposure to the eye. This may include damage to the cornea, the retina, or both parts of the eye.
- Skin is less at risk from damage by lasers, however, control measures need to be implemented to minimise the potential for skin burns. High powered lasers may cause effects ranging from erythema (redness of the skin) to severe blistering and deep burns.
- Other hazards may include electrical, mechanical, fire, explosion or implosion, contact with chemicals (used either in the laser or associated equipment), toxic by-products, cryogenic coolants and the possible generation of x-rays.

Staff and students wanting to use these high powered lasers should discuss their requirements with the Griffith University Laser Safety Officer.