Australian Government
Department of Health and Aged Care
Office of the Gene Technology Regulator

Guidance for certification of a PC3 facility

This document aims to guide applicants wishing to certify or re-certify a PC3 facility according to the *Guidelines for Certification of a Physical Containment Level 3 Facility* (the Guidelines). The Guidelines consist of requirements that must be met before a facility can be certified, and conditions that are likely to be imposed for the facility to remain certified. In general, an applicant can expect that the conditions for their PC3 facility will be similar to the standard conditions, with minor variations to accommodate particular facility features or alternative procedures than those required in the Guidelines, assessed as appropriate during the evaluation of the certification application.

Certified PC3 facilities are intended to be used for dealings involving GMOs that are not classified higher than Risk group 3 (AS/NZ 2243:3). Depending on the certification issued, a facility can be used to conduct dealings with genetically modified (GM) micro-organisms, invertebrates or animals, or with invertebrates or animals infected with GM micro-organisms.

Prior to any decision on an application for a new certification, or renewal of an existing certification, the Office of the Gene Technology Regulator (OGTR) will typically inspect the PC3 facility.

This guidance considers the Requirements and Conditions for PC3 certification together.

Contents

Refer to the Guidelines for definitions and acronyms

Overview

This guidance document is intended to provide additional information and suggestions to assist prospective or current certification holders to ensure their facilities comply with the PC3 Guidelines. Information is provided in relation to the physical boundary of the facility, equipment and services and work practices. The use of a facility for primary containment is also briefly addressed in Section 8.

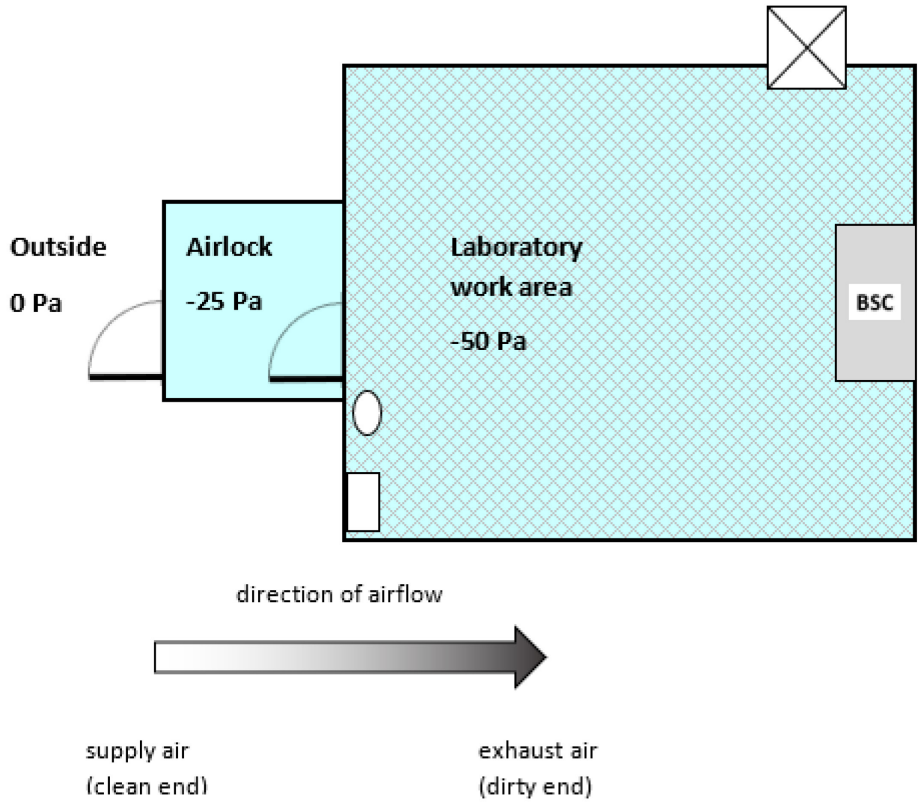
Section 1. Facility construction

1. Organisations are encouraged to consult with OGTR early in the design phase of any new building or the refurbishing of an existing facility to avoid potential inconsistencies with Guidelines.

Representative layouts of PC3 facilities

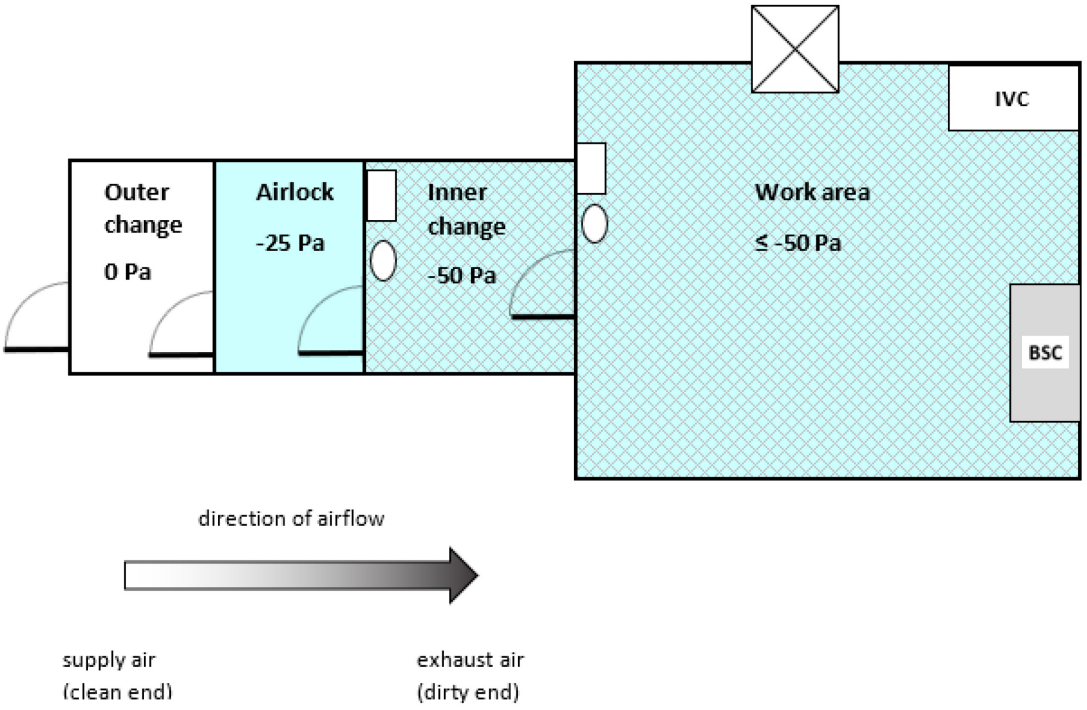
2. Facility design should consider the organisms proposed to be used in the facility and should ensure dealings with GMOs that pose different risks are separated spatially. It is also recommended to consider future-proofing a facility to accommodate different types of organisms or dealings without costly retrofitting.
3. Below are a few representations of typical PC3 facilities. All these diagrams are indicative only.

Figure 1: Representation of a PC3 facility with a single work area



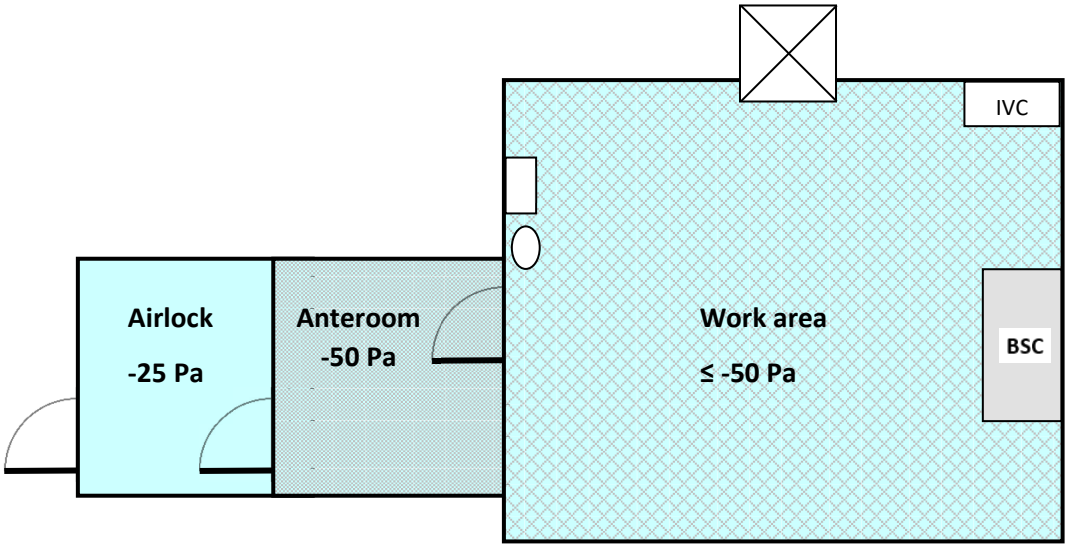
	Work area (PC3 facility minus the airlock)
	PC3 facility, i.e. airlock and work area
	Hand washbasin with hands free operation
	Hanging area for PPE
	Autoclave (e.g. barrier seal/pass through)
BSC	Biological safety cabinet

Figure 2: Representation of a PC3 facility with inner and outer change rooms



	Work area (PC3 facility minus the airlock)
	PC3 facility, i.e. airlock, inner change room and work area
	Hand washbasin with hands free operation
	Hanging area for PPE
	Autoclave (e.g. barrier seal/pass through)
BSC	Biological safety cabinet
IVC	Individually ventilated cages

Figure 3: Representation of a PC3 facility with a single work area and anteroom



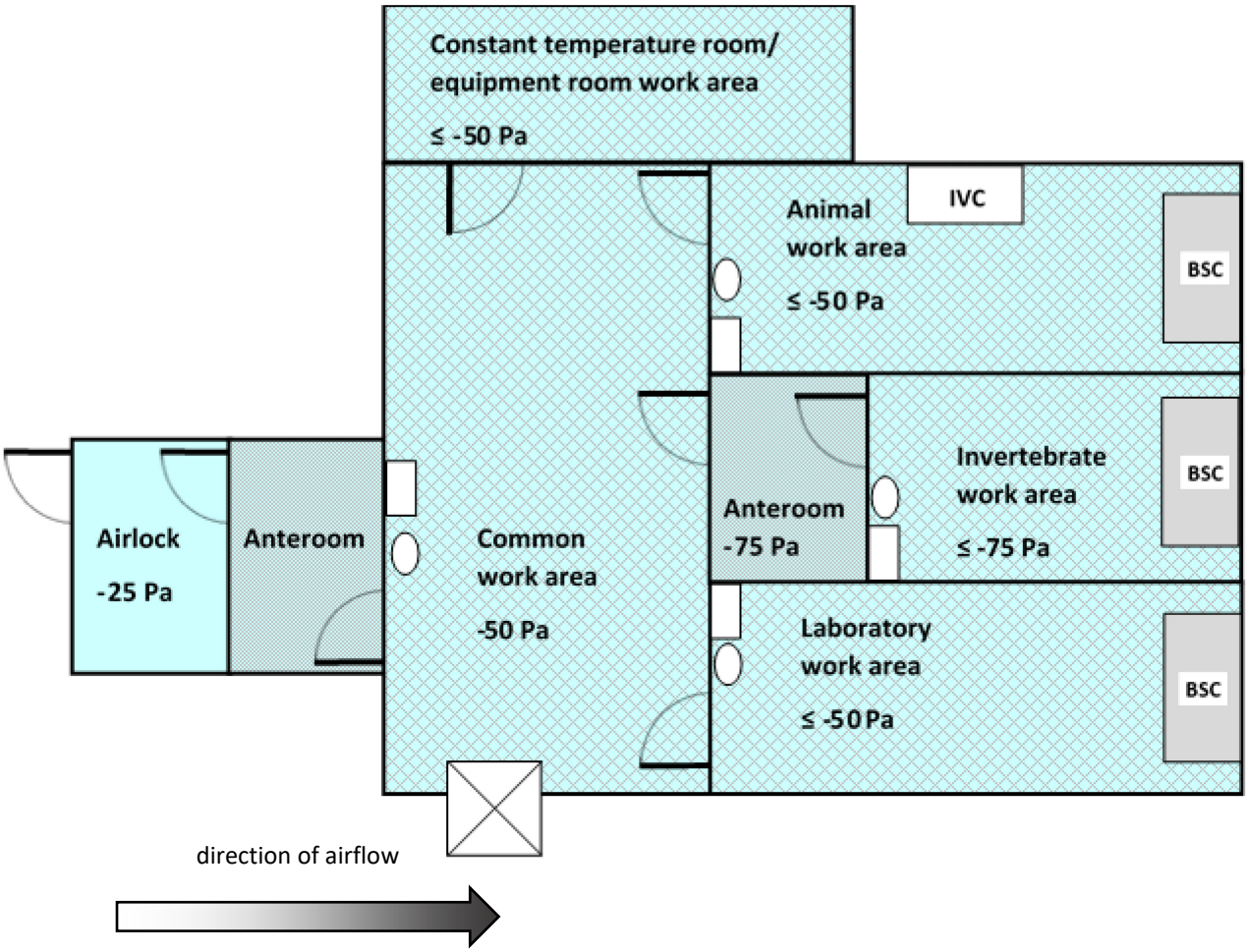
direction of airflow

supply air
(clean end)

exhaust air
(dirty end)

	Work area (PC3 facility minus the airlock and anteroom)
	PC3 facility, i.e. airlock, anteroom and work area
	Hand washbasin with hands free operation
	Hanging area for PPE
	Autoclave (e.g. barrier seal/pass through)
BSC	Biological safety cabinet
IVC	Individually ventilated cages

Figure 4: Representation of a PC3 facility with multiple work areas and anterooms



	Work area (PC3 facility minus the airlock and anteroom)
	PC3 facility, i.e. airlock, anteroom and work area
	Hand washbasin with hands free operation
	Hanging area for PPE
	Autoclave (e.g. barrier seal/pass through)
BSC	Biological safety cabinet
IVC	Individually ventilated cages

Structural considerations

Choice of site

4. When planning a new high-level containment facility, the location should be chosen carefully. If the site is prone to flooding or likely to be in the path of extreme weather events such as cyclones, the facility should be constructed to appropriate standards to withstand these conditions.
5. Whether applying for certification of a facility or submitting a variation for an existing certification, facility managers should assess the risks of GMOs escaping during an emergency event such as flooding or a fire.

Facility boundary

6. The facility boundary forms a barrier around the area where dealings with GMOs will be conducted. The boundary is formed by the floors, ceilings, walls, doors and windows on the outer perimeter of the facility. It must be constructed and maintained to prevent:
    - the escape of micro-organisms, animals or invertebrates being contained; and
    - the entry of pests and vectors (R11).
7. Mechanisms to prevent animals or invertebrates from traversing the boundary of the anteroom/airlock can include traps or drop-down door seals fitted to both inner and outer doors. Recapture of escaped invertebrates may be facilitated if the boundaries are of a contrasting colour to that of the invertebrates being contained in the facility. Consideration should also be given to having insecticidal agents effective against any invertebrates being handled in the facility, stored in either the facility, or in an accessible location close to the facility
8. False ceilings should be avoided as they create a harbourage space for pests, escaped animals and invertebrates. Additionally, this ceiling void may be difficult to decontaminate effectively if GMOs escape in that space.
9. When designing a PC3 facility, the inclusion of additional exits for use exclusively in the event of an emergency is acceptable. Emergency exits should be clearly labelled and managed appropriately by a building management system or other systems to ensure the doors are only opened in the event of an emergency. If interlocks are used for the anteroom and airlock, these should be provided with manual overrides in case of emergencies.
10. The facility could incorporate additional decontamination measures such as a decontamination chamber for the entry and exit of large items, a dunk tank or pass-through box built into the boundary wall for the transfer or entry, respectively, of smaller items.

11. The facility should be designed not just for people conducting dealings with GMOs but also for the safety of people entering the premises for servicing, maintenance, inspection and decontamination of spills. New facilities are often designed with plant rooms external to the facility to ensure maintenance and servicing personnel do not require entry to the facility.

Air leakage

12. Inward airflow prevents the movement of air carrying micro-organisms out of the facility. In PC3 facilities, inward airflow is created by the pressure differential between the facility and surrounding areas. This differential may be difficult to maintain, and the ability to safely conduct gaseous decontamination compromised, if the facility air leakage is too high. The Guidelines require that a new PC3 facility be constructed so that upon commissioning, it achieves an air leakage rate of no more than 120 L/min at a differential pressure of 200 Pa (R3).
13. This new requirement ensures that new facilities are constructed, at least initially, to meet a maximum initial air leakage level. With time, the facility seals tend to deteriorate, and air leakage rates can increase significantly. To minimise air leakage, the number of facility penetrations should be minimised.
14. AS/NZS 2243.3 recommends that the air leakage rate of the facility is retested at least once every 5 years, or after any modifications that could affect the integrity of the seal. However, this is not a requirement for maintaining a certification of a PC3 facility as long as the facility is able to undergo gaseous decontamination.
15. Lifts are not permitted in the PC3 facility because they displace large volumes of air and, this air movement could move GMOs to a different level in the same building. Lifts can also interfere with the pressure setting within the facility.

Choice of materials

16. As surfaces in the facility will be repeatedly exposed to harsh chemicals, work surfaces and those that form the facility boundary should be constructed from materials able to withstand decontamination.
17. The method of decontamination affects the choice of the materials for piping. For example, U-bends in sinks often undergo prolonged exposure to harsh chemicals as the chemical pools at the bottom of the bend and remains trapped. Some lower quality stainless steel will corrode with repeated exposure to bleach.

Section 2. Equipment and services

18. Wherever possible, equipment should be tested/commissioned by an independent entity. Equipment needs to be decontaminated before maintenance or servicing is undertaken.

BSC or other aerosol containment equipment

19. Given the importance of aerosol containment, facilities must have at least one BSC or equivalent (R20) appropriate for the dealings, which is powered by an uninterruptible power supply.
20. The term “appropriate for the dealings” refers to factors such as sturdiness, fitness for purpose, utility, and ability to be cleaned and tested.
21. The effectiveness of a BSC is adversely affected by factors disrupting airflow. This includes air currents caused by facility ventilation or the proximity of frequently used doors. The location of ventilation inlets and outlets should be considered when selecting the location of the BSC. Within the BSC, care should be taken to not obstruct the perforated grills located at its front and rear. The presence of multiple pieces of equipment in the BSC can disrupt airflow and reduces its effectiveness in containing aerosols. The use of Bunsen burners inside the BSC is also not recommended as the flame has a similar effect. Where possible, it is recommended that testing of BSCs be conducted while equipment normally used in the BSC are present and operating.
22. Where changing stations are present within the facility and used for the regular care of animals containing GM micro-organisms, this equipment must ensure containment of any potential GM aerosols. This means they should have similar features to a BSC and do not need to be approved in writing by the Regulator.
23. If any other aerosol containment equipment is proposed to be used instead of, or as well as, a BSC, it must be approved in writing by the Regulator (R20). The OGTR should be contacted as early as possible to ensure timely advice regarding the testing and commissioning data that should be provided and to discuss any additional requirements or conditions applicable to the proposed equipment.

Autoclaves

24. A PC3 facility must be fitted with an autoclave suitable for the GMOs used within the facility (R22). Preferably, the autoclave should be double ended with interlocked doors (barrier autoclave). One door should open into the facility and the other should open externally to the facility. Interlocking prevents the door at the clean (unloading) end from being opened until the sterilisation run has been completed successfully and the load is safe to remove. In a newly constructed facility, a barrier autoclave is a requirement, as this type of autoclave minimises the risk of recontamination of autoclaved waste.
25. For existing facilities where the location of the autoclave would affect the welfare of animals housed in the facility (e.g. due to heat, humidity, or noise generated during operation), the Regulator may consider an alternative location for the autoclave.

26. To demonstrate that autoclaves are compliant with conditions C32 and C33 (monitored for effectiveness, calibrated, and maintained), compliant equipment must be labelled (C34). This could be achieved by labelling the equipment with a notice showing the dates and results of calibration and monitoring.
27. Any autoclave in the facility that is not intended to be used for the decontamination of GMOs should be clearly labelled so that it will not be mistakenly used for this purpose.
28. Autoclaves must be validated by demonstrating that predetermined physical parameters can be met. This applies to all existing and new facilities. These parameters can vary significantly depending on the type of waste to be decontaminated. For example, the centre of a dense load (such as an animal carcass) would require a significantly longer cycle than a loosely packed load of solid laboratory waste (e.g. gloves, plasticware) for effective decontamination. Similarly, a frozen carcass would take longer to reach the decontamination temperature than would items at room temperature. Validation must be conducted prior to decontaminating a load type significantly different from those already validated. A load type is waste that has similar characteristics in terms of humidity, density, temperature going into the autoclave (frozen versus room temperature) and physical state (liquid versus solid). It is up to the organisation to determine the load types they use on a regular basis. Validation of load type can be conducted on non-contaminated waste and can be achieved by verifying biological indicators are successfully inactivated in the coolest or densest part of the waste. This will determine a combination of temperature and time suitable for certain load types. The number of biological indicators or other approved indicators used, and their placement depend on the load type to be decontaminated, the type of autoclave used, and pre-validation results available.
29. Effective decontamination is dependent on physical parameters of the autoclave. Pre-determined temperature should be reached in the coolest part of the autoclave and the densest part of the load for a pre-determined duration. Quarterly validation of the pre-determined physical parameters for a load type can be conducted using thermocouples or resistance thermometer probes as part of the data logging system in newer autoclaves as probes are typically independent from each other. For older autoclave, external dataloggers can be used for this quarterly validation.
30. With age, probes tend to deviate from the initial set point and give inaccurate readings. This may result in an incomplete decontamination event and the potential release of GMOs into the environment. Therefore, annual calibration of temperature and pressure probes, or other physical parameters, is an important and compulsory condition of the maintenance of heat-based equipment (C32 & C33). Tests and maintenance servicing should be performed by a trained competent person using measuring equipment that has a current

certificate of calibration issued by a body with third-party accreditation for completing these tests.

LWTS

31. The Guidelines only apply to a LWTS used as a secondary means of decontamination or for use during an emergency. In this context, the LWTS is a back-up treatment for liquid waste typically not containing viable GMOs.
32. Validation of the LWTS is expected at commissioning of the facility. Validation must be conducted against the GMO dealt with in the facility which is hardest to kill using the LWTS (R24 and C66) or a similar surrogate, scientifically known to be resistant to the method of decontamination used in the facility (heat or chemical). Given that some of these systems must reach high temperature to achieve an efficient decontamination cycle, validation using biological indicator may be difficult and, in some cases, unsafe. A literature review provided, at the time of commissioning, of effective physical parameters against the organism used in the facility or suitable surrogate would be acceptable. The LWTS should be maintained and regularly serviced to ensure that the determined physical parameters (temperature and time) are met. If additional GMOs are subsequently used in the facility and the proposed GMO is an organism more resistant to treatment than the GMOs used at that time, then the physical parameters should be re-assessed to confirm the LWTS will be efficient against that new organism.
33. When the LWTS used is a continuous decontamination system (e.g. Actini system), the LWTS should be tested for efficacy at least annually. This must include:
    a. the servicing and maintenance of the pump according to manufacturer's instruction,
    b. the testing of the pump flowrate, and
    c. the calibration of the temperature probes.
34. If a LWTS is proposed as a primary means of decontamination, it will be subject to more stringent requirements because any failure of the LWTS could lead to significant contamination outside the facility. Additional requirements and conditions would apply to the construction and maintenance of a LWTS intended for routine decontamination of viable GMOs and the room in which it is housed. Contact the OGTR if the LWTS will be used as a primary decontamination system.

Backflow prevention

35. For water supplies, backflow can be prevented by installing high hazard protection valves (e.g. RPZ valves) upstream of the potentially contaminating sources, in accordance with the requirements of AS/NZS 3500. These devices

are often fitted to prevent chemical contamination of the main water supply or the external environment. Based on the facility design, location of the facility within the building or the specific equipment, backflow prevention may not be required on all water supply services. If the certification holder does not see the necessity to fit a particular water reticulated service with backflow prevention, they must conduct a risk assessment to determine whether the reticulated services to the facility need to be separated from those servicing adjacent areas (R25). This would identify whether it is appropriate for the equipment or services (sinks, autoclave, shower, LWTS) to not be fitted with backflow prevention devices. If required and a registered testable device is not installed, a risk management plan must be produced. Risk management measures could include the use of non-testable backflow prevention, such as air gaps or non-return valves. The suitability of these measures must be reassessed if any change that impacts the assessment outcome occurs (R27).

36. Unused vacuum points do not require liquid traps or filters provided they are closed with tamper-proof fittings that prevent accidental use or have been disconnected from a vacuum source.

Hand washbasins/Eyewash equipment

37. A 'means of decontaminating hands' (R30) includes:

    - a dedicated hand wash basin fitted with taps that allow hands-free operation; or
    - hands-free dispensers filled with decontaminant solution (the decontaminant must be effective against the GMOs being dealt with in the facility. Decontaminant solutions must be replaced before their expiry date); or
    - removing and disposing of outer gloves when moving between work areas.

38. Hand/eye wash water can be discharged to the sewer, or the LWTS if present.

39. AS/NZS 2982 provides information on eyewash equipment. If the facility contains multiple work areas, providing eyewash equipment in each work area should be considered, but is not mandated.

Ventilation system

40. In a facility where dealings with GMOs are conducted in a BSC or animals are housed in IVCs, or the GMOs are double contained, the ventilation system and differential pressure regime are a back-up form of containment. However, a ventilation failure can still contribute to a loss of containment of the GMOs. This could occur if there is a breach of primary containment (e.g. someone drops something outside a BSC) and the ventilation system simultaneously malfunctions.

41. Procedures to manage any failure or malfunction of the main ventilation system controls must be in place (R42): an emergency stop button or automated management system are options to address this requirement. Failure of a single component, such as a supply fan or an exhaust fan, can result in extremely high positive or negative pressures in the facility. Therefore, if the ventilation system malfunctions, the potential for extreme pressures must be addressed, either:

    a. automatically, via a management system that ensures interlocks operate to shut down or adjust the ventilation system; or

    b. manually by an emergency stop.

    Alarms should be used to alert relevant people that the system has failed or malfunctioned.

42. Some components of the ventilation system may be remote from the facility. Ventilation ducting must be identifiable to minimise the chances of inadvertent exposure to GMOs (R19). This could be achieved either by labelling the ducts or by identifying the relevant ducts on a map at the entrance of the plant room. The expectation is that the HEPA housing would be decontaminated before the maintenance and testing of the HEPA filters. The ducts must be decontaminated prior to conducting repairs (C25).

HEPA filters

43. HEPA filters should be mounted as close as practicable to the junction of the ducting with the facility boundary.

44. The location and housing of the HEPA filters should allow for easy access for maintenance and testing. For new facilities, terminally mounted HEPA filters should be avoided in the facility. While this type of filter prevents contamination of downstream exhaust air ducts, the pleats in HEPA filters and the accumulation of dust on the surface of the filter can reduce gas penetration, and concentrations may need to be different for an effective decontamination. Additionally, temperature and humidity conditions at the HEPA filter housing can be different to conditions in the room, and this can cause issues such as condensation of the decontaminant chemical, compromising the efficacy of gaseous decontamination.

45. The exhaust air pre-filter should correspond to one of the following two types:

    - Type 1, Class A filters as specified in AS 1324.1 with separators and elastomeric compression seals or gel seals that do not support microbiological growth, which meet all requirements of AS 4260 with a minimum performance of Grade 2; or

    - separator-less filters that meet all the requirements of AS 4260 with a minimum performance of Grade 2 provided accredited data is available demonstrating full compliance with AS 4260 and, in particular, the

requirements for filter efficiency, leak testing, fire performance, structural strength and resistance to vibration.

46. Testing of HEPA filters must be done in accordance with AS 1807:2021 and AS 1807.7 for non-terminal HEPA filters (R35).

47. Supply air inlets are useful for reducing the amount of dust entering the facility and building up on the exhaust HEPAs but the OGTR does not require pre-filters or HEPA filters on supply air inlets.

Pressure differential across the facility

48. The purpose of the pressure gradient is to isolate higher risk areas from the rest of the facility. The establishment of an air pressure differential pattern in the facility is dependent on a reference zero pressure point set outside the facility. When selecting the reference pressure point, consider how readings may be affected by pressure fluctuations at that location due to external weather conditions and internal equipment.

49. In maintaining the facility pressure gradient, the facility ventilation system should be able to accommodate fluctuations caused by factors internal and external to the building. Internal factors include other ventilation systems within the building and equipment. External factors include local weather conditions such as wind and other natural pressure fluctuations.

50. Ventilation equipment should be installed to ensure that incoming air flows from the entrance towards the highest risk microbiological work areas.

51. Where multiple work areas are present in a PC3 facility, individual ventilation systems for each work area should be considered:

    - to achieve different air pressure in individual work areas based on the risk profile of the dealings conducted within each room;
    - to facilitate gaseous decontamination of individual work areas independently of the rest of the facility.

52. In multi-room facilities, differential air pressure in separate work areas can also be achieved by installing a single air handling unit which feeds into ducts with dampers to regulate the pressure. The dampers could be controlled by a building management system.

53. To minimise pressure fluctuation within the facility:

    - entry into and exit from the facility must be through an airlock (R7);
    - any item at the facility boundary that has a door that opens to the outside of the facility must be locked when not used (e.g. airlock, dunk tank, decontamination chamber etc); and
    - a variable speed drive on the exhaust fan can be used to facilitate room pressure control adjustments.

54. Testing of components of the ventilation system (interlock supply/exhaust, exhaust or supply back up if present) must occur annually in system failure scenarios (C37). This could consist of, for example:

    a. shutting down one of the exhaust fans and observing how quickly the pressure differential is re-established once the fan is turned back on or back up exhaust fans are activated;

    b. leaving the airlock door open and observing how this affects the pressure differential and ensuring that the alarm is activated when the pressure deviates from the set point.

Alarm

55. An alarm should not be triggered by the normal opening and closing of doors. The alarm must be activated when the pressure in the work area deviates from the set point by 15 Pa for more than 2 minutes (R41). Given other containment measures in the facility (GMOs are either double-contained or handled within a BSC), this alarm setting decreases the incidence of false alarms while still alerting people to a significant loss of pressure differential in the facility.

56. The alarm should be audible to staff working within the facility and alert relevant persons responsible for incident response. However, in areas housing animals, consider providing mute switches to avoid distress to the animals.

57. The facility management team should have a risk management plan ready to implement if the alarm is triggered. The procedure will depend on the type of GMOs present in the facility and the dealings conducted. This may involve ceasing all dealings, safely storing the GMOs in freezers or fridges and exiting the facility.

58. The OGTR does not need to be notified if the alarm is triggered. Reporting is only required if there is a loss of negative pressure gradient or positive pressurisation occurs.

Airlock

59. Facility entry/exit must be through an airlock (R7). Airlock doors must be self-closing and sealable (R7). Airlock doors cannot be opened simultaneously as this rapidly decreases pressure differentials. The outer airlock door must have a mechanism in place to restrict access to the facility.

60. The airlock must not contain hand washbasins or safety showers (C18). It may be used to store small supplies of clean PPE but it should not be used for long term storage of facility supplies (facility equipment or used PPE).

Section 3. Facility management

Responsibilities of the certification holder

61. If a facility is no longer able to meet the certification conditions, the certification holder must notify the Regulator (C15). This notification may include an application for a variation to the conditions and should also include an alternative, effective strategy to manage any risks associated with dealings with GMOs in the facility.

62. The certification holder must engage a facility manager who is given the necessary authority to run the facility and make top-level decisions (C3). The manager should also have access to resources to ensure that the facility is compliant at all times.

63. As the facility manager's responsibilities (outlined below) require a wide range of skills, they can be assisted by a team of delegates such as safety officers or regulatory compliance officers. At least one member of the team should be familiar with the technical aspects of facility design, operation and maintenance.

Facility manager

64. The facility manager's responsibilities include but are not limited to:

    - developing and implementing documented policies and procedure for the safe operation of the facility and the containment of GMOs (e.g. entry and exit procedures, work practices, decontamination procedures and emergency plans)
    - developing a facility manual as stipulated per condition C82, and reviewing it annually
    - training authorised persons as per conditions C77 – C81. This includes informing all authorised persons of changes to facility operating policies and procedures (see section on Training below)
    - coordinating all work where multiple projects or dealings on different organisms are conducted in the facility
    - limiting facility access to authorised persons and controlling access to voids around the perimeter of the facility (if applicable), the facility plant room (ventilation system) and the LWTS
    - coordinating the decontamination of the facility, equipment, PPE or work area(s)
    - managing records and documents relating to gaseous decontamination, and maintenance and testing of the facility equipment and services, including the ventilation system, primary aerosol containment equipment (e.g. BSC and IVC) and decontamination equipment.

65. Laboratory acquired infections are often caused by the inappropriate handling of pathogens and incorrect usage of equipment. Consequently, when training staff, facility managers should focus on teaching correct laboratory techniques and equipment use (e.g. BSC), emphasising that a lack of adherence to proper work practices is a major source of infections or loss of containment.

66. The facility manual should be revised regularly to incorporate updated protocols. It should be considered as a 'living document'.

67. When an accident, spill or 'near miss' occurs, the facility manager should determine if the problem stems from the current protocol or from incorrect execution of an appropriate protocol. Depending on the manager's determination, the current protocol needs to be revised or training should be revisited, as it is critical that accidents do not recur. Overall, the management team is strongly encouraged to adopt a quality management system, which allows better tracking and continuous assessments of existing training and safety protocols.

Training

68. Training is critical to the safe operation of a PC3 facility and ensures:

    - staff, including new starters, are aware of their responsibilities and familiar with all relevant procedures; and
    - current staff are updated on:
        - procedural changes required to conduct dealings
        - new organisms in the facility
        - new dealings authorised in the facility.

69. The Guidelines require that staff receive additional training when the facility manual is updated, or new dealings are about to commence within the facility (C79).

70. Procedures with animals or invertebrates must only be undertaken by authorised persons who have been trained to do so (Ani-C2 and Inv-C3). Training material and procedures must be updated whenever new types of animals presenting a different risk profile are used in the facility (C79).

Table 1: Training requirements

Condition number	Item	When	Duration records to be kept
C77	Training of authorised persons not undertaking dealings	Before entering the facility for the first time	
C78 and C81	Training of authorised persons undertaking dealings	Before commencing dealings	3 years
C79 and 81	Re-training of authorised persons undertaking dealings	As required and when facility manual changes significantly	3 years

Health monitoring

71. The certification holder should consider vaccination and regular health monitoring of staff conducting dealings, depending on the pathogenicity and other characteristics of the GMOs used in the facility, and in consultation with appropriate medical professionals.

72. Contingency plans that address inadvertent exposure to GMOs in the facility should also be developed and discussed with local authorities. The plans should include isolation and treatment protocols where appropriate.

Safety considerations

73. People entering the facility including those external to the organisation should be informed of any Workplace Health and Safety risks that they may be exposed to within the facility, and of any vaccinations that may be required prior to entering the facility.

74. A management plan should be developed to deal with events involving loss of containment, exposure of staff to GMOs within the facility, fire, flooding or other emergency. The plan should consider the removal, storage or destruction of GMOs and decontamination of equipment and surfaces. Consideration should also be given to the resources needed to implement the risk management plan, and their availability during such events.

Power failure

75. For critical equipment, an automatic changeover emergency power source or an uninterruptable power supply should be considered. The emergency power source should be adequate to operate the ventilation systems, primary containment equipment, and facility access. Emergency lighting and communication systems should be considered in the event of a power failure.

Communication

76. To communicate with staff in the event of an emergency, a reliable two-way communication system and a back-up must be present in the facility (R17). Examples of suitable alternative independent two-way communication systems are a landline telephone, a dedicated mobile telephone that is kept charged and remains in the facility, or a networked computer connected to a monitored location outside the PC3 facility. It is important that the methods of two-way communication chosen are not both disabled by a power outage.

Signage

77. When signs are attached to removable fixtures, such as backing boards or plastic frames, these fixtures should be secured to the door or wall so that they are not easily transferred to any other location. Signs must be visible prior to entering the airlock (C16). However, they do not need to be displayed on or next to the outside of emergency exits (which are not to be used to enter the facility).

Variations, suspensions and notifications

78. A facility is non-compliant whilst changes are being made to its boundary. Variations and suspensions of facility certification are two options that allow maintenance and structural work to an existing facility without having to surrender the certification. An online application form, requesting changes to facility certification, is available on OGTR's website.

79. Suspension (C22-23): The certification of a facility must be suspended before starting work on structural changes that affect the facility boundary. No GM dealings must be conducted in a suspended facility. Before lifting the suspension, an inspection by the OGTR and a variation to the conditions of certification may be required. These would be determined on a case-by-case basis.

80. Variation: Sometimes it may be possible to temporarily partition the facility to provide containment for GMOs in one section while another section is being modified. In such cases, a variation is required to change the rooms included in the facility description. When the work is complete, a second variation needs to be submitted to re-instate any area removed from the certification.

81. Many PC3 certification holders elect to conduct maintenance work in the facility and servicing of critical equipment during a shutdown period. It can apply to the whole facility or independent sections of the certified space. Annual shutdown is not mandatory, but it is an opportunity to safely manage any minor work required to ensure the facility continues to comply with the certification conditions. Notification by email to the OGTR is required for work which does not affect the facility boundary, such as the annual shutdown of the

facility or changing a part of the facility ventilation equipment. Condition C2 lists the steps required for the notification of such activities.

Section 4. Facility users and work practices

PPE

82. The wearing of PPE is mandatory in the facility (C47). In addition, facility managers should consider issuing prescription safety glasses and the use of disposable overshoes or dedicated facility footwear.

83. Where relevant, the PPE selected should readily enable the detection of invertebrates on the clothing. Consider using head coverings to help prevent the unintentional removal of invertebrates from the facility in hair. If head coverings are deemed necessary, consider the use of beard coverings as well. When conducting higher risk dealings in the facility, such as working with respiratory GM micro-organisms in equipment (e.g. Inhalation exposure system) outside of a BSC for example, the use of breathing apparatus or an appropriately fitted mask may be required under a DNIR licence or an approved NLRD.

84. Prior to entering the airlock or anteroom, hands must be decontaminated by:

    - washing hands with soap and water; or
    - using an effective hand sanitiser; or
    - removing outer gloves when double gloves are worn in the work area.

85. When exiting a work area where high risk dealings are conducted (e.g. a room housing animals potentially shedding micro-organisms or a dealing potentially generating aerosols), the outer layer of PPE must be removed (C49) and hands decontaminated as described above. Designated storage space should be provided for storing clean re-usable PPE and disposal of dirty PPE in a dedicated waste bin.

Aerosols

86. An aerosolised GMO is a suspension of GMOs or a suspension of droplets containing GMOs in the air. Once released, the aerosols can contaminate a large area within the facility. The larger droplets fall onto nearby surfaces, contaminating them where they land. The smaller droplets often evaporate quickly, leaving airborne GMOs free to drift long distances or be inhaled by people in the facility who are not wearing respiratory protection.

87. Many laboratory procedures cause a very slight release in pressure and this is often enough to generate aerosolised GMO droplets. Such procedures include but are not limited to:

    - using a syringe e.g. in animal inoculation

- opening of primary containment devices, viral preparation, or cell sorting
- surgical procedures, euthanising animals, or post-mortem dissection
- using aspirating equipment
- using high-energy equipment such as a vortex mixer or centrifuge.

88. Airborne GMOs can also be generated when a high concentration of GMOs is disturbed including when changing soiled animal bedding.
89. Dealings that generate aerosols containing GMOs must be conducted in a BSC or other aerosol containment devices approved in writing by the Regulator (C52), as the inhalation of GM aerosols containing GMOs can pose a health risk to all facility users. The risk from aerosols is insidious because, unlike a needlestick injury, the individual may be unaware that an accidental exposure has occurred.

Decontamination

90. As all items, including hard copy documents, must be decontaminated prior to removal from the facility (C60), it is recommended that a networked computer and scanner be provided to enable documents to be electronically sent outside the facility.
91. No waste should be taken out of the facility prior to being decontaminated, either chemically or through autoclaving.
92. The facility surfaces that must be decontaminated routinely include (C57):
    - work benches and furniture, including seating
    - any other surfaces likely to be contaminated by micro-organisms, such as walls, floors, equipment surfaces or water collection trays under freezers.
93. Additional decontamination is required after a spill to prevent persistence of GMOs (C70). Open spaces between and under benches, cupboards and other fittings where liquids are likely to seep, must be easily accessible for decontamination (R14).

Heat/chemical decontamination

94. Procedures should be developed for the decontamination of solid waste or re-usable equipment. For autoclaves, the preference is for a double barrier autoclave located at the boundary of the facility.
95. Mechanisms must be in place to ensure all liquid effluent can be decontaminated prior to discharge (R12). This requirement could be met, for example, by having documented procedures ensuring that viable liquid waste is not discharged down the sink.

96. If a LWTS is to be used as the primary decontamination of effluent, then additional conditions will apply. Refer to the section on primary containment (Section 8) for specific requirements.

97. AS/NZS 2243.3 is a recommended source of information when selecting and using chemical disinfectant agents. For effective chemical decontamination of a GMO, attention should be paid to both the recommended concentration of the chemical disinfectant and exposure time. For decontamination of the entire facility, the most resistant micro-organism or spores in the facility should be targeted or a suitable surrogate.

98. When decontaminating a spill, staff should be careful not to place themselves in a situation where they are likely to inhale GM aerosols. This is especially important in cases where the aerosol is slow to settle, such as dry aerosols generated when petri dishes are dropped.

99. Small items to be removed from the facility may be passed through a dunk tank filled with a decontaminant effective against the GMOs used in the facility.

Gaseous decontamination

100. The entire facility must be able to undergo gaseous decontamination (R2). For facilities that contain multiple work areas, an individual work area may be isolated and decontaminated independently of the rest of the facility.

101. Large items can be removed from the facility via a decontamination chamber where they can be fumigated with a gas such as formaldehyde, vaporous hydrogen peroxide or chlorine dioxide.

Other decontamination methods

102. If non-standard forms of decontamination (e.g. UV irradiation) are intended to be used in the facility, they must be approved in writing by the Regulator (C63). In this instance, the OGTR should be contacted as early as possible in the planning process to ensure timely advice is provided regarding the additional testing and commissioning data required, and additional requirements or conditions that may apply to the proposed method of decontamination.

Handling of non-GM or non-PC3 GMOs in the PC3 facility

103. Labelling is critical to the segregation of GMOs from non-GMOs.

104. A procedure must be in place to avoid cross-contamination between different research projects (C80). This is especially important if non-GMO, exempt or lower risk group GM dealings are being conducted in the facility. Means of preventing cross-contamination could include:

    - physical separation of the work;
    - temporal separation of the work; and

- ensuring work benches, surfaces and equipment are decontaminated prior to working with a different organism.

Decontamination also minimises the persistence of GMOs inside the facility.

Transport

105. Transport includes the movement of GMOs:
    - between two certified facilities
    - between a certified facility and storage outside of a certified facility
    - between a certified facility and any place specified in a licence
    - between two places of storage outside of a certified facility
    - between two places specified in a licence
    - from a certified facility, or from storage outside of a certified facility, to a site of decontamination (e.g. to an autoclave or incinerator)
    - in liquid waste via pipes or tubes from a certified facility for further transport, storage, decontamination or disposal
    - from a certified facility or from storage outside of a certified facility to the Australian border for export.

Storage

106. Storage is the holding or keeping of GMOs/parts of GMOs without undertaking any experiments or other procedures on the GMOs/parts of GMOs. This may involve the short or long-term holding of cultures at low or freezing temperatures, or the short-term holding of stocks of diapausing insects at low temperatures.

107. Storage would not include the holding of actively growing plants and animals. It is expected that there would be no metabolic activity or minimal metabolic activity in the GMOs during storage.

108. PC3 GMOs can only be stored in a PC3 facility, unless storage in an alternative facility is approved in writing by the Regulator (C76).

Section 5. Room or facility housing animals

Aerosol containment

109. Aerosol containment equipment needs to accommodate the changing of animal cages, bedding, feed, and water without compromising containment of GMOs. If animals are likely to shed micro-organisms, animals should be handled in a BSC.

110. Aerosol containment equipment such as IVCs and change stations do not need to be approved in writing by the Regulator.

111. When selecting IVCs, it is important to consider the type of GMOs being used in the facility. Where the GMO is an aerosol transmitted micro-organism and is, or may be shed, IVCs should be selected to ensure shed GMOs are contained within the cage, including when it is disconnected from the system. In this instance, cages should be individually fitted with a HEPA filter to protect the user.

112. When housing animals containing aerosol transmitted GM micro-organisms:

    - exhaust systems on the primary aerosol containment equipment must be sealed to prevent escape of GMOs (Ani-C5). Under normal operation, all exhaust air from the cages must be contained and filtered to a standard that is equivalent to HEPA filtration. Exhaust air must be drawn through the primary aerosol containment equipment to remove aerosolised GMOs.
    - On removal and in transit to a BSC, the cage, enclosure or primary aerosol containment equipment should maintain a seal integrity equal to HEPA filtration or 0.2 μm membrane filtration. The arrangement of the cage or enclosure HEPA-filtration must ensure that the work area is not exposed to GMOs during normal operation and routine maintenance of cages, racks or other equipment.

Inhalation exposure system

113. Inhalation exposure systems are used to infect small animals with aerosol transmitted micro-organisms such as *Mycobacterium tuberculosis*. These aerosol containment devices must be approved in writing by the Regulator and additional certification conditions will apply relevant to the testing and maintenance of components of this system such as the following (C28):

    - The physical parameters of the incinerator typically present in this equipment should be monitored by measuring the output air temperature during each run according to the manufacturer's recommendations.
    - The inhalation exposure system should be decontaminated, using a validated method, prior to any maintenance on the machine, including the replacement of HEPA filters.
    - Annual integrity testing of the intake and exhaust HEPA filters on the machine may not be required if these filters are replaced with new HEPA filters at least annually. This would be considered on a case-by-case basis during the certification or variation process.
    - The integrity of chamber seals and the output of the UV lamps should be tested at least annually.

114. Other considerations may apply depending on the inhalation exposure system used in the facility.

Other aerosol containment equipment

115. If other aerosol containment equipment is intended to be used, contact the OGTR to discuss additional conditions that may apply.

Section 6. Room or facility housing invertebrates

116. The facility physical boundaries alone are not sufficient for containment of invertebrates. While working with small invertebrates, they should be contained in specialised containment equipment (e.g. mesh cages, plastic isolator with sleeve openings, etc.) or in a designated area (e.g. a cage-like room constructed of fine mesh) within the physical boundaries of the invertebrate facility/room. Additional measures should be considered, such as the following:

    - Containers for small crawling invertebrates, such as ticks and mites, should stand in trays of oil as an additional containment measure.
    - Access to primary containers for research, feeding and cleaning etc. should also be designed to minimise the possibility of escape.
    - For aquatic life stages, in the event of a breach of the primary container, additional containment measures, such as trays or bunding should be implemented.
    - Mechanisms to reduce the invertebrate activity (e.g. by chilling) should be used.

117. Internal facility penetrations (e.g. for light fixtures, pipes, ducting) should be minimal since these may provide hiding places for escaped invertebrates. Surface mounting of services to the facility will minimise the number of penetrations to be sealed. Water that collects under equipment (e.g. freezers) may provide a place for escaped insects to hide or breed. Water collection trays should be accessible for cleaning or decontamination.

118. Invertebrates can also escape by attaching to people or items leaving the facility. The anterooms should have appropriately placed mirrors or hand-held mirrors that allow self-checking to ensure invertebrates are not unknowingly being transported outside the facility on people.

119. Effective insecticidal agents should be readily available in the anteroom. This would minimise the likelihood of the invertebrates migrating to another part of the facility while the person locates the insecticidal agents.

120. The use of air curtains at the entrance/exit of rooms should be considered. Inclusion of air curtains can dislodge insects resting on clothing surfaces and discourages the movement of insects into another room.

Aerosol containment

121. Bespoke procedures should be developed for dealings involving invertebrates that are likely to generate aerosols and cannot be conducted within a BSC.

122. Aerosol containment equipment should be selected based on a risk assessment evaluating the potential for aerosol generation during the conduct of the dealings with GMOs and the transmissibility of GMOs via aerosols.

123. Purpose-designed aerosol containment equipment is recommended to be used while dealing with small invertebrates containing GMOs or GM invertebrates as manipulations in a BSC can be extremely difficult because the airflow can blow small invertebrates around the BSC, into the filters, or into other inaccessible locations.

Section 7. Paperwork

Application for a new facility

124. The following documents will be required for an application for the certification of any PC3 facility:

    - a copy of the facility manual
    - the floor plan of the facility clearly indicating the locations of facility services, aerosol containment equipment, ventilation systems, and decontamination equipment
    - details of the LWTS – if present (e.g. type, brand, volume, commissioning and testing results, etc.)
    - results of testing and commissioning for:
        - HEPA filters
        - BSCs or other aerosol containment equipment installed in the facility
        - autoclaves or any other decontamination equipment installed in the facility
        - backflow prevention devices installed on pipes supplying water to the facility, if fitted, or the risk assessment justifying the absence of these devices

    In addition to the above, the following are required for areas housing animals or invertebrates:

    - details of animal/invertebrate handling procedures
    - details of all animals/invertebrates being dealt with in the facility, including the risks associated with the use of these animals/invertebrates and strategies for managing these risks

- contingency response plans, including the procedures and use of specialised equipment required for responding to escape of animals/invertebrates containing GMOs from primary containment
- procedures for the operation of primary aerosol containment equipment (e.g. IVCs), or cages/enclosure designed to prevent the release of aerosols and escape of animals/invertebrates being contained in the facility
- results of testing and commissioning of any aerosol containment equipment (e.g. IVCs), including the HEPA filters in the IVC or other aerosol containment equipment used for animal/invertebrate housing or animal handling procedures (e.g. BSC).

What to report and when?

125. The reporting and notification requirements are summarised in Table 2. Release of GMOs into the environment or exposure of people to the GMOs must be reported to the OGTR (ogtr.m&c@health.gov.au). These reports give the OGTR the opportunity to assess the risks stemming from the situation and initiate corrective action, if required.
126. In deciding whether an incident should be reported, consider the potential risk associated with what has transpired. Facility managers should question if any corrective action is required to avoid a repeat of the incident.
127. 'As soon as practicable' means a report should be provided to the OGTR within one to two business days of an incident.
128. In case of an emergency (e.g. if it is known or suspected that GMOs have escaped containment), contact the OGTR via free call on 1800 181 030 (24 hours).

Table 2: Reporting and Notification requirements

Condition	**What is reportable**	**Timeframe**
Reporting		
R27	Risk management plan for the absence of backflow prevention, if the risk assessment determines that backflow prevention is necessary, and a device is not subsequently installed	At the time of certification
	Review of the requirement and the reviewed risk assessment if any change impacting the outcome of the risk assessment occurs	as soon as practicable
C15	Annual inspection identifies non-conformity issue regarding the capacity of the facility to comply with all the conditions of the certification instrument	as soon as practicable
C27	Failure of the ventilation system (loss of the negative air pressure gradient or a positive pressure)	as soon as practicable

C70	Significant release of GMOs outside of a BSC or other approved containment device	as soon as practicable
C71	Discharge of untreated waste from the LWTS (Emergency or accidental)	as soon as practicable
C85	Incidents with GMOs/potential exposure to GMOs used in facility	as soon as practicable
Ani-C10 Inv-C8	Escape outside the facility of animals or invertebrates (GM or containing GMOs) or the animal is not recaptured	as soon as practicable
Notification		
C2	Annual maintenance shutdown	7 days prior to shutdown and again prior to commencing work
C4	Certification holder no longer has the authority to admit persons to the facility and exclude persons from the facility	as soon as practicable
C10	If the certification holder does not have the capacity to prevent dealings from occurring and the certification holder is not the owner of the facility and does not have the authority to admit and exclude persons from the premises, maintain the facility, fittings and/or containment equipment and LWTS	as soon as practicable

129. Significant release of GMOs outside of a BSC must be reported to the OGTR (C70) including a spill or release likely to:
    a. result in exposure of people working in the facility; or
    b. result in a breach of containment; or
    c. require the use of the spill kit present in the facility (larger volume not able to be decontaminated with a wipe and decontaminant).
130. Although not directly part of the reporting requirements, the final step in this process is to ensure that, where necessary, corrective or preventive action has been taken to remedy the situation.

What records should be kept?

131. A checklist that may be used for annual inspections of PC3 facilities is available on the OGTR website but its use is not mandatory. Any annual inspection report that identifies a significant non-conformity or issue must be forwarded to the Regulator as soon as practicable. However, annual inspection reports that do not identify any significant non-compliances should not be sent to the Regulator unless requested. An OGTR inspection of the facility may constitute an inspection for the purpose of condition C15.
132. Table 3 summarises the records that are required to be kept and the duration for which they must be kept. All reports/checklists must be made available to the Regulator, on request.

Table 3: Record keeping

Condition number	Item	Minimum frequency	Standard	Duration records to be kept
C14-15 C22 C2	Inspection of facility	• Annually • Before lifting suspension • At completion of a shutdown	Conditions of the certification instrument	3 years
C21	Pest prevention strategy	Ongoing	Effective	3 years
C28 C31	BSC	Annually and • after BSC is relocated • after maintenance • after HEPA filters are replaced	AS 2252.2 (class II), or AS 2252.3 (class III), as applicable.	3 years
C28 C31	IVCs and other Regulator approved aerosol containment equipment	Annually and • after maintenance • after HEPA filters are replaced	HEPA filter integrity and containment efficiency	3 years
C32 C33 C34	Autoclave	Tested and maintained annually or as directed by the manufacturer Efficacy tested either at least monthly or before/with each decontamination cycle	As per C33	3 years for maintenance 12 months for monthly efficacy testing
C33-34	LWTS	Tested and maintained annually or as directed by the manufacturer	As per C32	3 years
C33 C34	Other Regulator approved heat-based equipment to decontaminate GMOs	At least annually	As determined when approved	3 years
C36	Backflow prevention device	At least annually	AS 2845.3 by licenced plumber	3 years
C37 C38	Ventilation	At least annually	As per C37	3 years
C68 C69	Gaseous decontamination	As required per C69	C69	3 years

Condition number	Item	Minimum frequency	Standard	Duration records to be kept
C81	Training	As required per C76-80	C77-81	3 years

Section 8. What if I want to certify my facility as a primary containment facility?

133. The modular PC3 Guidelines assume the facility itself is not the primary means of GMO containment (i.e. is not a primary containment facility). Such primary containment facilities have additional requirements, and as such, they would be evaluated on a case-by-case basis. It would be prudent to contact the OGTR well in advance when designing a PC3 primary containment facility.

134. In a primary containment facility, GMOs would contaminate work surfaces, the air contained within the facility and PPE worn by staff. The certification holder should conduct a risk assessment to determine the facility design and PPE required to ensure the safety of people and the containment of GMOs. Considerations for this risk assessment include:

    - type of PPE to be worn (e.g. breathing apparatus, double layer PPE)
    - entry to and exit from the facility
    - an appropriate ventilation system
    - airlocks and/or anteroom
    - a changeroom including chemical or traditional showers
    - a LWTS, as all liquid waste would be considered as contaminated
    - disposal and decontamination procedures
    - the Regulator's minimum mandatory requirements, equipment and procedures as outlined in this document.

135. The facility should undergo gaseous decontamination at least annually and in between projects. Procedures should be developed and implemented for the validation of the gaseous decontamination.

136. Work benches and equipment should be decontaminated regularly after dealings are completed or at end of each day to minimise contamination with the GMOs.

137. Considerations should be given to procedures to be developed for the decontamination of solid waste or re-usable equipment. No waste should be taken out of the facility prior to being autoclaved or chemically decontaminated (consideration for the provision of dunk tank). A double barrier autoclave located within the facility is mandatory for newly constructed facility and is preferred for existing facilities.

138. In a primary containment facility, the LWTS constitutes the primary means of decontamination of liquid waste. The certification holder should ensure that the area/s housing the LWTS meets the requirements under 'Facility construction and access requirements' and 'Ventilation requirements' listed in Part A of the Guidelines.

139. The LWTS should be constructed and maintained to ensure adequate decontamination of GMOs expected to be dealt with in the facility. This includes the use of robust and suitable material for the pipes and tanks associated with this system, procedures to detect leaks, and validation of the system against the GMOs dealt with in the facility.

140. LWTS failure includes sensor/valve failures, loss of power, inability to receive effluent or inability to reach the decontamination temperature. The system should include holding tanks into which liquid waste can be diverted when the LWTS is being serviced or otherwise out of commission.

141. If the LWTS is located fully or partially outside of the work area of the facility, the LWTS is the only containment for the GMOs. In this case, additional requirements to those already required by the Guidelines would have to be met including:

    - a documented contingency plan and the means in place to respond to leakage of liquid containing GMOs and/or a failure of the LWTS. This plan should include:
        - details of any specialised equipment needed for such responses; and
        - the means of dispersing disinfectant throughout a large volume of spilled liquid to ensure a decontaminating concentration of disinfectant is present throughout.
    - minimising the likelihood of physical damage to components (such as pipes and collection tanks). For example, the LWTS could be located where it is protected from potential sources of damage;
    - pipes should be double skinned or have a mechanism in place for detecting leaks in areas where the pipes cannot be inspected easily;
    - secondary containment, such as bunding, should be provided in the area housing the LWTS to retain any leakage from the system. The bunding should be:
        - of sufficient capacity to contain the volume of liquid waste held in the largest single container, plus the volume of any disinfectant that might be used, with additional capacity to prevent any expected general fluid movement from breaching the secondary containment;
        - smooth, impermeable to water, easily cleaned, and resistant to damage by the cleaning agents and/or decontamination agents that will be used in case of leakage of the LWTS.

142. The considerations listed above are only a subset of the requirements likely to be imposed for the certification of a primary containment facility. Every facility would be assessed on a case-by-case basis and bespoke conditions may be included as part of the certification instrument.

Standards referred to in this document

'AS' followed by a number or other identification is a reference to the Australian Standard so numbered or identified. Refer to the most recent issue of the Standards.

'AS/NZS' followed by a number or other identification is a reference to the Australian New Zealand Standard so numbered or identified. Refer to the most recent issue of the Standards.

AS 1324.1	Air filters for use in general ventilation and air conditioning Part 1: Application, performance and construction
AS 1324.2	Air filters for use in general ventilation and air conditioning Part 2: Methods of test
AS 1807.7	Cleanrooms, workstations, safety cabinets and pharmaceutical isolators - Methods of test Method 7: Determination of integrity of HEPA filter installations not terminally mounted
AS 1807:2021	Separative devices - Biological and cytotoxic drug safety cabinets, clean workstations and pharmaceutical isolators - Methods of test
AS/NZS 2243.3	Safety in laboratories Part 3: Microbiological safety and containment
AS 2252.2	Controlled environments Part 2: Biological safety cabinets Class II – Design
AS 2252.3	Controlled environments Part 3: Biological safety cabinets Class III – Design
AS 2252.4	Controlled environments Part 4: Biological safety cabinets Classes I and II - Installation and use
AS 2845.3	Water supply - Backflow prevention devices Part 3: Field testing and maintenance of testable devices
AS/NZS 2982	Laboratory design and construction

AS/NZS 3500.1	Plumbing and drainage Part 1: Water services
AS 4260	High efficiency particulate air (HEPA) filters Classification, construction and performance

———————————————— END ————————————————