



NAPPO

North American Plant Protection Organization

Organización Norteamericana de Protección a las Plantas

NAPPO Regional Standards for Phytosanitary Measures (RSPM)

RSPM 22

Guidelines for the Design, Construction, and Operation of a Containment Facility for Insects and Mites used as Biological Control Agents

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Review

NAPPO Standards for Phytosanitary Measures are subject to periodic review and amendment. The next review for this NAPPO Standard is 2026. A review of any NAPPO Standard may be initiated at any time upon the request of a NAPPO member country.

Approval

This standard was approved by the North American Plant Protection Organization (NAPPO) Executive Committee on December 2, 2021 and is effective from this date.

Virtual approval of NAPPO Products

Given the current travel restrictions brought about by the COVID-19 pandemic, the NAPPO Management Team unanimously endorsed a temporary process for virtual approval of its products.

Beginning in January 2021 and until further notice, this statement will be included with each approved NAPPO product in lieu of the Executive Committee original signature page.

Approved by:

The document “Regional Standard for Phytosanitary Measures 22 (RSPM 22)– ***Guidelines for the Design, Construction and Operation of a Containment Facility for Insects and Mites used as Biological Control Agents***” was electronically approved by the NAPPO Executive Committee members for Canada (Greg Wolff, CFIA) on November 23, 2021, the United States (Osama El-Lissy, APHIS PPQ) on November 15, 2021, and Mexico (Francisco Ramírez y Ramírez, SENASICA-DGSV) on December 2, 2021. Electronic copies of approval emails from each Executive Committee member have been archived by the NAPPO Secretariat.

Stephanie Bloem

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NAPPO Executive Director

Implementation

No Implementation Plans are required.

Amendment Record

Amendments to this Standard will be dated and filed with the NAPPO Secretariat. The most recent version will be posted on the NAPPO website at: www.nappo.org.

Distribution

Once approved, this standard is uploaded to the NAPPO website and is distributed by the NAPPO Secretariat to the Secretariat of the International Plant Protection Convention (IPPC) and to other Regional Plant Protection Organizations (RPPOs).

INTRODUCTION

Scope

These guidelines are intended to assist in the design, construction, and operation of a containment facility – including a laboratory or greenhouse – for exotic arthropod biological control agents. These guidelines do not pertain to a containment facility for animal or plant pathogens, or plant parasitic nematodes. Each NAPPO member country may have other or more specific containment requirements depending on the circumstances.

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[Note: This document is frequently updated]

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Definitions, Abbreviations and Acronyms

Anteroom (syn. vestibule): A room between a containment space and corridor to provide movement between containment and non-containment areas and to prevent the escape of organisms under containment.

Definitions of phytosanitary terms used in this standard can be found in ISPM 5 and RSPM 5.

Background

Biological control agents are considered beneficial organisms because of their ability to control plant pests (e.g., insects and mites). However, these agents may have unintended consequences in the environment. NAPPO member countries have developed petition processes to ensure that possible ramifications are fully considered before exotic arthropod biological control agents are released into the environment.

As illustrated in the petition guidelines (RSPM 07 and 12), the containment of exotic biological control agents is sometimes needed. Containment may be required to ensure that unapproved agents, or potentially harmful organisms (e.g., disease agents, parasites, hyperparasitoids or cryptic and sibling species) are not released into the environment.

This standard recommends guidelines for maintaining the integrity of barriers between natural and contained environments to prevent the unwanted escape or introduction of exotic arthropod biological control agents or other organisms. These guidelines should be applied as appropriate by the NAPPO member countries, considering the circumstances, including risks to plant health.

OUTLINE OF REQUIREMENTS

Information is presented on the design, construction, and operation of a containment facility for the import, housing, and culture of exotic arthropods for the biological control of insects, mites, and weeds. It complements the information contained in ISPM 34: 2016, which focuses on quarantine pests on consignments of plants for planting.

Requirements

1. Physical (Design and Construction) - Exterior

- 1.1 The facility location should be in an area that will present minimal risks to agriculture, forestry, and the environment, taking into account the organisms that will be housed in the facility.
- 1.2 Regulatory officials responsible for authorizing the facility should be consulted before it is built.
- 1.3 Construction of new facilities should consider areas prone to natural disasters and to frequent adverse weather conditions (e.g., high winds, flooding or hail) and should consider local building code measures to address the risks.
- 1.4 Areas surrounding the facility should be cleared of debris and vegetation. Buffer areas around the facility may be established that include sentinel plants or trap crops to monitor for “escapes” based on the characteristics of the organisms housed in the facility.
- 1.5 The facility should have only one primary entry and exit. The exterior doors of the facility should be lockable.
- 1.6 The facility should be designed with the intended use in mind. For example, separate containment rooms should be planned if more than one organism will be housed or produced in the same facility and at the same time.
- 1.7 Location of supply and exhaust air ducts should be considered in the design of the facility to prevent outward airflow, which occurs when doors are opened, from compromising the negative air pressure system.
- 1.8 The movement of people and goods from and into the containment facility should be minimized, monitored, and documented (via logbooks, for example).
- 1.9 The facility should be equipped with appropriate communication and information transfer systems.

2. Physical (Structures and Equipment) - Interior

- 2.1 *Surfaces* - Walls, ceilings, floors, and furnishings (benches, cupboards, etc.) should have smooth impermeable surfaces that are easily cleared of objects, are washable, can withstand repeated cleaning and decontamination, and offer no hiding places or shadows (i.e., so arthropods on surfaces can be easily seen). Dropped/false ceilings should be avoided.
- 2.2 *Coloration* - All surfaces and furnishings, including flooring, should be in an appropriate color so that arthropods can be easily seen.
- 2.3 *Seals* – All seams, crevices, cracks, or other openings should be caulked, taped, or otherwise sealed. Seals should be regularly examined and maintained throughout the life of the facility. Particular attention should be paid to service outlets (e.g., electrical, plumbing, heating, ventilation, lighting fixtures and fire sprinklers); floor drains; furnishings (benches, cupboards, etc.); and window and door frames. Electrical boxes should be sealed and electrical outlets not in use should be plugged. Sealed lighting fixtures are recommended.
- 2.4 *Windows* - Windows (single or double paned) should be shatter-resistant and effectively sealed to prevent arthropod escape. They should be permanently rendered inoperable or locked so they cannot be opened. If windows are used as emergency exits, they should be appropriately sealed to prevent arthropod escape while remaining functional as exits.
- 2.5 *Doors* (preferably solid) - A double-door system should be used so that entry to the arthropod-confinement area is through a vestibule or foyer. Each door should be self-closing and close quickly. If possible, the vestibule should have an inter-locked system whereby one door cannot be opened at the same time as the other. An automatic system that shuts off lights in the vestibule when the interior door is opened is also useful because most arthropods do not normally dart from lighted areas into darkness. Consideration of commercially available systems where forced air blows insects away from the doors is recommended. It is important to have negative air pressure in the facility and a means to test airflows (see section 2.11). Above all, the doors should be tight-fitting and when closed, all crevices should be sealed or covered using magnetic seal strips, brush barriers or flexible flanges, etc. It is recommended that the door does not reach the floor but has a raised sill to improve security against arthropod escape. Emergency exits should be alarmed and not blocked with equipment. Note: Door security should not be solely dependent upon electrical apparatus. Electric service is subject to interruption for various reasons and such interruption could cause a breach in containment security.
- 2.6 *Storage spaces* - Provision should be made for adequate storage to minimize clutter in the containment area. Laboratory space should only be used to store materials routinely used in the laboratory. Storage in the laboratory should not exceed what is needed for daily laboratory operations.
- 2.7 *Light traps* - There should be regular operation of blacklight or regular light traps in the vestibule and outside the secure areas. These traps not only serve as containment security, but also as a continual monitoring tool to highlight problems so remedial measures can be taken. If the containment security system is working properly, no arthropods should be observed on/captured in the light traps. Lights should be placed inside the vestibule above the interior vestibule door, not the exterior vestibule door.

- 2.8 *Cages* - All cages used to house arthropods should be of sturdy, simple construction, capable of being disinfected for re-use. It is recommended that cages be lockable and provide full security (e.g., sleeve cages) against arthropod escape when the access ports are closed.
- 2.9 *Change rooms* - Ideally, the facility should be equipped with change rooms for everyone entering the facility. Such rooms should open off the vestibule so that laboratory coats and coveralls used in the arthropod-handling areas can be left in the secure area when not in use. There should be mirrors located in the vestibule for self-examination to prevent organisms from exiting the facility on personnel. Procedures should be in place to describe the removal and treatment of personal protective equipment.
- 2.10 *Emergency electricity* - The facility will have containment features (negative air pressure or flow, light traps, waste treatment, etc.) that are dependent on electricity. Emergency electricity generation is necessary in case of interruption or loss of service.
- 2.11 *Heating, ventilation, and air-conditioning (HVAC Systems)* - Negative air pressure is recommended for the facility so that when the door is opened, air rushes in to prevent the escape of small arthropods. There should be appropriate mesh or screening (e.g., 80 Mesh or equivalent finer metallic mesh screening with 0.177mm or 0.0070 inches openings or smaller) on all vents (heating, ventilation, and air-conditioning), drains and cages. HEPA filters are recommended for facilities dealing very small arthropods. If fume-hoods are required in the lab, ensure they are properly sealed, filtered and screened.

Additional considerations for greenhouses: Requirements for ventilating and controlling containment facilities should be considered when designing ventilation requirements for containment greenhouses. Construction should include screening of all forced-air and natural air venting systems. A control system that integrates lights, ventilation requirements, temperature control and shading systems should be considered when constructing a containment greenhouse. Where it is necessary to collect and treat wastewater, containment greenhouse floors should be sloped toward drains and have curbs to contain water. Consideration should also be given to the use of kneewalls, windbreaks and physical barriers to reduce the probability of loss of containment through mechanical damage to the containment greenhouse caused by machinery and carts, for example.

- 2.12 *Autoclaves and freezers* – Pass-through autoclaves (where both doors cannot be opened at the same time) are recommended to facilitate the secure transfer of materials out of the facility. If a stand-alone autoclave is present, a freezer should be available to pre-kill or immobilize arthropods prior to exit. Construction should allow space for pass-through autoclaves and freezers.
- 2.13. *Anterooms* – An anteroom (synonym vestibule) should be incorporated in the design of new containment facilities.

3. Operation

- 3.1 *Supervision* - Each facility should have a designated supervisor (i.e., containment officer), with a backup as needed. The supervisor will be responsible for all organisms that enter, are held in, or leave the facility. The supervisor will also be responsible for ensuring compliance with the regulatory requirements associated with the facility, maintaining the procedures

manual, implementing the procedures, and determining individuals who are authorized to work in the facility. The technical and operational procedures provided in ISPM 34: 2010 may be used as a guide for developing a manual, where applicable.

- 3.2 *Training* - Personnel entering the containment facility should complete training in the procedures specific to the containment facility. This includes training on the physical operation and design of the facility, as well as on the organism-associated hazards and precautions necessary to prevent or respond to the escape of contained organisms. Training should be documented, with refresher training planned as appropriate and needed. Training should be conducted according to the parameters set by the NPPO.
- 3.3 *Allowable Articles* - All persons in the facility should wear dedicated laboratory clothing (e.g., coat) appropriate to the circumstances. This clothing should remain in the facility. Unnecessary articles, including food for human consumption and personal effects (e.g., excess clothing, purses, backpacks) should not be brought into the containment area, but should be stored outside this area. Written procedures should be established (and posted in a visible place) for the movement of both persons and materials entering or leaving the containment facility, including the decontamination of laboratory clothing, to prevent organism escape.
- 3.4 *Removal from Facility* - No living arthropods or associated organisms should be removed from the facility without prior approval by the designated supervisor and the appropriate regulatory authority. In addition, materials leaving the containment facility should be decontaminated to ensure that no such organisms are removed inadvertently.
- 3.5 *Disposal/sterilization* - All packaging materials associated with the importation of exotic organisms, all rearing materials, all floor sweepings, etc., from the arthropod handling areas should be destroyed or sterilized using an effective and validated method appropriate to the circumstances (e.g., by autoclaving or incineration). If the means for decontaminating are outside the containment facility, there should be a detailed Standard Operating Procedure to ensure safe handling and disposal of the materials.
- 3.6 *Collection/Destruction* - The facility should be equipped with an efficient system for collection or destruction of organisms. For example, a built-in variable-speed vacuum system with gentle aspiration (for transfer of arthropods into containers without injury) or for aspiration with force sufficient to kill the unwanted arthropods (when separating host arthropods from their parasites and parasitoids).
- 3.7 *Plumbing* – Measures should be in place to prevent the escape of living arthropods or associated organisms down the drains and into the environment. Wastewater should be treated (e.g., with the use of drain meshes, plugs or by water sterilization) to prevent the escape of organisms.
- 3.8 *Cleaning/Decontamination* - There should be routine cleaning and decontamination of containment areas and equipment. There should be detailed Standard Operating Procedures for these duties. Rooms should be kept clean and free of debris. Only authorized staff should be allowed to clean the interior of the containment area.
- 3.9 *Recordkeeping* - Records should be kept of shipments, permits or other authorizing documents, confirmation of identities of species, dates of import, associated organisms, destruction/sterilization of packaging, entrance of visitors and transfer of organisms to other quarantine and containment facilities.

- 3.10 *Incoming Shipments* - Any plant materials accompanying the shipment should be destroyed or sterilized along with the packaging. Hyperparasitoids should be killed and sent for identification. Imported organisms should be kept under strict containment until authorized for release. The organisms should complete at least one generation in containment to be sure they are not harboring any pests.
- 3.11 *Facility Inspections* – Routine inspection of the containment facility should be conducted as required by the NPPO.

4 Containment Security

- 4.1 *Emergency Action Plan* - Each containment facility should have an emergency action plan to be implemented in the event of organism escape. In the event of an escape, appropriate action should be taken, including measures to destroy escaped organisms, measures to prevent future escapes and immediate notification to the regulatory authority.
- 4.2 *Signage* - A sign should be displayed at the entrance to the containment facility indicating that unauthorized entry is prohibited and providing contact information for the supervisor. A sign may also be desirable on the inner door of the vestibule (inside of containment and visible to personnel as they prepare to leave containment) indicating that unauthorized removal of organisms is prohibited.
- 4.3 *Procedures for Access* – Procedures to prevent unauthorized access to the facility should be developed and implemented.
- Entrances to the facility should be kept locked and procedures for access should be posted at entrances.
 - Access should be limited to those people essential to the operation of the facility.
 - Visitors should adhere to security procedures and be accompanied by authorized personnel.
 - There should be a logbook to record entry and exit at the facility. The name, organization, purpose of visit, date, time in and time out should be recorded in the logbook for each visitor.
- 4.4 *Decontamination* - Decommissioning of biological control containment facilities, including decontamination methods for all contaminated or potentially contaminated structures and materials (e.g., rearing materials, infected or infested plant materials, cultures, walls, floors, furniture, etc.) should be determined based on the design and history of the facility. Depending on the organism and the life stage concerned, decontamination may be achieved by methods such as sodium hypochlorite (bleach) washes of surfaces, hot water immersions, freezing, rapid heating, drying, dry heating, steaming, autoclaving, fumigation (e.g., vapor-phase hydrogen peroxide (VHP), chlorine dioxide, or appropriate pesticide), and/or other chemical disinfection or devitalization methods. All facility decommissioning, decontamination and waste management procedures must be in accordance with applicable federal, provincial/state, and municipal regulations.