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Great Lakes Forestry Centre
Insect Production and Quarantine Laboratories

Insect Quarantine Facility Bio-Safety Manual

Version: 4 September 2014

Canada

Insect Production and Quarantine Laboratories

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Insect Quarantine Facility
Contact Information

Bio-Safety Officer

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Insect Production Services Manager

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Program Intent

The Insect Production and Quarantine Laboratories (IPQL) is a multi-user facility under the control of the Insect Production Services (IPS) group used by researchers from the Great Lakes Forestry Centre (GLFC) and potentially by collaborating organizations including other Canadian Forest Service laboratories, provinicial and state agencies, universities and private industry.

The IPQL is divided into four areas having different functions and design elements:

1. domestic species zone
2. invasive species (quarantine) zone
3. variable utilization area (i.e., domestic or invasive)
4. other

The domestic species zone will be used for establishing and maintaining colonies of disease-free domestic insect species. This area will be used exclusively by personnel working in the Insect Production Unit (IPU). Routine entry and egress will be through a dedicated locker room and all other doors/stairwells will be for emergency egress and occasional equipment access. This clean-room area is designed to keep air-borne pathogens out by segregating insect species in separate laboratories having a clean air supply and established positive air pressure at all times. This portion of the facility is constructed using clean-room technology and follows many of the design concepts used for an insect quarantine facility (refer to invasive species zone), the differentiation being that the domestic species zone is designed to keep things out (e.g., air-borne microbials) whereas the invasive species zone is designed to keep things in (i.e., the insects maintained in those laboratories). Personnel from the domestic species zone may be required to enter into the invasive species zone, thus a separate entry (i.e., anteroom AA211C) is provided for their exclusive use.

The invasive species zone is a quarantine facility for exotic invasive forest insects. It will be used for establishing and maintaining year-round colonies of invasive forest insect species and for conducting a wide variety of research activities. This area will be used by personnel internal and external to GLFC. Routine entry and egress will be through an anteroom (AA106A) and all other doors/stairwells will be for emergency egress and occasional equipment access. This portion of the facility is built using clean-room technology and follows CFIA (Biohazard Containment and Safety Branch) facility requirements (including both required and recommended items) for a PPC-2A facility. All penetrations, including conduits and wiring, are sealed to facilitate cleaning and fumigation and to prevent insect escape. Clean-room technology is employed to minimize the spread of air-borne pathogens between research laboratories. Laboratories have a HEPA filtered air supply and are under negative air pressure at all times (i.e., there is inward directional air flow as you proceed deeper into the facility). Personnel from the domestic species zone may be required to enter into the invasive species zone through a separate entry (i.e., anteroom AA211C).

In the coming years, it is anticipated that our need for exotic invasive insect research infrastructure will increase and our need for domestic species space may diminish. This facility allows for future expansion of the invasive species zone into spaces formerly occupied by the domestic species zone, simply by opening and/or closing/alarming hallway doors and adjusting the air pressure from positive to negative. Therefore, the variable utilization area (modules AA222 through AA228) was constructed using clean-room technology and follows CFIA PPC-2A facility requirements. Modules AA222 through AA225 will initially be included in the domestic species zone but will have the capacity to have their use converted for invasives species (these spaces would be converted in multiples of two laboratories at a time).

The remainder of the facility includes all other common areas such as access hallways, offices, display areas and quality control facilities supporting the domestic and invasive species zones. These areas are accessible from the outside and from the main GLFC building and provide points of access to the domestic and invasive species zones.

List of Arthropods

The following regulated arthropods may be brought into the quarantine facility:

- Asian longhorned beetle, *Anoplophora glabripennis*
- emerald ash borer, *Agrilus planipennis*
- brown spruce longhorn beetle, *Tetropium fuscum*
- Chinese longhorn beetle, *Trichoferus compestris*
- Sirex woodwasp, *Sirex noctilio*
- others (upon approval of the Bio-Safety Officer and the CFIA)

Other non-regulated insects which may be brought into this quarantine facility:

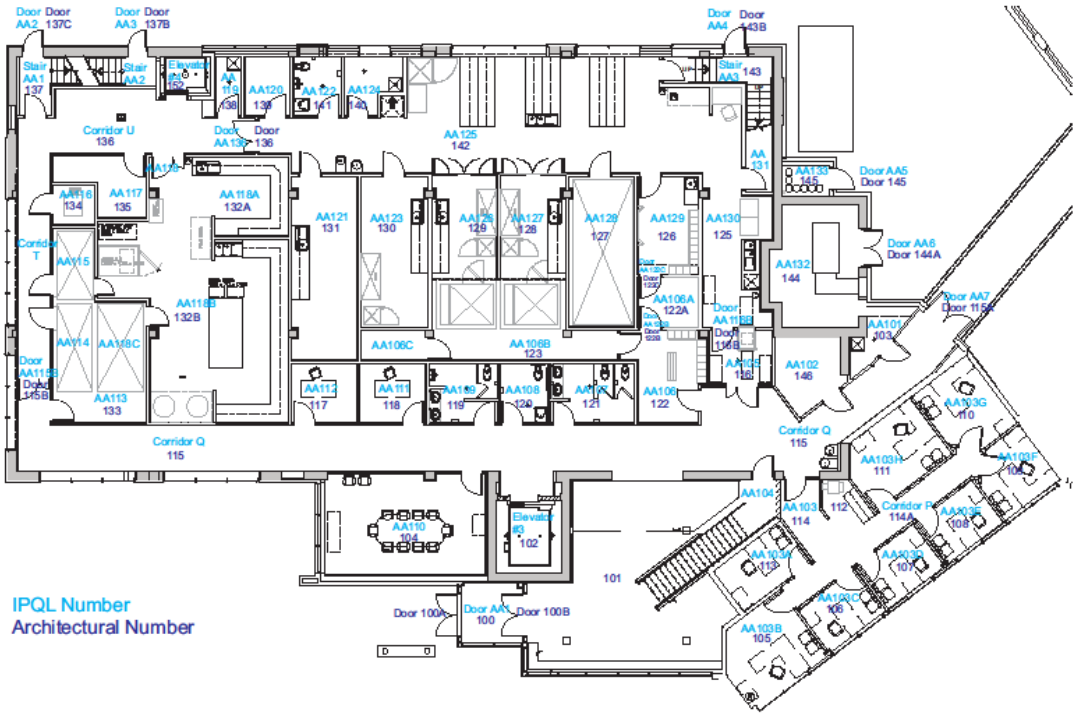
- mountain pine beetle, *Dendroctonus ponderosae*
- European oak borer, *Agrilus sulcicollis*
- others (upon approval of the Bio-Safety Officer)

List of Pathogens

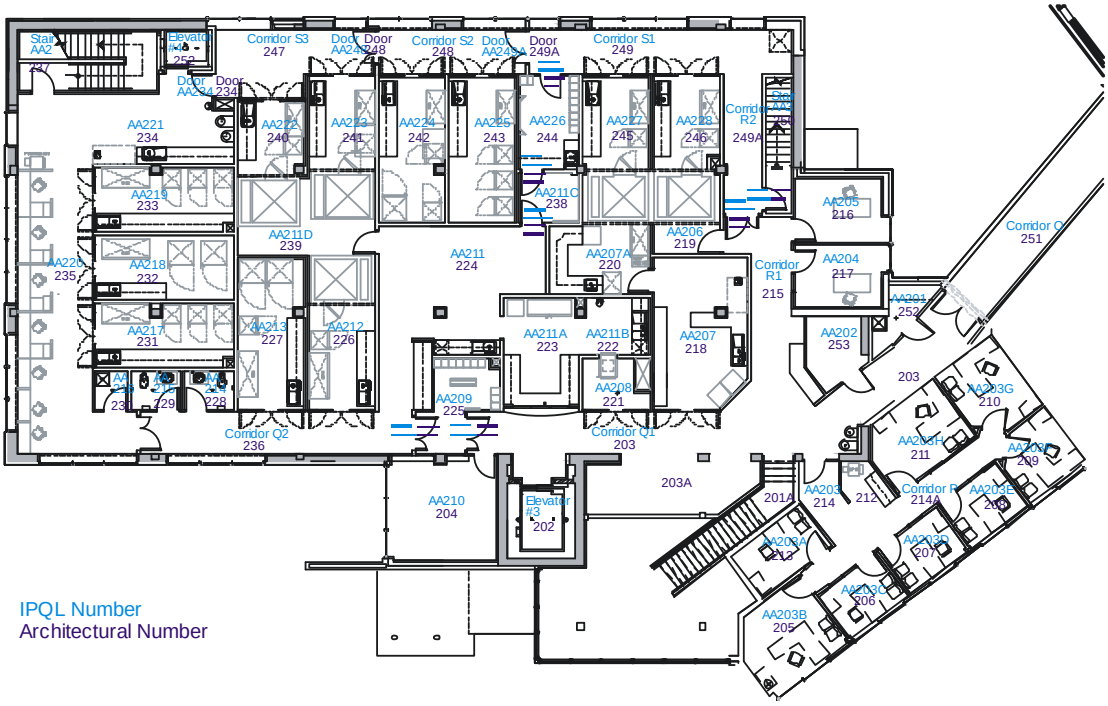
Various pathogens native to Canada may be tested within the quarantine facility to determine their potential as bio-control agents for the arthropod species approved for entry into the facility.

IPQL Facility Floor Plan

IPQL Level 1



IPQL Level 2



Insect Quarantine Facility Room Purpose

Room Number	Architectural Number	Room Name	Room Purpose
AA105	116	Autoclave Cleanout	This room will be used for waste disposal from the autoclave without having to enter the quarantine zone. The door adjacent to the autoclave (i.e., door #116B) is for emergency egress only and locked/alarmed at all times; this door does not have hardware from the side of the autoclave cleanout room.
AA106	122	Locker Room	This mixed gender locker room will be used exclusively by staff working in the quarantine zone of the facility. This space will be used for temporary storage of items that are restricted from entering the quarantine zone (e.g., coats, boots, etc.). Laboratory supplies will enter the facility through this space. This space will provide access for maintenance personnel to the adjacent service core and IT closet without entering the quarantine zone.
AA106A	122A	Anteroom	This is one of two entrances (i.e., anterooms) to the quarantine zone. It is integrated into the containment barrier to prevent the escape of insects. Doors are interlocked doors; lights go out when either door is opened; UV light and sticky traps are present; wall mounted mirrors are present for examining clothing to ensure that there are no hitch-hiking insects when leaving the quarantine zone; access is by swipe card.
AA120	139	Log Splitter	This room will be used to house an electric log splitter to split log bolts to kindling size prior to autoclaving/disposal. This space will also house a cleanout canister for the central vacuum system that is connected to each room within the first floor of the quarantine zone.
AA121	131	Invasives Research	This lab is an environmental rearing room that will predominantly be used to house insect cages (e.g., flushing insects from log bolts) and for maintaining those insects under controlled environment conditions.
AA122	141	Staff W/R	Washroom for exclusive use by staff within the quarantine zone; this room minimizes the necessity of staff needing to leave the facility.

AA123	130	Electrophysiology /Behavioral Lab	This lab is an environmental rearing room that will be used to conduct electrophysiological and behavioral studies of exotic insects. Insects will be maintained in cages in this work space and in a reach-in environmental chamber. Compressed gases are available for future equipment (e.g., HPLC, mass spec., etc). Exhaust ducts (currently capped off) have been installed for future installation of a goose-neck extraction arm and a flight tunnel. This lab is currently configured for inward directional airflow, but is capable of being adjusted for outward airflow to meet laboratory needs (i.e., when experimenting with insect pheromones). When re-adjusted for outward airflow, this space will have positive air pressure with respect to the adjacent quarantine space but will still have negative air pressure in comparison to all spaces outside of the quarantine barrier.
AA124	140	Janitor Room	Equipment and supplies in this janitor closet are dedicated to the quarantine zone of the facility. It is fitted with a slop-sink, janitor pail, cleaning supplies and storage space for maintenance personnel to keep tools and spare parts (e.g., light bulbs) within the quarantine zone.
AA125	142	General Work Area	The general work area is a laboratory space supporting research activities/staff within the quarantine area and provides access to research modules, washroom, log splitter room, janitor closet, storage room, cleanup area, fire-rated stair well (to level 2 of the quarantine zone) and emergency exits. Insects will be maintained in a reach-in environmental chamber. Door #136 will be closed/alarmed at all times and will only be used for emergency egress.
AA126	129	Invasives Research	This invasives research module is a multi-purpose research laboratory used exclusively by staff working in the quarantine zone. Insects are maintained within a reach-in environmental chamber and within a walk-in environmental chamber.
AA127	128	Invasives Research	This invasives research module is a multi-purpose research laboratory used exclusively by staff working in the quarantine zone. Insects are maintained within a reach-in environmental chamber and within a walk-in environmental chamber.
AA128	127	Walk-in Cold Room	This walk-in cold room will be used for storing diapausing insects (primarily in log bolts).

AA129	126	Change Room	This is a mixed gender change room for facility users to apply laboratory clothing, wash hands (hands-free sink), and for examining clothing to ensure that there are no hitch-hiking insects when leaving the quarantine zone. Privacy is not necessary since this space will only be used to apply lab coats, smocks or gowns. An air curtain is installed above the door to the anteroom to prevent the escape of insects.
AA130	125	Cleanup Area	The cleanup area provides space for washing and autoclaving of glassware/laboratory materials from within the quarantine zone. It also houses a refrigerator and a freezer for cold storage. A pass-through autoclave is located on the wall of the containment barrier and is installed with a bio-seal to prevent the escape of insects. The body of the autoclave is not located within this space so that maintenance personnel do not need to enter the quarantine zone. The door beside the autoclave (i.e., door # 116B) will be closed/alarmed at all times and only used for emergency egress.
AA131	NA	Storage Room	This storage space will be used to store limited quantities of supplies for use within the quarantine barrier. This space will also house a cleanout canister for the central vacuum system that is connected to each room within the second floor of the quarantine zone.
AA211C	238	Anteroom	This is one of two entrances (i.e., anterooms) to the quarantine zone. It is integrated into the containment barrier to prevent the escape of insects. Doors are interlocked doors; lights go out when either door is opened; UV light and sticky traps are present; wall mounted mirrors are present for examining clothing to ensure that there are no hitch-hiking insects when leaving the quarantine zone; access is by swipe card for domestic area personnel only.
AA222	240	Domestic Colony Module	Initially, this research module will be part of the domestic zone of the facility (i.e., not within the quarantine barrier). As more quarantine space is required, this module may become part of the quarantine zone, where it will be used as a multi-purpose research laboratory; insects will be maintained within a reach-in environmental chamber and within a walk-in environmental chamber.

AA223	241	Domestic Colony Module	Initially, this research module will be part of the domestic zone of the facility (i.e., not within the quarantine barrier). As more quarantine space is required, this module may become part of the quarantine zone where it will be used as a multi-purpose research laboratory; insects will be maintained within a reach-in environmental chamber and within a walk-in environmental chamber.
AA224	242	Domestic Colony Module	Initially, this research module will be part of the domestic zone of the facility (i.e., not within the quarantine barrier). As more quarantine space is required, this module may become part of the quarantine zone where it will be used as a multi-purpose research laboratory; insects will be maintained within reach-in environmental chambers.
AA225	243	Domestic Colony Module	Initially, this research module will be part of the domestic zone of the facility (i.e., not within the quarantine barrier). As more quarantine space is required, this module may become part of the quarantine zone where it will be used as a multi-purpose research laboratory; insects will be maintained within reach-in environmental chambers.
AA226	244	Change Room	This is a mixed gender change room for exclusive use by personnel from the domestic area to enter/exit the quarantine zone. Access is by swipe card. Personnel apply laboratory clothing, wash hands (hands-free sink), and examine clothing (using wall mounted mirrors) to ensure that there are no hitch-hiking insects when leaving the invasive species zone. Privacy is not necessary since this space will only be used to apply lab coats, smocks or gowns. An air curtain is installed above the door to the anteroom to prevent the escape of insects.
AA227	245	Invasives Research Module	This invasives research module is a multi-purpose research laboratory used exclusively by staff working in the quarantine zone. Insects are maintained within a reach-in environmental chamber and within a walk-in environmental chamber.
AA228	246	Invasives Research Module	This invasives research module is a multi-purpose research laboratory used exclusively by staff working in the quarantine zone. Insects are maintained within a reach-in environmental chamber and within a walk-in environmental chamber.

Stair AA3	Stair 143	Stair	This stairwell is available for emergency egress by all facility users and for authorized personnel to move between floors.

Insect Quarantine Facility Standard Operating Procedures (SOPs)

SOPs included in this manual:

- IQ Facility Access Authorization (IPS/030/002)
- Movement of Exotic Invasive Pests (IPS/031/002)
- Bio-Safety Officer Responsibilities (IPS/032/003)
- Conducting Research in IQ (IPS/033/002)
- Maintenance Personnel Responsibilities (IPS/034/002)

TITLE: Insect Quarantine Facility Access Authorization

APPROVING OFFICIAL: DD / MM / YY
Manager, Insect Production Services (IPS) _____ ___/___/___

SIGNIFICANT CHANGES FROM PREVIOUS VERSION:

-This Standard Operating Procedure (SOP) has been modified for applicability to the newly constructed Great Lakes Forestry Centre (GLFC) Insect Quarantine (IQ) Facility.
-There are numerous minor changes, however the most significant changes relate to available IQ facilities specified on Insect Production Services (IPS) Form Number 0103/005 (Appendix 1).
-The title "Insect Quarantine Officer (IQO)" has been revised to "Bio-Safety Officer (BSO)" to match terminology used by the regulatory authority (i.e., Canadian Food Inspection Agency - CFIA).

1.0 INTRODUCTION

1.1 Purpose

This SOP has been established to delineate who is authorized to enter the GLFC IQ facility, to clearly define procedures for requesting approval for conducting research within the facility, and to identify training requirements for facility users.

1.2 Scope

This SOP shall be followed by all scientific personnel (GLFC, Canadian Forest Service - CFS, or otherwise) requesting authorization to conduct research with exotic and/or invasive forest insects within the GLFC IQ facility.

1.3 Definitions

Bio-Safety Manual – A manual containing only those IPS SOPs that relate specifically to the IQ facility.

Bio-Safety Officer (BSO) – A member of IPS who has supervisory authority over the daily operation of the IQ facility and who provides technical/research support to users of the facility.

Controlled Copy – A copy of an SOP distributed to select GLFC personnel having a unique copy number and dated signature of the IPS manager. Controlled copies are intended to ensure that GLFC personnel follow the most recent version of the SOP.

Effective Date – The date from which the procedures given in an SOP are to be implemented.

Great Lakes Forestry Centre (GLFC) – One of five Canadian Forest Service (CFS) research facilities in Canada.

Insect Production Services (IPS) – A GLFC work team consisting of the Insect Production Unit (IPU), the Quality Control Unit (QCU) and Insect Quarantine (IQ) personnel who perform insect rearing, quality control and quarantine activities in support of forest pest research activities internal and external to the CFS.

Insect Production Services Manager – The individual who has overall responsibility for activities of the IPS team.

Insect Production Unit (IPU) – A work unit of IPS consisting of personnel who perform insect rearing, diet making and methods development activities at GLFC.

Insect Quarantine (IQ) – A general-use facility under the control of IPS used for rearing exotic forest insects and conducting associated research activities.

Invasive Insects – Insects that adversely affect the habitats and bioregions they invade economically, environmentally, and/or ecologically and have become newly established in that area. They can be domestic (i.e., native to Canada) or introduced (i.e., exotic, non-indigenous, alien).

Methods Development (MD) Lab – A research facility under the control of IPS used exclusively by the IPU for developing new rearing methods and for establishing new insect colonies.

Principal Investigator (PI) - An individual internal or external to GLFC who has the responsibility for the overall conduct of the phase(s) of a study performed within the IQ facility.

Quality Control Unit (QCU) – A work unit of IPS consisting of personnel who conduct routine production, process and product control testing and develop new QC methodology in support of IPU activities.

Standard Operating Procedures (SOPs) – Directives describing routine administrative or technical procedures conducted by IPS personnel or users of the IQ facility.

1.4 Safety

NA

1.5 Materials

1.5.1 IPS Form Number 0103/005 (*Request to Use IQ Facility*, Appendix 1).
1.5.2 IPS Form Number 0104/003 (*IQ Facility User Agreement*, Appendix 2).

2.0 PROCEDURES

2.1 Potential Users of the Facility

2.1.1 Potential users of the IQ facility include GLFC researchers, IPU personnel, external CFS researchers and non-CFS personnel.
2.1.2 Priority for facility use will be assigned as specified in 2.2.

2.2 Scheduling Facility Use

2.2.1 The BSO will schedule facility use based on:
a) Space available.
b) CFS research needs.
c) Potential for conflicting activities (e.g., research with insect pathogens may conflict with experiments/rearing of healthy insects).
d) Facility maintenance requirements (i.e., periodic shut-down of the facility or environmental chambers may be required for conducting maintenance and/or sanitation procedures).
e) Training needs of proposed researchers (refer to 2.3.1).

2.2.2 When space or conflicting activities within the facility become problematic, the IPS manager will assign priority. Disagreements will be resolved by the Director, Integrated Pest Management.

2.3 Request to Use IQ Facility

2.3.1 Any individual or group of researchers wanting to conduct research within the IQ facility shall complete a *Request to Use IQ Facility* form (IPS Form Number 0103/005, Appendix 1) and submit it to the BSO for approval, prior to making arrangements for a movement certificate or import permit. The form shall contain the following information:
a) Project description (i.e., a brief outline of the work to be performed within the IQ facility).
b) Proposed start and end dates for using the facility.
c) Names of people associated with the project who will need access to the facility; these individuals must be trained in quarantine procedures as specified in 2.5.1.
d) Identification of the insect species that will be brought into the facility, including the scientific name, the life stage(s) that will be brought in, and the anticipated date(s) of arrival at the facility.

e) Other materials to be brought into the IQ facility, including equipment, plant materials, soils, pathogens, etc.
f) Materials to be removed from the facility during or at completion of experimentation, including dead insects, equipment, etc.
g) Facilities requested, including module numbers, walk-in and reach-in environmental rearing chambers, general work area, refrigerator and/or, freezer. Parameters for temperature, relative humidity and light cycle must be specified for each chamber/room (refer to the Insect Quarantine Facility Floor Plan in Appendix 3). To facilitate scheduling of concurrent use of the facility by multiple research groups, dates shall be provided for periods of time when facility equipment will not be required for the entire duration that facility access was requested. [Note: Some work spaces (e.g., cold room) may need to be shared with other facility users as determined by the BSO. Also, some modules can accommodate the installation of additional reach-in chambers, if required].
h) Expected work hours on weekdays, nights, weekends and holidays.
i) Other special requirements, including a description of assistance requested from the BSO.
j) Dated name and signature of the PI. Only one individual shall be designated as the PI for the project.

2.3.2 Request forms will be reviewed by the BSO and approved if criteria specified in 2.2.1 are met. The BSO may request a meeting/discussion with the PI to modify the request in order to better accommodate multiple users of the facility. The BSO will provide a copy of the approved form to the PI, along with agreed modifications. Individuals identified on the approved form will be granted access to the IQ facility for the stated project only and access privileges will expire at the end date of the stated project. Individuals may be required to undergo further quarantine-related training when submitting subsequent *Request to Use IQ Facility* forms due to the availability of new or revised SOPs.

2.3.3 Facility users shall only enter research modules for which access was approved as specified on IPS Form Number 0103/005 (Request to Use IQ Facility, Appendix 1).

2.3.4 Users of the facility may request changes to their original request at any time and the BSO will try to accommodate their needs.

2.3.5 The BSO may revoke access privileges at any time.

2.4 IQ Facility User Agreement

2.4.1 Upon return of a copy of the approved *Request to Use IQ Facility* form by the BSO to the PI, the PI shall ensure that each person identified as being a potential user of the facility provides a signed copy of the *IQ Facility User Agreement* (IPS Form Number 0104/003, Appendix 2) to

the BSO indicating that they have read the *Bio-Safety Manual*, will abide by all of the protocols contained within the SOPs, and will immediately report any mishaps to the BSO. (Failure to comply may result in revocation of access privileges). The BSO will then schedule and administer the required quarantine related training before these persons are allowed entry into the facility.

2.5 Training

2.5.1 All scientific and maintenance personnel must be trained/approved by the BSO in the use of applicable SOPs (as determined by the BSO) before being allowed to work in the facility. Additional training will be provided by the BSO upon the implementation of new or revised SOPs.

2.6 Level of Access

2.6.1 Users of the IQ facility will be identified by the BSO as *Newcomers*, having *Restricted Access,* or having *Full Access*, based on their level of training and experience in quarantine procedures. The BSO and the IPS manager have *Full Access* to the facility.

2.6.2 Users identified as having *Full Access* will be given swipe card access to applicable portions of the IQ facility, as determined by the BSO. Users with *Full Access* may enter/leave the facility as needed.

2.6.3 *Newcomers* and *Restricted Access* facility users will not be granted swipe card access, must contact the BSO each time they need facility access, and must make prior arrangements with the BSO to gain facility access outside of normal working hours.

2.6.4 *Restricted Access* users (but not *Newcomers* except as stated in 2.6.6) may also gain entry to the facility via *Full Access* users within the same working group.

2.6.5 *Restricted Access* users will be escorted into the facility each time they require entry. The BSO (or *Full Access* user as specified in 2.6.4) shall monitor their activities as needed (i.e., they may be left unattended for short periods of time).

2.6.6 *Newcomers* will be continuously monitored by the BSO until they become designated by the BSO as having *Restricted Access*. The BSO may assign a *Full Access* user to monitor/accompany a *Newcomer*.

2.6.7 Facility access will be denied to all users identified on the *Request to Use IQ Facility* form upon completion of the project. Subsequent access privileges may be reinstated upon the approval of a new research project in the IQ facility.

2.6.8 Researchers will not normally be given access to the upper level of the IQ facility (i.e., swipe card access through door AA250) unless deemed necessary by the BSO.

2.7 Access by Cleaning Personnel

2.7.1 GLFC cleaning staff are not permitted to enter the IQ facility at any time.

2.8 Access by Maintenance Personnel

2.8.1 Facility maintenance personnel and external contractors may enter the IQ facility as specified in the current version of SOP Number 0034 (Maintenance Personnel Responsibilities).

2.9 Visitor Access

2.9.1 Scientific personnel who have been authorized by the BSO to use the facility shall not provide access to anyone not identified on the previously submitted *Request to Use the IQ Facility* form (IPS Form Number 0103/005, Appendix 1). Requests for access by others shall be made directly to the BSO. The BSO (or the IPS manager) may provide tours for visitors to the facility. PIs having full facility access privileges may provide tours upon notification/approval of the BSO prior to each event.

2.9.2 The BSO (or the IPS manager, or PI as stated in 2.9.1) shall instruct visitors (i.e., tours) on entry/exit procedures and shall escort them during the entire time that they are present in the facility.

2.10 Calculations

NA

2.11 Documentation and Reporting

2.11.1 Compliance to this SOP shall include completion of the following forms:

a) IPS Form Number 0103/005 (*Request to Use IQ Facility*, Appendix 1).
b) IPS Form Number 0104/003 (*IQ Facility User Agreement*, Appendix 2).

3.0 DISTRIBUTION AND ARCHIVING

3.1 Distribution

This SOP shall be distributed by the IPS manager to IPS personnel who are required to work in the IQ facility and to any other potential facility users (e.g., GLFC personnel) who request a controlled copy. Controlled copies are monitored for chain of custody to ensure that current versions are distributed timely and that outdated versions are destroyed. A current version of this SOP may be viewed in the *Bio-Safety Manual* maintained within the IQ facility or through the GLFC intranet.

3.2 Archiving

3.2.1 The IPS manager shall maintain a historical file of this SOP when it is replaced by a new version.

3.2.2 The BSO shall maintain historical files of submitted forms, including the *Request to Use IQ Facility* (IPS Form Number 0103/005, Appendix 1) and the *IQ Facility User Agreement* (IPS Form Number 0104/003, Appendix 2).

3.3 Destruction of Outdated SOPs

When a new version of this SOP is available for distribution, all persons in possession of a controlled copy shall ensure that the retired version is returned to the IPS manager upon request.

4.0 ASSURING SOP VALIDATION AND COMPLIANCE

4.1 Responsible Individual

4.1.1 The BSO is responsible for assuring that this SOP is valid.

4.1.2 The BSO is responsible for assuring that this SOP is followed by anyone requiring access to the GLFC Insect Quarantine facility to conduct research activities and that these persons have been appropriately trained in the use of this SOP.

4.1.3 IQ facility users are responsible for complying with procedures specified on a *Controlled Copy* of this SOP and shall never use non-controlled copies (which could be outdated).

5.0 REVISION OF THE SOP

5.1 Responsible Individual

The BSO is responsible for assuring that this SOP is current. If necessary, the BSO shall initiate the revision process.

5.2 Revision Schedule

This SOP shall be revised when its provisions no longer agree with current practices or GLFC policies, and shall be approved by the IPS manager and the CFIA Office of Biohazard Containment and Safety.

6.0 CONTINGENCIES

When facility users find circumstances that do not permit compliance with this SOP, the BSO shall be consulted.

7.0 CONFIDENTIALITY

IPS SOPs are not considered to be confidential documents and may be distributed to outside parties. *Controlled Copies* shall not be reproduced.

8.0 REFERENCES

Bio-Safety Manual
Current version of SOP Number 0034 (Maintenance Personnel Responsibilities)

9.0 APPENDICES

Appendix 1: IPS Form Number 0103/005 (*Request to Use IQ Facility*).
Appendix 2: IPS Form Number 0104/003 (*IQ Facility User Agreement*).
Appendix 3: Insect Quarantine Facility Floor Plan.

Appendix 1

Request to Use IQ Facility

SECTION A – TO BE COMPLETED BY THE APPLICANT*

Project Description:

Facility Use Start Date: (DD/MM/YY) Facility Use End Date: (DD/MM/YY)

Names of Potential Users:

Insect species to be brought into facility
Scientific Name: Life Stage(s): Date(s) of Arrival: (DD/MM/YY) Source:

Materials to be brought into facility (e.g., equipment, plant materials, soil, pathogens, etc.):

Materials to be removed from facility (e.g., dead insects, equipment, etc.):

Facilities Requested:

✓	Module/Room Name	✓	Chamber	°C	%RH	Lights On	Lights Off
	Cold Room AA128				NA	NA	NA
	Module AA127		Reach-in				
			Walk-in				
	Module AA126		Reach-in				
			Walk-in				
	Module AA123 (Electrophysiology Lab)		Reach-in				
			Room				
	ModuleAA121(Flushing Room)		Room				
	General Work Area AA125		Reach-in				
			Fridge	NA	NA	NA	NA
			Freezer	NA	NA	NA	NA
			Oven		NA	NA	NA
			Counters	NA	NA	NA	NA
	Module AA227		Reach-in				
			Walk-in				
	Module AA228		Reach-in				
			Walk-in				

Indicate dates required if different than facility use start and end dates specified above:

Expected Work Hours
Weekdays: Nights: Weekends: Holidays:

Other Special Requirements (e.g., description of assistance requested from Bio-Safety Officer):

Principal Investigator Name: Signature: Date: (DD/MM/YY)

SECTION B – TO BE COMPLETED BY THE BIO-SAFETY OFFICER

Approved**☐ Disapproved ☐ BSO Signature: Date: (DD/MM/YY)

**Lab wear to be worn: ☐ Lab coats ☐ Bunny suit, shoe covers, head cover, beard cover (if applicable)

*Submit the completed form to the GLFC Bio-Safety Officer

IPS Form Number 0103/005

Appendix 2

IQ Facility User Agreement

My signature below stipulates that I have read the *Bio-Safety Manual* for users of the GLFC Insect Quarantine facility, agree to abide by all of the protocols contained within and will report any mishaps to the BioSafety Officer. Failure to comply may result in revocation of facility access privileges.

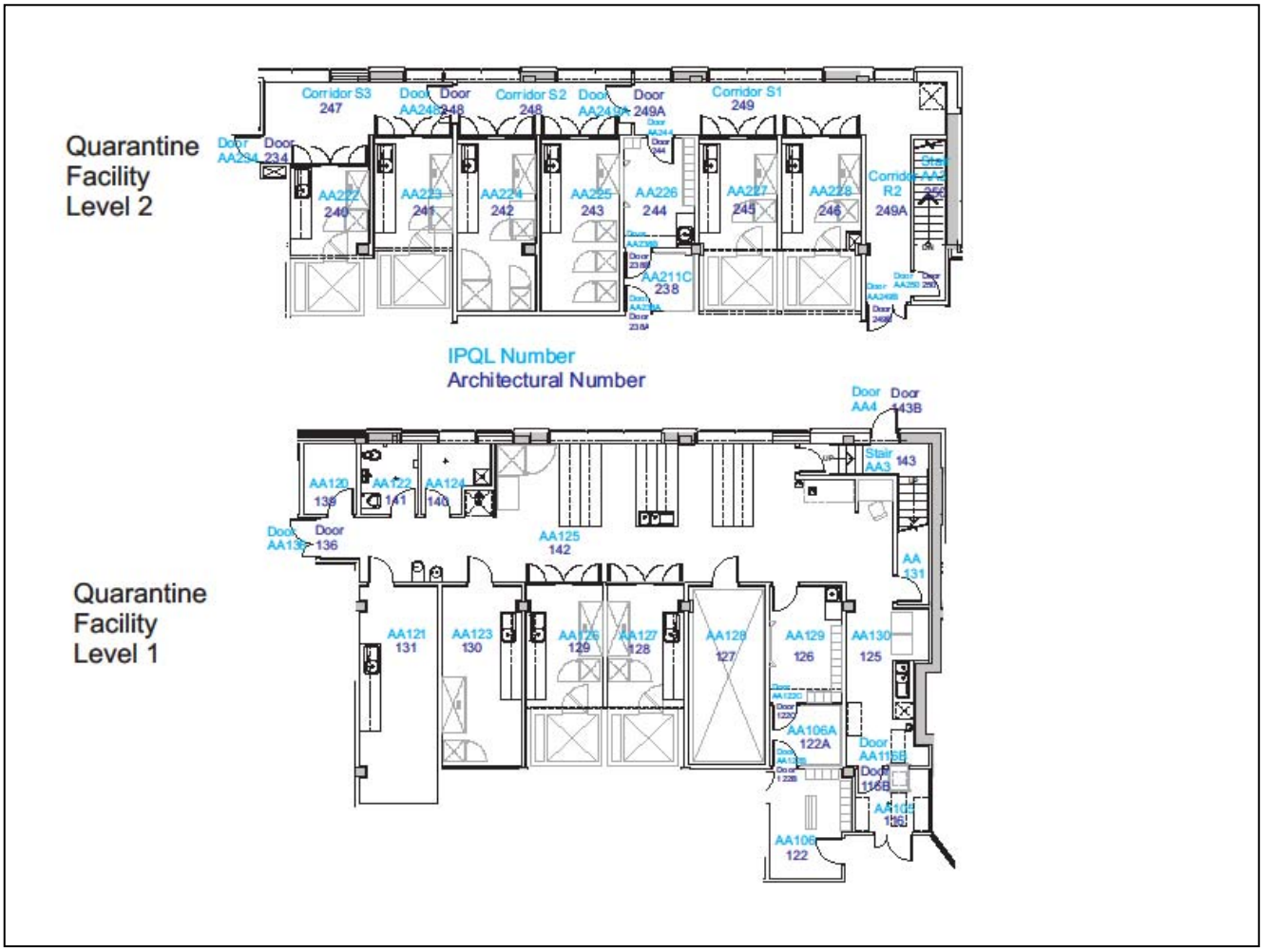
Printed Name: _____
(Quarantine User)

Signature: _____

Date: _____
(DD/MM/YY)

IPS Form Number 0104/003

Appendix 3


Quarantine Facility Level 2
Corridor S3 247
Corridor S2 248
Corridor S1 249
Door 234
AA222 240
AA223 241
AA224 242
AA225 243
AA226 244
AA227 245
AA228 246
Corridor R2 249A
AA211C 238
IPQL Number
Architectural Number
Quarantine Facility Level 1
Door 143B
Stair AA3 143
AA120 139
AA122 141
AA124 140
Door 136
AA125 142
AA 131
AA121 131
AA123 130
AA126 129
AA127 128
AA128 127
AA129 126
AA130 125
AA106A 122A
AA106 122

TITLE: Movement of Exotic Forest Insects

APPROVING OFFICIAL:

DD / MM / YY

Manager, Insect Production Services (IPS) _____ ___/___/___

SIGNIFICANT CHANGES FROM PREVIOUS VERSION:

-A Permit to Import is now only valid for 1 year.
-The web location has changed for the *Application for Permit to Import Plants and Other Things under the Plant Protection Act*.
-The title "Insect Quarantine Officer (IQO)" has been revised to "Bio-Safety Officer (BSO)" to match terminology used by the regulatory authority (i.e., CFIA).
-Insect Quarantine (IQ) facility users are now advised to apply for a *Permit to Import* at least 3 months in advance of the proposed shipping date.

1.0 INTRODUCTION

1.1 Purpose

This Standard Operating Procedure (SOP) describes CFIA, North American Plant Protection Organization (NAPPO) and Great Lakes Forestry Centre (GLFC) standards and policies for moving live exotic forest insects or infested materials to or from the GLFC IQ facility. Conditions specified by the CFIA on a *Permit to Import* or on a *Movement Certificate* take precedence over the procedures identified in this SOP.

1.2 Scope

This SOP shall be followed by all users of the GLFC IQ facility who are responsible for the movement of live exotic forest insects or infested materials to or from the facility.

1.3 Definitions

Bio-Safety Officer (BSO) – A member of IPS who has supervisory authority over the daily operation of the IQ facility and who provides technical/research support to users of the facility.

Canadian Food Inspection Agency (CFIA) – The CFIA is the national plant protection organization responsible for the administration and enforcement of the Plant Protection Act.

Controlled Copy – A copy of an SOP distributed to select GLFC personnel having a unique copy number and dated signature of the IPS manager.

Controlled copies are intended to ensure that GLFC personnel follow the most recent version of the SOP.

Effective Date – The date from which the procedures given in an SOP are to be implemented.

Great Lakes Forestry Centre (GLFC) – One of five Canadian Forest Service (CFS) research facilities in Canada.

Insect Production Services (IPS) – A GLFC work team consisting of the Insect Production Unit (IPU), the Quality Control Unit (QCU) and IQ personnel who perform insect rearing, quality control and quarantine activities in support of forest pest research activities internal and external to the CFS.

Insect Production Services Manager – The individual who has overall responsibility for activities of the IPS team.

Insect Quarantine (IQ) – A general-use facility under the control of IPS used for rearing exotic forest insects and conducting associated research activities.

Movement Certificate – A document issued pursuant to the Plant Protection Act and signed by an inspector that authorizes the movement of things within Canada or from Canada to a foreign destination.

North American Plant Protection Organization (*NAPPO)* - a regional plant protection organization of the International Plant Protection Convention, coordinates the efforts among Canada, the United States and Mexico to protect their plant resources from the entry, establishment and spread of regulated plant pests, while facilitating intra/interregional trade.

Permit to Import – A document issued pursuant to the Plant Protection Act that authorizes the import of things into Canada.

Standard Operating Procedures (SOPs) – Directives describing routine administrative or technical procedures conducted by IPS personnel or users of the IQ facility.

Voucher Specimen – A representative insect sample obtained from a batch of exotic forest insects brought to GLFC under a *Permit to Import* or a *Movement Certificate* and provided to the BSO for archiving.

1.4 Safety

NA

1.5 Materials

1.5.1 Current version of the *Application for Permit to Import Plants and Other Things under the Plant Protection Act* and instructions for completion: http://www.inspection.gc.ca/english/for/pdf/c5256e_re.pdf

2.0 PROCEDURES

2.1 Permit to Import

2.1.1 A *Permit to Import* issued by the CFIA is mandatory for the import of live exotic forest insects or infested materials. Refer to the CFIA website for a current list of regulated pests: http://www.inspection.gc.ca/english/plaveg/protect/listpespare.shtml

2.1.2 Facility users intending to import live exotic forest insects or infested materials for conducting research activities within the IQ facility shall first obtain facility access authorization from the BSO (refer to the current version of SOP Number IPS/030; *IQ Facility Access Authorization*).

2.1.3 Refer to the CFIA website to download the most recent application form (i.e., *Application for Permit to Import Plants and Other Things under the Plant Protection Act*) and instructions for completion and submission: http://inspection.gc.ca/english/for/pdf/c5256e_re.pdf

2.1.4 Facility users are advised to apply for a *Permit to Import* well in advance (e.g., 3 months) of the shipment being exported from the country of origin.

2.1.5 Facility users are responsible for fees associated with submitting an application for import. Refer to the CFIA website for a current fee structure: http://www.inspection.gc.ca/english/reg/cfiaacia/feesfrais/part_12e.shtml

2.1.6 Facility users shall provide the BSO with a copy of the completed application prior to submission and a copy of the *Permit to Import* upon receipt from the CFIA. A copy of the *Permit to Import* shall also be provided to the local CFIA inspector by the facility user.

2.1.7 Facility users are responsible for arranging transport of the insects to the IQ facility and must ensure that the exporter:

a) marks shipping containers and accompanying invoice to identify the person importing the insect, the foreign exporter, the insect species and the import permit number;
b) encloses materials in chew proof containers (e.g., hard plastic or metal) that are completely sealed with tape;
c) complies with handling, transport and/or documentation requirements specified by the CFIA on the *Permit to Import*; and

d) includes a copy of the *Permit to Import* with the shipping containers so that it will be readily available to the broker (if applicable) and to Canada Customs officials at the point of entry.

2.1.8 Facility users shall comply with all conditions set out by the CFIA on the *Permit to Import* and shall ensure that importation is transacted not later than the expiration date specified, unless an extension is granted by the issuing office.

2.1.9 A *Permit to Import* is valid for a period of one year unless otherwise stated by the issuing office. It is the responsibility of the importer to renew the *Permit to Import* as required.

2.1.10 Upon becoming aware of an incident whereby there is an actual or potential escape or release of insects during transport, the person importing the material shall ensure that immediate action is taken to prevent the situation from escalating (i.e., placing a patch on a broken shipping container) and as many of the free insects are collected as possible. Breaches that occur during transport shall be reported immediately to the CFIA and their recommendation for additional corrective action shall be followed. All incidents shall be documented and reported to the BSO as specified in the current version of SOP Number IPS/033 (*Conducting Research in Insect Quarantine*).

2.2 Movement Certificate

2.2.1 A *Movement Certificate* issued by the CFIA is mandatory for the movement of live exotic forest insects and/or host materials from any domestic area of infestation into a non-regulated area. A certificate is also required when moving materials from the IQ facility to any other domestic or foreign destination.

2.2.2 Facility users intending to move insects and/or host materials as specified in 2.2.1 to the IQ facility shall first obtain facility access authorization from the BSO (refer to the current version of SOP Number IPS/030; *IQ Facility Access Authorization*).

2.2.3 Facility users requiring a *Movement Certificate* shall contact the CFIA area or regional office closest to the location from which the insect and/or host material is to be exported and provide the request (verbally or by email) to the inspector who has signing authority for certificates. Refer to the following website to locate CFIA area and regional offices: http://www.inspection.gc.ca/english/directory/offbure.shtml

2.2.4 Facility users shall be prepared to provide the following information about the material to the CFIA inspector when requesting a *Movement Certificate*:

a) location of origin
b) destination
c) description, including quantity and identifying marks
d) date of transport

e) name of the individual (i.e., an employee of GLFC) transporting it
f) description of its temporary storage at GLFC prior to entering the IQ facility, if applicable (e.g., location, duration, environmental conditions, security, etc.).

2.2.5 The individual transporting the material shall ensure that:

a) Materials are enclosed in chew proof containers (e.g., hard plastic or metal) and are completely sealed with tape.
b) Shipping containers bear such marks that will identify the contents.
c) Containers are properly secured in a transporting vehicle in a manner that restricts movement of the sample.
d) Conditions for handling/transport are complied with as specified by the CFIA on the *Movement Certificate*.
e) Materials/containers are made available for inspection as requested by the CFIA.
f) Materials are transported on the date specified on the *Movement Certificate* unless an extension is granted by the issuing office.
g) Shipment is accompanied by a copy of the signed *Movement Certificate*.
h) Materials are transported directly to the IQ facility unless specified otherwise on the *Movement Certificate*.
i) Upon becoming aware of an incident whereby there is an actual or potential escape or release of insects during transport, immediate action is taken to prevent the situation from escalating (i.e., placing a patch on a broken shipping container) and as many of the free insects as possible are to be collected. Breaches that occur during transport shall be reported immediately to the CFIA inspector identified on the *Movement Certificate* and their recommendation for additional corrective action shall be followed. All incidents shall be documented and reported to the BSO as specified in the current version of SOP Number IPS/033 (*Conducting Research in Insect Quarantine*).

2.3 Receipt of Materials at GLFC

2.3.1 Upon the arrival of exotic forest insects and/or host material at GLFC, the individual transporting/importing the insects/materials shall provide both the BSO and the local CFIA inspector with a copy of the signed *Movement Certificate*. Containers shall be made available for inspection as requested by the local CFIA inspector. If the inspector is not on-site at the time of arrival of the material, no action is required beyond the delivery of the *Movement Certificate* to the inspector's office. (For materials that arrive via a *Permit to Import*, the BSO and the local CFIA inspector shall be notified verbally or by email).

2.3.2 The individual responsible for the import or movement shall follow the procedures described in the current version of SOP Number IPS/033 (*Conducting Research in Insect Quarantine*) for notifying the BSO,

bringing materials into the IQ facility, opening the shipping containers and cleaning/disposing of the shipping containers.

2.3.3 The CFIA shall be notified if containers are lost during transport and not immediately located. Such incidents shall be documented and reported to the BSO as specified in the current version of SOP Number IPS/033 (*Conducting Research in Insect Quarantine*).

2.3.4 Voucher specimens of exotic forest insects shall be provided to the BSO for archiving as specified in the current version of SOP Number IPS/033 (*Conducting Research in Insect Quarantine*).

2.4 Approval to Move or Export Insects from IQ Facility

2.4.1 Facility users intending to move insects or infested materials from the IQ facility to a domestic or foreign destination shall follow the procedures specified in *2.2*.

2.4.2 Facility users intending to export insects or infested materials from the IQ facility to a foreign destination shall also comply with the shipping procedures and documentation requirements of the importing country.

2.5 Revocation of Facility Access Privileges

2.5.1 Facility users who do not comply with this SOP will have their facility access privileges revoked by the BSO.

2.6 Calculations

NA

2.7 Documentation and Reporting

2.7.1 Compliance to this SOP may include completion of the following:
a) *Application for Permit to Import Plants and Other Things under the Plant Protection Act*.
b) Incident reporting (refer to the current version of SOP Number IPS/033; *Conducting Research in Insect Quarantine*).

2.7.2 Compliance to this SOP shall include the provision of copies of the following documents to the BSO:
a) *Application for Permit to Import Plants and Other Things under the Plant Protection Act*
b) *Permit to Import*
c) *Movement Certificate*

2.7.3 Compliance to this SOP shall include the provision of copies of the following documents to the local CFIA inspector:
a) *Permit to Import*
b) *Movement Certificate*

3.0 DISTRIBUTION AND ARCHIVING

3.1 Distribution

This SOP shall be distributed by the IPS manager to IPS personnel who are required to work in the IQ facility and to any other potential facility users (e.g., GLFC personnel) who request a controlled copy. Controlled copies are monitored for chain of custody to ensure that current versions are distributed timely and that outdated versions are destroyed. A current version of this SOP may be viewed in the *IQ Procedural Manual* maintained within the IQ facility or through the GLFC intranet.

3.2 Archiving

3.2.1 The IPS manager shall maintain a historical file of this SOP when it is replaced by a new version.

3.3 Destruction of Outdated SOPs

When new versions of this SOP are available for distribution, all persons in possession of a controlled copy shall ensure that the retired version is returned to the IPS manager upon request.

4.0 ASSURING SOP VALIDATION AND COMPLIANCE

4.1 Responsible Individual

4.1.1 The BSO is responsible for assuring that this SOP is valid.
4.1.2 The BSO is responsible for assuring that this SOP is followed by anyone conducting research in the GLFC IQ facility and that those persons have been appropriately trained in the use of this SOP.
4.1.3 IQ facility users are responsible for complying with procedures specified on a *Controlled Copy* of this SOP and shall never use non-controlled copies (which could be outdated).

5.0 REVISION OF THE SOP

5.1 Responsible Individual

The BSO is responsible for assuring that this SOP is current. If necessary, the BSO shall initiate the revision process.

5.2 Revision Schedule

This SOP shall be revised when its provisions no longer agree with current practices, GLFC policies, CFIA standards, or NAPPO standards and shall be approved by the IPS manager and the CFIA Office of Biohazard Containment and Safety.

6.0 CONTINGENCIES

When facility users find circumstances that do not permit compliance with this SOP, the BSO shall be consulted.

7.0 CONFIDENTIALITY

IPS SOPs are not considered to be confidential documents and may be distributed to outside parties. *Controlled Copies* shall not be reproduced.

8.0 REFERENCES

a) *Application for Permit to Import Plants and Other Things under the Plant Protection Act* and instructions for completion: http://www.inspection.gc.ca/english/for/pdf/c5256e_re.pdf
b) CFIA list of regulated pests: http://www.inspection.gc.ca/english/plaveg/protect/listpespare.shtml
c) CFIA fee structure for a *Permit to Import*: http://www.inspection.gc.ca/english/reg/cfiaacia/feesfrais/part_12e.shtml
d) CFIA area and regional offices: http://www.inspection.gc.ca/english/directory/offbure.shtml
e) Current version of SOP Number IPS/030 (*IQ Facility Access Authorization*)
g) Current version of SOP Number IPS/033 (*Conducting Research in Insect Quarantine*).

9.0 APPENDICES

NA

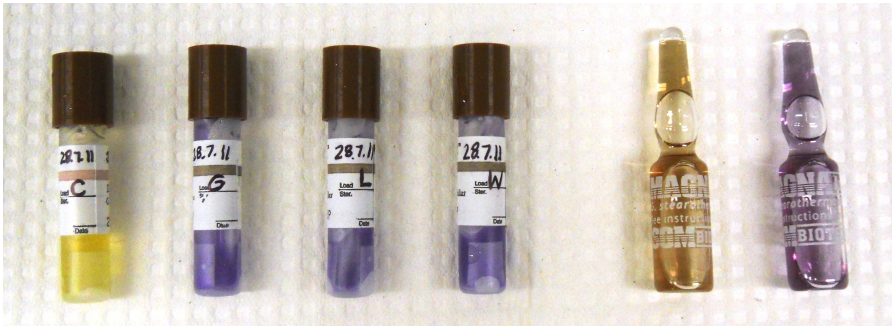
Natural Resources Canada | Ressources naturelles Canada

Great Lakes Forestry Centre
Insect Production Services

STANDARD OPERATING PROCEDURE

Number: IPS/032/003

Bio-Safety Officer Responsibilities



Effective Date: 4 September 2014

Canada

TITLE: Bio-Safety Officer Responsibilities

APPROVING OFFICIAL:

DD/MM/YY

Manager, Insect Production Services (IPS) _____ ___/___/___

SIGNIFICANT CHANGES FROM PREVIOUS VERSION:

-This Standard Operating Procedure (SOP) has been modified to include a procedure for autoclaving intact log bolts.
-An annual validation procedure has been added for intact log bolts.
-A new form has been added.

1.0 INTRODUCTION

1.1 Purpose

This SOP has been established to ensure that responsibilities of the BSO are clearly defined and are conducted timely, consistently and in support of maintaining the established IPS quality management system.

1.2 Scope

This SOP shall be followed by the BSO in the performance of her/his duties. The IPS manager shall provide back-up for the BSO and follow the duties described herein.

1.3 Definitions

Biological Safety Cabinet (BSC) – A class 2 containment cabinet designed for both worker and sample protection; room air is drawn into the front of the unit; the unit is designed in such a way that room air is HEPA filtered before blowing over the work area; air-borne hazardous particles coming off samples in the work area are pulled away from the worker and the air is vented back into the room after HEPA filtration; this type of unit is not suitable for worker protection from chemical fumes.

Bio-Safety Manual – A manual containing only those IPS SOPs that relate specifically to the IQ facility.

Bio-Safety Officer (BSO) – A member of IPS who has supervisory authority over the daily operation of the IQ facility and who provides technical/research support to users of the facility.

Controlled Copy – A copy of an SOP distributed to select GLFC personnel having a unique copy number and dated signature of the IPS manager. Controlled copies are intended to ensure that GLFC personnel follow the most recent version of the SOP.

Delta System – Hardware/software system used by GLFC engineering personnel to program, monitor and track environmental conditions within the facility and to provide an alarm when tolerance limits are exceeded.

Effective Date – The date from which the procedures given in an SOP are to be implemented.

Great Lakes Forestry Centre (GLFC) – One of five Canadian Forest Service (CFS) research facilities in Canada.

Insect Production Services (IPS) – A GLFC work team consisting of the Insect Production Unit (IPU), the Quality Control Unit (QCU) and insect quarantine (IQ) personnel who perform insect rearing, quality control and quarantine activities in support of forest pest research activities internal and external to the CFS.

Insect Production Services Manager – The individual who has overall responsibility for activities of the IPS team.

Insect Production Unit (IPU) – A work unit of IPS consisting of personnel who perform insect rearing, diet making and methods development activities at GLFC.

Insect Quarantine (IQ) – A general-use facility under the control of IPS used for rearing exotic forest insects and conducting associated research activities.

Insectary – A multi-species rearing facility under the control of IPS used exclusively by the IPU for maintaining insect colonies and preparing artificial diets.

Invasive Insects – Insects that adversely affect the habitats and bioregions they invade economically, environmentally, and/or ecologically and have become newly established in that area. They can be domestic (i.e., native to Canada) or introduced (i.e., exotic, non-indigenous, alien).

NIST Traceable Thermometer/Hygrometer – A thermometer/hygrometer with a manufacturer's certificate of accuracy verifying that it was calibrated and tested against standards traceable to the National Institute of Standards and Technology (NIST).

Principal Investigator (PI) - An individual internal or external to GLFC who has the responsibility for the overall conduct of the phase(s) of a study performed within the IQ facility.

Quality Control Lab – An analytical laboratory under the control of IPS used by the QCU for monitoring production, process and product control for all IPU insect colonies, and for developing new QC methods and procedures.

Quality Control Unit (QCU) – A work unit of IPS consisting of personnel who conduct routine production, process and product control testing and develop new QC methodology in support of IPU activities.

Standard Operating Procedures (SOPs) – Directives describing routine administrative or technical procedures conducted by IPS personnel or users of the IQ facility.

Voucher Specimen – A representative insect sample obtained from a batch of exotic insects brought to GLFC under a *Permit to Import* or a *Movement Certificate* and provided to the BSO for archiving.

1.4 Safety

1.4.1 The BSO must exercise health precautions to minimize risk to her/himself and to co-workers.
1.4.2 The BSO shall have access to, and be familiar with, the MSDS for all chemicals used in the IQ facility.
1.4.3 The BSO shall maintain a chemical/hazardous substance inventory for the IQ facility following current GLFC policies.

1.5 Materials

1.5.1 IPS Form Number 0108/005 (*Weekly Checklist for IQ Facility*, Appendix 1).
1.5.2 IPS Form Number 0109/005 (*Monthly Checklist for IQ Facility*, Appendix 2).
1.5.3 IPS Form Number 0110/002 (*IQ Training Log*, Appendix 3).
1.5.4 IPS Form Number 0111/001 (*IQ User Access Level,* Appendix 4).
1.5.5 IPS Form Number 0081/002 (*Equipment Logbook,* Appendix 5).
1.5.6 IPS Form Number 0082/001 (*Maintenance and Repair Log,* Appendix 6).
1.5.7 IPS Form Number 0083/001 (*Cleaning log,* Appendix 7).
1.5.8 IPS Form Number 0084/001 (*Calibration Log,* Appendix 8).
1.5.9 IPS Form Number 0112/002 (*IQ Insect Receipt Log,* Appendix 9).
1.5.10 IPS Form Number 0113/001 (*IQ Insect Transfer Log* Appendix 10).
1.5.11 IPS Form Number 0114/001 (*IQ Autoclave Log*, Appendix 11).
1.5.12 Insect Quarantine Autoclave Settings.
1.5.13 IPS Form Number 0115/002 (*IQ Facility Inspection Checklist*, Appendix 13).
1.5.14 IPS Form Number 0116/002 (*IQ BSC Flow Rates,* Appendix 14).
1.5.15 Validation of Autoclave Sterilization using Biological Indicators (Appendix 15).
1.5.16 IPS Form Number 0142/002 (Air Pressure Monitor Validation, Appendix 16).
1.5.17 IPS Form Number 0156/001 (Autoclave Validation for Whole Log Bolts, Appendix 20).

2.0 PROCEDURES

2.1 Approving Requests to Use IQ Facility

2.1.1 Upon receipt of a written request for using the IQ facility (i.e., refer to the current version of IPS Form Number 0103; *Request to Use IQ Facility*), the BSO shall review the form and may request a meeting/discussion with the PI to modify the request to better accommodate multiple users of the facility. The BSO shall provide specific instructions for pest-associated hazards to prevent the accidental release of pests. Agreed changes shall be documented on the form by the BSO. Approval shall be granted by dated signature of the BSO only if: 1) criteria for scheduling facility use are met (refer to the current version of SOP Number IPS/030, *IQ Facility Access Authorization*), and 2) upon determination that the IQ facility is currently approved by the CFIA for receiving the requested insect species from the specified source (refer to CFIA directive D-12-03). If the BSO is in agreement that scheduling criteria are met, but not CFIA approval, she/he shall apply for written authorization from the CFIA as per the procedure identified in D-12-03.

2.1.2 The BSO may approve entry of non-exotic invasive species (e.g., mountain pine beetle) into the IQ facility.

2.1.3 When space or conflicting activities within the facility become problematic, the IPS manager will assign priority. Disagreements will be forwarded by the IPS manager to the Director, Integrated Pest Management, for resolution.

2.1.4 The BSO shall provide a copy of the approved request form to the PI and shall maintain the original with facility records.

2.1.5 The BSO shall try to accommodate changes to the original request upon notification by the PI (or representative) during the conduct of the research project.

2.1.6 The BSO may revoke access privileges at any time.

2.2 Training

2.2.1 Upon approval of a written request for using the IQ facility (i.e., current version of IPS Form Number 0103. *Request to Use IQ Facility*), the BSO shall compare the names of identified potential users with the *IQ Training Log* (refer to 2.2.4) to determine the need for provision of training in new or revised SOPs.

2.2.2 The BSO shall provide *Bio-Safety Manual* training as follows:

a) Upon receipt of a signed *IQ Facility User Agreement* (i.e., refer to the current version of IPS Form Number 0104), the BSO shall meet with the potential facility user(s) and provide a detailed overview of the contents of the *Bio-Safety Manual* through presentation of a PowerPoint slide-show or by reading aloud each applicable SOP, provide verbal clarification where necessary and provide explanations of the intent of every procedure specified.

b) The BSO shall request the user to review the *CFIA Containment Standards for Handling Plant Pests* as well as applicable SOPs in the

Bio-Safety Manual (located on the GLFC intranet) and instruct them to read the material prior to commencing work in the IQ facility.

2.2.3 Whenever new or revised SOPs have been approved for use, the BSO shall inform all applicable/current users of the facility and provide/document training as soon as possible.

2.2.4 The BSO shall maintain a record of all training that she/he provides to users of the IQ facility using IPS Form Number 0110/002 (*IQ Training Log*, Appendix 3). A separate form shall be initiated for each facility user. The BSO shall maintain a historical file of these records.

2.2.5 The BSO shall provide new users with an on-site demonstration of access procedures (including when, where and how to don/doff lab wear), followed by a tour of the facility whereby she/he describes the physical operation and design of the facility. Prior users shall be provided with a demonstration of any procedures that have been revised since their last use of the facility.

2.2.6 Demonstration of the location of the following safety items shall be provided to new users of the facility:

a) fire extinguishers
b) telephones (including emergency contact numbers)
c) emergency exits
d) first aid kit
e) MSDS
f) eyewash stations
g) emergency shower
h) chemical spill kit
i) biological spill kit

2.2.7 The BSO shall monitor users (new and prior) closely as they perform procedures identified in the SOPs for the conduct of their research program in the IQ facility. New users must be accompanied by the BSO at all times (except as stated in 2.3.9). The level of monitoring required will be determined by the BSO on a case-by-case basis and will likely diminish over time.

2.2.8 Facility maintenance personnel shall be trained by the BSO (or IPS manager) in the use of applicable SOPs (or pertinent sections of SOPs) before being allowed to enter or work in the facility. Maintenance personnel are required to read applicable portions of the Bio-Safety Manual and to sign the IQ Facility User Agreement (IPS Form Number 0104). Training shall be documented by the BSO (or IPS manager, if applicable) as specified in 2.2.4.

2.2.9 The BSO shall train facility users in the use of the biological spill kit.

2.3 Assigning Level of Access

2.3.1 The BSO shall designate IQ users with one of the following levels of access for the facility, based on her/his assessment of the user's qualifications/experience in IPS IQ procedures:
   a) *Newcomer* - those individuals having little or no experience in the IPS IQ facility.
   b) *Restricted Access* - those individuals having limited experience.
   c) *Full Access* - those individuals having significant experience.

2.3.2 The BSO shall accompany and monitor the activities of *Newcomers* at all times within the IQ facility (except as stated in 2.3.9).

2.3.3 Individuals designated as having *Restricted Access* shall be escorted into the facility each time they require entry. The BSO shall monitor their activities as needed (i.e., they may be left unattended for short periods of time).

2.3.4 Individuals designated as having *Full Access* shall be permitted un-restricted access to the facility and the BSO may conduct sporadic monitoring of their activities. These individuals shall have their swipe card re-programmed for entry into applicable portions of the IQ facility as specified in 2.33.

2.3.5 Based on the assessment of the BSO, facility users may progress through the various levels of access.

2.3.6 Facility users must be trained in IPS IQ procedures (refer to 2.2) before being assigned any level of access.

2.3.7 The BSO shall document facility user names, level of access and date of competence for each level on IPS Form Number 0111/001 (*IQ User Access Level*, Appendix 4). This form shall be maintained with facility records.

2.3.8 The date when access is terminated (either at the end of the research program or when access privileges are revoked) for any facility user shall be documented by the BSO on the *IQ User Access Level* form. Swipe card access will be terminated as specified in 2.33. Subsequent access privileges may be reinstated as specified in 2.33.

2.3.9 The BSO may assign any facility user previously designated as having *Full Access* to monitor/accompany the activities of those having *Newcomer* or *Restricted Access*.

2.4 Visitors

2.4.1 Tours of the IQ facility shall be kept to a minimum to reduce the entry of contaminants and to reduce the risk of escape of controlled insects.

2.4.2 The BSO (or IPS manager) shall escort and monitor visitors at all times within the IQ facility. Upon request, the BSO may approve a PI (only those having *Full Access* privileges) to provide a tour.

2.4.3 The BSO (or IPS manager/PI as specified in 2.4.2) shall provide visitors with basic training on entry and exit procedures and shall provide them with the garments specified in 2.8.2.

2.4.4 Prospective facility users shall be provided a tour, upon request, to determine whether or not the facility will meet their needs.

2.4.5 Regulatory inspectors shall be allowed access to the facility without prior notice. The BSO (or IPS manager) shall provide basic instruction on facility entry and exit procedures. Inspectors shall be provided with the garments specified in 2.8.2. Inspectors shall be escorted at all times.

2.5 BSO Contact Information

2.5.1 The BSO shall ensure that signage is installed on facility entry doors indicating the level of containment (e.g., PPC-2A) and contact information for the BSO and IPS manager during and after normal working hours.

2.5.2 Each telephone or telephone docking station in the IQ facility shall be posted with the contact information for both the BSO and the IPS manager during and after normal work hours.

2.5.3 The BSO shall ensure that each environmental chamber/room in the IQ facility is posted with her/his contact information during and after normal work hours. The BSO will normally be identified as the primary contact and the user of the unit identified as the alternate contact.

2.6 Maintaining Facility Access Logs

2.6.1 The BSO shall post an *Insect Quarantine Access Log* (refer to the current version of IPS Form Number 0106) at the door to each anteroom and replace it at least monthly. Completed forms shall be maintained by the BSO with facility records.

2.7 Breach in Security/Access

2.7.1 The BSO shall immediately notify the IPS manager when any breach in the security/access of the IQ facility becomes evident. The BSO and IPS manager shall take corrective action to ensure the integrity of the containment barrier and to revise procedures to prevent future breaches. Breaches shall be documented on an *Insect Quarantine Incident Report* as specified in section 2.18.

2.8 Provision of Equipment and Supplies

2.8.1 The BSO shall ensure that the IQ facility is stocked with basic laboratory equipment, instruments and supplies as specified in the current version of SOP Number IPS/033 (*Conducting Research in Insect Quarantine*).

2.8.2 The BSO shall ensure that sufficient quantities and sizes of lab wear are always available in the change area for facility users, visitors and maintenance personnel. At the start of each research program, lab wear of the appropriate size shall be labeled with the name of potential facility

users and hung in the applicable lockers and areas having heightened bio-safety requirements. A sufficient number of lab wear shall be labeled for visitors and hung in the applicable lockers. Lab wear shall be labeled with the names of maintenance personnel and shall be stored in the applicable locker. The BSO shall ensure that a laundry hamper is available in the change area to store soiled lab coats.

2.8.3 The BSO is responsible for laundering lab coats as specified in 2.27.1f.

2.9 Maintenance and Repair of Facility and Equipment

2.9.1 The BSO is responsible for ensuring IQ equipment and facilities are maintained in good working order and that the biological security envelope is always maintained.

2.9.2 Requests for *Work Orders* shall be completed and submitted by the BSO or IPS manager (i.e., not by facility users). Copies of *Work Orders* shall be maintained with facility records. The BSO shall follow up on all maintenance activities to ensure that the work is completed as required.

2.9.3 Any maintenance, repair, calibration, or major cleaning action performed on IQ equipment or environmental chambers/rooms, either by the BSO or by maintenance personnel, shall be documented by the BSO on the applicable form in the equipment logbook (refer to 2.10) i.e., actions performed by maintenance personnel and documented on IPS Form Number 0141 shall be transcribed by the BSO into the applicable logbook.

2.9.4 The BSO shall ensure that defective equipment is labeled as “out of service” until such time that it is repaired, replaced or discarded.

2.9.5 Upon request by maintenance personnel to open mechanical access panels in walls or ceilings of the IQ facility, or to breach the containment barrier in any way (e.g., drill holes through the barrier), the BSO shall ensure that facility users in that area are not handling insects at the required time (i.e., halt all work), the immediate area is visually examined for free insects, and the duration of the breach is kept to a minimum. The BSO shall be on-site for the duration of the breach in order to monitor activities. Upon completion of the work, the BSO shall verify the integrity of the containment barrier by smoke pencil or other visual aid and include relevant documentation in the next facility recertification submission. The BSO shall consult the CFIA prior to commencing extensive changes to the IQ facility.

2.10 Equipment Logbooks

2.10.1 The BSO shall create and maintain a specific logbook (3-ring binder) for each piece of equipment and environmental chamber in the IQ facility.

2.10.2 Logbooks shall be located in the QC lab to facilitate easy access by the BSO. Records shall be made available to facility users upon request.

2.10.3 Each logbook shall be labeled on the front cover and/or spine to identify, by simple name or number, the specific device to which it pertains.

2.10.4 The first page of each logbook shall be a title page (IPS Form Number 0081/002, *Equipment Logbook*, Appendix 5) that identifies the specific name or number of the device to which it pertains and provides additional information including the type of device, manufacturer and serial number.

2.10.5 The remainder of the logbook shall be divided into sections applicable to the device, including:

(a) *Maintenance and Repair Log* (IPS Form Number 0082/001, Appendix 6)
(b) *Cleaning log* (IPS Form Number 0083/001, Appendix 7)
(c) *Calibration Log* (IPS Form Number 0084/001, Appendix 8)
(d) References (this section shall include any additional information such as certificates of calibration, operator manuals, etc.)

2.11 Environmental Chambers and Rooms

2.11.1 The BSO is responsible for the maintenance, operation, sanitation and historical tracking of each environmental chamber/room.

2.11.2 The BSO shall document required parameters for an environmental chamber (as determined by the facility user on the *Request to Use IQ Facility)* on the *Set Parameters for Environmental Chambers/Rooms* form (IPS Form Number 0005/002, Appendix 18) and attach it to the front of the unit. Expired forms shall be maintained in the equipment logbook for the associated unit.

2.12 Maintaining IQ Computer Workstation

2.12.1 The BSO shall ensure the availability of a computer work station (including laptop, docking station, monitor and scanner) for facility users to scan datasheets for immediate availability outside of the containment barrier, to access the *Bio-Safety Manual*, or to record/store data electronically if the user wishes to do so. Facility users shall be permitted to take the laptop to their assigned research module.

2.12.2 Electronic records for the IQ facility shall be stored by the BSO on the QC network drive, which is routinely backed-up by the GLFC IT department. Hard drives on computers in the IQ and QC facilities shall only be used for temporary storage of files not essential to daily operations or for maintenance of historical records.

2.13 Storage

2.13.1 The BSO shall approve all materials and supplies for entry into the IQ facility.

2.13.2 Bulk quantities of materials and supplies (e.g., rearing containers, lids, etc.) destined for use in the IQ facility shall be stored where they are protected from deterioration and contamination (i.e., they are not be stored in other GLFC laboratories/facilities where they may be exposed to pathogens).

2.13.3 The BSO shall designate storage locations for smaller quantities of materials and supplies within the IQ facility. These items shall be kept in enclosed cupboards, shelves or bins, where feasible, and shall be stored in a manner that will maintain their cleanliness and the cleanliness of the facility.

2.13.4 The BSO shall designate locations within the IQ facility where instruments/equipment are to be used and/or stored.

2.13.5 Maintenance personnel may store a minimal inventory of tools, equipment and spare parts in the IQ facility janitor room, or any other space designated by the BSO.

2.14 Movement of Pests

2.14.1 Import and/or movement of live exotic or domestic invasive insects into or out of the IQ facility shall be conducted as specified in the current version of SOP Number IPS/031 (*Movement of Exotic Forest Insects*), including the maintenance of files for copies of applications, permits and certificates.

2.15 Control of Materials and Supplies Entering Facility

2.15.1 The BSO shall monitor users of the facility to ensure that only those materials and supplies previously identified by the PI (refer to the current version of SOP Number IPS/030, *IQ Facility Authorization*) are brought into the facility and have been removed (where feasible) from their original packaging boxes outside of the IQ facility access door. The BSO may approve additional items upon request.

2.15.2 Upon notification of the arrival of live exotic or domestic invasive insects to the IQ facility, the BSO shall:

a) Examine the packaging/containers to ensure that containment has been maintained. If containment has been breached, determine if insects have escaped by comparing numbers remaining with numbers shipped (if available). If insects have escaped (or if unknown), report and document the occurrence as specified in section 2.18.

b) Document the arrival/receipt of insects on the *IQ Insect Receipt Log* (IPS Form Number 0112/002, Appendix 9) and maintain with IQ records.

c) Notify the applicable PI and/or their support personnel, if required.

2.15.3 The BSO shall ensure that domestic invasives (e.g., mountain pine beetle) approved for entry into the IQ facility are handled as though they are

exotic. i.e., procedures specified in the *Bio-Safety Manual* apply to any insect species brought into the IQ facility.

2.15.4 The BSO shall examine plants and plant materials to ensure that they are relatively free of insects, fungi, etc. before being brought into the facility.

2.15.5 The BSO shall ensure that soils and/or peat moss (excluding potted plants) have been autoclaved (refer to the current version of SOP Number IPS/033, *Conducting Research in Insect Quarantine*) prior to entering the IQ facility even when the material has been advertised as already being sterilized.

2.15.6 The BSO shall ensure that equipment and instruments entering the facility have been autoclaved or sterilized using a bleach working solution (refer to 2.34.1, 10 min. contact time), where feasible.

2.15.7 The BSO shall ensure that paperwork entering the facility from offices or administrative areas in the building is kept to a minimum. She/he should recommend to facility users that they make required documentation available on the GLFC computer system that can be accessed using the IQ computer.

2.15.8 The BSO shall monitor facility maintenance personnel to ensure that they limit the tools, equipment and parts (beyond those specified in 2.13.5) to only those items necessary for the task at hand.

2.16 Archiving Voucher Specimens

2.16.1 Upon receipt of voucher specimens of exotic or domestic invasive insects from facility users, the BSO shall:

a) Document the date of receipt of archival samples on the *IQ Insect Receipt Log* (IPS Form Number 0112/002, Appendix 9).
b) Ensure that samples are stored in sealed vials containing 70% ethanol (archived samples should be checked periodically and topped-up as needed).
c) Ensure that samples are labeled with the name of the insect species and movement certificate/import permit number.
d) Maintain samples for easy retrieval.

2.16.2 The BSO shall confirm the identity of archival samples, either independently or with the assistance of other qualified personnel, and shall document the date of confirmation on the *IQ Insect Receipt Log* (IPS Form Number 0112/002, Appendix 9).

2.17 Bio-safety Containment Procedures

2.17.1 The BSO shall maintain the physical biological containment barrier of the facility, including all items listed on IPS Form Number 0115/002 (*IQ Facility Inspection Checklist*, Appendix 13). Formal inspection/documentation shall be performed as specified in 2.30.1,

however the BSO shall be cognizant of maintaining the physical containment barrier on a daily basis.

2.17.2 Upon becoming aware that a break in the IQ containment barrier (e.g., broken door seal) has occurred, the BSO shall take the following corrective actions:
- a) If possible, temporarily seal the break in the barrier using readily available materials (e.g., tape).
- b) Instruct users of the affected area to cease insect handling operations until repairs have been made.
- c) Contact facility maintenance personnel to make the appropriate permanent repair.
- d) If timely repair cannot be made, remove all insects from the affected area but retain within the quarantine zone.
- e) Post the affected area as being off limits.
- f) Document and report incidents as specified in *2.18*.

2.17.3 The BSO shall ensure that any item that is to be removed from the facility has been sterilized and/or closely examined as specified in 2.22.

2.17.4 The BSO shall ensure that facility users comply with requirements for handling/rearing exotic insects as specified by the CFIA on the movement certificate or import permit.

2.17.5 Upon arrival of insects at the IQ facility, the BSO shall inspect materials as specified in 2.15.2 and 2.15.3.

2.17.6 Upon arrival of insects at the IQ facility, the BSO shall instruct facility users on appropriate procedures for opening packages/containers, which are to:
- a) Ensure that the door to the room is closed and the air pressure monitor is not in alarm (i.e., inward directional air flow is maintained). Post sign on door indicating “do not enter, transfer in process”.
- b) Examine packages/containers to ensure that containment has been maintained as specified in 2.15.2a.
- c) Open small packages/containers within a sleeved cage and/or BSC.
- d) Open large packages/containers in a room where there are no other insect handling operations being performed.
- e) Open packages slowly; where feasible, use forceps to transfer insects and count insects before and after the transfer.

2.17.7 The BSO shall ensure that shipping packages/containers are autoclaved/sterilized immediately upon removal of the contents. Facility users shall be monitored to ensure that re-useable containers (e.g., Rubbermaid bins) are sterilized as specified in 2.20.5. The method and date of sterilization shall be documented on the IQ Insect Receipt Log (IPS Form Number 0112/002, Appendix 9).

2.17.8 The BSO shall ensure that insect handling and experimentation is conducted only in areas previously authorized by the BSO (refer to the current version of SOP Number IPS/030, *IQ Facility Access Authorization*).

2.17.9 The BSO shall monitor facility users to ensure that their experimental protocols and data sheets for use in the facility include methods to account for the whereabouts of each and every insect during its entire life cycle. The BSO shall hold users of the facility accountable for being excruciatingly stringent in correlation of actual numbers of insects with those identified/expected on the data sheets. The BSO shall routinely review data sheets for confirmation of numbers since it is unacceptable to have missing insects.

2.17.10 The BSO shall ensure that users do not remove data sheets from the facility until the rearing and/or the experiment is complete and the facility is sufficiently sanitized. When required sooner, datasheets may be scanned and saved to a common/personal drive where they can be retrieved by the user from outside of the facility.

2.17.11 Upon becoming aware of an incident whereby there is an actual or potential escape or release of insects from the facility, the BSO shall take immediate action to prevent the situation from escalating, which is to:

a) Place a patch on broken holding cage, if applicable, and arrange for permanent repair when time permits.
b) Instruct users of the affected area to cease insect handling operations in the area until free insects have been collected.
c) Close the door to the affected area and post the are as being off limits.
d) Collect all of the free insects using applicable collection devices (e.g., forceps, insect nets, etc.), or render non-viable (e.g., sticky traps).
e) Count the number of insects collected to ensure that all are accounted for.
f) Document and report the occurrence as specified in section 2.18.

2.17.12 The BSO shall ensure that all materials to be discarded are placed in garbage containers lined with autoclave bags. Living insects shall be killed by either of the following methods before being discarded:

a) place insects in an escape-proof vented container and autoclave at 121°C for 30 minutes, or
b) place insects in a vial containing either methanol or ethanol (minimum 70%) for at least 24 hours.

2.17.13 The BSO shall ensure that log bolts are sterilized and disposed using either of the following methods:

a) Autoclaving split wood:
   i) Autoclave log bolts for 60 minutes (include a steam indicator strip) and allow to cool (Note: this first of two autoclave cycles should kill all living organisms including fungal contamination and insects, except perhaps any insects that may have penetrated to the core).
   ii) Cut log bolts to a maximum length of 20” and diameter of 12” using the electric chain saw (when log bolts exceed these specifications, the BSO shall insist that the facility user responsible cut them to size); log bolts may stored in sealed bins and held in the walk-in cold room until subsequent splitting and autoclaving).

iii) Split to kindling size (i.e., sufficiently small such that steam will not need to penetrate more than 1'' during subsequent autoclaving) using the electric log splitter (Note: any insects that are found shall be removed and killed by placing in 70% ethanol for at least 24 hours; when there are large quantities of material to be split, the BSO shall obtain assistance of the individual responsible for generating the waste).

iv) Autoclave split wood for 60 minutes (include a steam indicator strip).

v) Once cool enough to handle, remove from the facility using the autoclave door on the outside of the quarantine envelope (i.e., autoclave cleanout room AA105) and dispose with regular waste.

b) Autoclaving intact log bolts:

i) Ensure that log bolts are not larger than 10" in diameter (this is the diameter at which the annual validation procedure is to be conducted) and 36" in length (this is the maximum length that can be accommodated in our autoclave); when necessary, use the electric chain saw or hand saw to cut the log bolts to the required size.

ii) Autoclave the log bolts (and steam indicator strip) for three hours (pre-vac cycle) at 121°C (plus an additional 5 min dry time to reduce moisture in the surrounding work room after autoclaving). This cycle will take 3hr 26 min to complete (including evacuation of the chamber).

iii) Allow the log bolts to remain in the chamber (with the door sealed) for an additional 60 minutes to allow the heat to penetrate deeper (total time in the autoclave is 4hr 26min).

iv) Log bolts may be discarded after an additional 60 minutes of standing time either on the floor (room AA105) or within the chamber (i.e., 5hr 26min after the initiation of the autoclave cycle).

v) Dispose with regular waste.

2.17.14 The BSO shall ensure that sticky traps are positioned in each anteroom as well as strategically throughout the facility and are replaced as needed.

2.17.15 The BSO shall ensure that a black-light trap is positioned in each anteroom and the bulb is replaced as needed.

2.17.16 The BSO shall ensure that procedures specified in 2.22 are followed for the removal of any item from the facility.

2.17.17 The BSO shall ensure that procedures specified in 2.19 are followed when unintentionally introduced organisms are found by facility users during the conduct of their rearing/experimentation.

2.17.18 Upon approval of IPS Form Number 0103 (*Request to Use IQ Facility*), the BSO must determine whether or not heightened bio-security requirements are necessary, and to which part(s) of the facility these requirements apply. The BSO may consult the CFIA for assistance. For example, when a researcher will be working with a very small insect (e.g.,

mountain pine beetle) in one of the research modules, additional lab wear (i.e., bunny suits, shoe covers and beard covers, if applicable) must be worn. The BSO must:

a) Discuss the heightened bio-security requirements with applicable personnel.
b) Post notices in the change rooms and at each applicable module indicating which part(s) of the facility require additional protective lab wear.
c) Ensure that the researcher(s) and maintenance personnel comply with lab wear requirements.
d) Ensure that all waste coming from these restricted areas is placed in sealed containers and taken directly to the autoclave for immediate sterilization.

2.17.19 The BSO shall ensure that the entry door to each research module is posted with signage indicating the nature of the plant pest/organisms contained within.

2.17.20 The BSO shall take corrective action whenever a differential air pressure monitor alarm is triggered. If an alarm is triggered due to a door being held open too long, the BSO shall provide applicable instruction to the facility user. If there is a mechanical breakdown of the air supply/return system thereby causing an alarm, or if the wall-mounted monitor is faulty, the BSO shall:

a) Instruct users of the affected area to cease insect handling operations until repairs have been made; when air pressure to the whole containment zone is affected, work shall cease throughout the IQ facility.
b) Contact facility maintenance personnel to make the repair.
c) If timely repairs cannot be made, remove all insects from the affected area but retain within the quarantine zone.
d) Post the affected area as being off limits.

2.17.21 The BSO shall take corrective action whenever damaged insect screens are found on air supply or return ducts, which is to:

a) Immediately seal the duct opening using a nearby blast gate.
b) Instruct users of the affected area to cease insect handling operations until repairs have been made.
c) Contact facility maintenance personnel to make the repair.
d) If timely repairs cannot be made, remove all insects from the affected area but retain within the quarantine zone.
e) Post the area as being off limits.

2.18 Incident Reporting

2.18.1 Facility users are required to immediately report to the BSO any incidents that occur in the IQ facility, or during transport, resulting in actual or potential escape of insects. Serious breaches are first reported verbally to

the BSO who shall determine corrective action and notify appropriate authorities. The BSO shall ensure that the facility user documents the incident on an *Insect Quarantine Incident Report* (refer to the current version IPS Form Number 0107) in a timely manner and provides the completed form to the BSO for facility records and for dissemination to the CFIA, if required.

2.18.2 If incidents are discovered by the BSO, she/he shall document the occurrence and corrective action on the *Insect Quarantine Incident Report* (refer to the current version of IPS Form Number 0107).

2.18.3 The BSO shall determine the effectiveness of corrective actions taken prior to approving the *Insect Quarantine Incident Report* by means of her/his dated signature.

2.18.4 When deemed necessary by the BSO, she/he shall investigate the root cause of an incident and implement revisions to SOPs and/or applicable training of personnel.

2.18.5 The BSO shall maintain *Insect Quarantine Incident Reports* with facility records.

2.19 Unintentionally Introduced Organisms

2.19.1 The BSO shall ensure that facility users immediately render unintentionally introduced exotic organisms (e.g., other insects, parasitoids, hyper-parasitoids, pathogens, nematodes, etc. found during the conduct of rearing/experimentation with regulated materials imported from another country) non-viable, either by autoclaving or placing in 70% ethanol for at least 24 hours.

2.19.2 The BSO shall obtain prior authorization and bio-safety requirements from the CFIA upon notification from facility users that they intend to maintain unintentionally introduced exotic insects or nematodes within the IQ facility, or to send pathogens to a level 3 facility for further experimentation.

2.19.3 Upon detection of unintentionally introduced exotic organisms, the BSO shall determine the need for decontamination of the facility and ensure that these actions are performed.

2.19.4 The BSO shall solicit advice from the CFIA and/or the scientific community, as required.

2.20 Sanitation and Autoclaving

2.20.1 The BSO shall ensure that users of the facility:

a) Keep it meticulously clean and free of clutter.
b) Clean work areas (e.g., bench tops) after each use by spraying with the provided bleach working solution (refer to 2.34.1) and allowing 10 minutes of contact time before wiping with sterile paper towel.

Surfaces can be sprayed with Windex and wiped with sterile paper towel to remove residue left by the cleaning solution.

c) Clean floors of their assigned work areas (including reach-in and walk-in chambers) whenever they become visibly soiled. Floors shall not normally be swept or dry mopped. They shall be vacuumed using the facility central vacuum cleaning system.
d) Handle materials in a manner that minimizes dispersion of particulates through the air. The BSC shall be used when there is risk of particulates becoming air-borne (e.g., dismantling cages or chambers with fungal spores).
e) Maintain a garbage bag (i.e., autoclave bag) within the rear part of the chamber when working in the BSC. Do not discard materials in containers outside of the cabinet. Avoid movement of materials or excessive movement of hands and arms through the front access opening during use. When personnel must enter or exit the cabinet, do so from straight on and allow the cabinet to stabilize before resuming work.
f) Clean the interior of the BSC after each session using the method specified in 2.20.1b. (The bench-top access panel of the BSC shall be removed and cavity below shall be cleaned on a weekly basis by the BSO).
g) Clean up spillage in environmental chambers as it occurs by collecting all insects (or rendering them non-viable), accounting for all insects, autoclaving waste, cleaning up debris using the central vacuum system and sanitizing the unit using the provided bleach working solution (refer to 2.34.1).
h) Always position screens in the sink drains.
i) Maintain order of equipment and supplies.

2.20.2 The BSO shall perform and document routine daily, weekly, monthly and annual cleaning/sanitation actions as specified in 2.26 through 2.29.

2.20.3 The BSO shall ensure that cleaning supplies are readily available to facility users, including:

a) bleach working solution (refer to 2.34.1), prepared daily
b) autoclaved paper towel
c) vacuum hose and wand
d) scouring pads

2.20.4 The BSO shall ensure that all garbage pails are lined with autoclave bags and are replaced as needed.

2.20.5 The BSO shall ensure that any item that is to be removed from the facility is autoclaved whenever possible. Items that are not autoclavable shall be cleaned with hot soapy water followed by sanitation with the bleach working solution (refer to 2.34.1) and visual inspection before leaving the facility. Items that can not be autoclaved or cleaned with the bleach solution shall be meticulously inspected before being removed from the facility.

2.20.6 The BSO shall conduct all autoclaving of materials that are to be removed from the facility. Required autoclave settings for common materials are identified on the table in Appendix 12; standard loads are described in Appendices 15 and 19. Refer to the operator manual for settings to be used with other materials and/or volumes. A biological indicator shall be included with all non-standard loads and the materials shall not be removed from the facility until validated as being sterile. The lot number of the biological test indicator and the results for the positive control and test indicator shall be recorded in the description of materials on the IQ Autoclave Log.

2.20.7 Waste materials may be left in sealed autoclave bags within the sealed autoclave chamber or in the cold room until it is convenient for the BSO to run the autoclave. Autoclave bags and containers are not to be overfilled. Prior to autoclaving, the BSO shall loosen the bag closures so that sufficient steam will be able to penetrate all areas of the autoclave bag.

2.20.8 The BSO shall ensure that log bolts are sterilized and disposed as specified in 2.17.13.

2.20.9 The BSO shall ensure that all autoclaving is conducted with a steam indicator test strip/tape enclosed within the chamber (i.e., within the deepest part of the load) to give a visual indication that the contents passed through a steam sterilization cycle. The BSO shall initial the strip chart recorder on the autoclave for each cycle. When applicable, the BSO shall conduct a visual inspection of materials following an autoclave cycle to ensure that all insects were rendered non-viable.

2.20.10 All autoclaved materials destined for disposal shall be removed from the chamber door on the outside of the quarantine barrier (i.e., autoclave cleanout room AA105).

2.20.11 Every cycle of the autoclave shall be documented on IPS Form Number 0114/001 (*IQ Autoclave Log*, Appendix 11) and shall be maintained in a binder within the IQ facility. Records shall include:

a) date
b) cycle # (transcribed from the autoclave strip chart recorder)
c) description of material autoclaved (e.g., waste, packaging materials, etc.)
d) test strip indicator (i.e., salvaged from chamber and attached to form)
e) initials

2.20.12 The BSO shall validate autoclave performance against the standard test loads identified in Appendix 15 at least once per year and after each breakdown/mechanical repair, using a Biological Verification Test Pack. Autoclave performance against whole log bolts shall be validated annually as per Appendix 19 and shall be documented on IPS Form Number 0156/001 (Autoclave Validation for Whole Log Bolts, Appendix 20). Additionally, the autoclave shall be validated monthly against a standard "waste" test load. Procedures specified by the manufacturer of the Test Pack shall be followed. Verification shall be documented in the equipment

logbook for the autoclave. The lot number of the biological test indicator and the results for the positive control and test indicator shall be recorded in the description of materials in the IQ Autoclave Log.

2.20.13 The BSO shall ensure that cleaning equipment is dedicated for use in the IQ facility only.

2.20.14 After the receipt of air sample results with high air particle counts, the BSO shall conduct intensive cleaning and sanitation of areas specified on the report.

2.21 Project Completion

2.21.1 Upon completion of a project/study in the IQ facility, the BSO shall clean and disinfect all areas that were used by the researcher, prior to allowing the next researcher to commence activities.

2.21.2 Equipment and materials supplied by the facility user but not intended for use in the near future shall be removed from the facility following procedures specified in 2.22 and returned to the facility user, or discarded.

2.21.3 All exotic insects shall be destroyed at the completion of their intended use, either by autoclaving or in killing jars.

2.22 Materials Exiting the Facility

2.22.1 No material of any kind shall be removed from the IQ facility until it has been autoclaved, sanitized and/or inspected by the BSO as specified in 2.20.5.

2.22.2 Materials shall normally be removed from the IQ facility when the experiment is complete, there are no active rearing activities, and the facility has been sufficiently sanitized. Upon request, the BSO may grant approval for the removal of items at other times after sufficient sterilization and inspection. The BSO shall inspect all items before removal from the facility.

2.22.3 Living insects shall be killed by autoclaving or in killing jars before being discarded. Removal of live exotic insects from the facility shall be conducted as specified in the current version of SOP Number IPS/031 (*Movement of Exotic Forest Insects*). The BSO shall document such removal on the *IQ Insect Transfer Log* (IPS Form Number 0113/001, Appendix 10) and maintain it with IQ records.

2.23 Provision of Assistance

2.23.1 Rearing activities and experimentation conducted within the IQ facility are the responsibility of the facility user. Upon request, the BSO shall strive to be available to assist users during times of excessive work load.

2.23.2 Assistance may be provided when sufficient notice is given, however researchers shall be informed that they should not expect this service unless it was agreed upon prior to commencement of the project.

2.23.3 The BSO will not be available to provide vacation leave replacement, however, when given sufficient notice, the BSO may (pending her/his work load) perform basic maintenance of rearing operations (e.g., misting cages, etc.) during these absences. The BSO will not take responsibility for experimental conduct.

2.23.4 The BSO shall strive to be available to assist facility users during periods of unavoidable leave (e.g., illness).

2.24 Contingency for Fire or Chemical Spill Alarm

2.24.1 The BSO shall ensure that the GLFC Floor Emergency Officer, Deputy Floor Emergency Officer and Floor Monitors are aware of IQ entry and egress practices.

2.24.2 Floor emergency personnel shall be instructed not to enter the IQ facility during an alarm situation.

2.24.3 Monitors shall be instructed to check the sign-in/out log on the door to ascertain that the area has been vacated. When there is a record of someone entering but not exiting, the monitor shall use a telephone to call into the facility and demand that personnel vacate the area. If there is no answer, the monitor shall inform the Floor Emergency Officer, who will report to the Emergency Control Center that it has not been confirmed that the facility is clear (it will then be the responsibility of the Fire Department to clear the area if deemed necessary).

2.25 Power Outage

2.25.1 Even though all essential systems within the IQ facility are connected to the emergency generator, the BSO (upon determination that a power outage has occurred in the IQ facility) shall immediately:

a) Determine the status of the insects housed in the environmental chambers/rooms.
b) Do a visual check of the NIST thermometer/hygrometer that is located in the environmental chamber/room to ensure that parameters have not been exceeded.
c) Reset/reprogram chamber(s), if required.
d) Reset/reprogram timer(s) for lighting, if required.
e) Review Delta System records and notify users of the facility, indicating the extent and duration that environmental parameters were exceeded, if applicable.
f) Confirm that air pressurization has returned to normal.

2.26 Daily Work Schedule

2.26.1 At the start of each work day, the BSO shall check Delta System records for each environmental chamber, rearing room and cold room to ensure that environmental conditions have been appropriately maintained since last being checked.

2.26.2 The BSO shall enter the IQ facility daily (excluding weekends and holidays) and conduct a visual check of each room. She/he shall avoid entering other laboratories in GLFC prior to entering the IQ facility, when possible, thereby reducing the potential introduction of pathogens and microbial contaminants.

2.26.3 If an alarm has been triggered for a reach-in or walk-in chamber/room, the BSO shall transfer the contents (i.e., insect/plant material) to the alternate environment posted on the unit, contact the maintenance department for repair, notify applicable facility users, and document the maintenance/repair action in the equipment log.

2.26.4 If a differential air pressure alarm has been triggered, the BSO shall immediately visit the location to determine the cause and to ensure that the integrity of the facility bio-safety envelope has been maintained. The BSO shall take corrective action as specified in 2.17.20.

2.26.5 Each time the BSO enters a reach-in or walk-in chamber/room, she/he shall make a crude assessment of the environmental conditions (i.e., temperature, relative humidity, light regime) against the NIST traceable thermometer/hygrometer and against the required settings posted on the door of the unit. If there are discrepancies, she/he shall contact facilities maintenance personnel to repair the unit.

2.26.6 Upon each entry to the IQ facility, the BSO shall be cognizant of the integrity of the containment barrier and take corrective action as specified in 2.17.11.

2.26.7 The BSO shall monitor facility users to ensure that they comply with all established IQ SOPs.

2.26.8 Each day, the BSO shall:

a) Ensure that change rooms are maintained in an orderly fashion.
b) Prepare fresh bleach working solution (refer to 2.34.1).
c) Vacuum areas that are visibly soiled.
d) Replace autoclave bags in waste receptacles, as needed.

2.27 Weekly Work Schedule

2.27.1 The BSO shall perform the following weekly tasks, document the event on IPS Form Number 0108/005 (*Weekly Checklist for IQ Facility*, Appendix 1) and maintain the completed form with facility records:

a) Print out and review Delta System environmental records and maintain with historical records.
b) Check sticky traps and replace when no longer tacky or when numerous insects have been caught. When insects have been caught,

take remedial action to determine their source and nature (refer to 2.17.11).

c) Check black light to ensure that it is functioning. When insects have been caught, take remedial action to determine their source and nature (refer to 2.17.11).
d) Autoclave waste and remove from facility.
e) Check sink drains to ensure that screens are in position.
f) Launder soiled lab coats. Lab coats shall be autoclaved prior to removal from the facility and laundered by the external contractor.
g) Flush the autoclave following procedures indicated in the operator's manual.

(Note: tasks a, b, c and e are to be performed by the BSO only on Level 1 of the facility; conduct of these tasks on Level 2 of the facility are the responsibility of IPU personnel and are included on their check lists, however the BSO is responsible for reviewing their work on a monthly basis as specified in 2.28.1-l)

2.27.2 The BSO shall perform the following weekly cleaning/sanitation actions, document the event on IPS Form Number 0108/005 (*Weekly Checklist for IQ Facility*, Appendix 1) and maintain the completed form with facility records:

a) Vacuum and bleach (refer to 2.34.1) facility floors (Level 1 and stairwell) including walk-in chambers (only those that are set above freezing temperature) and the cold room. The facility HEPA filtered central vacuum system shall be used to clean floors (i.e., they shall not normally be swept or dry mopped).
b) Reach-in chambers shall be checked to ensure that they are being kept clean by the user. The BSO shall vacuum and bleach the chambers as needed.
c) Clean the following items using the bleach working solution (refer to 2.34.1) and Windex (where required to remove the bleach residue):
   - door handles (rooms and chambers)
   - bench tops
   - light switches
   - keyboard, mouse, scanner
   - telephones.
d) Clean bathroom AA122.
e) Clean all BSCs and fume hood by vacuuming and using the bleach working solution. Remove the access panels in the BSCs to clean under the bench top.
f) Scrub sinks with scouring pad, if required.

(Note: all tasks above are to be performed by the BSO only on Level 1 of the facility; conduct of these tasks on Level 2 of the facility are the responsibility of IPU personnel and are included on their check lists, however the BSO is responsible for reviewing their work on a monthly basis as specified in 2.28.1-l)

2.28 Monthly Work Schedule

2.28.1 The BSO shall perform the following monthly tasks, document the event on IPS Form Number 0109/005 (*Monthly Checklist for IQ Facility*, Appendix 2) and maintain the completed form with facility records:

a) Verify the accuracy of the Delta System for the following rooms/chambers by comparison with a NIST traceable thermometer/hygrometer:
   - Environmental Rooms AA121, AA123
   - Chambers AA12301, AA12501, AA12601, AA12602, AA12701, AA12702
   - Cold Room AA128

b) Test the panic bar alarms on doors AA116B, AA136 and AA4, and replace the batteries as needed, i.e., panic bars shall be depressed sufficiently to set off the alarm, but not pushed to the point where the door seal is broke and containment is lost (the panic bar alarm is to be reset using a grand master key).

c) Assess supply inventories and re-stock as needed.

d) Validate the autoclave using bio-indicators as specified in 2.20.12.

e) Ensure that air sampling is conducted by facility QC personnel. The BSO shall take corrective action as specified by QC personnel.

f) Record air flow rates for BSCs #11, 12 and 13 on *IPS Form Number 0166/002* (Appendix 14) and maintain with facility records. Compare flow rates to previous results to determine if performance of the unit is decreasing. Arrange for servicing as required.

g) Check each fire extinguisher within the IQ facility to ensure that they are fully pressurized as indicated on the gauge. Sign and date the attached tags. Arrange for servicing as required.

h) Check the eyewash located in room AA125 to ensure that it is functioning properly. Sign and date the attached tag. Arrange for servicing as required.

i) Check the emergency shower in room AA125 to ensure that it is functioning properly (i.e., hold a bucket under the nozzle and pull the chain). Sign and date the attached tag. Arrange for servicing as required.

j) Replace the *Insect Quarantine Access Log* (refer to current version of IPS Form Number 0106) at the start of each month and maintain the completed log with facility records.

k) Test emergency light battery packs (i.e., by pressing test button) to ensure that they are functioning properly. Battery packs are located in rooms AA106B, AA102, AA202, AA206 and stair AA3. Arrange for servicing as required.

l) Review IPU check lists for their assigned work space on Level 2 (and conduct on-site spot checks as needed) to ensure completion of the following tasks for that part of the quarantine facility:
- chambers, floors, telephones, door handles, bench tops, sinks, light switches, BSCs and windows all cleaned
- black light checked
- electrical plug covers inserted
- sticky trap checked
- Delta system printouts taken and filed
- Delta system compared with NIST thermometers
- pressure taken for BSC #10
- fire extinguisher checked
- eyewash checked
- emergency shower checked
- panic bar alarms checked
- screen in floor drain
- screens in sinks
- screens on air supply/return vacuumed

m) Ensure that electrical plug covers are inserted into every outlet not occupied by an electrical cord.

2.28.2 The BSO shall perform the following monthly cleaning/sanitation actions, document the event on IPS Form Number 0109/005 (*Monthly Checklist for IQ Facility*, Appendix 2) and maintain the completed form with facility records:

a) Use bleach working solution (refer to 2.34.1) to clean shelves in:
- walk-ins AA12601 and AA12701
- reach-ins AA12301, AA12501, AA12602 and AA12702
- refrigerator.

b) Vacuum the screens on all air supply and return grills.

c) Check floor drain screens (located in rooms AA122, AA124 and AA125) and clean as required.

d) Empty the two facility HEPA vacuum canisters (located in rooms AA120 and AA131) and clean with the bleach working solution (refer to 2.34.1). Autoclave the waste from canisters prior to disposal.

e) Clean microscopes and balances.

f) Clean windows with Windex (including module doors) when required.

(Note: all tasks above are to be performed by the BSO only on Level 1 of the facility; conduct of these tasks on Level 2 of the facility are the responsibility of IPU personnel and are included on their check lists, however the BSO is responsible for reviewing their work on a monthly basis as specified in 2.28.1-l).

2.28.3 Prior to each monthly test of the GLFC fire alarm system by GLFC emergency committee personnel, the BSO shall post a notice at each entrance to the IQ facility prohibiting entry during the test to ensure that

there are no ongoing insect handling activities (Note: during an alarm, the facility ERV shuts down and facility air pressurization is lost).

2.29 Annual Work Schedule

2.29.1 The BSO shall conduct a formal inspection of the containment barrier at least annually as specified in 2.30.

2.29.2 The entire IQ facility (i.e., walls, ceilings, cupboard interiors, light fixtures, etc.) shall be cleaned annually by the BSO using the bleach working solution (refer to 2.34.1).

2.29.3 The BSO shall ensure that BSCs, balances and chemical fume hood are serviced and certified as needed (typically on an annual basis) and records are maintained as specified in 2.9.3.

2.29.4 The BSO shall meet with the IPS manager annually to discuss her/his training and development plan.

2.29.5 The BSO shall inspect the facility freezer and defrost it, if required.

2.29.6 The BSO shall validate and document the performance of the autoclave as specified in 2.20.12.

2.29.7 The BSO shall validate each air pressure monitor within the facility following the procedure outlined in Appendix 16 and document the testing on IPS Form Number 0142/002 (Appendix 17).

2.29.8 In addition to the routine cleaning/sanitation actions performed on environmental chambers as described throughout this SOP, the BSO shall conduct an annual thorough cleaning of each chamber using the bleach working solution (refer to 2.34.1). The BSO may request users of the chambers to remove contents from the storage compartment for cleaning/sanitation of the unit.

2.29.9 The BSO shall check the actual contents of the first aid kit against the list of required contents and requisition/add supplies as needed.

2.29.10 The BSO shall replace batteries in panic bar alarms on facility doors (whether required or not) and document in the comments section on IPS Form Number 0115/002 (*IQ Facility Inspection Checklist*, Appendix 13).

2.29.11 In collaboration with facilities engineering staff, the BSO shall have the main power to the facility turned off to ensure that the back-up generator starts as required and powers the following essential systems:

a) ERV (i.e., maintains pressurization and environmental controls throughout containment area)
b) BMS/Delta system (i.e., controls for environmental chambers and cold rooms)
c) BSCs in Rooms AA123, AA126, AA127, AA227 and AA228.
d) chemical fume hood (Room AA125)
e) emergency lighting
f) air pressure monitors
g) walk-in environmental chambers (temperature, lights, humidity) numbers: AA12601, AA12701, AA22701, and AA22801.

h) reach-in environmental chambers (temperature, lights, humidity) numbers: AA12301, AA12501, AA12602, AA12702, AA22702 and AA22802.
i) cold room #1 AA128 (temperature, lights).
j) alarms for doors AA122B/C, AA116B, AA136, AA4, AA238A/B AA249A and AA249B.
k) door interlocks (Doors AA122B/C, AA238A/B).
l) air curtains for doors AA122C and AA238B.
m) swipe card readers at doors AA122B, AA122C, AA238A, AA238B, AA244 and AA250.
n) egress buttons at doors AA122B, AA122C, AA238A and AA238B.
o) sliding doors AA126, AA127, AA227 and AA228.
p) sump pump.
q) IT Closet (i.e., computer network, telephone system, paging).
r) fire alarm (fire alarm is also on battery back-up).

(Note: BacNet Gateway for Delta System is located in the main GLFC building and is on back-up power in that location)

2.29.12 The BSO shall conduct an annual inspection of the containment barrier as specified in 2.30.

2.29.13 The BSO shall contact the GLFC emergency committee to obtain a list of dates for testing of the fire alarm system.

2.30 Facility Inspection

2.30.1 The BSO shall conduct a formal inspection of the containment barrier at least annually. The BSO shall notify the IPS manager to request assistance with the inspection. All items listed on IPS Form Number 0115/002 (*IQ Facility Inspection Checklist*, Appendix 13) shall be inspected and checked as being compliant or not. Smoke pencils shall be used to check for leaks in the barrier, however, facility maintenance personnel must first be notified in order to turn off fire/smoke alarms for the IQ facility. The smoke pencil shall slowly be passed by each penetration (e.g., electrical, plumbing, etc.) and door opening and the swirl of smoke examined for turbulence caused by air penetration. Smoke pencils will also be used to confirm inward directional air flow at each door along the containment barrier; door alarms shall be temporarily turned off and the door cracked open with the pencil held in that location; the direction of movement of the smoke will indicate directional air flow.

2.30.2 Upon completion of the inspection, the BSO shall determine if any findings warrant documentation and reporting of “incidents” as specified in 2.18.

2.30.3 Corrective action required following inspection shall be implemented as soon as feasible and the date of completion shall be documented on the facility inspection checklist.

2.31 CFIA Certification

2.31.1 The BSO shall arrange for inspections of the IQ facility by the CFIA at intervals requested by them.

2.31.2 Prior to an inspection by the CFIA, the BSO shall perform a facility inspection as specified in 2.30 (if one has not recently been conducted) and implement required corrective actions prior to the arrival of the inspector(s).

2.31.3 The BSO shall ensure that corrective actions are taken for all findings identified by the CFIA, documentation relating to the inspection is maintained with facility records, and the IPS manager is kept current of all activities associated with the inspection.

2.31.4 Upon receipt of an approved *Permit to Import* or *Movement Certificate* for an insect species new to our quarantine facility, the BSO shall co-ordinate with the CFIA for facility certification for working with that species, if requested by them.

2.32 Future Facility Expansion

2.32.1 Upon determination by the BSO that IQ facility user requests will exceed the capacity of the current facility, she/he shall consult the IPS manager for approval to expand the facility into lab modules formerly occupied by the domestic species area of the building. CFIA approval must be obtained prior to expansion.

2.32.2 Upon approval by the IPS manager to expand the IQ facility, the BSO shall perform the following actions prior to opening the connection between the old and new work areas:

a) Conduct an intensive cleaning (as per 2.29.2) of the work area that is to be incorporated into the quarantine zone, if required.
b) Conduct a visual inspection of the new containment barrier and repair any seals (e.g., screens, drains, caulking, etc.) requiring maintenance.
c) Instruct facility maintenance personnel to change air pressurization of the new lab space from “positive” to “negative”. Air pressurization of the new hallway shall be equal to that of the adjacent existing IQ hallway. Air pressurization of the new lab modules shall be lower than the adjacent hallway.
d) Conduct a facility inspection (as per 2.30) as it pertains to the newly acquired lab space.

2.32.3 Upon completion of 2.32.2, the BSO shall ensure that door alarms are turned off on those doors now fully incorporated within the quarantine zone, and turn on the door alarms at the new quarantine barrier. The BSO shall test the newly alarmed doors by breaching them and checking for applicable audible messages and email notifications. Signage on doors shall be changed, as applicable.

2.33 Swipe Card Building Passes

2.33.1 Upon approval of a *Request to Use IQ Facility* form by the BSO, she/he shall provide the IPS manager with the name(s) of individuals [i.e., only those persons designated as *Full Access* (as per 2.3.1)] who require swipe card access, the applicable door numbers, and the start/end dates for their access.

2.33.2 The BSO shall notify the IPS manager whenever individuals progress from *Restricted Access* to *Full Access* and require changes to the programming of doors to facilitate swipe card access.

2.33.3 The BSO shall notify the IPS manager if the end date for swipe card access for an individual needs to be extended (i.e., provide name of individual, door numbers, and new end date).

2.33.4 Researchers will not normally be given access to the upper level of the IQ facility (i.e., swipe card access through door AA250) unless deemed necessary by the BSO.

2.33.5 The BSO shall notify the IPS manager whenever facility access privileges need to be revoked for any individual.

2.33.6 The IPS manager is responsible for implementing changes to IQ facility swipe card access and for maintaining a historical file of those changes.

2.34 Calculations

2.34.1 The bleach working solution for general cleaning shall have a final sodium hypochlorite concentration of 0.3%. Bleach stock material with a 5.25% sodium hypochlorite concentration (e.g., Javex®) shall be diluted by combining 60ml bleach and 940ml water (i.e., 6% dilution). Bleach stock material with a 6.0% sodium hypochlorite concentration (e.g., Ultra Javex®) shall be diluted by adding 53ml bleach and 947ml water (i.e., 5.25% dilution). If another brand of bleach is used, volumes may need to be adjusted to provide a 0.3% sodium hypochlorite working solution.
[Note: minimum contact time of 10 minutes is required for effective sanitation]

2.35 Documentation and Reporting

2.35.1 Compliance to this SOP shall include completion of the following forms:

a) IPS Form Number 0005/002 (*Set Parameters for Environmental Chambers/rooms*)
b) IPS Form Number 0108/005 (*Weekly Checklist for IQ Facility*)
c) IPS Form Number 0109/005 (*Monthly Checklist for IQ Facility*)
d) IPS Form Number 0110/002 (*IQ Training Log*)
e) IPS Form Number 0111/001 (*IQ User Access Level*)
f) IPS Form Number 0081/002 (*Equipment Logbook*)
g) IPS Form Number 0082/001 (*Maintenance and Repair Log*)
h) IPS Form Number 0083/001 (*Cleaning Log*)
i) IPS Form Number 0084/001 (*Calibration Log*)

j) IPS Form Number 0112/002 (*IQ Insect Receipt Log*)
k) IPS Form Number 0113/001 (*IQ Insect Transfer Log*)
l) IPS Form Number 0114/001 (*IQ Autoclave Log*)
m) IPS Form Number 0115/002 (*IQ Facility Inspection Checklist*)
n) IPS Form Number 0116/002 (*IQ BSC Flow Rates*)
o) IPS Form Number 0142/002 (*Air Pressure Monitor Validation*).

2.35.2 Compliance to this SOP may include completion and/or maintenance of current versions of the following forms referred to herein:
a) IPS Form Number 0103 (*Request to Use IQ Facility*)
b) IPS Form Number 0104 (*IQ Facility User Agreement*)
c) IPS Form Number 0106 (*Insect Quarantine Access Log*)
d) IPS Form Number 0107 (*Insect Quarantine Incident Report*)
e) IPS Form Number 0141 (*Insect Production Services Sign-in Form*)
f) CFIA application for Written Authorization

3.0 DISTRIBUTION AND ARCHIVING

3.1 Distribution

This SOP shall be distributed by the IPS manager to the BSO and to any other potential facility users (e.g., GLFC personnel) who request a controlled copy. Controlled copies are monitored for chain of custody to ensure that current versions are distributed timely and that outdated versions are destroyed. A current version of this SOP may be viewed in the *Bio-Safety Manual* maintained within the IQ facility or through the GLFC intranet.

3.2 Archiving

3.2.1 The IPS manager shall maintain a historical file of this SOP when it is replaced by a new version.
3.2.2 The BSO shall maintain historical files for all forms specified in *2.35*.
3.2.3 The BSO shall maintain a historical collection of voucher specimens of exotic insects brought into the IQ facility.
3.2.4 The BSO shall maintain copies of *Work Orders* for the IQ facility.
3.2.5 The BSO shall maintain files for copies of applications, permits and certificates.
3.2.6 The BSO shall maintain all facility records for a period of at least 3 years.

3.3 Destruction of Outdated SOPs

When a new version of this SOP is available for distribution, all persons in possession of a controlled copy shall ensure that the retired version is returned to the IPS manager upon request.

4.0 ASSURING SOP VALIDATION AND COMPLIANCE

4.1 Responsible Individual

4.1.1 The BSO is responsible for assuring that this SOP is valid.
4.1.2 The BSO is responsible for assuring that she/he complies with this SOP.

4.1.3 The BSO is responsible for complying with procedures specified on a *Controlled Copy* of this SOP and shall never use non-controlled copies (which could be outdated).

5.0 REVISION OF THE SOP

5.1 Responsible Individual

The BSO is responsible for assuring that this SOP is current. If necessary, the BSO shall initiate the revision process.

5.2 Revision Schedule

This SOP shall be revised when its provisions no longer agree with current practices, GLFC policies or CFIA requirements, and shall be approved by the IPS manager and the CFIA Office of Biohazard Containment and Safety.

6.0 CONTINGENCIES

When facility users find circumstances that do not permit compliance with this SOP, the BSO shall be consulted.

7.0 CONFIDENTIALITY

IPS SOPs are not considered to be confidential documents and may be distributed to outside parties. *Controlled Copies* shall not be reproduced.

8.0 REFERENCES

Bio-Safety Manual
CFIA Containment Standards for Handling Plant Pests
CFIA Directive D-12-03
Current version of the following forms:
a) IPS Form Number 0103 (*Request to Use IQ Facility*)
b) IPS Form Number 0104 (*IQ Facility User Agreement*)
c) IPS Form Number 0106 (*Insect Quarantine Access Log*)
d) IPS Form Number 0107 (*Insect Quarantine Incident Report*)
e) IPS Form Number 0141 (*Insect Production Services Sign-in Form*)
Current version of the following SOPs:
a) SOP Number IPS/030 (*IQ Facility Access Authorization*)
b) SOP Number IPS/031 (*Movement of Exotic Forest Insects*)
c) SOP Number IPS/033 (*Conducting Research in Insect Quarantine*)

9.0 APPENDICES

Appendix 1: IPS Form Number 0108/005 (*Weekly Checklist for IQ Facility*)
Appendix 2: IPS Form Number 0109/005 (*Monthly Checklist for IQ Facility*)
Appendix 3: IPS Form Number 0110/002 (*IQ Training Log*)
Appendix 4: IPS Form Number 0111/001 (*IQ User Access Level*)
Appendix 5: IPS Form Number 0081/002 (*Equipment Logbook*)
Appendix 6: IPS Form Number 0082/001 (*Maintenance and Repair Log*)
Appendix 7: IPS Form Number 0083/001 (*Cleaning Log*)

Appendix 8: IPS Form Number 0084/001 (*Calibration Log*)
Appendix 9: IPS Form Number 0112/002 (*IQ Insect Receipt Log*)
Appendix 10: IPS Form Number 0113/001 (*IQ Insect Transfer Log*)
Appendix 11: IPS Form Number 0114/001 (*IQ Autoclave Log*)
Appendix 12: Insect Quarantine Autoclave Settings
Appendix 13: IPS Form Number 0115/002 (*IQ Facility Inspection Checklist*)
Appendix 14: IPS Form Number 0116/002 (*IQ BSC Flow Rates*)
Appendix 15: Validation of Autoclave Sterilization
Appendix 16: Air Pressure Monitor Validation Procedure
Appendix 17: IPS Form Number 0142/002 (*Air Pressure Monitor Validation*)
Appendix 18: IPS Form Number 0005/002 (*Set Parameters for Environmental Chambers/rooms*)
Appendix 19: Autoclave Validation Procedure for Whole Log Bolts
Appendix 20: IPS Form Number 0156/001 (Autoclave Validation for Whole Log Bolts)

Appendix 1

IQ Weekly Checklist
(Excluding modules assigned to IPU)

Week: DD/MM/YY to DD/MM/YY

	Task	Initials
Cleaning	Facility floors vacuumed and bleached (level 1 and stairwell)	
	Floors of Walk-ins vacuumed and bleached □AA12601 □AA12701	
	Floor of Cold Room (AA128) vacuumed and bleached	
	Reach-ins assigned to others checked/cleaned □AA12301 □AA12501 □AA12602 □AA12702	
	Door handles cleaned (rooms and chambers)	
	Bathroom cleaned	
	Bench tops bleached and windexed	
	Sinks scrubbed with scouring pad	
	Light switches cleaned	
	BSCs vacuumed and cleaned	
	Fume hood vacuumed and cleaned	
	Keyboard, mouse and scanner cleaned	
	Telephones cleaned	
Other	Delta System printouts taken, reviewed, filed	
	Sticky traps checked	
	Black light checked	
	Garbage autoclaved and removed	
	Screens in sink drains checked	
	Lab coats checked/laundered	
	Autoclave flushed	

IPS Form Number 0108/005

Appendix 2

IQ Monthly Checklist

Month:

Task		Initials	Date (DD/MM/YY)
Cleaning	Shelves of Walk-ins cleaned □AA12601 □AA12701		
	Shelves of Reach-ins checked/cleaned □AA12301 □AA12501 □AA12602 □AA12702		
	Shelves cleaned in fridge		
	Screens on air supply and return grills vacuumed		
	Floor drain screens checked/cleaned		
	HEPA vacuum canisters emptied and cleaned (2 units)		
	Microscopes cleaned		
	Balances cleaned		
	Windows (including module doors) checked/cleaned		
Other	Panic bar alarms tested □AA4 □AA136 □AA116B		
	Supply inventory assessed and re-stocked		
	Autoclave validated using bio-indicators		
	Electrical plug covers checked		
	Air sampling conducted		
	BSC flow rates recorded		
	Fire extinguishers checked		
	Eyewash checked		
	Emergency shower checked		
	IQ Access Logs replaced (both levels)		
	Maintenance personnel sign-in form filed		
	Compare Delta System with NIST — Walk-ins □AA12601 □AA12701		
	Compare Delta System with NIST — Reach-ins □AA12301 □AA12501 □AA12602 □AA12702		
	Compare Delta System with NIST — Cold Room AA128		
	Compare Delta System with NIST — Environmental Rooms □AA121 □AA123		
	Test emergency light battery packs □AA106B-left □AA106B-right □AA102 □AA202 □AA206 □AA3		
	IPU check list for level 2 modules reviewed; spot check conducted		

IPS Form Number 0109/005

Appendix 3

IQ Training Log

Name: _____

Date of Training (DD/MM/YY)	Description of Training	Initials of BSO	Initials of Trainee

IPS Form Number 0110/002

Appendix 4

IQ User Access Level

Name	Access Level			Access
	Newcomer (DD/MM/YY)	Restricted Access (DD/MM/YY)	Full Access (DD/MM/YY)	Terminated (DD/MM/YY)

IPS Form Number 0111/001

Appendix 5

Equipment Logbook

Instrument Location: _____

Instrument Type: _____

Manufacturer: _____

Model Number: _____

Serial Number: _____

EDR (GLFC ID) Number:
_____

IPS Form Number 0081/002

Appendix 6

Maintenance and Repair Log

Equipment ID: _____ Location: _____

Date (DD/MM/YY)	Description of Maintenance or Repair Action	Initials

IPS Form Number 0082/001

Appendix 7

Cleaning Log

Equipment ID: _____ Location: _____

Date (DD/MM/YY)	Description of Cleaning Action	Initials

IPS Form Number 0083/001

Appendix 8

Calibration Log

Equipment ID: _____ Location: _____

Date (DD/MM/YY)	Description of Calibration Action	Initials

IPS Form Number 0084/001

Appendix 9

IQ Insect Receipt Log

Date Received: _____ (DD/MM/YY)

Insect Species: _____

Movement Certificate#: _____

Received From: _____

Import Permit #: _____

Intended User(s): _____
_____
_____
_____

Phytosanitary Certificate #: _____

Condition Upon Receipt:

_____
_____
_____

Description (including quantity):

_____
_____
_____
_____
_____
_____
_____
_____

Decontamination of Packaging Materials:
Method_____ Date_____ (DD/MM/YY)

IQ Storage Location(s): _____
_____
_____

Archive Samples: Rec'd _____ (DD/MM/YY)

ID'd _____ (DD/MM/YY)

Completed by: _____ Printed Name _____ Signature

IPS Form Number 0112/002

Appendix 10

IQ Insect Transfer Log

Date Distributed: _____ (DD/MM/YY)

Insect Species: _____

Movement Certificate#: _____

Person Responsible For Transport: _____

Recipient: _____

Description (including quantity):

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Completed by: _____ Printed Name _____ Signature

IPS Form Number 0113/001

Appendix 11

IQ Autoclave Log

Date (DD/MM/YY)	Cycle #	Description of Materials Autoclaved	Test Strip	Initials

IPS Form Number 0114/001

Appendix 12

Insect Quarantine Autoclave Settings

Material	Type of Cycle	Temperature (°C)	Sterilizing Time (minutes)	Drying Time (minutes)	Print Interval (minutes)
Waste	Pre-Vac	121	30	2	15
Glassware	Pre-Vac	121	30	30	15
Wood (split)	Pre-Vac	121	60	2	15
Wood (whole bolts)	Pre-Vac	121	180*	5	15
Lab Coats	Pre-Vac	121	30	10	15
1000ml Liquid	Liquid	121	45	0	15
500ml Liquid	Liquid	121	40	0	15
2000ml Liquid	Liquid	121	55	0	15

*Sterilized log blots shall remain in the sealed chamber for an additional 60 minutes, plus another 60 minutes in the chamber or on the floor prior to disposal.

[Refer to the operator manual for settings to be used with other materials and/or volumes]

Appendix 13

IQ Facility Inspection Checklist

Date of Inspection: DD/MM/YY

BSO Signature:

Area/Item Inspected	Compliant (✓)		Comments	Corrective Action Implemented	
	Yes	No		Date (DD/MM/YY)	Initials
Sign at entrances (e.g., containment area, unauthorized entry prohibited, contact information)					
Sign at exits (e.g., unauthorized removal of organisms prohibited)					
Entrances kept locked					
Anteroom lights controlled by door					
Air curtains controlled by door					
Door closures (i.e., self-closing, close quickly)					
Weather stripping on doors (i.e., tight fitting)					
Inward directional air flow					
Emergency exit alarms					
Access log					
Black lights					
Sticky traps					
Screens on air supply and return vents					
Screens in sink drains					
Screens on chemical fume hood					
Supplies stored in closed bins/cupboards					
Cages/containers secure against escape					
Integrity of walls, floor and ceiling					
Seals maintained [i.e., all seams, cracks or openings around service outlets (electrical, plumbing, heating, ventilation), floor drains, furnishings (benches, cupboards), door frames, etc.]					
Autoclave validated against standard loads					

IPS Form Number 0115/002

Appendix 14

IQ BSC Flow Rates
(Inches W.C.)

BSC #11 SN 100660-2879	BSC #12 SN 801-7591	BSC #13 SN 12242	Date (DD/MM/YY)	Initials

IPS Form Number 0116/002

Appendix 15

4 November 2013

Validation of Autoclave Sterilization using Biological Indicators

Two types of biological indicators (3M™ Attest™ and MagnaAmp®) are used to validate sterilization of five load types in the IPQL autoclave (Amsco Lab 250, Serial Number 0305610-08).

The 3M™ Attest™ biological indicator is used to validate sterilization of glassware, lab coats, waste or wood within the autoclave chamber when using the "prevacuum" (i.e., vacuum-assisted) cycle. It consists of a sealed glass ampoule containing a disc inoculated with *Geobacillus stearthermophilus* spores, growth medium and a Bromocresol Purple pH indicator, which changes colour when the sterilization process fails. The ampoule is placed in the autoclave load type and autoclaved as per one of the procedures indicated below.

The MagnaAmp® biological indicator is used to validate sterilization of water within the autoclave chamber when using the "liquid" cycle. It also consists of a sealed glass ampoule containing *Geobacillus stearthermophilus* and a specially formulated culture medium that changes colour to indicate failure of the sterilization process. The ampoule is suspended directly in the vessel of water to be autoclaved as per the procedure indicated below.

Both types of biological indicators are fitted with a steam indicator strip to provide preliminary indication that steam sterilization has occurred. It turns from pink to brown when exposed to steam (indicating a *positive* assessment), however successful sterilization cannot be validated using this indicator alone.

Upon the completion of applicable autoclave cycle for the load type, the ampoule is removed from the load and immediately incubated for 48h at 55-60°C. Prior to incubation, the 3M™ Attest™ ampoule is crushed in middle (while wearing safety gloves) to expose the inoculated disk to the growth medium, and is lightly shaken to ensure proper mixing. Both types of indicators should remain purple, resulting in a *negative* assessment and acceptance of the sterilization validation test. They will turn yellow when spores have survived the autoclave process, resulting in a *positive* assessment and failure of the test. Positive control ampoules (i.e., biological indicators from the same lot of each type) are not to be exposed to the autoclaving process but are to be incubated along with each test batch. These should turn yellow to show that the associated lot of indicators, as well as the incubation process, function as intended.

Five typical load types may be encountered in the quarantine facility. Descriptions and validation procedures for each are as follows:

1) **Glassware**: Place laboratory glassware (cylinders and beakers) in a large autoclavable plastic bin. Insert the 3M™ Attest™ biological indicator in the interior of a cylinder, wrap the end loosely with tin foil and place in the centre of the bin surrounded by other cylinders. Autoclave for 30 minutes using the "prevacuum" cycle, followed by a 30 minute dry-time within the chamber.

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Appendix 15 (continued)

4 November 2013

2) **Liquids**: The largest volume of water sterilized in the IPQL is 2000ml, therefore validation is to be performed using this volume in a Pyrex bottle. Suspend a MagnaAmp® biological indicator in the middle of the bottle using a wire as shown in the attached photo. Cap the bottle loosely with tin foil since the bottle cap will no longer fit due to the presence of the wire. Include the bottle cap in the chamber during the sterilization process. Autoclave for 55 minutes using the "liquid" cycle. Do not use any dry-time.


3) **Lab coats**: Place at least five lab coats in a mesh autoclavable bin. Insert a 3M™ Attest™ biological indicator in the pocket of a lab coat positioned in the middle of the group. Autoclave for 30 minutes using the "prevacuum" cycle, followed by a 10 minute dry-time within the chamber.


4) **Waste**: Place a typical sample of laboratory waste (e.g., paper, cardboard and paper towel) in an autoclavable bag. Tie string to a 3M™ Attest™ biological indicator and put the ampoule in the centre of the waste with the free end of the string protruding through the bag opening. Tie the bag loosely. Autoclave for 30 minutes using the "prevacuum" cycle, followed by a 2-minute dry-time within the chamber.


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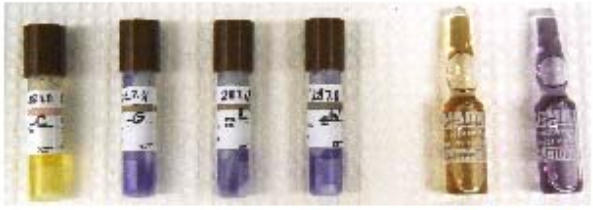
Appendix 15 (continued)

4 November 2013

5) **Wood:** Place split wood (approximately one-inch in diameter) in an autoclavable bin. Place a 3M™ Attest™ biological indicator in the middle of the load (not visible from the top). Autoclave for 60 minutes using the "prevacuum" cycle and no dry-time. Allow the material to cool within the chamber for 24h then autoclave again using the same settings.


Expected results (after incubation) for sterilization of glassware, lab coats, waste and liquids:



A B C D E F

A. 3M™ Attest™ Biological control (positive control vial)
B. 3M™ Attest™ Biological control for the Glassware prevacuum cycle
C. 3M™ Attest™ Biological control for the Lab coat prevacuum cycle
D. 3M™ Attest™ Biological control for the Waste prevacuum cycle
E. MagnaAmp® Biological control (positive control vial)
F. MagnaAmp® Biological control for the 2000ml Liquid cycle

Expected results (after incubation) for sterilization of wood:

G H

G. 3M™ Attest™ Biological Control (positive control vial)
H. 3M™ Attest™ Biological control for the Wood prevacuum cycle

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Appendix 15 (continued)

4 November 2013

Recording of results

Post-incubation results of biological indicators are to be recorded as follows:

Incubation Date	Load-Type	Biological Indicator Used	Lot #	Chemical Indicator Strip (+/ -)	Colour	Success of Sterilization (Yes/No)
	Glassware	3M™ Attest™				
	Liquids	MagnaAmp®				
	Lab coats	3M™ Attest™				
	Waste	3M™ Attest™				
	Wood	3M™ Attest™				

Post-incubation results of positive controls are to be recorded as follows:

Incubation Date	Biological Indicator Used	Lot #	Colour	Success of Incubation (Yes/No)
	3M™ Attest™			
	MagnaAmp®			

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Appendix 16

Air Pressure Monitor Validation Procedure
Version: 10 October 2013

Purpose:

This procedure is intended to ensure that wall-mounted air pressure monitors throughout the quarantine facility and the domestic production facility are yielding accurate data and to ensure that this data is transmitted accurately to the Building Management System (i.e., Delta System).

Equipment Required:

Hand-held Air Pressure Monitor
Adaptor
Extension cord
Rubber tubing (approx. 5ft)
1-ml disposable pipette (with tapered end removed)
V-shaped Spatula
IPS Form Number 0142
2 Walkie-talkies

Page 1 of 4

Appendix 16 (continued)

Methodology:

(CAUTION: Do not blow into either of the ports of the hand-held sensor or the unit will become damaged)
-Conduct validation testing when other workers are not present in the facility (i.e., ensure that facility users are not opening and closing doors or operating exhaust fans).
-Perform validation of monitors in the order shown on IPS Form 0142.
-Connect the adapter to the hand-held air pressure monitor.
-Plug the adaptor into the extension cord.
-Plug the extension cord into a power source near to the location of the wall monitor being checked.
-Ensure that the reading on the wall monitor is relatively stable prior to conducting the validation procedure.
-Insert the 1 ml pipette into the rubber tube and connect the other end of the tube to the applicable port on the hand-held monitor; attach the tube to "LO" port when the air pressure on the opposite side of the door being tested is at a lower air pressure than the air space where the monitor is located; attach the tube to the "HI" port when the air pressure on the opposite side of the door being tested is at a higher air pressure than the air space where the monitor is located.

-Hold the open end of the pipette next to the open port of the monitor and wait for the read-out to stabilize (about one minute).

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Appendix 16 (continued)

-If the reading does not equal zero, use a pen tip to press the "zero" button on the front of the unit.

-Ensure that the unit now reads zero.
-Where required, use a spatula to create a temporary opening between the rubber door sweep and the floor of the door associated with the wall monitor being validated.

-Slide the open end of the pipette through the gap created by the spatula until it is fully inserted into the room but the rubber tube does not touch the door sweep.

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Appendix 16 (continued)

-Remove the spatula (i.e., the rubber door sweep should re-seal against the pipette).
(Note: the pipette may be slid between the two centre door panels of the sliding doors rather than underneath)

-Ensure that the rubber tube is not restricted by the door sweep or pinched anywhere else along its length.
-Wait for the reading on the hand-held monitor to stabilize (approximately one minute).
-Contact the facility engineer using the walkie-talkie and relay the readout from the wall-mounted monitor; ensure that it corresponds to the Delta system reading (±1 Pa); if they do not correspond, initiate repair and/or calibration and repeat the test.
-Take simultaneous readings from the hand-held monitor and the wall-mounted monitor; record the data on IPS Form Number 0142 [Note: readings from the wall-mounted monitor are stated in Pascal (Pa) whereas the readings from the hand-held monitor are stated in Inches of Water].
-Withdraw the pipette from under the door and ensure that the door sweep closes the gap.
-Once all readings are documented, convert hand-held monitor readings from Inches of Water to Pascal by multiplying by 248.8 and record on the form.

i.e., (Inches Water) x 248.8 = Pascal

-Ensure that the read-out from the hand-held monitor corresponds to the wall-mounted monitor within 3 Pa; if they do not correspond, initiate repair and/or calibration and repeat the test.
-The person conducting the validation procedure shall apply her/his name and dated signature to IPS Form Number 0142 and maintain the form with facility records.

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Appendix17

Air Pressure Monitor Validation

Conducted by: _____ (Name) _____ (Signature) ___/___/___ (DD/MM/YY)

Monitor Location		Reading on Wall-Mounted Monitor (Pa)	Reading on Delta System (Pa)	Hand-held Monitor	
Zone	Door Transition			Reading on Monitor (Inches Water)	Conversion to Pa*
Domestic	AA209/Q2				
Domestic	Q2/AA220				
Domestic	AA220/AA217				
Domestic	AA220/AA218				
Domestic	AA220/AA219				
Domestic	S3/AA222				
Domestic	S3/AA223				
Domestic	S2/AA224				
Domestic	S2/AA225				
Quarantine	S2/S1				
Domestic	Stair AA1/Outside	NA	NA		
Quarantine	U/AA125				
Domestic	U/AA118A				
Domestic	Q2/AA213				
Domestic	Q2/AA212				
Quarantine	AA211/AA211C				
Quarantine	AA211C/AA226				
Quarantine	R1/R2				
Domestic	Q/T				
Quarantine	AA105/AA130				
Quarantine	AA106/AA106A				
Quarantine	AA106A/AA129				
Quarantine	AA129/AA125				
Quarantine	AA125/AA127				
Quarantine	AA125/AA126				
Quarantine	AA125/AA123				
Quarantine	AA125/AA121				
Quarantine	Stair AA3/Outside				
Quarantine	R2/Stair AA3				
Quarantine	S1/AA228				
Quarantine	S1/AA227				
Quarantine	AA226/S1				

* Inches Water x 248.8 = Pa

IPS Form Number 0142/002

Appendix 18

Set Parameters for Environmental Chambers/Rooms

Chamber/Room ID:

Temperature: °C

Limits: ±

Relative Humidity: %

Limits: ±

Photoperiod: On / off

Alternate Environment:

After Hours Contact:
Name
Phone
Cell

Alternate Contact:
Name
Phone
Cell

Effective Date:_____
DD/MM/YY

IPS Form Number 0005/002

Appendix 19

8 April 2014

Autoclave Validation Procedure for Whole Log Bolts

Autoclave performance against whole log bolts shall be validated annually under the most difficult scenario that we might ever encounter within our bio-containment facility (i.e., preliminary tests showed that sugar maple was the species most resistant to heat penetration; 36 inches is the maximum capacity of our autoclave). Therefore, validation shall be performed using a recently cut (i.e., prior to cracking caused by drying) sugar maple log 10±0.5 inches in diameter (i.e., mean of the diameter at each end), 36±0.5 inches long, and free of penetrations caused by wood boring insects thus providing test material with the greatest resistance to steam penetration during the autoclaving process.

The log bolt shall be autoclaved at 121°C for three hours using the pre-vac cycle and a five minute dry time (dry time reduces moisture in the surrounding work room after autoclaving). A steam indictor strip shall be included with the log to ensure that the required chamber temperature is achieved. The total autoclave cycle will last approximately 3hr 26min, including generator warm-up and chamber evacuation time.

Upon completion of the autoclave cycle, the log bolt shall be left in the sealed chamber for an additional one hour since preliminary tests revealed that heat continues to be driven from the sapwood deeper into the heartwood. Immediately upon completion of this one hour waiting period, the log bolt shall be removed and holes drilled in a straight line along the central axis to a depth of five inches (i.e., to the centre of the 10 inch diameter log). One of the holes shall be located at the middle of the central axis and additional holes shall be located at five inch increments toward each end of the log (i.e., the log will receive a total of 7 holes). The diameter of drill bit shall not be more than 1/16 inch larger than the diameter of the glass thermometers (calibrated and tested against thermometer standards traceable to the National Institute of Standards and Technology) that are to be immediately be inserted into the holes for taking temperature measurements, thus ensuring a snug fit and accurate readings. Each hole will be plugged with a thermometer for the duration of the subsequent sample period.

Core temperatures shall first be taken 15 minutes after the log is removed from the autoclave to allow sufficient time for drilling of holes and for the thermometer temperatures to stabilize, and again at 15 minute intervals thereafter for a three hour sampling period. All temperature measurements are to be recorded to the nearest 0.5°C on IPS Form Number 0156/001 (Autoclave Validation for Whole Log Bolts).

The autoclave validation procedure is deemed to be successful when all thermometers in the log measure at least 56°C for a minimum of one hour during the three hour sampling period.

No attempt shall be made to insert biological indicators into the core of the log bolt since they require a minimum temperature of 121°C for deactivation, whereas internal log bolt temperatures will not attain this level of heating when following this autoclaving procedure.

Appendix 20

Autoclave Validation for Whole Log Bolts

Date:

Autoclave Cycle Number: Steam Sterilization Time:

Wood Species:

Room Temperature:

Log Dimensions
Diameter: Length:

Time Post Autoclaving*	Core Temperature (°C)						
	Location #1	Location #2	Location #3	Location #4	Location #5	Location #6	Location #7
15 min**							
30 min**							
45 min**							
60 min**							
75 min**							
90 min**							
105 min**							
120 min**							
135 min**							
150 min**							
165 min**							
180 min**							

*3hr steam sterilization at 121 °C + 5min dry time + chamber evacuation + 60min in sealed chamber= 4hr 26min total time in chamber
**additional time is at room temperature

IPS Form Number 0156/001

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ISSN 2368-4658

TITLE: Conducting Research in Insect Quarantine

APPROVING OFFICIAL:

DD / MM / YY

*Manager, Insect Production Services (IPS)*_____ ___/___/___

SIGNIFICANT CHANGES FROM PREVIOUS VERSION:

This Standard Operating Procedure (SOP) has been modified for applicability to the newly constructed Great Lakes Forestry Centre (GLFC) Insect Quarantine (IQ) Facility. Changes include the following:

-The floor plan has been revised.
-The title "Insect Quarantine Officer (IQO)" has been revised to "Bio-Safety Officer (BSO)" to match terminology used by the regulatory authority (i.e., Canadian Food Inspection Agency - CFIA).
-Insect Production Services (IPS) personnel now have a separate entrance to the quarantine facility via the domestic rearing zone; all other personnel are restricted from using this entrance.
-When portions of the quarantine zone require heightened bio-safety measures, personnel working in those areas will be required to wear bunny suits, shoe covers, head covers and beard covers (if applicable), rather than lab coats as required elsewhere in the facility; notices will be posted in the change rooms and at affected research modules whenever heightened bio-safety measures are required.
-Personnel no longer have access to the entire quarantine facility, only to areas for which access was approved by the BSO.
-Lists of equipment available to facility users have been revised.
-Storage room C343 is no longer available to facility users.
-Facility users will be required to assist with splitting of log bolts when quantities are large or when the log bolts exceed the maximum size restriction.
-A central vacuum system, chemical fume hood and wireless phone system are now available to facility users.
-Rooms are fitted with alarms for air pressurization.

1.0 INTRODUCTION

1.1 Purpose

This SOP has been established to standardize methods and procedures for assuring the bio-safety of the IQ facility, to reduce the incidence and spread of pathogens and microbial contaminants within the facility, and to delineate responsibilities of users from those of the BSO.

1.2 Scope

This SOP shall be followed by all scientific personnel (GLFC, Canadian Forest Service – CFS or otherwise) conducting research and rearing activities with exotic and/or invasive forest insects within the GLFC IQ facility.

1.3 Definitions

Biological Safety Cabinet (BSC) – A class 2 containment cabinet designed for both worker and sample protection; room air is drawn into the front of the unit; the unit is designed in such a way that room air is HEPA filtered before blowing over the work area; air-borne hazardous particles coming off samples in the work area are pulled away from the worker and the air is vented back into the room after HEPA filtration; this type of unit is not suitable for worker protection from chemical fumes.

Bio-Safety Manual – A manual containing only those IPS SOPs that relate specifically to the IQ facility.

Bio-Safety Officer (BSO) – A member of IPS having supervisory authority over the daily operation of the IQ facility and who provides technical/research support to users of the facility.

Controlled Copy – A copy of an SOP distributed to select GLFC personnel having a unique copy number and dated signature of the IPS manager. Controlled copies are intended to ensure that GLFC personnel follow the most recent version of the SOP.

Delta System – Hardware/software system used by GLFC engineering personnel to program, monitor and track environmental conditions within the facility and to provide an alarm when tolerance limits are exceeded.

Effective Date – The date from which the procedures given in an SOP are to be implemented.

Great Lakes Forestry Centre (GLFC) – One of five Canadian Forest Service (CFS) research facilities in Canada.

Insect Production Services (IPS) – A GLFC work team consisting of the Insect Production Unit (IPU), the Quality Control Unit (QCU) and IQ personnel who perform insect rearing, quality control and quarantine activities in support of forest pest research activities internal and external to the CFS.

Insect Production Services Manager – The individual who has overall responsibility for activities of the IPS team.

Insect Production Unit (IPU) – A work unit of IPS consisting of personnel who perform insect rearing, diet making and methods development activities at GLFC.

Insect Quarantine (IQ) – A general-use facility under the control of IPS used for rearing exotic forest insects and conducting associated research activities.

Invasive Insects – Insects that adversely affect the habitats and bioregions they invade economically, environmentally, and/or ecologically and have become newly established in that area. They can be domestic (i.e., native to Canada) or introduced (i.e., exotic, non-indigenous, alien).

Movement Certificate – A document issued pursuant to the Plant Protection Act and signed by an inspector that authorizes the movement of things within Canada or from Canada to a foreign destination.

NIST Traceable Thermometer/Hygrometer – A thermometer/hygrometer with a manufacturer's certificate of accuracy verifying that it was calibrated and tested against standards traceable to the National Institute of Standards and Technology (NIST).

Permit to Import – A document issued pursuant to the Plant Protection Act that authorizes the import of things into Canada.

Principal Investigator (PI) - An individual internal or external to GLFC who has the responsibility for the overall conduct of the phase(s) of a study performed within the IQ facility.

Quality Control Unit (QCU) – A work unit of IPS consisting of personnel who conduct routine production, process and product control testing and develop new QC methodology in support of IPU activities.

Standard Operating Procedures (SOPs) – Directives describing routine administrative or technical procedures conducted by IPS personnel or users of the IQ facility.

1.4 Safety

1.4.1 Personnel must exercise health precautions (e.g., proper lifting procedures) to minimize risk to themselves and to their co-workers.
1.4.2 Personnel shall have access to, and be familiar with, the MSDS for all chemicals used in the IPU facility.
1.4.3 Eating, chewing gum, drinking, smoking, storing of food or utensils shall not occur in the IQ facility.
1.4.4 Personnel who apply pesticides must be appropriately trained and protected.

1.5 Materials

1.5.1 IPS Form Number 0106/002 (*Insect Quarantine Access Log*, Appendix 2).
1.5.2 IPS Form Number 0107/002 (*Insect Quarantine Incident Report*, Appendix 4).

2.0 PROCEDURES

2.1 Compliance with SOPs

Facility users who do not comply with this SOP or any other SOPs established for the IQ Facility will have their facility access privileges revoked.

2.2 Procedure to Enter Facility

(refer to the floor plan in Appendix 1)

2.2.1 All research and maintenance personnel (excluding IPU personnel) shall enter the IQ facility using the entrance on level one and:

(a) Personnel shall endeavor to schedule their work in the IQ facility for the start of each day prior to entering any other laboratory and/or handling of other insects, viruses, fungi, etc., thereby reducing the incidence and spread of pathogens and microbial contaminants within the facility.
(b) Personal belongings, including boots and coats, shall not be brought into the facility. These shall be left in the outer locker room AA106.
(c) Prior to entering anteroom AA106A, personnel shall document their entry on the *Insect Quarantine Access Log* (IPS Form Number 0106/002, Appendix 2), including printed name (visitors shall also include the name of their organization if they are not employed by GLFC), initials, purpose of the visit, current date and time of entry.
(d) Personnel entering the anteroom shall allow the door to close and the air pressure to stabilize before opening the door to the change room. Personnel are not to enter the containment zone in the event of an air pressure alarm. Doors shall never be propped open, nor opened with a grand master key (i.e., anteroom doors shall never be opened simultaneously) except in emergency situations (e.g., for the passage of a stretcher). In an emergency, contact the BSO manager of IPS, or facilities manager. When time does not permit, any other emergency exit door may be used.
(e) Upon entering the change room, personnel are required to don a lab coat. Disposable shoe covers shall also be applied when the floor in their proposed work area may become contaminated with infested plant material or soil (upon exit, these shoe covers shall

be doffed in the work area/module where they were worn). Lab wear shall be selected from the applicable lockers and shall be worn over street clothing. Wearers shall ensure that they are fully buttoned and/or zipped. Personnel having recurring visits to the facility shall obtain garments from the locker previously identified by the BSO. IPU visitors to the IQ facility shall select lab wear from the locker labeled as "visitors".

When heightened bio-safety measures have been requested by the BSO during the facility access authorization process (i.e., on the *Request to Use IQ Facility* form, SOP Number IPS/030) additional lab wear shall be applied upon entry to the work area specified. At the door to the applicable module/work area, the user shall remove his/her lab coat, hang it on the wall hook, then enter the module and apply the supplied lab wear e.g., bunny suit, shoe covers, head cover, and beard cover (if applicable).

(f) Long hair is to be tied back so that it cannot come into contact with potentially contaminated material. Personnel shall select a wireless telephone from the charging station and may then enter the inner rooms of the facility. Do not pass through door AA129 at the same time someone is entering the change room via the anteroom (i.e., doors AA129 and AA122C shall never be opened at the same time).

(g) Personnel shall not enter any room in the facility if the associated air pressure monitor is alarming.

(h) Facility users shall only enter research modules and other work areas for which access was approved by the BSO during the facility access authorization process as specified in the current version of IPS SOP Number IPS/030. Notices will have been posted by the BSO in the change room and at each research module/work area requiring heightened bio-safety measures.

2.2.2 IPU personnel shall normally enter the IQ facility using the entrance on level two and:

(a) IPU personnel shall endeavor to schedule their work in the IQ facility for the latter part of the day to avoid the necessity of going back to domestic rearing modules, thereby reducing the potential spread of pathogens and microbial contaminants.

(b) Personal belongings, including boots and coats, shall not be brought into the IQ facility. These shall be left in the outer locker room AA209.

(c) Prior to entering anteroom AA211C, personnel shall remove their lab coat and hang it on the supplied wall hook, then document their entry on the *Insect Quarantine Access Log* (IPS Form Number 0106/002, Appendix 2), including printed name (visitors shall also include the name of their organization if they are not employed by GLFC), initials, purpose of the visit, current date and

time of entry. Wireless phones and footwear from the IPU shall not be brought into the IQ facility.

(d) Personnel entering the anteroom shall allow the door to close and the air pressure to stabilize before opening the door to the change room. Personnel are not to enter the containment zone in the event of an air pressure alarm. Doors shall never be propped open, nor opened with a grand master key (i.e., anteroom doors shall never be opened simultaneously) except in emergency situations (e.g., for the passage of a stretcher). In an emergency, contact the BSO manager of IPS, or facilities manager. When time does not permit, any other emergency exit door may be used.

(e) Upon entering the change room, personnel are required to don a lab coat. Disposable shoe covers shall also be applied when the floor in their proposed work area may become contaminated with infested plant material or soil (upon exit, these shoe covers shall be doffed in the work area/module where they were worn). Lab wear shall be selected from the applicable lockers and shall be worn over street clothing. Wearers shall ensure that they are fully buttoned and/or zipped. Personnel having recurring visits to the facility shall obtain garments from the locker previously identified by the BSO. IPU visitors to the IQ facility shall select lab wear from the locker labeled as “visitors”.

When heightened bio-safety measures have been requested by the BSO during the facility access authorization process (i.e., on the *Request to Use IQ Facility* form, SOP Number IPS/030) additional lab wear shall be applied upon entry to the work area specified. At the door to the applicable module/work area, the user shall remove his/her lab coat, hang it on the wall hook, then enter the module and apply the supplied lab wear (e.g., bunny suit, shoe covers, head cover, and beard cover, if applicable).

(f) Long hair is to be tied back so that it cannot come into contact with potentially contaminated material. Personnel shall select a wireless telephone from the charging station and may then enter the inner rooms of the facility. Do not pass through door AA244 at the same time someone is entering the change room via the anteroom (i.e., doors AA244 and AA238B shall never be opened at the same time).

(g) Personnel shall not enter any room in the facility if the associated air pressure monitor is alarming.

(h) Facility users shall only enter research modules and other work areas for which access was approved by the BSO during the facility access authorization process as specified in the current version of IPS SOP Number IPS/030. Notices will have been

posted by the BSO in the change room and at each research module/work area requiring heightened bio-safety measures.

(i) When required, IPU personnel may enter the IQ facility on level one following the procedures specified in 2.2.1

2.3 Procedure to Exit Facility

2.3.1 All personnel (excluding IPU) shall exit the IQ facility on level one. IPU personnel shall exit the IQ facility on the same level from which they entered (normally level two).

2.3.2 All personnel shall exit using the following procedures:

(a) Upon exiting an area of heightened bio-safety, personnel shall examine themselves for hitch-hiking insects, then remove their lab wear and hang it on the wall hook within the work area; immediately upon exiting the module, personnel shall apply a lab coat before proceeding through the facility.

(b) Prior to entering the change room, peer through the viewing window on the door (i.e., door AA129 or door AA244) to ensure that the door to the anteroom is closed (i.e., both doors shall never be opened at the same time).

(c) Hands must be washed in the change room prior to passing through the door to the anteroom.

(d) Prior to removing lab wear, personnel shall use the mirror in the change room to examine themselves to ensure that there are no hitch-hiking insects on the garments. When more than one individual is present, they shall examine each other. Personnel shall remove their lab wear and return it to the applicable locker; damaged or soiled garments shall be placed in the hamper and replacement garments may be obtained from the supply locker; booties (if applicable) shall be placed in the hamper for decontamination before disposal. Personnel shall return the wireless phone to the charging station. Personnel shall remove their shoes and leave them in the change room.

(e) Upon entering the anteroom, personnel shall use the mirrors to examine themselves again for hitch-hiking insects, and also to allow the air pressure to stabilize before proceeding through to the facility exit.

(f) Upon exit from the facility, personnel shall document their departure time on the *Insect Quarantine Access Log* (IPS Form Number 0106/002, Appendix 2).

(g) IPU personnel may return to the domestic rearing zone but may not enter any of the rearing modules until the next day, after returning home, showering and changing clothing.

2.4 Facility Room Allocation

Refer to the *Floor Plan of Insect Quarantine Facility* (Appendix 1) and to the table for *IQ Facility Room Allocation* (Appendix 3).

2.5 Facility Equipment and Supplies

2.5.1 The IQ facility is equipped with basic laboratory equipment, instruments and supplies. Users shall check with the BSO for availability of specific items at the start of their activities in the facility. Users are responsible for provision of consumables (e.g., rearing containers) applicable to their work and for any instruments/equipment not currently available in the facility. The BSO will provide the materials identified in 2.5.2 and 2.5.3.

2.5.2 General work spaces within the IQ facility are equipped with:

- pass-through autoclave
- biological indicators
- steam indicator strips
- dishwasher
- reach-in environmental chamber
- cold room
- analytical balance
- chainsaw (electric)
- computer (with scanner)
- dissecting microscopes (x2)
- freezer (upright with manual defrost)
- refrigerator (with frost-free freezer)
- log splitter
- magnifying lamps (x2)
- oven/incubator
- plant lights
- central vacuum cleaning system (HEPA filtered)
- alcohol burner
- autoclave bags
- ethanol (70%)
- killing jars (ethanol)
- lab instruments (e.g., forceps, scissors, loops, etc.)
- office supplies (e.g., markers, pens, pencil, tape, labels, etc.)
- paper towels (autoclaved)
- sanitation/janitorial supplies, including bleach working solution (refer to 2.18.1).
- vials for insect samples
- thermometers/hygrometers (NIST traceable)
- sleeved cages

2.5.3 Each research module within the IQ facility is equipped with:

- alcohol burner
- BSC, class 2 (i.e., provides worker and sample protection)
- reach-in environmental chamber
- walk-in environmental chamber
- autoclave bags
- ethanol (70%)
- killing jars (ethanol)
- lab instruments (e.g., forceps, scissors, loops, etc.)
- office supplies (e.g., markers, pens, pencil, tape, labels, etc.)
- paper towels (autoclaved)
- sanitation/janitorial supplies, including bleach working solution (refer to 2.18.1).
- steam indicator strips
- thermometers/hygrometers (NIST traceable)
- vials for insect samples

2.6 Environmental Chambers and Rooms

2.6.1 Users of the chambers/rooms shall be cognizant of the environmental conditions within a unit every time it is accessed (either by doing a visual check of the NIST thermometer/hygrometer or by the feel of the environment) and shall notify the BSO when problems are detected (outside of normal work hours, the user shall notify the contact individual identified on the door of the unit). The memory function of these NIST instruments is not to be reset by the facility user.

2.6.2 Users of the facility are not permitted to change environmental settings for chambers/rooms. Changes shall be requested through the BSO who may facilitate programming changes when there are no conflicting requirements of other users.

2.6.3 Users of the facility are expected to maintain order in the units and to clean up spillage. Floors shall be cleaned using the facility central vacuum system. Refer to section 2.11.

2.6.4 The following procedures are the responsibility of the BSO but are listed here to assist facility users with their research activities:

a) Each environmental chamber/room is posted with a form prepared by the BSO identifying the environmental parameters that are set for the unit, including:
   - chamber/room identifier;
   - date that the environmental parameters are initiated;
   - environmental parameters that are set for the unit, including upper and lower acceptable limits;

- description of alternate environmental conditions (including duration, if applicable) that are suitable for temporary storage of unit contents in the event of a mechanical breakdown;
- prioritized list of individuals to be contacted after hours in the event of mechanical breakdown of the unit.

b) Each environmental chamber/room has:
- connection to the GLFC Delta System so that environmental conditions are monitored on a continuous basis;
- NIST traceable thermometer/hygrometer that is located in a position easily viewed by personnel each time they open/enter the unit;
- alarm system that is activated at both the engineer's station, main security desk, and desk of BSO whenever environmental tolerance limits are exceeded.

c) Environmental conditions are reviewed daily (except holidays and weekends) by the BSO using the facility Delta System to ensure that tolerance limits have not been exceeded since the last time they were checked. Facility users will be notified by the BSO whenever tolerances have been exceeded. Records of hourly tracking of temperature, relative humidity and light conditions within each unit are printed weekly by the BSO and are available to users of the facility upon request.

d) Equipment failure/repair actions and monthly verification of the accuracy of the Delta System are initiated and documented by the BSO. Historical records/logbooks of these activities are available to users of the facility upon request.

e) Routine weekly and annual cleaning of each environmental chamber/room is conducted by the BSO, in addition to vacuuming performed as needed by the facility user.

2.7 Storage

2.7.1 Materials and supplies approved by the BSO for entry into the facility shall be stored in locations designated by the BSO.

2.7.2 Bulk quantities of materials and supplies (e.g., rearing containers, lids, etc.) destined for use in the IQ facility shall be stored outside of the facility (e.g., basement) where they are protected from deterioration or contamination (i.e., they are not to be stored in other GLFC laboratories/facilities where they may be exposed to pathogens).

2.7.3 Smaller quantities of materials and supplies may be stored in the IQ facility in enclosed cupboards/shelves or in bins designated by the BSO. These shall be stored in a manner that will maintain their cleanliness and the cleanliness of the facility.

2.8 Movement of Exotics

Import and/or movement of live exotic forest insects into or out of the IQ facility shall be conducted as specified in the current version of SOP Number IPS/031 (*Movement of Exotic Forest Insects*).

2.9 Materials and Supplies Entering Facility

2.9.1 Only those items previously identified by the PI and approved by the BSO may be brought into the facility [refer to the current version of SOP Number IPS/030 (*IQ Facility Authorization*)]. Other items may be brought into the facility upon subsequent approval by the BSO.

2.9.2 The BSO shall be notified in a timely manner as to the arrival of live insects at the IQ facility. Insects must not to be brought into the facility without prior authorization by the BSO as specified in the current version of SOP Number IPS/031 (*Movement of Exotic Forest Insects*).

2.9.3 Plants and plant materials shall be inspected by the user before being brought into the IQ facility to ensure that they are relatively free of unexpected insects, fungi, etc.

2.9.4 Soils and peat moss (excluding potted plants) shall be autoclaved (i.e., using pass-through autoclave in room A105) prior to entering the IQ facility, even when the material has been advertised as already being sterilized. These materials must be subjected to two 60-minute sterilizations (separated by 48h) and shall be stored in a sealed container (e.g., Rubbermaid tote) that has been sterilized prior to use [i.e., sprayed with a bleach working solution (refer to 2.18.1), followed by wiping with sterile paper towel after at least 10 minutes of contact time].

2.9.5 Materials and supplies shall be removed (where feasible) from their original packaging boxes outside of the IQ facility access door.

2.9.6 Equipment and instruments entering the facility shall be autoclaved by the BSO if possible (i.e., using pass-through autoclave in room AA105). If not, they shall be sprayed with a bleach working solution (refer to 2.18.1) where feasible, followed by wiping with sterile paper towel after at least 10 minutes of contact time. These items must remain in the facility until removal is authorized by the BSO as specified in 2.10.

2.9.7 Paperwork entering the facility from other administrative areas in the building shall be kept to a minimum. It is recommended that users of the facility make required documentation available on the GLFC computer system that can be accessed using the IQ computer. Paperwork from other research laboratories must not enter the IQ facility.

2.9.8 Where possible, researchers shall endeavor to restrict the size of log bolts entering the facility to a maximum dimension of 20” long and 12” diameter to facilitate splitting at the termination of the experiment.

Researchers are responsible for cutting log bolts to a size that will fit into the log splitter.

2.10 Materials Exiting the Facility

2.10.1 No material of any kind shall be removed from the IQ facility until the rearing and/or the experiment is complete, the facility is sufficiently sanitized as specified in 2.11, and these items have been inspected by the BSO. Upon request, the BSO may grant approval for the removal of items at other times after sufficient sterilization and inspection.

2.10.2 Procedures specified in the current version of SOP Number IPS/031 (*Movement of Exotic Forest Insects*) shall be followed for the removal of live exotic forest insects from the facility.

2.10.3 Materials for discard shall be placed in garbage containers lined with autoclave bags and left for autoclaving and discard by the BSO. Insects for disposal shall either be placed in an escape proof vented container for immediate autoclaving by the BSO, or be placed in a vial containing either methanol or ethanol (minimum 70%) for at least 24 hours. The BSO shall be notified whenever larger items (i.e., log bolts) or large quantities of items need to be discarded, and when garbage containers become full. Upon request by the BSO, facility users shall assist with the splitting and autoclaving of log bolts.

2.10.4 Facility users conducting research in modules requiring heightened bio-safety measures (as specified in the current version of IPS SOP Number 0030) shall not remove any materials from the module they have been authorized to work in, unless approved by the BSO (exception: contaminated or potentially contaminated glassware used in the module shall be placed in sealed containers and provided to the BSO for autoclaving prior to being washed by the user).

2.11 Sanitation

2.11.1 Users of the IQ facility shall keep it meticulously clean and free of clutter.

2.11.2 Work areas (e.g., bench tops) shall be cleaned after each use by spraying with the provided bleach working solution (refer to 2.18.1) and allowing 10 minutes of contact time before wiping with sterile paper towel. Surfaces can be sprayed with Windex and wiped with sterile paper towel to remove residue left by the cleaning solution.

2.11.3 Facility users shall clean the floors of their assigned work areas (including reach-in and walk-in chambers) whenever they become visibly soiled. Floors shall never be swept or dry mopped. They shall be vacuumed using the facility central vacuum cleaning system.

2.11.4 Materials shall be handled in a manner that minimizes dispersion of particulates through the air. The BSC shall be used when there is risk of particulates becoming air-borne.

2.11.5 Maintain a garbage bag (i.e., autoclave bag) within the rear part of the chamber when working in the BSC. Do not discard materials in containers outside of the cabinet. Avoid movement of materials or excessive movement of hands and arms through the front access opening during use. When personnel must enter or exit the cabinet, do so from straight on and allow the cabinet to stabilize before resuming work.

2.11.6 The complete interior of the BSC or chemical fume hood shall be cleaned by the user after each session using the method specified in 2.11.2. (The bench-top access panel of the cabinet is removed and cavity below cleaned by the BSO on a weekly basis).

2.11.7 Users of environmental chambers shall clean up spillage as it occurs as specified below. Additional cleaning/sanitation actions are performed by the BSO on a routine basis. Contents shall be removed from the storage compartment as requested by the BSO for cleaning/sanitation of the unit. The user shall clean up spillage by:

a) collecting all insects as per 2.12.10, or rendering them non-viable as per 2.10.3;
b) accounting for all insects as per 2.12.8;
c) placing waste materials is garbage containers as per 2.10.3;
d) vacuuming the floor as per 2.11.3;
e) sanitizing the unit as per 2.11.2.

2.11.8 Personnel using the facility sinks shall ensure that screens are always positioned in the drains.

2.11.9 Additional weekly cleaning/sanitation actions are performed in the IQ facility on a routine basis by the BSO.

2.11.10 Facility users are responsible for cleaning their own glass/lab ware. Small quantities of dirty glass/lab ware may be held in closed bins until it is convenient to clean them. Glassware that is contaminated or potentially contaminated must be autoclaved (by the BSO) prior to washing.

2.12 Bio-safety Containment Procedures (handling of invasive insects)

2.12.1 Conditions for handling/rearing exotic forest insects must be complied with as specified by the CFIA on the *Movement Certificate* or *Permit to Import*. All insects approved by the BSO for entry into the IQ facility shall be handled as though they are exotic, even if they are native to Canada (e.g., mountain pine beetle).

2.12.2 The BSO shall be notified upon arrival of insects at the IQ facility as specified in 2.9.2.

2.12.3 Packages/containers of insects shall be opened as instructed by the BSO. This involves:

a) Ensuring that the door to the room is closed and the air pressure monitor is not in alarm (i.e., inward directional air flow is maintained). Post sign on door indicating "do not enter, transfer in process".

b) Examining packages/containers to ensure that containment has been maintained. If containment has been breached, determine if insects have escaped by comparing numbers remaining with numbers shipped (if available). If insects have escaped (or if unknown), report the occurrence verbally to the BSO who will determine corrective action and notify the appropriate authorities. Document the occurrence on an *Insect Quarantine Incident Report* (IPS Form Number 0107/002, Appendix 4) and provide it to the BSO in a timely manner. Ensure that corrective actions taken include measures to prevent recurrence of the incident.

c) Opening small packages/containers within a sleeved cage and/or BSC.

d) Opening large packages/containers in a room where there are no other insect handling operations being performed.

e) Opening packages slowly; where feasible, use forceps to transfer insects and count insects before and after the transfer.

2.12.4 Disposable shipping packages/containers shall be placed in autoclave bags, sealed and stored in the autoclave chamber for autoclaving/discard by the BSO. Autoclave bags are not to be overfilled. The BSO shall be notified when disposable shipping packages/containers require autoclaving so that she/he can perform the sterilization and document the occurrence. Re-useable containers (e.g., Rubbermaid bins) shall be examined for the presence of insects, washed with soapy water, sprayed with the provided working solution (allowing 10 minutes of contact time), rinsed with tap water, then removed from the facility as soon as possible (following approval/inspection by the BSO).

2.12.5 Any plant materials, soil, etc. accompanying a shipment must be destroyed by autoclaving when they are no longer required.

2.12.6 Voucher specimens of exotic and domestic invasive insects shall be provided to the BSO for archiving as soon as they become available (this may be several months if materials are held in cold storage prior to use). Specimens shall be placed into vials containing 70% ethanol and shall be labeled with the name of the insect species and *Movement Certificate/Permit to Import* number.

2.12.7 Insect handling and experimentation shall only be conducted in the areas previously authorized by the BSO (refer to the current version of SOP Number IPS/030, *IQ Facility Access Authorization*).

2.12.8 Experimental protocols and data sheets developed/used by researchers in the facility shall include methods for maintaining an on-going inventory of their insects, thereby accounting for the whereabouts of each and every insect during its entire life cycle. Users of the facility are accountable for being excruciatingly stringent in correlation of actual numbers of insects with those identified/expected on the data sheets. Data sheets shall be made available to the BSO upon request for confirmation of these numbers. It is unacceptable to have missing insects. They must be found or accounted for before experimentation can proceed.

2.12.9 Original versions of data sheets may not be removed from the facility until the rearing and/or the experiment has been completed and the facility has been sufficiently sanitized. When required sooner, datasheets may be scanned and saved to a common/personal drive where they can be retrieved by the user from outside of the facility.

2.12.10 Personnel shall take immediate corrective action to prevent actual or potential escape of insects resulting from incidents that occur in the IQ facility as follows:

a) Place a patch on broken holding cage, if applicable, and arrange for permanent repair when time permits.
b) Cease other insect handling operations in the area until free insects have been collected.
c) Close the door to the affected area and post the are as being off limits.
d) Collect all of the free insects using applicable collection devices (e.g., forceps, insect nets, etc.), or render non-viable (e.g., sticky traps).
e) Count the number of insect collected to ensure that all are accounted for (refer to 2.12.8).
f) Document the occurrence in an *Insect Quarantine Incident Report* (IPS Form Number 0107/002, Appendix 4) and provide it to the BSO in a timely manner. Ensure that corrective actions taken include measures to prevent recurrence of the incident.

2.12.11 Personnel who become aware of any breach in the security/access of the IQ facility shall immediately notify the BSO.

2.12.12 Personnel who become aware of any break in the insect containment envelope (e.g., broken door seals) of the IQ facility shall immediately notify the BSO. Air supply or exhaust ducts with damaged insect screens shall immediately be sealed using the nearby blast gates. Insect handling operations shall cease in the affected area and the BSO shall be notified immediately.

2.12.13 Personnel who find unintentionally introduced organisms (e.g., other insects, parasitoids, hyper-parasitoids, pathogens, nematodes, etc.) during the conduct of their rearing/experimentation with regulated materials imported from another country shall render them non-viable

(e.g., autoclave or killing jar, as applicable) as soon as they are found. Researchers intending to keep these unintentional insects or nematodes viable within our facility or to send pathogens to a level 3 facility for further experimentation (exotic pathogens may not be maintained in our level 2 facility) must notify the BSO, who will obtain approval from the CFIA. Facility users shall comply with bio-safety requirements specified by the BSO.

2.12.14 There are no restrictions (beyond those specified in Section 2.13) for working with unintentionally introduced organisms (e.g., other native insects, parasitoids, hyper-parasitoids, pathogens, nematodes, etc.) found during the conduct of rearing/experimentation with regulated materials brought to the IQ facility from elsewhere in Canada via a *Movement Certificate*.

2.12.15 The use of automated watering systems should be avoided within the IQ facility.

2.12.16 Alcohol burners are not to be used within BSCs since air flow patterns may be disrupted and/or the HEPA filter may become damaged.

2.12.17 The following procedures shall be followed during the routine handling, feeding and maintenance of insects to maintain containment:

a) Always maintain insects in sealed chew-proof containers/cages.
b) Whenever opening containers/cages, ensure that the door to the room is closed and the air pressure monitor is not in alarm (i.e., inward directional air flow is maintained).
c) Open containers/cages in a BSC whenever feasible; however, working on a bench top is permissible when working with small numbers of insects and taking care not to allow any to escape; if insects enter the mechanical areas of the BSC, contact the BSO to remove the appropriate access panel to capture them; if this isn't feasible, leave the unit running for 48 hours with the door closed and a note to keep it turned on (this will render the insect non-viable due to desiccation).
d) Avoid opening cages/containers when insects are in the immediate vicinity of the opening/lid.
e) When opening containers/cages, minimize the length of time in which the container is open; take care not let insects escape into the BSC or room.
f) When reaching into a cage or container, ensure that insects do not enter your lab-wear by having elasticized cuffs or by wearing sleeve protectors; inspect your sleeves frequently for hitch-hiking insects.
g) Insects shall be counted/verified (as per 2.12.8) each time they are transferred to a new container (e.g., during diet changes) and at the termination of experimentation or rearing.
h) Any material being removed from the container/cage shall be autoclaved by the BSO prior to washing or disposal.
i) Sanitization procedures specified in Section 2.11 shall be followed.

2.12.18 Each time an electrical cord is removed from a wall outlet, a plastic outlet cap shall immediately be inserted.

2.13 Working with Pathogens/Parasitoids in IQ

2.13.1 Personnel intending to conduct experimentation with insect pathogens/parasitoids must be pre-authorized to do so by the BSO, thereby minimizing the potential for conflicting activities.
2.13.2 Extreme care must be taken to avoid contamination of other areas of the facility.
2.13.3 Containers of pathogens or those housing infected insects must only be opened within the BSC.
2.13.4 Dosing of insects with pathogens must be conducted within the BSC.
2.13.5 Materials used for the venting of rearing cages/containers housing infected insects must have smaller pore sizes than the size of the pathogen.
2.13.6 Pathogens are to be stored in sealed, break-resistant containers such as screw top vials. Pathogens are to be clearly identified and dated.

2.14 Provision of Assistance by the BSO

2.14.1 Rearing activities and experimentation conducted within the IQ facility are the responsibility of the facility user.
2.14.2 Upon request, the BSO may be available to assist facility users during times of excessive work load. Assistance may be provided when sufficient notice is given, however researchers should not expect this service unless it was agreed upon prior to commencement of the project.
2.14.3 The BSO will not be available to provide vacation leave replacement, however, with sufficient notice the BSO will perform basic maintenance of rearing operations (e.g., misting cages, etc.) during these absences. The BSO will not take responsibility for experimental conduct.
2.14.4 The BSO will strive to be available to assist facility users during periods of unavoidable leave (e.g., illness).

2.15 Contingency for Fire or Chemical Spill Alarm

2.15.1 Upon hearing the fire or chemical spill alarm, personnel shall close all open insect containers and shall vacate the facility immediately following routine exit procedures. When danger is imminent (e.g., visible smoke or chemical odor), routine exit procedures shall be omitted (i.e., use any door for exit, do not change clothing, do not sign out).
2.15.2 When a user of the facility is also an IPS Emergency Floor Monitor, that individual shall do a sweep of the facility prior to vacating it.

2.15.3 The BSO is responsible for ensuring that GLFC emergency personnel are aware of IQ practices described in 2.15.1 and 2.15.2 and that during an alarm situation they should not enter the IQ facility.

2.16 Power Outage

2.16.1 All essential systems in the IQ facility (i.e., environmental chambers/rooms, air handling systems, alarms, etc. are connected to the emergency back-up generator.

2.16.2 IQ facility users who determine (prior to being notified by the BSO) that a power failure has occurred shall immediately:

a) Determine the status of their insects housed in the environmental chambers/rooms.
b) Do a visual check of the NIST thermometer/hygrometer that is located in the environmental chamber/room to ensure that parameters have not been exceeded.
c) Notify the BSO who will reset/reprogram the chamber and the NIST thermometer/hygrometer, if required.

2.16.3 In the event of failure (power or otherwise) of the BSC or chemical fume hood during use, IQ facility users shall immediately seal any containers of pests, pathogens, etc. to prevent escape into the room or to the outside. An immediate visual inspection shall be conducted of the cabinet and surroundings to ensure that biological containment has been maintained. The interior of the cabinet shall be cleaned as specified in 2.11.6. Gloves are to be removed within the cabinet and the sash is to be closed. A sign shall be posted on the BSC/hood warning others to not use it. The BSO must be notified and the cabinet/hood must not be used until the unit is fully functional.

2.17 Facility Maintenance and Repair

2.17.1 Damaged/malfunctioning equipment, facilities, etc. shall be reported immediately to the BSO.

2.17.2 The BSO is responsible for ensuring IQ equipment and facilities are maintained in good working order. Requests for Work Orders shall be completed and submitted by the BSO or IPS manager.

2.18 Calculations

2.18.1 The bleach working solution for general cleaning shall have a final sodium hypochlorite concentration of 0.3%. Bleach stock material with a 5.25% sodium hypochlorite concentration (e.g., Javex®) shall be diluted by combining 60ml bleach and 940ml water (i.e., 6% dilution). Bleach stock material with a 6.0% sodium hypochlorite concentration (e.g., Ultra Javex®) shall be diluted by adding 53ml bleach and 947ml

water (i.e., 5.25% dilution). If another brand of bleach is used, volumes may need to be adjusted to provide a 0.3% sodium hypochlorite working solution.
[Note: minimum contact time of 10 minutes is required for effective sanitation]

2.19 Documentation and Reporting

2.19.1 Compliance to this SOP shall include completion of the following forms:
a) IPS Form Number 0106/002 (*Insect Quarantine Access Log*, Appendix 2)
b) IPS Form Number 0107/002 (*Insect Quarantine Incident Report*, Appendix 4).

3.0 DISTRIBUTION AND ARCHIVING

3.1 Distribution

This SOP shall be distributed by the IPS manager to IPS personnel who are required to work in the IQ facility and to any other potential facility users (e.g., GLFC personnel) who request a controlled copy. Controlled copies are monitored for chain of custody to ensure that current versions are distributed timely and that outdated versions are destroyed. A current version of this SOP may be viewed in the *Bio-Safety Manual* maintained within the IQ facility or through the GLFC intranet.

3.2 Archiving

3.2.1 The IPS manager shall maintain a historical file of this SOP when it is replaced by a new version.
3.2.2 The BSO shall maintain historical files of *Insect Quarantine Access Logs* and *Insect Quarantine Incident Reports*.
3.2.3 The BSO shall maintain a historical collection of voucher specimens of exotic forest insects brought into the IQ facility.
3.2.4 Facility users shall maintain records of insect inventories (as specified in 2.12.8) for a period of at least 3 years.

3.3 Destruction of Outdated SOPs

When new versions of this SOP are available for distribution, all persons in possession of a controlled copy shall ensure that the retired version is returned to the IPS manager.

4.0 ASSURING SOP VALIDATION AND COMPLIANCE

4.1 Responsible Individual

4.1.1 The BSO is responsible for assuring that this SOP is valid.
4.1.2 The BSO is responsible for assuring that this SOP is followed by anyone conducting research in the GLFC IQ facility and that those persons have been appropriately trained in the use of this SOP.

4.1.3 IQ facility users are responsible for complying with procedures specified on a *Controlled Copy* of this SOP and shall never use non-controlled copies which could be outdated.

5.0 REVISION OF THE SOP

5.1 Responsible Individual

The BSO is responsible for assuring that this SOP is current. If necessary, the BSO shall initiate the revision process.

5.2 Revision Schedule

This SOP shall be revised when its provisions no longer agree with current practices or GLFC policies, and shall be approved by the IPS manager and the CFIA Office of Biohazard Containment and Safety.

6.0 CONTINGENCIES

When facility users find circumstances that do not permit compliance with this SOP, the BSO shall be consulted.

7.0 CONFIDENTIALITY

IPS SOPs are not considered to be confidential documents and may be distributed to outside parties. *Controlled Copies* shall not be reproduced.

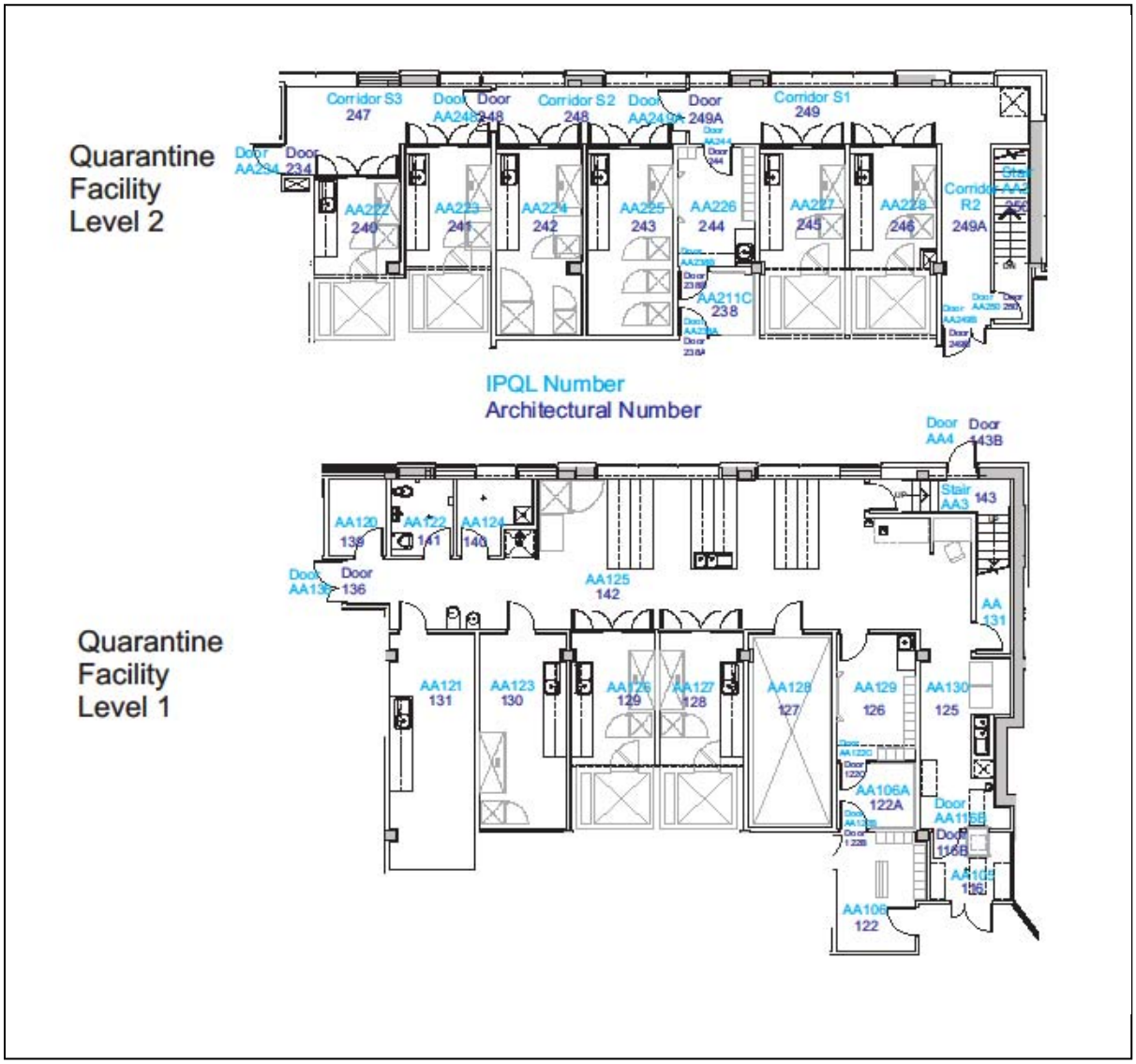
8.0 REFERENCES

a) *Bio-Safety Manual*
b) Current version of SOP Number IPS/030 (*IQ Facility Access Authorization*)
c) Current version of SOP Number IPS/031 (*Movement of Exotic Forest Insects)*

9.0 APPENDICES

Appendix 1: Insect Quarantine Facility Floor Plan
Appendix 2: IPS Form Number 0106/002 (*Insect Quarantine Access Log*)
Appendix 3: IQ Facility Room Allocation
Appendix 4: IPS Form Number 0107/002 (*Insect Quarantine Incident Report*)

Appendix 1


Quarantine Facility Level 2
Corridor S3 247
Corridor S2 248
Corridor S1 249
Door 249A
AA222 240
AA223 241
AA224 242
AA225 243
AA226 244
AA227 245
AA228 246
Corridor R2 249A
AA211C 238
IPQL Number
Architectural Number
Quarantine Facility Level 1
Door AA4
Door 143B
Stair AA3 143
AA120 139
AA122 141
AA124 140
Door 136
AA125 142
AA 131
AA121 131
AA123 130
AA126 129
AA127 128
AA128 127
AA129 126
AA130 125
AA106A 122A
Door AA115B
Door 115B
AA106 122

Appendix 2 (Level 1)

Insect Quarantine Access Log (Level 1)

Printed Name (Visitors shall include organization name)	Initials	Purpose	Date (DD/MM/YY)	Time In	Time Out

IPS Form Number 0106/002

Appendix 2 (Level 2)

Insect Quarantine Access Log (Level 2)

Printed Name (Visitors shall include organization name)	Initials	Purpose	Date (DD/MM/YY)	Time In	Time Out

IPS Form Number 0106/002

Appendix 3

IQ Facility Room Allocation

Room #	Room Name	Description/Activity
AA105	Autoclave Cleanout	-removal of sterilized waste from IQ facility
AA106	Locker Room	-store personal belongings -entry/exit log book for facility users and visitors
AA106A	Anteroom	-controlled facility access
AA106B	Service Core	-access to mechanical components of walk-in chambers, cold room and IT closet
AA106C	IT Room	-control room for building management system
AA130	Cleanup Area	-dish washing -autoclaving
AA129	Change Room	-apply/remove lab garments -hand washing -air curtain at anteroom door
AA128	Cold Room	-storage of diapausing insects
AA127	Research Module	-assigned to scientific personnel for research activities
AA126	Research Module	-assigned to scientific personnel for research activities
AA123	Research Module (Electrophysiology Lab)	-assigned to scientific personnel for research activities -laboratory with environmental controls
AA121	Research Module (Flushing Room)	-assigned to scientific personnel for flushing insects from log bolts -laboratory with environmental controls
AA120	Log Splitter Room	-splitting log bolts; central vacuum cleanout
AA122	Janitor Room	-janitor room dedicated to IQ facility -storage of tools and parts for facility maintenance personnel
AA124	Wash Room	-personal activity
AA125	General Work Area	-multi-user research area -computer facilities -access to level 2
AA211C	Anteroom	-controlled IQ facility access for IPU personnel only -entry/exit log book for facility users and visitors
AA222	Future IQ Research Module	-to be assigned to scientific personnel for research activities when more IQ space is required

AA223	Future IQ Research Module	-to be assigned to scientific personnel for research activities when more IQ space is required
AA224	Future IQ Research Module	-to be assigned to scientific personnel for research activities when more IQ space is required
AA225	Future IQ Research Module	-to be assigned to scientific personnel for research activities when more IQ space is required
AA226	Change Room	-for IPU personnel only -apply/remove lab garments -hand washing -air curtain at anteroom door
AA227	Research Module	-assigned to IPU personnel for colony establishment
AA228	Research Module	-assigned to IPU personnel for colony establishment

Appendix 4

Insect Quarantine Incident Report

SECTION A – TO BE COMPLETED BY THE FACILITY USER
Description/Explanation of Incident: Likelihood of Insect Escape:
Date of Incident _____ (DD/MM/YY)
Corrective Action Taken: Success of Corrective Action:
Form Completed by: Printed Name_____ Signature_____ Date_____ (DD/MM/YY)
SECTION B – TO BE COMPLETED BY THE BIOSAFETY OFFICER
CFIA notification: Yes ☐ No ☐ BSO Signature_____ Date_____ (DD/MM/YY)

IPS Form Number 0107/002

TITLE: Maintenance Personnel Responsibilities

APPROVING OFFICIAL:

DD / MM / YY

*Manager, Insect Production Services (IPS)*_____ ___/___/___

SIGNIFICANT CHANGES FROM PREVIOUS VERSION:

-Procedures to enter and exit the Insect Quarantine (IQ) Facility, Insectary and Methods Development labs have been revised for applicability to our new facilities.
-We now have separate requirements for the type of lab wear to be worn in each part of the IQ facility; areas requiring heightened bio-safety measures (e.g., bunny suits, etc.) are posted in the change room and on the door of select modules.
-Maintenance personnel are now required to document maintenance activities performed in the IQ Facility, Insectary and/or Methods Development labs on a new log (IPS Form Number 0141/001, Appendix 1).
-the title "Insect Quarantine Officer (IQO)" has been revised to "Bio-Safety Officer (BSO)" to match terminology use of the regulatory authority (i.e., Canadian Food Inspection Agency - CFIA).
-Maintenance personnel are not permitted to open mechanical access panels within the IQ facility without prior approval by the BSO and in the presence of the BSO.

1.0 INTRODUCTION

1.1 Purpose

This Standard Operating Procedure (SOP) has been established to identify responsibilities of Great Lakes Forestry Centre (GLFC) facility maintenance personnel for assuring bio-safety within Insect Production Services (IPS) facilities/labs and to reduce the incidence/spread of pathogens/microbial contaminants.

1.2 Scope

This SOP shall be followed by all GLFC facility maintenance personnel performing maintenance/repair activities within IPS facilities including IQ, Insectary, Methods Development Lab and Quality Control (QC) Lab.

1.3 Definitions

Bio-Safety Officer (BSO) – A member of IPS who has supervisory authority over the daily operation of the IQ facility and who provides technical/research support to users of the facility.

Controlled Copy – A copy of an SOP distributed to select GLFC personnel having a unique copy number and dated signature of the IPS manager. Controlled copies are intended to ensure that GLFC personnel follow the most recent version of the SOP.

Delta System – Hardware/software system used by GLFC engineering personnel to program, monitor and track environmental conditions within the facility and to provide an alarm when tolerance limits are exceeded.

Effective Date – The date from which the procedures given in an SOP are to be implemented.

Great Lakes Forestry Centre (GLFC) – One of five Canadian Forest Service (CFS) research facilities in Canada.

Insect Production Services (IPS) – A GLFC work team consisting of the Insect Production Unit (IPU), the Quality Control Unit (QCU) and IQ personnel who perform insect rearing, quality control and quarantine activities in support of forest pest research activities internal and external to the CFS.

Insect Production Services Manager – The individual who has overall responsibility for activities of the IPS team.

Insect Production Supervisor – A member of IPS having supervisory authority over the daily operation of the insectary.

Insect Production Unit (IPU) – A work unit of IPS consisting of personnel who perform insect rearing, diet making and methods development activities at GLFC.

Insect Quarantine (IQ) – A general-use facility under the control of IPS used for rearing exotic forest insects and conducting associated research activities.

Insect Quarantine Procedural Manual – A manual containing only those IPS SOPs that relate specifically to the IQ facility.

Insectary – A multi-species rearing facility under the control of IPS used exclusively by the IPU for maintaining insect colonies and preparing artificial diets.

Methods Development (MD) Lab – A research facility under the control of IPS used exclusively by the IPU for developing new rearing methods and for establishing new insect colonies.

NIST Traceable Thermometer/Hygrometer – A thermometer/hygrometer with a manufacturer's certificate of accuracy verifying that it was calibrated and tested against standards traceable to the National Institute of Standards and Technology (NIST).

Quality Control Lab – An analytical laboratory under the control of IPS used by the QC Unit for monitoring production, process and product control for all IPU insect colonies, and for developing new QC methods and procedures.

Quality Control Unit (QCU) – A work unit of IPS consisting of personnel who conduct routine production, process and product control testing and develop new QC methodology in support of IPU activities.

Standard Operating Procedures (SOPs) – Directives describing routine administrative or technical procedures conducted by IPS personnel or users of the IQ facility.

1.4 Safety

1.4.1 Personnel must exercise health precautions (e.g., proper lifting procedures) to minimize risk to themselves and to their co-workers.

1.5 Materials

NA

2.0 PROCEDURES

2.1 Access Authorization

2.1.1 Facility maintenance personnel must be trained/approved by the BSO or IPS manager in the use of this SOP before being allowed to work in IQ, Insectary, or MD lab.

2.1.2 Maintenance personnel shall not allow entry of external contractors into IQ, Insectary, or MD lab without prior approval by applicable IPS personnel. External contractors shall be instructed by maintenance personnel on entry/exit procedures and shall be escorted during the entire time that they are present in the facility. When maintenance personnel can't always be present, they shall arrange for applicable IPS personnel to monitor the contractors.

2.1.3 Maintenance personnel shall not allow entry of visitors or research staff into IQ, Insectary, or MD lab. GLFC cleaning staff are not permitted to enter the IQ facility at any time.

2.1.4 Access authorization is not required for the QC lab.

2.2 Procedure to Enter IPS Facilities

2.2.1 There are no restrictions or special access procedures for entering/exiting the QC lab.

2.2.2 When possible, maintenance personnel shall endeavor to schedule their work in the IQ facility, Insectary or MD lab for the start of the day prior to entering any other laboratory, thereby reducing the incidence and spread of pathogens and microbial contaminants from other parts of the building.

2.2.3 Personal belongings, including boots and coats, shall not be brought into the IQ facility, Insectary or MD lab. Personnel shall limit the tools entering the facilities to only those required to perform the required task.

2.2.4 Materials and supplies shall be removed (where feasible) from their original packaging boxes outside of the facility access door for IQ, Insectary or MD lab.

2.2.5 Paperwork entering these facilities from other administrative areas in the building shall be kept to a minimum.

2.2.6 Maintenance personnel shall limit the tools, equipment and parts to those items necessary for the task at hand. Limited supplies of tools, equipment and parts may be stored in the IQ facility in the location designated by the BSO.

2.2.7 Entering the IQ Facility:

a) Maintenance personnel shall normally enter the IQ facility using the first floor anteroom; BSO approval must be obtained prior to entry via the second floor anteroom.

b) Prior to entering the anteroom, personnel shall document their entry on the *Insect Quarantine Access Log* (IPS Form Number 0106/002, Appendix 2), including printed name (contractors shall also include the name of their organization), initials, purpose of the visit, current date and time of entry. Personnel entering the IQ facility to perform maintenance activities shall also sign in using the Insect Production Services Sign-in Form (IPS Form Number 0141/001, Appendix 1).

c) Personnel entering the anteroom shall allow the door to close and the air pressure to stabilize before opening the change room door. Personnel are not to enter the containment zone in the event of an air pressure alarm. Doors shall never be propped open, nor opened with a grand master key i.e., anteroom doors are never to be opened simultaneously. In an emergency, contact the BSO manager of IPS, or facilities manager. When time does not permit, any other emergency exit door may be used.

d) Upon entering the change room, check the posted notice identifying part(s) of the facility having heightened bio-safety requirements. When intending to enter areas without heightened bio-safety requirements, only lab coats need to be worn. Disposable shoe covers shall also be applied when the floor in the proposed work

area may become contaminated with infested plant material or soil (upon exit, these shoe covers shall be doffed in the work area/module where they were worn). Lab wear shall be selected from the applicable lockers and shall be worn over street clothing. Wearers shall ensure that they are fully buttoned and/or zipped. Contractors/visitors shall select lab wear from the locker labeled as "visitors".

When heightened bio-safety measures have been identified by the BSO on the posted notice in the change room (and/or at the required location) additional lab wear shall be applied upon entry to the work area specified. At the door to the applicable module/work area, maintenance personnel shall remove their lab coats, hang them on the wall hook, then enter the module and apply the supplied lab wear (e.g., bunny suit, shoe covers, head cover, and beard cover, if applicable).

e) Long hair is to be tied back so that it cannot come into contact with potentially contaminated material. Personnel may then enter the inner rooms of the facility. Do not pass through door AA129 at the same time someone is entering the change room via the anteroom (i.e., doors AA129 and AA122C shall never be opened at the same time).

2.2.8 Entering the Insectary and/or MD lab:

a) Prior to entering the facility, maintenance personnel shall apply booties over their street shoes. Alternatively, street shoes may be left in the locker room and personnel may apply dedicated lab shoes.
b) Upon entering the facility, ensure that both feet make contact with the anti-microbial mat. Hands shall be disinfected with the supplied anti-microbial cleaner.
c) Upon entering the facility to perform maintenance activities, personnel shall also sign in using the Insect Production Services Sign-in Form (IPS Form Number 0141/001; Appendix 1).

2.3 Procedure to Exit IPS Facilities

2.3.1 There are no restrictions on the removal of materials from the Insectary, MD Lab or QC Lab, however removal of materials from the IQ facility shall be strictly controlled as specified in section *2.4*.

2.3.2 Exiting the IQ Facility:

a) Maintenance personnel shall exit the IQ facility using the same door by which they entered, normally the first floor locker room and anteroom (except for emergency egress).
b) Upon exiting an area of heightened bio-safety, personnel shall examine themselves for hitch-hiking insects, then remove their lab wear and hang it on the wall hook; immediately upon exiting the

module, personnel shall apply a lab coat before proceeding through the facility.

c) Prior to entering the change room, peer through the viewing window on the door (i.e., door AA129 or door AA244) to ensure that the door to the anteroom is closed (i.e., both doors shall never be opened at the same time).

d) Prior to removing lab wear, personnel shall use the mirror to examine themselves to ensure that there are no hitch-hiking insects on the garments. When more than one individual is present, they shall examine each other. Personnel shall remove their lab wear and return it to the applicable locker; damaged or soiled garments shall be placed in the hamper and replacement garments may be obtained from the supply locker; gloves and booties (if applicable) shall be placed in the hamper for decontamination before disposal.

e) Hands must be washed using the sink in the change room.

f) Upon entering the anteroom, personnel shall use the mirrors to examine themselves again for hitch-hiking insects, and also to allow the door to close and the air pressure to stabilize before exiting.

g) Upon exit from the facility, personnel shall document their departure time on the *Insect Quarantine Access Log* (IPS Form Number 0106/002; Appendix 2). Personnel exiting the IQ facility after performing maintenance activities shall also sign out using the Insect Production Services Sign-in Form (IPS Form Number 0141/001; Appendix 1) ensuring that actions performed are sufficiently detailed for historical maintenance records.

2.3.3 Exiting the Insectary and/or MD lab:

a) Personnel shall exit the facility through the main door on the second floor (i.e., Door AA225A), except for emergency egress.

b) Footwear (i.e., dedicated lab shoes or disposable booties) shall be removed every time personnel leave the Insectary.

c) Personnel exiting the facility after performing maintenance activities shall also sign out using the Insect Production Services Sign-in Form (IPS Form Number 0141/001, Appendix 1) ensuring that actions performed are sufficiently detailed for historical maintenance records.

2.4 Materials Exiting the IQ Facility

2.4.1 Materials (e.g., worn out parts or equipment) shall not be removed from the IQ facility without approval and inspection/sterilization by the BSO. Tools may be removed from the facility on the day of entry after meticulous inspection by maintenance personnel to ensure that there are no hitch-hiking insects.

2.4.2 Materials for discard shall be placed in garbage containers within the IQ facility and left for autoclaving and discard by the BSO. The BSO

shall be notified whenever larger items or large quantities of items need to be discarded. Materials originating in areas of heightened bio-safety shall be left in garbage containers in those areas.

2.5 Facility Maintenance and Repair

2.5.1 Maintenance personnel shall strive to repair IPS environmental chambers/rooms as soon as possible after notification of malfunction.

2.5.2 Upon notification of malfunction of environmental chambers/rooms via the Delta alarm system, maintenance personnel shall notify the contact person specified on the door of the unit. When breakdown occurs outside of normal work hours, maintenance personnel shall temporarily move chamber contents to alternate environmental conditions described on the door of the unit (the contact person shall be notified immediately if the alternate conditions cannot be met or if assistance is required).

2.5.3 The memory function of *NIST Traceable Thermometer/Hygrometers* is not to be reset by maintenance personnel.

2.5.4 Maintenance personnel shall notify applicable IPS personnel each time a maintenance, repair or calibration operation is performed on any piece of equipment in IPS facilities by completion of the "actions performed" section of the Insect Production Services Sign-In Form (IPS Form, Number 0141/001, Appendix 1). This will facilitate IPS personnel in documenting the activity in equipment logs, performing required cleaning, and making applicable notations on experimental and/or rearing records.

2.5.5 Maintenance personnel shall label defective/malfunctioning equipment as "out of service" until such time that it is repaired, replaced or discarded.

2.5.6 Requests for Work Orders relating to the IQ facility shall only be accepted from the BSO or IPS manager (i.e., not from users of the IQ facility). Requests for Work Orders relating to the Insectary, MD lab or QC lab my be accepted from any member of IPS.

2.6 Sanitation

2.6.1 Facility sanitation is the responsibility of IPS personnel. Maintenance personnel shall inform applicable IPS personnel whenever equipment/facilities are repaired/serviced (as specified in 2.5.4) so that appropriate sanitation measures may be taken.

2.6.2 Materials for discard from the IQ facility shall be handled as specified in 2.4.2. There are no restrictions on materials being removed from the Insectary, MD lab or QC lab.

2.6.3 GLFC cleaning staff are not permitted to enter IQ or IPU facilities at any time.

2.7 Environmental Chambers and Rooms

2.7.1 Maintenance personnel are not permitted to change environmental settings for chambers/rooms without an explicit request from IPS personnel (i.e., requests shall not be accepted from IQ facility users).

2.7.2 Maintenance personnel shall assist IPS personnel with environmental chamber/room programming, historical tracking records and/or calibration when requested.

2.7.3 Maintenance personnel shall ensure that environmental chambers/rooms in IPS facilities are connected to the GLFC Building Management System (i.e., Delta Control System) so that environmental conditions are monitored on a continuous basis.

2.7.4 Maintenance personnel shall ensure that the alarm system is activated at the engineer's station, main security desk and workstations of IPS personnel whenever environmental tolerance limits are exceeded.

2.7.5 Maintenance personnel may contact IPS staff at any time to view historical maintenance records for all equipment within the IPS facility.

2.8 Insect Containment Envelope for IQ Facility

2.8.1 Maintenance personnel who become aware of any breach in the security/access of the IQ facility shall immediately notify the BSO.

2.8.2 Maintenance personnel who become aware of any break in the insect containment envelope (e.g., broken door seals) of the IQ facility shall immediately notify the BSO.

2.8.3 Maintenance personnel who are required to penetrate the containment envelope of the IQ facility (e.g., drill hole through wall) during maintenance/repair actions shall first notify the BSO and comply with her/his instructions.

2.8.4 Maintenance personnel shall not open mechanical access panels within the IQ facility without prior approval by the BSO. These panels form part of the insect containment envelope, therefore special safety measures must first be implemented by the BSO. The panels shall not be opened unless the BSO is present to monitor activities.

2.8.5 Each time an electrical cord is removed from a wall outlet, a plastic outlet cap shall immediately be inserted.

2.9 Contingency for Fire or Chemical Spill Alarm

2.9.1 Upon hearing the fire or chemical spill alarm, maintenance personnel shall follow routine exit procedures and vacate IPS facilities immediately. When danger is imminent (e.g., visible smoke or chemical odor), routine exit procedures shall be omitted (i.e., use any door to exit, do not change clothing, do not sign out).

2.10 Power Outage

2.10.1 Upon the restoration of power after an outage of sufficient duration to trigger an alarm, maintenance personnel shall check the Delta System to ensure that all essential systems and environmental chambers/rooms are functioning correctly and shall take corrective action when required.

2.11 Calculations

NA

2.12 Documentation and Reporting

2.12.1 Compliance to this SOP shall include completion of the *Insect Quarantine Access Log* (IPS Form Number 0106/002, Appendix 2) and the Insect Production Services Sign-In Log (IPS Form Number 0141/001, Appendix 1).

3.0 DISTRIBUTION AND ARCHIVING

3.1 Distribution

This SOP shall be distributed by the IPS manager to GLFC facility maintenance personnel who are required to work in IPS facilities, to the BSO and to any other IPS personnel who request a controlled copy. Controlled copies are monitored for chain of custody to ensure that current versions are distributed timely and that outdated versions are destroyed. A current version of this SOP may be viewed in the *IQ Procedural Manual* maintained within the IQ facility or through the GLFC intranet.

3.2 Archiving

3.2.1 The IPS manager shall maintain a historical file of this SOP when it is replaced by a new version.

3.3 Destruction of Outdated SOPs

When new versions of this SOP are available for distribution, all persons in possession of a controlled copy shall ensure that the retired version is returned to the IPS manager.

4.0 ASSURING SOP VALIDATION AND COMPLIANCE

4.1 Responsible Individual

4.1.1 The BSO and the IPU supervisor are responsible for assuring that this SOP is valid for the portion of IPS facilities for which they are responsible.

4.1.2 The BSO and the IPU supervisor are responsible for assuring that this SOP is followed by maintenance personnel working in the portion of IPS facilities for which they are responsible.

4.1.3 Maintenance personnel are responsible for complying with procedures specified on a *Controlled Copy* of this SOP and shall never use non-controlled copies (which could be outdated).

5.0 REVISION OF THE SOP

5.1 Responsible Individual

The BSO and the IPU supervisor are responsible for assuring that this SOP is current. If necessary, either person shall initiate the revision process.

5.2 Revision Schedule

This SOP shall be revised when its provisions no longer agree with current practices or GLFC policies, and shall be approved by the IPS manager and the CFIA Office of Biohazard Containment and Safety.

6.0 CONTINGENCIES

When maintenance personnel find circumstances that do not permit compliance with this SOP, the BSO or IPU supervisor shall be consulted.

7.0 CONFIDENTIALITY

IPS SOPs are not considered to be confidential documents and may be distributed to outside parties. *Controlled Copies* shall not be reproduced.

8.0 REFERENCES

NA

9.0 APPENDICES

Appendix 1: IPS Form Number 0141/001 (Insect Production Services Sign-in Form).

Appendix 2: IPS Form Number 0106/002 (Insect Quarantine Access Log).

Appendix 1

Insect Production Services
Sign-in Form

Date: _____

Name: _____

Department/Company: _____

Time Entered (am or pm): _____

Time Exited (am or pm): _____

Actions Performed (please be specific):

_____

_____

_____

_____

_____

_____

Signature: _____

IPS Form Number 0141/001

Appendix 2 (Level 1)

Insect Quarantine Access Log (Level 1)

Printed Name (Visitors shall include organization name)	Initials	Purpose	Date (DD/MM/YY)	Time In	Time Out

IPS Form Number 0106/002

Appendix 2 (Level 2)

Insect Quarantine Access Log (Level 2)

Printed Name (Visitors shall include organization name)	Initials	Purpose	Date (DD/MM/YY)	Time In	Time Out

IPS Form Number 0106/002

Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments

CONTAINMENT STANDARDS

For Facilities Handling Plant Pests

First Edition

Biohazard Containment and Safety
Science Branch
Canadian Food Inspection Agency

Canada

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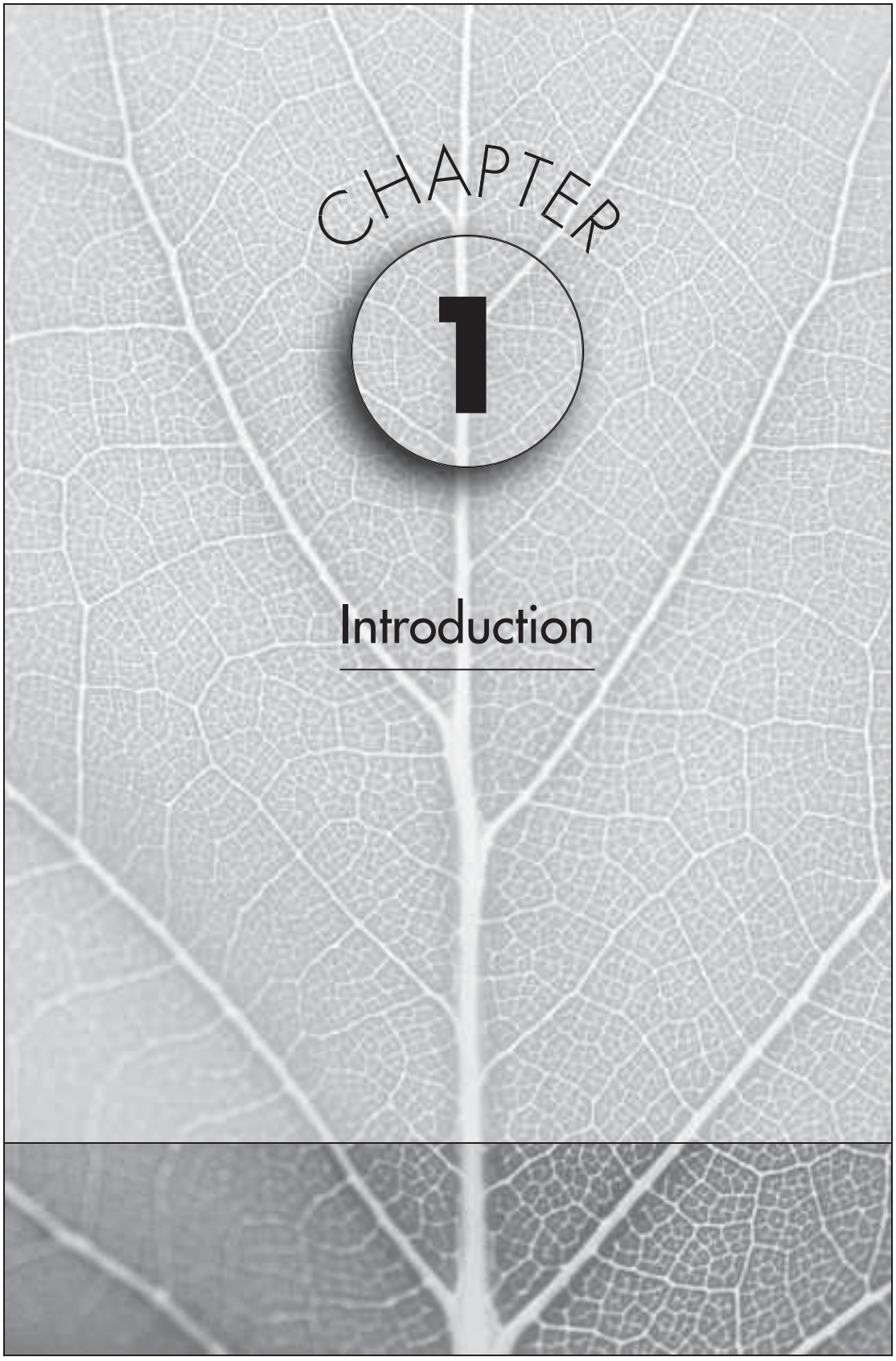


Introduction

CHAPTER 1 – INTRODUCTION

1.1 Scope

This document describes the minimum acceptable physical and operational requirements for **facilities**[1] that work with **plant pests**[2] other than weeds, soil,[3] genetically modified plants and arthropod **biological control**[4] agents.

Some of the information presented in these standards may be useful for the **containment** of biocontrol arthropods. However, the North American Plant Protection Organization's Regional Standard for Phytosanitary Measures (RSPM) No. 22, entitled *Guidelines for the Construction and Operation of a Containment Facility for Insects and Mites used as* ***Biological Control Agents***, takes precedence over the present document for the containment of biological control arthropods.

This document is intended as a resource for Canadian Food Inspection Agency (CFIA) staff and for other persons who grow, raise, culture or produce anything that is a pest or is infected or infested with a pest. It provides guidance on the operation of plant pest containment facilities such as laboratories, **greenhouses** and **screenhouses**. Compliance with these standards and with documents such as Import Permits will help to ensure that economically and environmentally significant plant pests do not inadvertently escape into the environment and become established in Canada.

1.2 Background

The *Containment Standards for Veterinary Facilities*, published in 1996 by Agriculture and Agri-Food Canada, provides guidance for those who design, build, operate or work in facilities in which animal pathogens are handled. The *Laboratory Biosafety Guidelines*, 3rd Edition, published in 2004 by the Public Health Agency of Canada, provide similar guidance

[1] See the Glossary for the definition of the bolded terms in the text.

[2] Any thing that is injurious or potentially injurious, whether directly or indirectly, to plants or to products or by-products of plants, and includes any plant prescribed as a pest [Plant Protection Act, 1990]. This includes any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (IPPC, 2002) including, but not limited to, arthropods, molluscs, bacteria, fungi, nematodes, phytoplasmas, viruses, and viroids.

[3] Soil is regulated under Directive D95-26: "Phytosanitary requirements for soil and related matter, alone or in association with plants" (http://www.inspection.gc.ca/english/plaveg/protect/dir/d-95-26e.shtml).

[4] Refer to NAPPO (2004) and De Clerck-Floate (2006) for the importation and release process for biological control arthropods and for containment facility requirements, respectively.

for those involved with laboratories in which human pathogens are handled. Neither of these two documents addresses the containment of plant pests.

Plant pests almost never infect or infest healthy people, and they therefore pose little direct risk to laboratory personnel. Some can, however, pose a significant threat to agricultural production, forests and natural environments. As a result, it is important that personnel working with plant pests and the facilities housing these organisms take steps to prevent the accidental escape of potentially damaging pests into the environment. The level of containment required to prevent escapes will depend on specific pest biology and the impact that an escape might have on the Canadian environment.

Most countries, including Canada, have developed regulations to prevent the introduction and spread of economically and environmentally significant plant pests. Canada's *Plant Protection Act* (PPA) serves to protect plant life and the agricultural and forestry sectors of the Canadian economy by preventing the importation, exportation and spread of pests, and by controlling or eradicating pests in Canada. The *Plant Protection Act* and *Regulations* give the CFIA the authority to prohibit or restrict the movement into, within, and out of Canada[5] of any plant pest or other thing that is or could be infested with a pest, or is or could be a biological obstacle to the control of a plant pest. The Act also provides other authorities such as inspection powers.

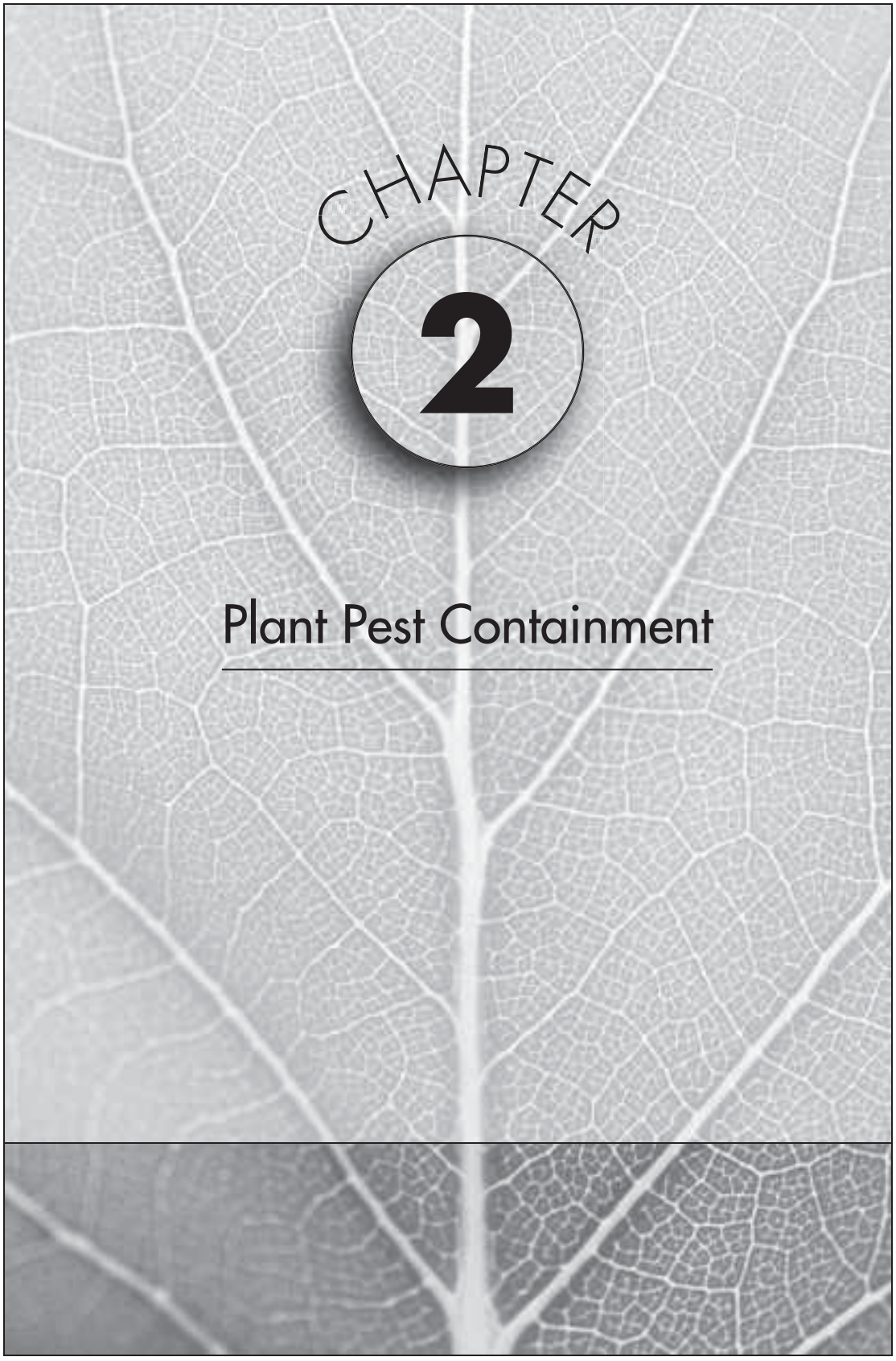
Researchers frequently undertake studies on the biology, ecology, detection, identification, control and eradication of plant pests. Additionally, scientists often study exotic beneficial organisms to determine whether they have potential as biological control agents. Persons wishing to import plant pests or potential biological control agents must apply to the CFIA for a Permit to Import.[6] For first-time introductions of foreign biological control agents, a full petition meeting the standards of the North American Plant Protection Organization[7] (NAPPO) must be submitted to the CFIA, requesting authority to import and release the agent into the environment. The petition must

[5] Certain plant pathogens that could be used to develop biological weapons appear on the Export Control List and are regulated by the Department of Foreign Affairs and International Trade (DFAIT). See http://www.dfait-maeci.gc.ca/eicb/military/epe-en.asp

[6] See http://www.inspection.gc.ca/english/for/pdf/c5256e.pdf for instructions for permits to import.

[7] For a full explanation of this process, see De Clerck-Floate, R.A., P.G. Mason, D.J. Parker, D.R.Gillespie, A.B. Broadbent and G. Boivin. 2006. *Guide for the importation and release of arthropod biological control agents in Canada*. AAFC publication, Ottawa. In Press.

contain detailed information on the agent's biology and ecology obtained through careful scientific survey and/or experimentation. Risks associated with each importation are assessed by regulatory scientists, who determine whether the importation should be allowed or should be prohibited or restricted. Where importation is restricted, the CFIA will stipulate import conditions designed to mitigate pest risks, and site visits may be conducted by CFIA inspectors to verify that the proposed facilities and operational procedures are appropriate for the containment of imported pests.



Plant Pest Containment

CHAPTER 2 – PLANT PEST CONTAINMENT

2.1 Pest Biology and Containment

In order for a plant pest to survive, establish and spread in an environment, the following conditions must be met: 1) the pest must be able to find a suitable host; 2) susceptible material (e.g. plant tissue) must be available; and 3) the environment must be conducive to the pest's establishment and development. These three factors must all occur over a sufficient and overlapping period of time. Natural limitations to any one of the three factors and/or human intervention, such as the use of chemical or biological controls, can influence pest establishment or spread. Thus, plant pests can be contained by spatial and temporal isolation from their hosts, either in the natural environment or in **containment facilities**.

In order to prevent the escape and the establishment of plant pests in the environment, the facilities that work with such pests and their operating procedures must be appropriate to the biology of the specific pests under consideration. In addition, the operating procedures must prevent the introduction of organisms into the facility that could contaminate, kill or transmit contained pests. Singh (1999) states that: "Containment requirements for various pathogen [and other pest] groups will vary according to the pest risks they pose to…agriculture because of their unique biologies, particularly their modes of dispersal, and their survival potential under adverse conditions." In the absence of arthropod vectors, organisms such as bacteria, viruses, phytoplasmas and nematodes generally have no means of becoming dispersed over long distances. Arthropods can actively disperse or be passively dispersed by air currents; however, their spread can be prevented by sealing facilities in which they are kept and by using appropriately sized filters and screening. Fungi that are not well adapted for aerial dispersal can also be contained fairly easily, but those fungi that produce spores adapted for efficient aerial dispersal are very difficult to contain and may require the use of sealed facilities with **HEPA filtered** ventilation systems. Containment precautions must also be appropriate to the proposed type of work. Containing pests *in vitro* (e.g. as pure cultures on petri plates) is inherently easier than containing pests *in vivo* (e.g. on infected or infested plants) and, similarly, containing pests in small-scale experiments presents a lower risk of pest escape than containing them in large-scale experiments.

Effective containment involves the use of trained personnel, appropriate and documented operational procedures, effective use of **primary containment** devices and facilities designed to limit access to authorized personnel.

2.2 Risk Assessment, Risk Management and Containment

Facilities that handle plant pests should be constructed and operated to achieve the containment levels required for the pests concerned. The level required depends on the risk of the plant pest escaping and becoming established in the environment and on the environmental, economic, agricultural, forestry and trade consequences of such an introduction.

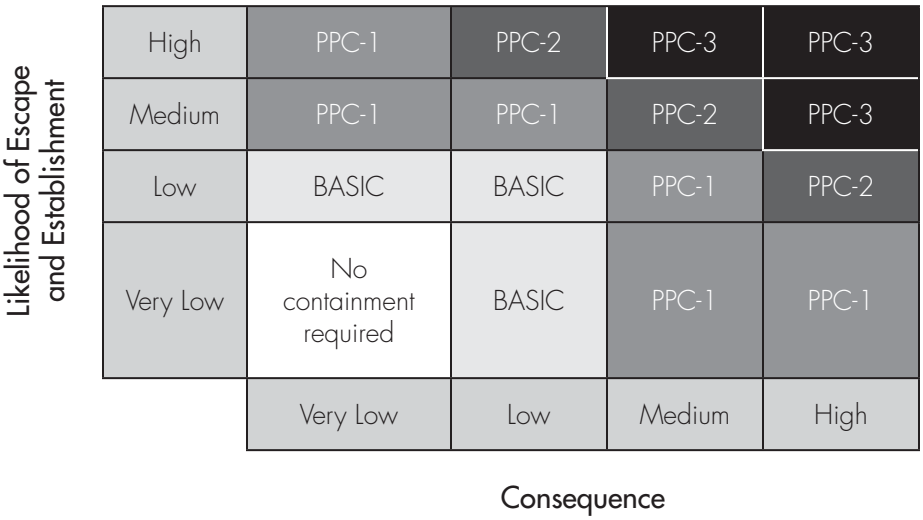
To provide a framework for ensuring appropriate biological containment in facilities that work with plant pests in Canada, a containment classification system has been developed that is consistent with the systems for human and animal pathogens. It has four containment levels: Basic; **P**lant **P**est **C**ontainment Level 1 (PPC-1); Plant Pest Containment Level 2 (PPC-2); and Plant Pest Containment Level 3 (PPC-3). Physical and operational requirements for these levels are described below (section 2.3) and comprehensive and detailed descriptions for PPC-1, PPC-2 and PPC-3 are discussed in chapter 3 (Physical Requirements) and 4 (Operational Practices) of this document. The containment requirements for a particular organism are frequently project-specific, and are determined after assessing pest risk factors such as:

- the known presence or absence of the organism in Canada;
- its host range and the local presence of potential hosts;
- the existence of, or the potential for, significant organism biotypes or strains that are exotic to an area;
- the history of the organism in other new environments;
- the virulence or aggressiveness of the organism;
- the availability of pest risk information;
- the nature of the proposed work (*in vitro*, *in vivo* or large-scale *in vivo*);

- the location, proximity of suitable hosts and time of year of the proposed work;
- the mode of transmission or spread (e.g. active flight, passive airborne, contact, soil-borne, water-borne);
- its potential rate of local and long-distance spread;
- the presence of vectors in Canada (e.g. arthropods, fungi, nematodes);
- the presence of vectors in or near the containment facility;
- the persistence of the organism in the environment and its potential for overwintering;
- environmental requirements for establishment and spread;
- the potential capacity to control or eradicate the organism if it escapes;
- the potential for economic or environmental loss from the organism;
- the economic and environmental significance of potential pest organisms and their host plants; and
- biosecurity-related risks (e.g. the potential for theft and misuse).

Based on a review of the above, regulatory scientists make risk management recommendations aimed at reducing the risk of organism escape and establishment in Canada. Appropriate containment levels are determined by a reviewer, who uses the conceptual risk model (Figure 1) shown below. The risk model demonstrates the general principle of requiring increased levels of containment with increasing risk of plant pest escape and establishment and increasing economic, environmental, agricultural, forestry and trade consequences associated with an escape. There are many methods of assessing risk. Figure 1 is a simplified graphical representation of how risk can be categorized for plant pests.

Figure 1. Conceptual Risk Model for Determining Containment Level



2.3 Plant Pest Containment Levels

Regardless of the containment level of the facility, the physical attributes of the facility and the operational procedures must be suitable for containing the pest(s) under consideration and should be tailored to that purpose. In view of the variables involved, the appropriate containment of plant pests must be determined on a case-by-case basis and specific applications may require precautions in addition to those described for each of the containment levels.

The concept of biological containment is usually applied to work done in buildings, **growth chambers** or greenhouses which have, or present, physical barriers to prevent the escape of pests. Although the concept of biocontainment under field conditions seems contradictory, there are some pests that can safely be contained under quarantine conditions in the field. For example, areas with natural geographic isolation (e.g. islands), a local absence of susceptible host tissue or a climate unsuitable for long-term pest survival may be effective in preventing the escape and establishment of particular plant pests.

Comprehensive descriptions of each containment level are provided in chapter 3 (Physical Requirements) and 4 (Operational Practices). Simplified facility diagrams for PPC-1, PPC-2 and PPC-3 are presented in Appendix 1. The following brief descriptions explain the major features of each containment level and provide illustrative examples of the type of plant pest work that would be appropriate at each level.

2.3.1 BASIC

Basic containment is the lowest containment level for plant pests and it provides simple, but adequate, barriers to pest escape. Facilities may consist of field plots, basic laboratories or simple glass, plastic or screen houses which may have dirt or gravel floors and unscreened vents. Containment of plant pests is achieved through sanitation (see 4.1.5.16), spatial isolation from susceptible hosts, physical security, signage, destruction of waste and destruction of all viable pests at the end of the experiment or the testing period.

The following are examples of the types of work that could be appropriately conducted (with or without supplemental conditions) in Basic containment:

- establishing a field plot using plants infected with a virus that can only be transmitted by grafting;
- using lyophilized virus-infected plant tissue as a control in an ELISA test; or
- using plant tissue infected with a common strain of tobacco mosaic virus to inoculate tobacco plants for a high school biology project.

2.3.2 Plant Pest Containment Level 1 (PPC-1)

PPC-1 containment is the next highest containment level for plant pests. Facilities include permanent structures such as laboratories, greenhouses and screenhouses. Windows that can be opened must be fitted with appropriate screens, and greenhouses must be fully screened and caulked to both contain and exclude arthropods. An autoclave must be available to treat waste and waste water must be treated to kill pests where appropriate. Containment is achieved primarily through operational practices including training in safety and containment precautions, limiting access to authorized personnel, use of protective clothing, effective sanitation and housekeeping, monitoring for and controlling undesired pests, and the use of good laboratory practices.

The following are examples of the types of work that could be appropriately conducted (with or without supplemental conditions) in PPC-1 containment:

- inoculating host plants with isolates of plum pox or other plant viruses in the absence of the vectors of those viruses;
- importing low-risk tropical insects into butterfly houses for study, display or rearing; or
- studying and rearing nematodes of quarantine concern in Canada that have low spread potential (e.g. *Globodera rostochiensis* and *Ditylenchus destructor*).

2.3.3 Plant Pest Containment Level 2 (PPC-2)

PPC-2 facilities include permanent structures such as laboratories and greenhouses but not screenhouses. Containment is achieved through facility design, operational procedures and the use of specialized equipment. All PPC-1 physical and operational requirements also apply to this containment level.

Key additional operational practices include:

- use of primary containment devices;
- use of dedicated or disposable laboratory clothing;
- appropriate decontamination of solid and liquid waste;
- pest monitoring and regular inspection of screens, filters and caulking for defects;
- clear documentation of **standard operating procedures (SOPs)**;
- mandatory personnel training; and
- the availability of suitable emergency response plans.

Key additional physical requirements include:

- restricted access via an anteroom;
- an on-site autoclave; and
- greenhouses that are mechanically ventilated with screened or filtered inlet and exhaust air.

Key additional physical requirements for PPC-2 arthropod facilities include:

- sealing or screening all penetrations into the work area;
- **inward directional airflow**; and
- access via a dedicated anteroom.

The following are examples of the types of work that could be appropriately conducted (with or without supplemental conditions) in PPC-2 containment:

- conducting plant inoculations with an isolate of *Ralstonia solanacearum* Biovar 2, Race 3, the causal agent of Potato Brown Rot disease;
- morphological examination and DNA extraction of sporangia of *Synchytrium endobioticum*, the causal agent of Potato Wart, and their use as diagnostic controls;
- growing chrysanthemum plants infected with *Puccinia horiana*, the causal agent of Chrysanthemum White Rust;
- rearing the arthropod pest *Anoplophora glabripennis*, the Asian longhorned beetle;
- conducting plant inoculations with specific races of the corn pathogen *Helminthosporium turcicu*;
- conducting fruit inoculations in a laboratory using *Alternaria gaisen*, the causal agent of Black Spot of pear; or
- culture work with, and diagnostics for, *Phytophthora ramorum*, the causal agent of Sudden Oak Death.

2.3.4 Plant Pest Containment Level 3 (PPC-3)

PPC-3 is the highest containment level for plant pests. All PPC-1 and PPC-2 physical and operational requirements apply to this containment level. Containment is achieved through the use of highly specialized facilities, stringent operational procedures and specialized equipment. Designing, constructing and maintaining a PPC-3 greenhouse facility is complex and expensive. The use of growth chambers or **growth rooms** within a PPC-3 facility can be a cost-effective alternative to constructing a PPC-3 greenhouse.

Key additional operational practices include:

- designation of a person with responsibility for the overall operation of the facility;
- a high level of physical security;
- restricted access with a log being kept of personnel and visitors entering the facility;
- full clothing change before entering the facility with the possibility of washing or showering on exit, if required;
- checks to confirm inward directional airflow and regular inspections for deterioration in seals; and
- a procedural manual, including standard operating procedures (SOPs), that addresses all emergencies including those relating to containment.

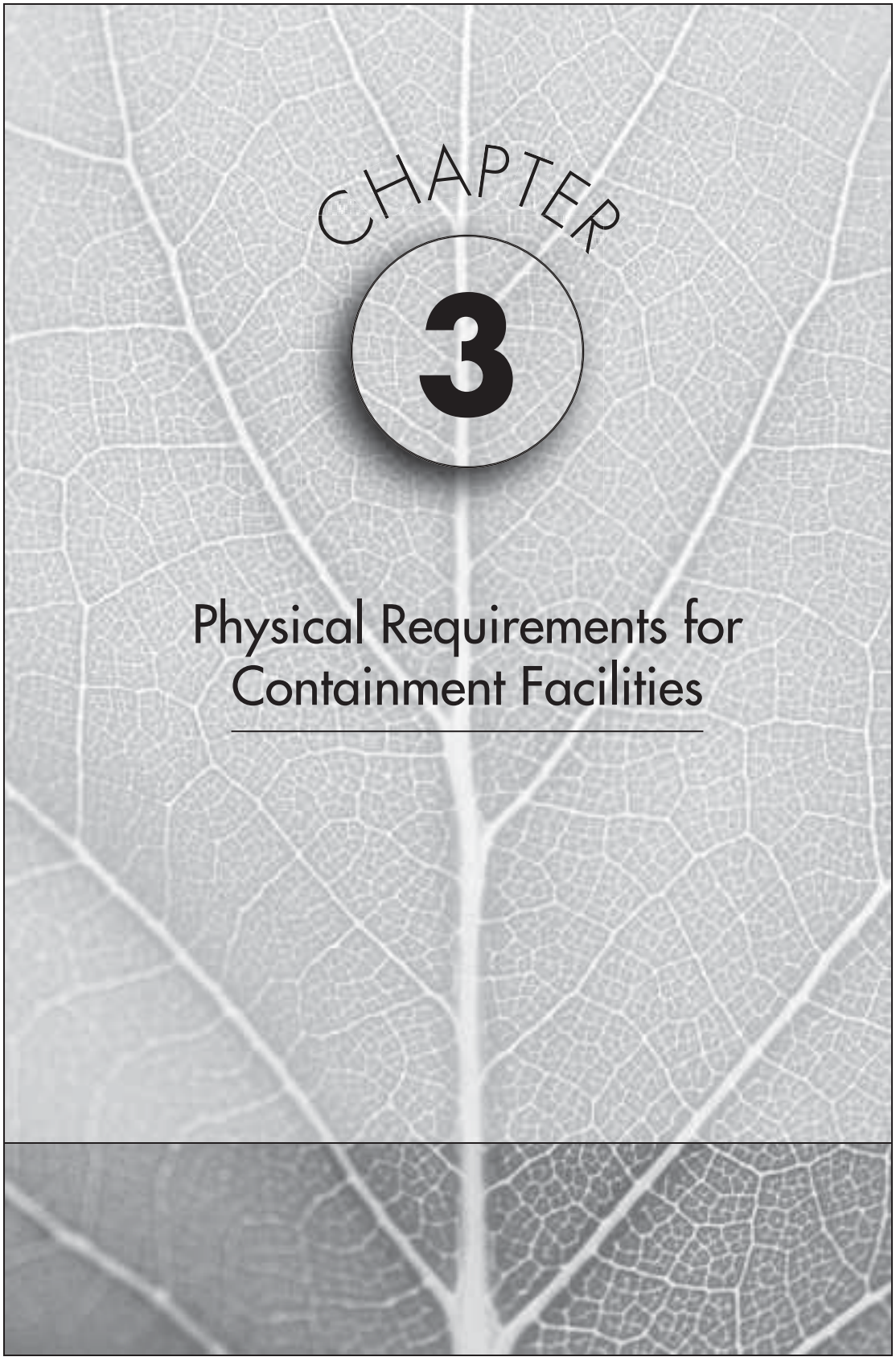
Key additional physical requirements include:

- dedicated anterooms with change areas;
- sealed facilities with inward directional airflow from "clean" to "dirty" areas;
- HEPA filtered exhaust air;
- drains routed to an effluent treatment system;
- electronic data transfer capability;
- emergency power for critical containment systems; and
- break-resistant glazing for greenhouses.

The following are examples of the types of work that could appropriately be conducted (with or without supplemental conditions) in PPC-3 containment:

- conducting plant inoculations with isolates of *Phakopsora pachyrhizi*, the causal agent of Asian Soybean Rust, in an area in close proximity to susceptible hosts;
- conducting plant inoculations with imported isolates of *Gymnosporangium yamadae*, the causal agent of Japanese Apple Rust, in an area in close proximity to susceptible hosts;

- biocontrol research with exotic microbial plant pests that are difficult to contain and in cases where the establishment risks are poorly documented; or
- conducting plant inoculations with pests of environmental and/or economic concern that have a high establishment and/or trade potential risk and that produce airborne spores, such as the pathogen *Phytophthora ramorum*.



Physical Requirements for Containment Facilities

CHAPTER 3 – PHYSICAL REQUIREMENTS FOR CONTAINMENT FACILITIES

This chapter describes physical requirements for the containment of plant pests. The facility must be suitable for containing all pest organisms in use and it must be capable of containing the pest requiring the highest level of containment. New facilities must be constructed to meet applicable construction standards.

3.1 Primary Containment

Primary containment devices (e.g. **biological safety cabinets**[8] **[BSCs]**, insect cages etc.) and the use of good laboratory techniques reduce the overall pest pressure inside the **containment perimeter**. Primary containment therefore reduces reliance on the **secondary containment** provided by the design of the facility.

Biological safety cabinets protect personnel, products and the environment from airborne or aerosolized microorganisms. Class II BSCs, Type A1, A2, B1 and B2, are appropriate for work carried out with plant pathogens. The exhaust air from these cabinets is HEPA filtered, thus providing an extra level of protection against pest escape. Similarly, insect cages provide increased levels of containment by preventing the unrestricted movement of arthropods or by excluding potential arthropod vectors. Growth chambers and growth rooms can offer a cost-effective alternative to containment greenhouses while providing more precise levels of environmental control. Growth chambers and growth rooms can be located within a **containment zone** and thus provide primary containment or they can be sealed and modified to meet PPC-2 or PPC-3 containment requirements.

3.2 Secondary Containment

Facility design and construction provides effective secondary containment to prevent the release of plant pests that have escaped from primary containment. The selection, design and installation of doors, windows, screening and air handling systems, along with the use of appropriate sealants, are factors that determine how well a facility can contain plant pests. Facility design and construction must be complemented with dedicated and trained staff who follow documented procedures and effectively utilize primary containment measures whenever feasible to minimize pest escape.

[8] Refer to Chapter 9 of the Laboratory Biosafety Guidelines (http://www.phac-aspc.gc.ca/publicat/lbg-ldmbl-04/index.html) for a detailed description of BSCs and their installation, certification and use.

3.3 Risk Mitigation

Risk mitigation measures should be applied within containment facilities, where feasible, to reduce the risk of pest escape and thereby effectively reduce the physical containment requirements needed for a particular plant pest. These measures may include providing adequate isolation between infected and uninfected hosts, providing a vector-free environment, caging insects and plants, and rendering all material non-viable at the end of experiments. Risks from plant pests can also be mitigated by locating containment facilities in areas where susceptible hosts are not present, and by conducting work during periods of the year when local hosts are not present or where, or when, local weather conditions would kill any pests that escape.

3.4 Design Considerations for New Facilities

Facility design needs to address pest-specific issues in order to enhance the overall performance and operation of a containment laboratory, greenhouse or screenhouse. Designers, owners and operators should consider:

- Facility location - The site chosen for a containment facility should include an assessment of local agricultural and forestry programs as well as the local environment. A containment facility can be safely constructed in almost any location depending on available resources and construction methodologies. The risks to agriculture, forestry and the environment, including the impact of possible pest releases, should be considered before any work is begun with a particular pest. In areas prone to natural disasters, buildings and support systems should meet enhanced building code measures for the construction of containment facilities.
- Energy conservation - If energy conservation measures are envisaged (e.g. through the use of building automation controls, night air-change set-back [reductions], heat recovery and air recirculation), these measures must not compromise the level of containment provided by the facility.
- Inward directional airflow - Several standards (e.g. ANSI/ AIHA Z-9.5-1992 and NFPA 45) recommend or require the use of inward directional airflow for new laboratory construction. Although it is advisable for new and existing facilities to have inward directional airflow, this is only a requirement for PPC-2 arthropod facilities and all PPC-3 facilities.

- Sealed PPC-3 containment zones should be located away from exterior walls to avoid pressure reversals associated with high winds. This cannot be done with greenhouses but their construction must be designed to prevent unplanned air infiltration.
- New facilities require storage space for supporting operations, cleaning, spill management, emergency safety response programs and tools and equipment. Providing dedicated equipment, washroom facilities, storage areas and clerical workstations inside the containment zone should be considered as a way to minimize traffic into and out of the containment facility.
- Containment facilities require frequent washdowns of surfaces and these surfaces need to be resistant to chemical attack and absorption. The underside of plastic laminated benches may contain absorptive organic materials which, in the case of PPC-3 facilities, must be sealed to facilitate cleaning and to prevent absorption of fumigants. Use of epoxy bench-top surfaces, stainless steel or other non-absorptive solid surfaces is recommended.
- To facilitate decontamination and maintenance, systems such as liquid effluent treatment systems and HEPA filter housing systems must be located as close to the containment perimeter as possible, and consideration should be given to installing valves to isolate sections of ductwork and drains. Appropriately sized screens or filters need to be used to protect all openings that may provide routes for incoming or escaping arthropods.
- Circuit breakers and shut-off valves should be located outside of the containment perimeter to facilitate maintenance.

3.5 Greenhouse Design Considerations

All requirements for ventilating and controlling containment laboratories need to be considered when designing ventilation requirements for greenhouses. Typically, greenhouses have high humidity, high heat production, significant cold weather influences and increased risks of ingress or egress of flying vectors. Ventilation strategies need to include screening of all forced-air and

natural air venting systems. Air conditioning may include a combination of cooling/heating (temperature control), humidity control, CO_2 control and air circulation patterns. In greenhouses that rely on screened natural air venting, it will be difficult to maintain negative pressure in areas prone to high winds. Greenhouses that are designed to be tight require verification of their as-constructed performance and regular testing for leaks.

A control system that integrates lights, ventilation requirements, temperature control and shading systems should be envisaged when constructing a containment greenhouse.

Where it is necessary to collect and treat waste water, greenhouse floors should be sloped toward drains and have curbs to contain water.

To increase physical security, consideration should be given to locating greenhouses away from public walkways and other amenities. 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 greenhouse caused by things such as machinery and carts.

3.6 Screenhouses

Screenhouses may be constructed to provide BASIC or PPC-1 containment.

3.7 Physical Containment Requirements

The following tables describe physical containment requirements for facilities (e.g. laboratories, greenhouses, screenhouses) working with plant pests. The following symbols are used:

● Required

○ Recommended[9]

The absence of a symbol in the tables indicates that an item is either not required or not applicable. Where ● or ○ are followed by an "A" suffix, the item applies only to arthropod facilities. Where the "A" suffix is not present, the item applies to all facilities, including those working with arthropods.

[9] Recommended items are optional, depending upon the nature of the pest(s) requiring containment.

3.7.1 Structure, Location and Access

3.7.1	Structure, Location and Access	PPC-1	PPC-2	PPC-3
1	Appropriate security to be provided for the building (e.g. fencing, motion sensors, physical barriers, patrols).		○	●
2	Signage to be installed on entry doors within the containment zone indicating containment level, contact information, and entry requirements.	○	●	●
3	Entry to the containment zone is via self-closing and lockable doors.	○	●	●
4	Restricted access to the containment zone is to be ensured through a controlled access system (e.g. electronic access card, code or equivalent).	○	●	●
5	Entry and exit is to be via an anteroom. Where stipulated by building codes, anterooms that permit rapid emergency egress are to be placed at emergency exits. Corridors are acceptable as anterooms for non-arthropod PPC-2 areas.		●	●
6	If separate from a containment facility, greenhouse and screenhouse entry and exit is to be via an anteroom. Corridors and **headerhouses** are acceptable for PPC-1 and PPC-2 facilities.	○	●	●
7	Anteroom doors are to be self-closing and shall not open simultaneously (interlocking doors, and audible or visual alarms are acceptable).		●	●

3.7.1	Structure, Location and Access *(continued)*	PPC-1	PPC-2	PPC-3
8	Anteroom to be provided with windowless self-closing doors and lights that automatically switch off when either door is opened, and switch on only when both doors are closed, to avoid attracting phototropic arthropods.		● A	● A
9	Entry is to allow for separation of personal clothing from dedicated facility clothing (i.e. "clean" change area separated from "dirty" change area).		● A	●
10	Anterooms can be considered as a change room, and a single change room can include both a clean and a dirty change area with a line demarcating the two areas.		● A	●
11	Insect traps (e.g. sticky, pheromone, visible or ultraviolet light) to be provided in the anteroom of the containment zone.	○ A	● A	● A
12	Tight-fitting doors (e.g. with weather stripping, magnetic seals, brush barriers or flexible flanges) and, preferably, a raised threshold to be provided to deter ingress or egress of arthropods.		● A	● A
13	Inner anteroom door to be fitted with a forced-air curtain, as required, to deter arthropods from exiting the containment zone.		○ A	○ A

3.7.1	Structure, Location and Access *(continued)*	PPC-1	PPC-2	PPC-3
14	Mirrors to be installed within the containment zone and immediately inside the anteroom to permit self-inspection for hitchhiking arthropods.		● A	● A
15	Emergency exits are to be provided, where required, that open only from the inside, are alarmed and display "Emergency Exit Only" signage to deter unauthorized access.	○	●	●
16	Dedicated laboratory clothing and personal protective equipment are to be stored separately from street clothing.	○	●	●
17	Lowered ceilings to be provided in arthropod rearing rooms to facilitate arthropod recapture.		○ A	○ A
18	Facilities, including greenhouses and screenhouses, are to be designed to withstand extremes of local weather and anticipated maximum snow and ice loads, as well as wind, windborne debris and hail.	○	●	●
19	Greenhouses are to be constructed with a rigid reinforced frame with walls, floors and glazing forming a shell. All perforations and joints in greenhouses and between the greenhouse and other contained structures are to be sealed to provide a continuous containment barrier.		●	●

3.7.2 Surface Finishes and Casework

Surface finishes should be scratch and stain resistant, easy to clean and durable enough to withstand repeated disinfection, while offering minimal opportunity for pests to persist and cross-contaminate samples. Appropriate surface coloration is important for facilities working with arthropods, to facilitate the detection of escaped individuals.

3.7.2	Surface Finishes and Casework	PPC-1	PPC-2	PPC-3
1	Surfaces are to be continuous and compatible with adjacent and overlapping materials (to maintain adhesion and a continuous perimeter). For PPC-3 containment, walls and floors with welded seams are acceptable. A continuous 100 mm (minimum) cove floor finish up the wall is recommended.		● A	●
2	Floors to be slip-resistant in wet areas.		●	●
3	Interior coatings are to be easy to clean and resistant to gas and chemicals, as well as to repeated disinfection in accordance with function (e.g. will withstand disinfection, fumigation).		●	●
4	Bench tops to be non-absorptive, impervious to water, and resistant to acids, alkalis, organic solvents and moderate heat. Backsplashes to be installed tight to wall and sealed at wall-bench junction.	○	○	●
5	Greenhouse floors to be impervious to water and easy to clean (e.g. concrete).	○	●	●

3.7.3 Containment Perimeter

The containment perimeter is the continuous floor, ceiling and wall surfaces that form a barrier against the ingress or egress of plant pests, including all windows, doors and service penetrations into the area.

3.7.3	Containment Perimeter	PPC-1	PPC-2	PPC-3
1	Autoclave or other **validated** and acceptable means of waste treatment/ disposal are to be located within the containment zone or, if not available in the containment zone, then procedures must be in place to safely transport waste for treatment/disposal elsewhere.	●	●	
2	Dedicated double-door barrier autoclave with bio-seal flange is to be located on the containment barrier; equipped with interlocking doors (recommended) or audible or visual alarms, to prevent the simultaneous opening of both doors. Body of autoclave should be located outside of containment for ease of maintenance.			●
3	Autoclave to be equipped with a cycle log recorder to record time, temperature, and pressure.	○	●	●
4	For materials that require removal from the containment zone and cannot be autoclaved (e.g. heat sensitive equipment, samples, film), other proven and validated treatment technologies (e.g. irradiation, chemicals, gas) are to be provided at the containment barrier.			●

3.7.3	Containment Perimeter *(continued)*	PPC-1	PPC-2	PPC-3
5	All penetrations of the containment perimeter, including all conduits and wiring, are to be sealed with an appropriate sealant to facilitate cleaning and fumigation and to prevent arthropod escape.		● A	●
6	Windows positioned on containment barrier are to be non-opening and sealed to suit local climactic conditions; window glazing material must provide the required level of security.		● A	●
7	Containment zone to be screened or sealed for PPC-1 and PPC-2, and sealed for PPC-3 and PPC-2 arthropod containment zones.	●	●	●
8	Spare greenhouse window panels, emergency glazing and screening to be stored nearby for emergency repairs.	○	●	●
9	Greenhouse glazing must be break-resistant (e.g. double glazing, laminated or tempered glass, polycarbonate) and provide the required level of security.		● A	●
10	Greenhouse glazing must be sealed to the greenhouse framework with a sealant that provides a tight, flexible and continuous seal resistant to degradation by chemical disinfectants, UV radiation and temperature changes.		●	●

3.7.4 Heating, Ventilation and Air Conditioning (HVAC)

Systems must be capable of providing a comfortable environment for laboratory staff that is also suitable for the organisms with which they work.

3.7.4	Heating, Ventilation and Air Conditioning	PPC-1	PPC-2	PPC-3
1	Inward directional airflow is to be provided such that air will always flow towards areas of higher containment (e.g. ± 12.5 to 25 Pa differential).		● A	●
2	Supply and exhaust air to be appropriately filtered or screened in order to contain and exclude pests.		● A	
3	Supply and exhaust air systems are to be designed to prevent backdraft of contaminated air to other areas.		● A	
4	Supply and exhaust air ducts to be equipped with dampers to allow for screen or filter cleaning, removal and replacement.		● A	
5	Supply and exhaust air ducts to be equipped with bubble-tight dampers to permit gaseous or fumigant decontamination (the bubble-tight dampers can also be used to provide backdraft protection and isolation of the HEPA filters).			●
6	Exhaust air is to be HEPA-filtered. HEPA filters to be installed in a certifiable housing.			●
7	Bubble-tight dampers should be installed as close as possible to the containment perimeter.			○

3.7.4	Heating, Ventilation and Air Conditioning *(continued)*	PPC-1	PPC-2	PPC-3
8	Pre-filters or screens should be installed to protect and extend the life of the HEPA filters.			○
9	Filter housings and ductwork must be able to withstand pressure changes due to air supply and/or exhaust fan failures.			●
10	HEPA filter efficiency is to be demonstrable with the filter in place.			●
11	Airflow control devices and duct sensors to be located downstream of the exhaust HEPA filter and upstream of the supply bubble-tight damper or HEPA filter.			●
12	Supply and exhaust air systems to be interlocked to prevent sustained laboratory positive pressurization.		● A	●
13	Supply and exhaust air ductwork to be sealed airtight between the room perimeter and HEPA filter or bubble-tight damper(s) in accordance with SMACNA Seal Class A 1985.		○ A	●
14	Alarms (audible or visible) to be provided both inside and outside the containment zone to signal air handling systems failure.		○ A	●
15	Visual pressure-monitoring devices to be provided at the entry to the containment zone.		○ A	●

3.7.4	Heating, Ventilation and Air Conditioning *(continued)*	PPC-1	PPC-2	PPC-3
16	Greenhouse vents and greenhouse HVAC penetrations to be screened with appropriate mesh screening to prevent pest escape.	●	●	
17	Greenhouses constructed to meet PPC-3 level must undergo and pass the following tests: (a) an air infiltration test conducted according to ASTM E 283-91: the test pressure difference will be 6.24 pounds per square foot positive static pressure, and the allowable leakage rate is 0.03 cfm per square foot; (b) a static pressure water resistance test conducted according to ASTM E 331-93: the minimum test pressure will be 10 pounds per square foot, and the passing standard is no water penetration to the interior surface; and (c) a dynamic pressure water resistance test conducted according to AAMA 501.1-94: the minimum test pressure will be 10 pounds per square foot, and the passing standard is no water penetration to the interior surface.			●
18	Greenhouse ventilation system to be designed to allow for greenhouse fumigation and pesticide applications.	●	●	●

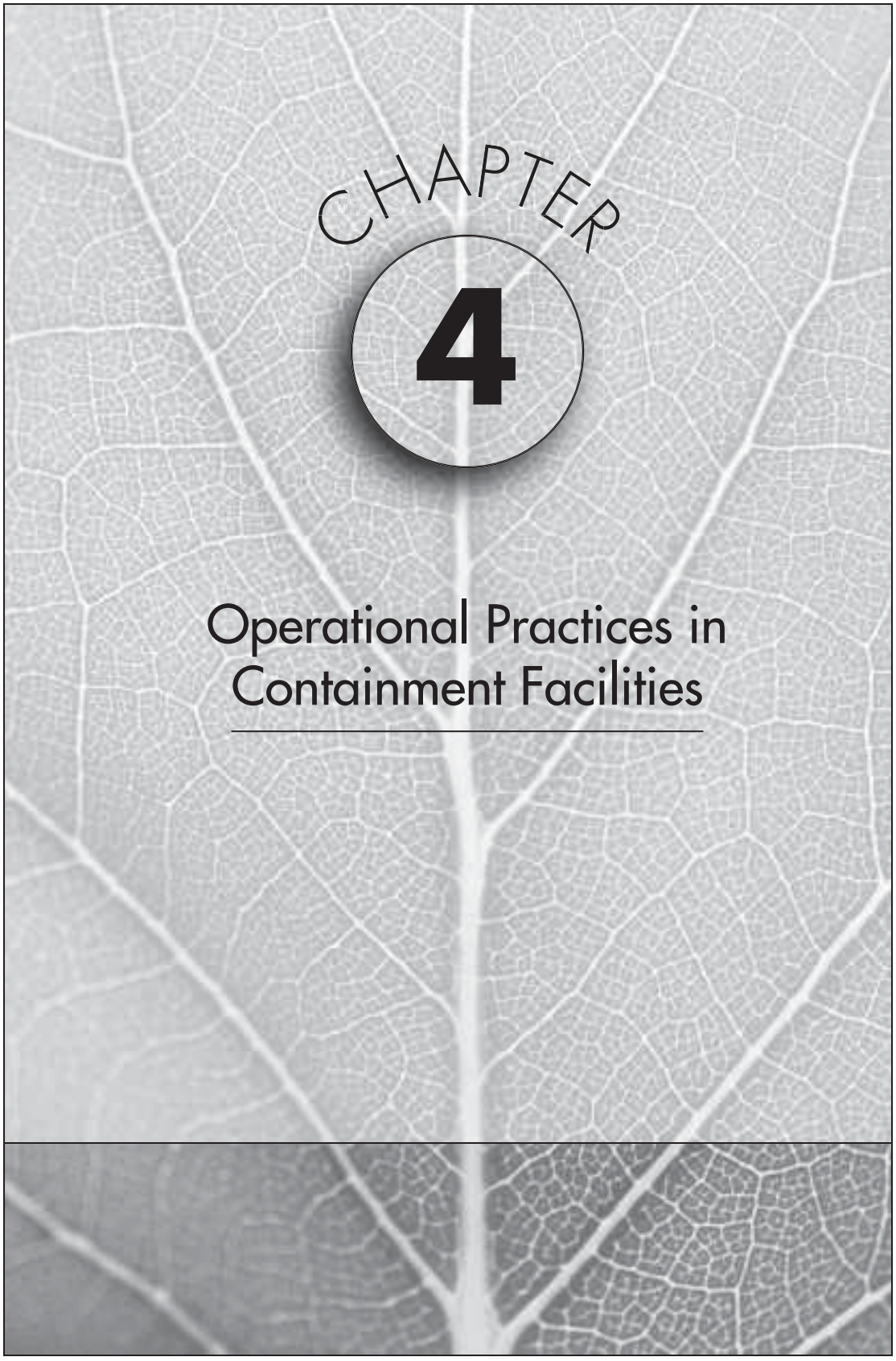
3.7.5 Facility Services

Facility services include all plumbing, electrical, gas, oil and safety equipment, etc. related to the operation of the facility. All such systems must be installed in a manner that does not compromise the containment required for the plant pests that will be used in the facility.

3.7.5	Facility Services	PPC-1	PPC-2	PPC-3
1	A handwashing sink (or, if required, a sink and a shower) to be located within the containment zone and near the point of exit.	○	●	●
2	Handwashing sinks to be provided with "hands-free" capability.		○	●
3	Appropriate primary containment devices to be available (e.g. BSCs), as required, to minimize the potential contamination of the containment zone.	○	●	●
4	Emergency eyewash facilities to be provided in the laboratory containment zone in accordance with activities and applicable regulations (i.e. ANSI Z358.1-1998).	●	●	●
5	Emergency shower equipment to be provided in the laboratory containment zone in accordance with activities and applicable regulations (i.e. ANSI Z358.1-1998).	●	●	●
6	Facility service supply controls to be located both inside and outside of the containment zone, as required, to facilitate servicing.		○	○

3.7.5	Facility Services *(continued)*	PPC-1	PPC-2	PPC-3
7	All drains and associated piping to be connected to a validated effluent sterilization system consistent with laboratory activity and local regulations.			●
8	150-mm drain traps to be provided to avoid trap drying.		● A	●
9	Soil traps to be installed in drains as required.	●	●	●
10	Plumbing vent lines (including effluent sterilization system) to be appropriately screened or filtered to prevent ingress and egress of arthropods.		● A	● A
11	Communication system (e.g. fax, LAN, modem) to be provided to allow the electronic transfer of information and data from the containment zone to other areas.		○ A	●
12	Intercom or telephone system to be provided to allow voice communication beyond the containment zone and to reduce traffic into and out of containment zones.		○ A	●
13	Laboratory to be adequately equipped (e.g. BSCs, thermocyclers, ELISA plate readers, centrifuges and microscopes) to avoid moving equipment into or out of the containment zone.		○	●
14	Alarm system to be installed to detect loss of containment due to unauthorized entry or mechanical or power failure.		○	●

3.7.5	Facility Services *(continued)*	PPC-1	PPC-2	PPC-3
15	Monitoring and security system to be installed to monitor critical containment systems. System monitoring to be available outside of the containment zone.		○	●
16	Emergency power system to be provided for HVAC, lighting, BSCs, essential equipment and other safety systems.		○	●
17	Vacuum pump contamination to be minimized by filtration of vacuum line and use of disinfectant traps.		○	●



Operational Practices in Containment Facilities

CHAPTER 4 – OPERATIONAL PRACTICES IN CONTAINMENT FACILITIES

This section describes containment practices applicable to plant pests. Operational practices must be adequate to contain all organisms in use. Facility personnel, including scientists, technicians, and maintenance and greenhouse staff, all play an essential role in the successful containment of plant pests and the exclusion of unwanted pests from containment facilities.

4.1 PPC-1 Practices

The following general practices are required when working with plant pests in a PPC-1 facility.

4.1.1 Access

Limit access to containment zone and support areas to authorized personnel only.

4.1.2 Documentation

4.1.2.1 Designate and name a contact person for the facility, or one for each area or experiment.

4.1.2.2 Keep an up-to-date inventory of all imported plant material and plant pests.

4.1.3 Training

Personnel must be provided with training on pest-associated hazards and the precautions necessary to prevent the release of contained pests. Personnel must show evidence that they know and understand the required precautions; training must be documented; and refresher and retraining programs must be implemented as appropriate.

4.1.4 Personal Protective Equipment

4.1.4.1 Appropriate protective clothing, properly fastened, should be worn by all personnel, as well as visitors, trainees and others, when working in the facility, to ensure that pests are not inadvertently transported outside of the containment facility on street clothing.

4.1.4.2 Potentially contaminated laboratory clothing must not be worn in non-laboratory/greenhouse/screenhouse areas if this presents a risk of inadvertently disseminating pests.

4.1.4.3 Gloves (e.g. latex, vinyl, co-polymer) can be worn, as appropriate, to avoid the inadvertent contamination of samples and work areas; gloves are to be removed when leaving the containment zone and **decontaminated**, as appropriate, along with other laboratory wastes, prior to disposal.

4.1.5 Work Practices

4.1.5.1 Comply with all conditions stipulated on Permits to Import.

4.1.5.2 Render all organisms non-viable prior to disposal.

4.1.5.3 Employ good laboratory practices to prevent the escape of pests.

4.1.5.4 Keep doors closed to reduce the potential movement of plant pests.

4.1.5.5 Eating, chewing gum, drinking, smoking, storing of food and utensils, storing of personal belongings, applying cosmetics, and inserting or removing contact lenses should not occur in the containment zone. The wearing of contact lenses is recommended only when other forms of corrective eyewear are not suitable.

4.1.5.6 Long hair is to be tied back or restrained so that it cannot come into contact with hands, specimens, containers or equipment in view of the potential for disseminating pests.

4.1.5.7 Treat all pests and materials in a containment zone in accordance with the highest containment requirement for that area (e.g. if PPC-1 and PPC-2 pests are in the same room, PPC-2 practices must be followed).

4.1.5.8 All pests and material that is infested or suspected of being infested with a pest must be moved or transported in containers that are secure, leak-proof and not easily broken, in order to prevent the accidental release or escape of a pest. The containers may only be opened within a facility that provides the appropriate containment level for the pest in question.

4.1.5.9 Keep all work areas within a containment zone, including dedicated clerical work stations, clean and tidy. Storage of materials should be minimized, and paperwork should be done outside of containment zones if this presents a risk of disseminating pests.

4.1.5.10 Keep workplace exposure to any plant pest at the lowest practical level and avoid the generation of aerosols when manipulating pests or inoculating plants.

4.1.5.11 Cultures are to be stored in sealed, preferably break-resistant, containers such as screw-top vials. Cultures are to be clearly identified and dated. Where possible, petri dish cultures of sporulating fungi should be sealed with stretch film.

4.1.5.12 Contaminated materials and equipment must be properly cleaned and decontaminated before leaving the facility for servicing or disposal.

4.1.5.13 Render non-viable all unintentionally introduced pests, including those contaminating cultures, as soon as they are detected.

4.1.5.14 Where practical, confine all arthropods in cages or other containers that prevent escape.

4.1.5.15 Where applicable, disinfectants that are effective against the organisms in use must be available at all times when plant pests are handled or stored.

4.1.5.16 Sanitation practices should be implemented when working with plants and plant pests. These practices include:

- treating all plants and soils as if they are infected/infested;
- minimizing entry of personnel into laboratory and plant growth areas;
- providing adequate separation and/or physical barriers between plants infected or infested with different plant pests;
- washing hands (after removing gloves) before leaving the containment zone, and at any time after handling materials known or suspected to be contaminated with plant pests, if this poses a risk of inadvertently spreading pests;
- using decontaminated soil, soil-less potting mix or inert growing media, and cleaning up spilled soil or growing medium;
- watering plants carefully, avoiding soil and water splash, and avoiding touching plants with the hose;
- avoiding the use of automated watering systems where their use presents a risk of disseminating pests;
- cleaning and decontaminating work surfaces as appropriate with a suitable disinfectant;
- disinfecting items such as clippers, pruners and knives during and after use, as appropriate, to avoid plant-to-plant transfer of pests;
- cleaning and decontaminating pots, stakes and saucers after use, or using disposables that are decontaminated and discarded after use;

- surface sterilizing plant material before planting or transferring to tissue culture;
- maintaining obligate parasites (e.g. viruses, nematodes) in tissue culture plantlets where possible;
- eliminating unwanted pests by heat or cold therapy, surface sterilization, meristem culture or other suitable means;
- inspecting for, and removing and destroying, host plants infected or infested with unwanted organisms;
- using good housekeeping practices to keep the area neat, clean and free of dead plant material and unwanted plants and pests; and
- using dedicated cleaning equipment (e.g. brooms, mops, garbage cans) within containment zones.

4.1.5.17 Work surfaces that have become permeable (i.e., cracked, chipped, or loose) must be repaired, sealed or replaced.

4.1.5.18 Regularly monitor autoclaves used for decontamination using biological indicators to ensure efficacy (e.g. consider weekly or monthly monitoring, depending on the frequency of use of the autoclave). Monitoring records must be kept for three years.

4.1.5.19 Loss of containment must be reported immediately to the laboratory supervisor and remedied as soon as possible. Written reports of such incidents must be maintained for three years, and the results of incident investigations used for continuing education.

4.1.5.20 Maintain an effective bird, rodent, weed and plant pest control program to prevent entry and eliminate undesired pests from the containment zone.

4.1.5.21 Greenhouse personnel who apply pesticides must be appropriately trained and protected.

4.2 PPC-2 Practices

In addition to the practices required for PPC-1 facilities that handle plant pests, the following sections describe the minimum operational practices required for PPC-2 containment facilities.

4.2.1 Access

4.2.1.1 Entry must be restricted to authorized laboratory and maintenance staff and other persons on official business.

4.2.1.2 Entry to PPC-2 arthropod containment zones must be restricted to authorized laboratory staff, maintenance staff and other persons on official business. Access to specific areas within these containment zones shall be granted on an "as needed" basis only.

4.2.2 Documentation

4.2.2.1 A Procedures Manual covering safety and general laboratory and greenhouse operations, including entry and exit protocols and cleaning schedules, must be available to all staff, and its requirements followed; it must be reviewed and updated regularly. The Procedures Manual may consist of a series of Standard Operating Procedures.

4.2.2.2 An Emergency Response Plan must be available that describes emergency procedures, including those for accidents, fires, chemical spills, air handling failure, BSC failure, power loss and containment loss. Plans must cover emergency entry/exit procedures, corrective actions and notification of key personnel and government officials.

4.2.2.3 The Laboratory Director or the Director's designate(s) such as supervisors are responsible for:

- organisms that enter, are held within, or leave the containment zone;
- compliance with all regulatory requirements;

- maintenance of SOPs and the Procedures Manual;
- compliance with SOPs and the Procedures Manual; and
- determining who is authorized to work in the facility.

4.2.2.4 Records shall be kept of activities in the facility for three years, including records of all building and equipment maintenance, shipments received, confirmations of pest identification, dates of import, CFIA Permits to Import, associated imported plant material, associated organisms detected, decontamination of packaging materials and transfer of plant pests or organisms to other facilities where authorized by a CFIA inspector. Records shall also be kept of all inoculations or infestations of plant material and the movement of plant material and plant pests into or out of containment.

4.2.2.5 Appropriate signage indicating the nature of the plant pests/organisms being used (i.e. type and containment level) must be posted on the inner entry door to each laboratory. If there are special provisions for entry, the relevant information must be included on the sign; the contact information of the laboratory supervisor or other responsible person(s) must be listed.

4.2.3 Training

4.2.3.1 Personnel working in the containment zone must be trained in, and follow, the Standard Operating Procedures for the area. Trainees must be supervised by a trained staff member. Visitors, maintenance staff, janitorial staff and others must be provided with training and/or supervision commensurate with their anticipated activities in the containment zone.

4.2.4 Personal Protective Equipment

4.2.4.1 Personnel entering the containment zone may need to wear protective clothing up to and including full coverage protective clothing. All protective clothing must be removed prior to exiting the containment zone.

4.2.4.2 Dedicated or disposable footwear (e.g. rubber boots, shoe covers) should be worn when working with soil or soilborne pests in situations where the floor may be contaminated with infested plant material or soil. Where such footwear is used, it must be removed for reuse or decontamination prior to exiting the containment zone.

4.2.4.3 Where appropriate, BSCs or other primary containment devices are to be used for procedures involving potential allergens and for procedures that involve high concentrations or large volumes of plant pests or their propagules.

4.2.5 Work Practices

4.2.5.1 Personnel may not bring unnecessary personal belongings (e.g. hats, coats, purses) into the containment zone if there is a risk that these items could harbour pests on exit, resulting in a loss of containment.

4.2.5.2 Laboratory doors must be kept closed as required by the facility design.

4.2.5.3 To minimize places where plant pests can persist, avoid using containment zones for general storage of items not used in that area.

4.2.5.4 To facilitate minor repairs, a basic tool kit should always be available inside the containment zone.

4.2.5.5 Packages of pests from foreign sources must be opened in a BSC or a sleeved cage, as appropriate, and packaging material must be decontaminated as soon as possible.

4.2.5.6 Where appropriate, footbaths (e.g. trays containing cloth pads soaked in disinfectant) shall be provided in the anteroom of facilities containing soilborne pests, to disinfect footwear, shoe covers or dedicated footwear.

4.2.5.7 If there is a risk of disseminating pests in clothing known to be or suspected of being contaminated, such clothing must be decontaminated (e.g. heat-treated, frozen, autoclaved or soaked in a 5% bleach solution) before laundering. Clothing does not need to be decontaminated if there are laundering facilities within the containment zone and the facilities have been proven to be effective in killing the pests in use.

4.2.5.8 If there is a risk of disseminating pests with the movement of paper, use an electronic communication system to transfer information and data from the containment zone.

4.2.5.9 All contaminated materials, solid or liquid, including soil from soil traps, must be decontaminated using validated methods before disposal or reuse. Wastes should be sterilized in a timely manner and not allowed to accumulate and decay.

4.2.5.10 All liquids potentially contaminated by pests must be decontaminated. Liquids must be collected and treated with steam, heat, chemicals or other proven and validated treatment technology prior to discharge into sewer or septic systems.

4.2.5.11 Periodic inspections of the containment zone must be made by facility staff to check for faults and deterioration (e.g. deteriorated door seals and brushes, screens or caulking); corrective action must be taken and records kept for three years. Such inspections shall occur at least every six months.

4.2.5.12 Supply and exhaust filters, pre-filters and screens are to be inspected and cleaned or replaced by a designated person on a regular basis.

4.2.5.13 Where applicable, inward directional airflow must be confirmed on a regular basis using a smoke pencil, tape, tissue or other suitable means.

4.2.5.14 An effective and appropriate monitoring system (e.g. insect traps, spore traps, susceptible sentinel host plants) and pest control program should be in place to control undesired pests and to detect escaped pests.

4.2.5.15 Inspect all plant material and insect traps on a regular basis. Remove all debris and dead plant material so that it does not act as a refuge for plant pests.

4.2.5.16 Keep areas surrounding greenhouses free of debris, garbage, compost piles and overhanging shrubs and trees.

4.2.5.17 Where appropriate, staff must examine themselves, or be examined by others, for hitchhiking arthropods prior to exiting the containment zone. Hitchhiking arthropods must be removed or killed before exit.

4.3 PPC-3 Practices

All operational practices for PPC-1 and PPC-2 containment facilities apply to PPC-3 facilities. The following sections describe the additional minimum operational practices required in PPC-3 containment facilities.

4.3.1 Access

Entry to the containment zone must be restricted to authorized laboratory staff, maintenance staff and others on official business. Access to specific areas within the containment zone may be granted on an "as needed" basis only.

4.3.2 Documentation

4.3.2.1 The Laboratory Director or the Director's designate is responsible for all organisms that enter, are held within, or leave the facility; for compliance with all regulatory requirements, including permit requirements; for maintenance of the Standard Operating Procedures (SOP) manual; for ensuring compliance with the SOP manual; and for determining who is authorized to work in the facility.

4.3.2.2 The Laboratory Director or designate is responsible for the SOP manual that includes procedures specific to the operation of the facility. It must be kept current, and employees must certify that they have understood and agree to abide by relevant SOPs. The SOP manual must include policies and procedures for the following:

- entry of authorized personnel;
- receipt of exotic material;
- organism handling;
- waste disposal;
- identification of received pests;
- record keeping;
- housekeeping, cleaning and disinfection;
- entry, exit and decontamination protocols for equipment, samples, and solid and liquid waste;
- cleaning of soil traps and disposing of contents;
- monitoring of visitors;
- monitoring for pest escapes;
- emergency contacts;
- operation, repair and maintenance of air handing systems;

- operation, repair and maintenance of waste treatment systems;
- emergency repair procedures;
- training of staff;
- use of equipment; and
- inoculation of plants.

4.3.2.3 The above SOPs are to be supplemented with SOPs specific to the nature of the work being conducted and to each project or activity, as appropriate.

4.3.2.4 A log book of all people entering and leaving the facility must be maintained and kept for three years.

4.3.3 Training

4.3.3.1 Personnel entering the containment zone must have completed training in the procedures specific to the containment zone and must show evidence of having understood the training; training must be documented and signed by the employee and supervisor.

4.3.3.2 Personnel must demonstrate proficiency in appropriate practices (SOPs) and techniques.

4.3.3.3 Personnel working in the containment zone must possess knowledge of the physical operation and design of the facility (e.g. air pressure gradients between zones, directional airflow patterns, alarm signals for air pressure failure, and the containment perimeter).

4.3.4 Personal Protective Equipment

4.3.4.1 Personnel entering the containment zone must remove street clothing, jewelry, etc., and change into dedicated laboratory clothing and shoes; dedicated laboratory clothing and shoes must be removed in a manner that minimizes the potential transfer of pests from potentially contaminated laboratory clothing before leaving the

containment zone. The use of full coverage protective clothing (i.e. completely covering all street clothing and hair) may be an acceptable alternative. Personnel must wash their face and hands prior to exiting the containment zone.

4.3.4.2 In the event of life-threatening emergencies, personal health and safety are a priority. Exit protocols shall have been established in advance which allow routine procedures to be bypassed while maintaining pest containment as much as possible.

4.3.5 Work Practices

4.3.5.1 Personnel entering a containment zone should make an effort to bring all materials they will need with them; if something has been forgotten, established traffic patterns must still be adhered to (i.e. either telephone for someone to bring it in, or exit using proper protocols).

4.3.5.2 If aerosol exposure presents a risk of pest escape, protocols must be in place to determine whether showering is required on exit from the containment zone.

4.3.5.3 Smoke testing (i.e. using a smoke pencil held at the door between the anteroom and the containment zone, and other doors as required) is to be done periodically by staff to verify inward directional airflow.

4.3.5.4 A containment check must always be performed before entering the containment zone (i.e. verify correct readings on the pressure monitoring device).

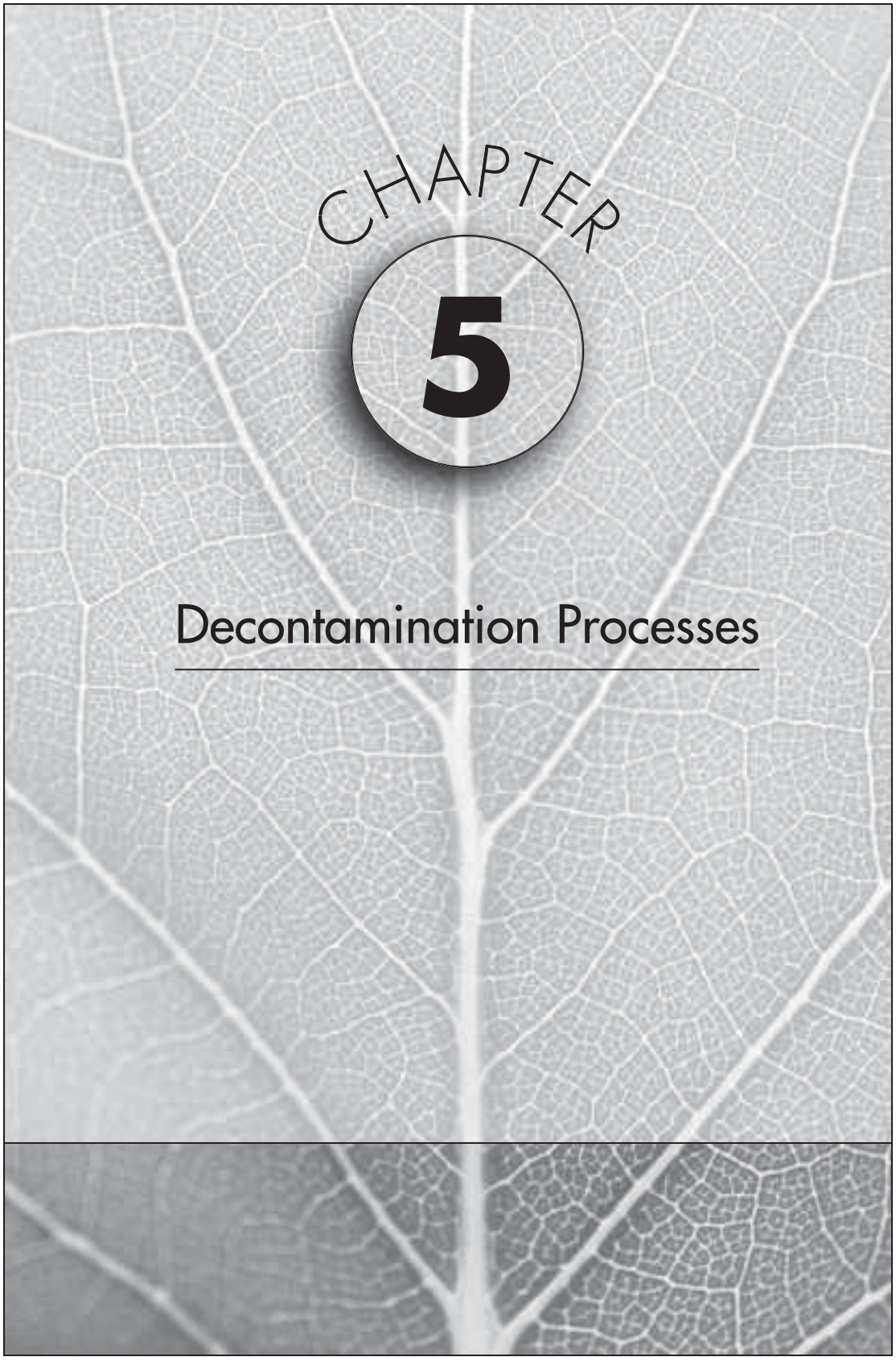
4.3.5.5 Routine cleaning must be done by personnel who use the containment zone, or by other personnel specifically trained for this task, in order to minimize the number of people exposed to the pests under containment and thus the possibility of pest escape.

4.3.5.6 The containment zone must be kept locked and all doors must remain closed when not in use.

4.3.5.7 Work with plant pests in open vessels on open benches must be kept to a minimum.

4.3.5.8 Viable plant pests must be either stored inside the containment zone, or kept in leak-proof containers which are placed in locked storage located outside of the containment zone.

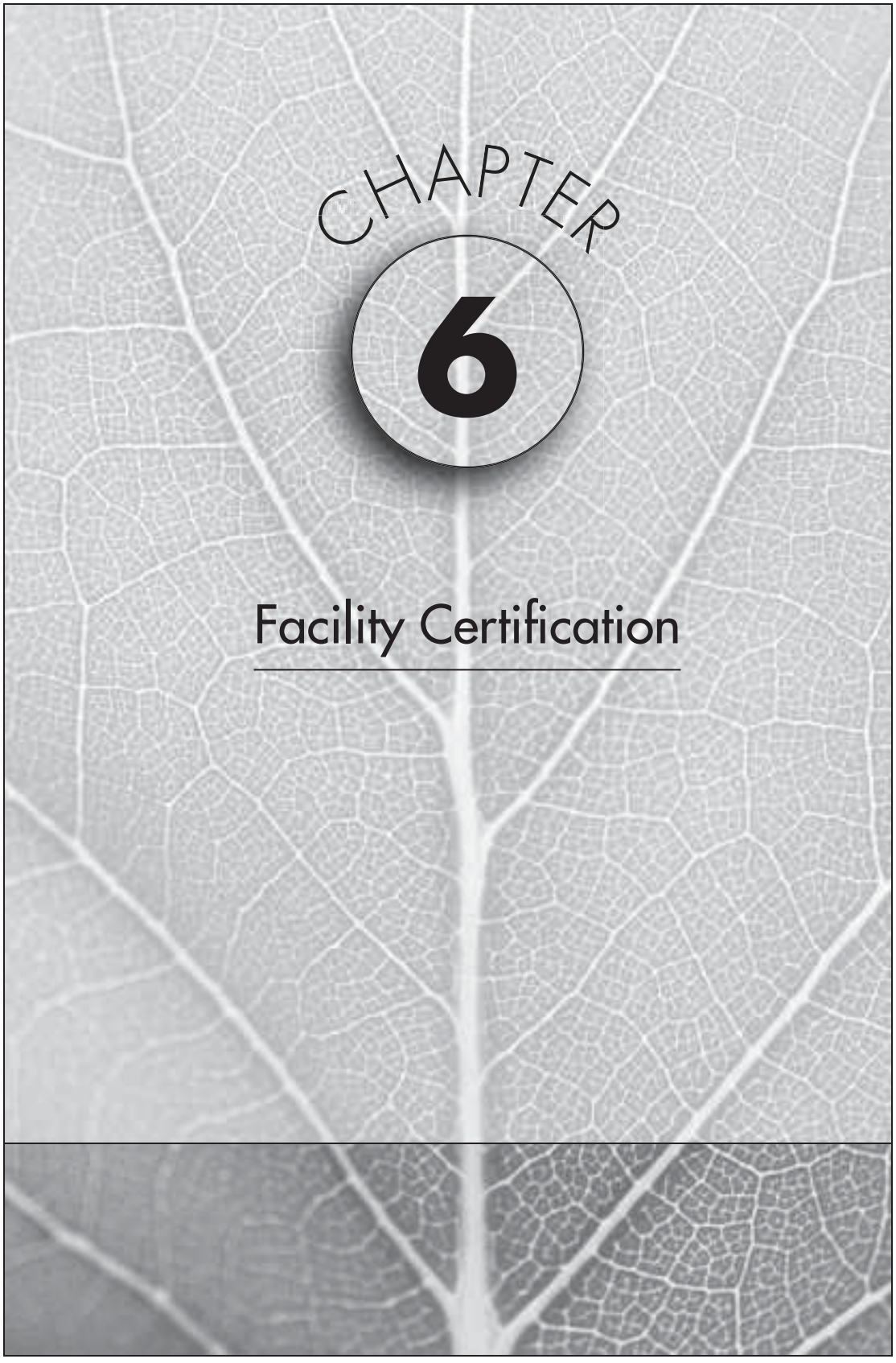
4.3.5.9 Drain traps must be kept filled with water or disinfectant (e.g. through regular sink usage, automatic primers or by filling traps in areas that are not frequently used).



Decontamination Processes

CHAPTER 5 – DECONTAMINATION PROCESSES

Decontamination methods used for all contaminated or potentially contaminated materials (e.g. rearing materials, infected or infested plant materials, cultures) must be validated. Depending on the particular organism and the life stage concerned, decontamination may be achieved by methods such as hot water immersion, freezing, rapid heating, drying, dry heating, steaming, autoclaving, fumigation or chemical disinfection. All decontamination and waste management procedures must be in accordance with applicable federal, provincial and municipal regulations.



Facility Certification

CHAPTER 6 – FACILITY CERTIFICATION

When appropriate, CFIA inspectors may conduct site visits and certify that facilities meet these standards, thereby providing assurance that they can appropriately contain plant pests.

6.1 Certification

Laboratories handling plant pests should refer to chapters 3 and 4 of these Standards to verify that their operational practices and physical containment are adequate to contain the pests that will be used there. In order to receive a Permit to Import, PPC-2 and PPC-3 facilities must be certified by the CFIA. Facilities importing pests and planning work that requires PPC-2 containment may be inspected by CFIA inspectors, and/or facility staff may be required to complete a detailed inspection checklist. Facilities importing pests and planning work that requires PPC-3 containment will undergo an initial inspection by CFIA inspectors. Certifications are valid for a period of two years. If a facility is not granted certification, or certification is revoked for any reason, the deficiency or deficiencies must be corrected before the facility can be certified or re-certified.

The critical containment components to be verified during initial certification of PPC-3 facilities are provided in section 6.3. All of these components are to be verified during the commissioning of a new facility. Certification and re-certification records must be retained for three years and they must be available for review by a CFIA inspector, who may elect to re-verify some or all of the components. All as-built drawings of the PPC-3 facility with specifications of surfaces must be submitted for review. Operational protocols must be submitted for review before work with plant pests at the PPC-3 level can be carried out. Training of personnel must be completed and documented. Users must understand containment principles and proposed procedures. Detailed records of the certification process and test reports for PPC-2 and PPC-3 facilities must kept for three years.

6.2 Re-certification

Re-certification of PPC-3 facilities must initially be conducted annually. Detailed records and test reports are required for re-certification and these must be retained for three years. Before **program changes** can be implemented at PPC-3 facilities, operational procedures must be submitted for review and approval by the CFIA. Program changes include changes related to the nature of the work or the procedures employed that would increase the risk of pest escape from the facility.

6.3 Verification and Performance Testing of PPC-3 Facilities

6.3.1 Room Integrity

Room integrity is to be verified by smoke testing the room perimeter to detect leaks. All joints, corners and sealed penetrations are to be smoke-tested for leaks.

6.3.2 Air Handling Systems

Particle challenge testing of HEPA filters is to be performed *in situ* by the particle scanning method to ensure they do not contain leaks in the filter media, the bond between the media and frame or around the frame gasket and support. Particle penetration is not to exceed 0.01%.

Ductwork systems are to be pressure decay tested to confirm that leakage rates do not exceed 0.2% of duct vol/min at 500 Pa. The American Society of Mechanical Engineers (Standard N510 *Testing of Nuclear Air Treatment Systems*, 1995, gives procedures for testing the leak-tightness of ducts and plenums.

Room pressure control systems are to operate as specified (i.e. ensure negative pressures are maintained). Control systems are to be tested for fail-safe operation by testing for failure of system components. Alarms are to be tested for the detection of positive pressurization and air handling systems failure is to be tested by simulation of alarm conditions.

6.3.3 Fume hoods

Fume hoods and associated exhaust systems are to comply with relevant design and installation requirements and they must be tested *in situ* in accordance with CSA Z316.5-04, *Fume Hoods and Associated Exhaust Systems* (2004). Fume hoods are to comply with the requirements for HEPA filtration. The installation of a charcoal filter prior to the HEPA filter may be envisaged as a measure to protect the HEPA filter from deleterious effects of chemical vapours and also as protection for personnel performing maintenance and certification testing of the HEPA filter.

6.3.4 Biological Safety Cabinets

Testing and certification of BSCs shall be performed in accordance with CSA Z316.3-95 or the applicable NSF Standard. Interlocks (i.e. Class II Type B2 BSC internal cabinet supply fan and exhaust fan) are to be tested in accordance with the applicable NSF standard. Manufacturer's requirements for airflows for BSCs must be met.

6.3.5 Emergency Power

Emergency electrical generators must be tested under appropriate load conditions to ensure systems will operate as specified.

6.3.6 Surface Finishes

Benches, casework, walls and floors are to be inspected to determine whether they are cleanable and can withstand decontamination methods. Where applicable, surfaces should be continuous and without seams to allow for thorough cleaning and decontamination, and penetrations must be sealed.

6.3.7 Communication Devices

Where they are present, communication and electronic data transfer systems (e.g. computer, telephone, facsimile) are to be tested to ensure that they will operate as specified.

6.3.8 Access Control / Security Devices

Security systems (e.g. controlled access) must be tested/verified to ensure that they will operate as specified.

6.3.9 Autoclaves and Decontamination Systems

All treatment systems (e.g. autoclaves, liquid effluent treatment systems) must be verified to ensure that they operate as specified and tested using representative loads. Biological indicators or an internal load temperature probe should be used to confirm that treatment parameters have been achieved. All other decontamination systems (e.g. dunk tanks, gas sterilizers) are to be tested to ensure that they operate as specified. References

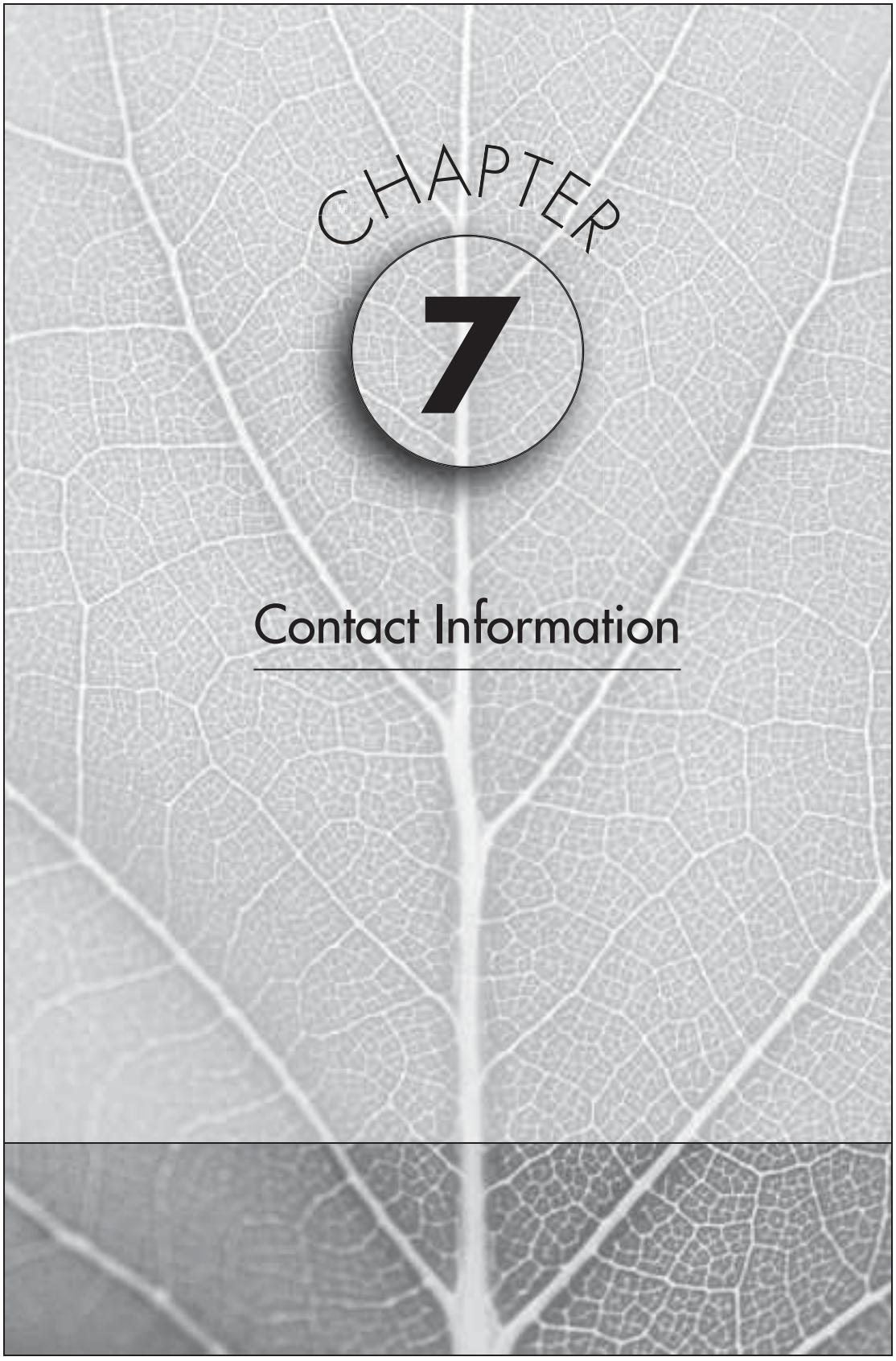
pertaining to the maintenance and efficacy of decontamination systems and disinfectants must be kept for three years. A description of the procedure to be followed must be provided to the CFIA.

6.3.10 Effluent Treatment System Plumbing

Drains and associated piping leading to liquid effluent treatment systems (including associated vent lines) must be tested in accordance with Section 3.6 of the National Plumbing Code of Canada (1995).

6.3.11 Standard Operating Procedures

Standard operating procedures for the facility must be updated on a regular basis, and updated SOPs must be submitted to the CFIA at the time of re-certification.



Contact Information

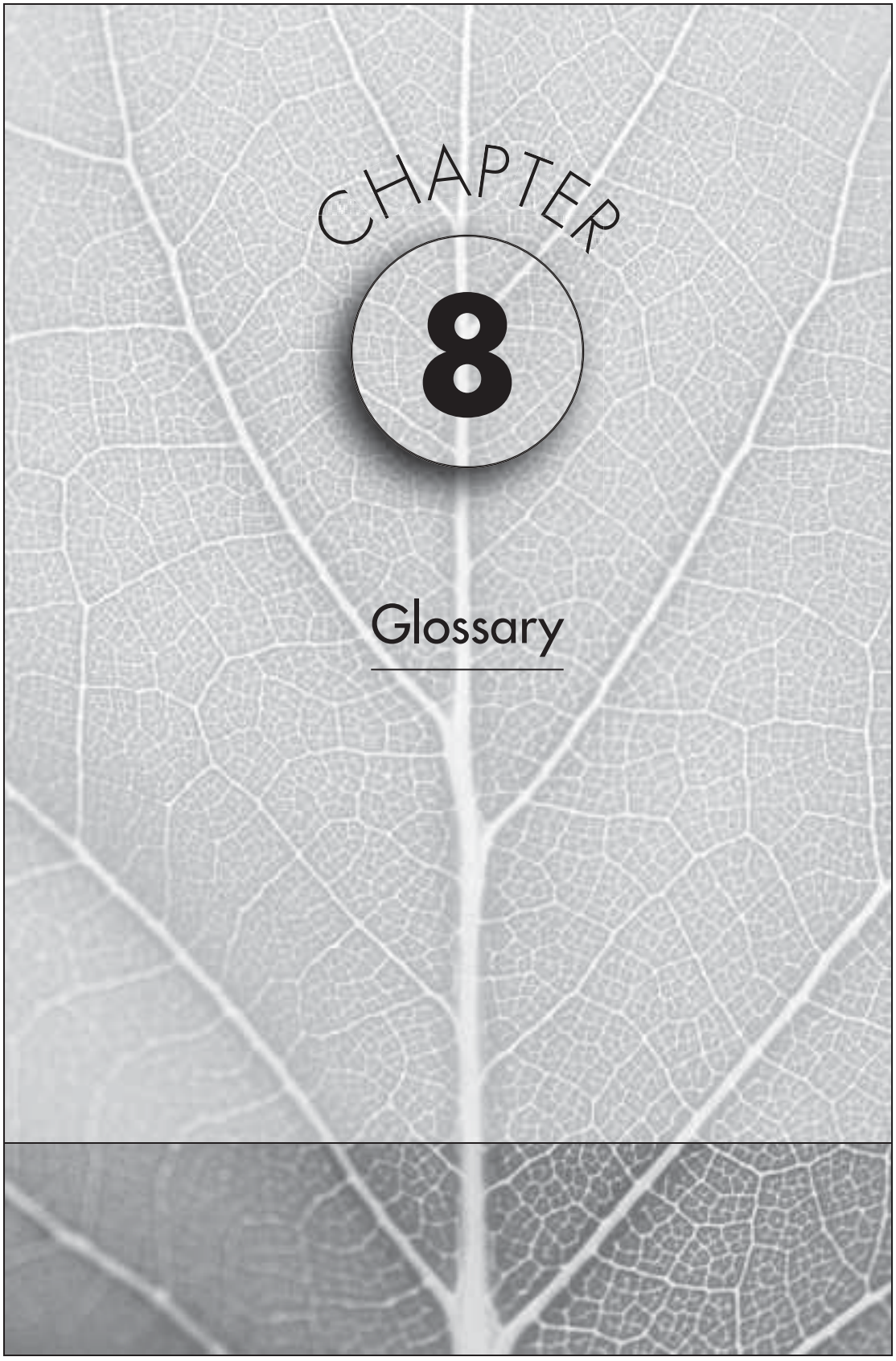
CHAPTER 7 – CONTACT INFORMATION

For information regarding the Containment Standards for Facilities Handling Plant Pests please contact:

Office of Biohazard Containment and Safety
Canadian Food Inspection Agency
159 Cleopatra Drive
Ottawa, ON
K1A 0Y9
Tel. (613) 221-7068
Fax (613) 228-6129
http://www.inspection.gc.ca/english/sci/bio/bioe.shtml

For information regarding Permits to Import for plant pests please contact:

Plant Health Division
Permit Office
Canadian Food Inspection Agency
59 Camelot Drive
Ottawa, ON
K1A 0Y9
Tel. (613) 225-2342
Fax (613) 228-6605
http://www.inspection.gc.ca/english/plaveg/internat/internate.shtml#2



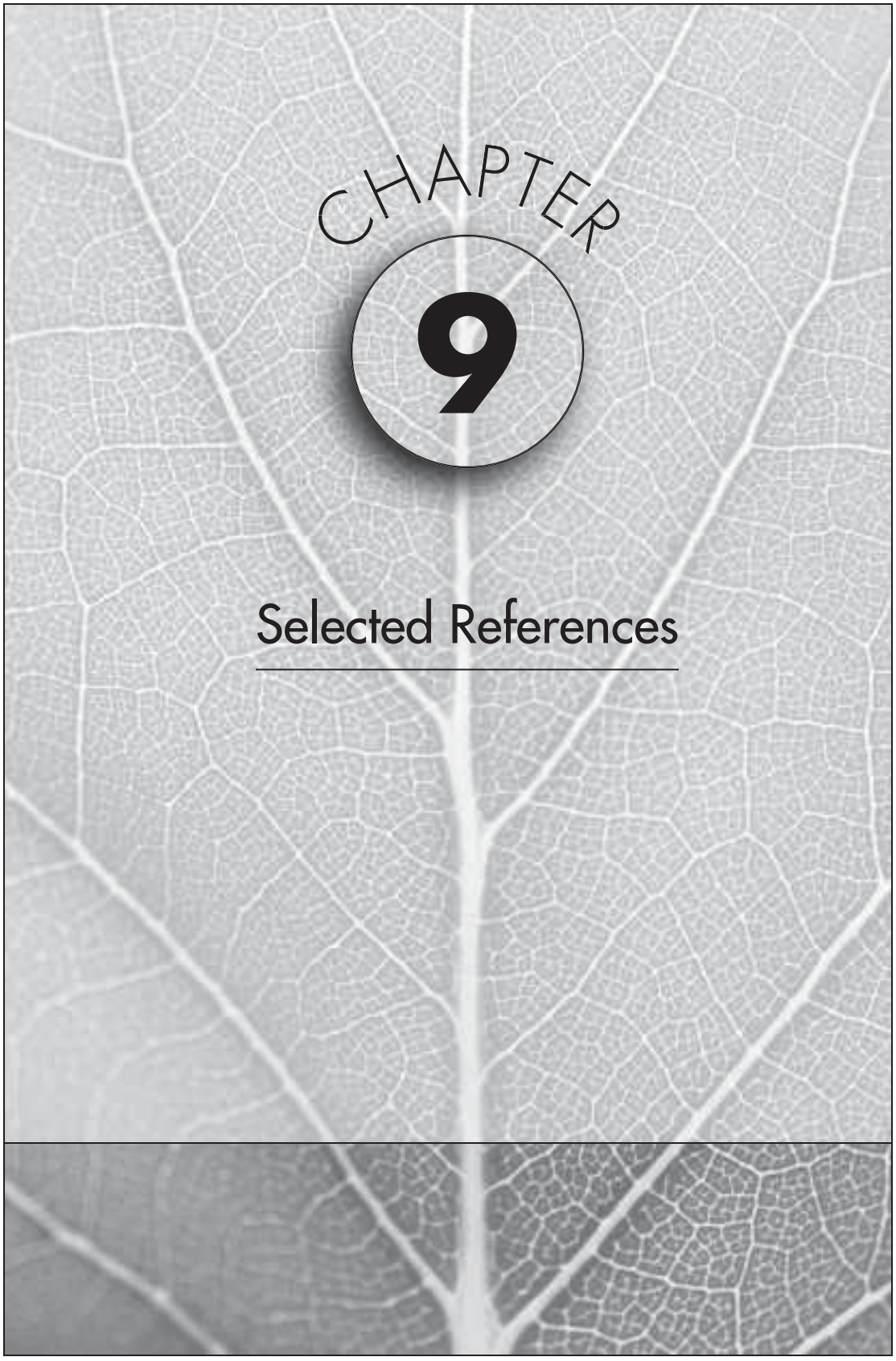
Glossary

CHAPTER 8 – GLOSSARY

ANSI	American National Standards Institute
Biological control (Biocontrol)	Pest control strategy making use of living natural enemies, antagonists, or competitors and other self-replicating biotic entities (IPPC, 2004).
Biological control agent	A natural enemy, antagonist or competitor, and other self-replicating biotic entity used for pest control (IPPC, 2004).
Biological safety cabinet (BSC)	A primary containment device that provides protection for personnel, the environment, and, in some cases, products from airborne or aerosolized microorganisms. BSCs consist of a leak-tight box, HEPA filter(s) and a motor/blower system to provide controlled air movement through the box and filters.
Containment	Restricting plant pests to their intended locations through the use of operational procedures, physical barriers and facility design.
Containment facility	A structure whose purpose is to prevent escape of material held within it, into the environment (NAPPO 2005).
Containment perimeter	The continuous floor, ceiling and wall surfaces that form a barrier against the ingress or egress of plant pests, including all windows, doors and service penetrations into the area.
Containment zone	A contiguous physical area within a physical structure that meets specified containment requirements.
Decontaminate	To render a plant pest non-viable.
Facility	Laboratories, greenhouses, screenhouses, growth chambers and other supporting structures and buildings.

Greenhouse	A structure with a floor and transparent walls and roof designed and used principally for growing plants in a controlled and protected environment.
Growth chamber	A mechanical device designed to provide a suitable environment for growing plants under controlled light and temperature conditions.
Growth room	A structure with walls, a roof and a floor designed and used principally for growing plants or other organisms in a controlled and protected environment (VLAREM II 2005).
Headerhouse	A building connected to one or more greenhouses that may include laboratories, offices, storage and greenhouse support areas.
HEPA filter	High Efficiency Particulate Air filters with a minimum efficiency of 99.97% at 0.3 µm.
Inward directional airflow	Airflow created by a ventilation system such that air will always flow to areas of higher risk of contamination (e.g. 12.5 – 25 Pa differential).
Kneewall	A partial-height solid wall in a greenhouse that is placed to minimize the possibility of glass breakage.
NAPPO	North American Plant Protection Organization
Pass-box	A sealed box with two doors constructed through and sealed to the containment perimeter. The box is equipped with interlocking doors (preferred), or audible or visual alarms to prevent the simultaneous opening of both doors.

Plant pest	Any thing that is injurious or potentially injurious, whether directly or indirectly, to plants or to products or by-products of plants, and includes any plant prescribed as a pest [PPA 1990]. This includes any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products (IPPC 2004) including, but not limited to, arthropods, molluscs, bacteria, nematodes, fungi, phytoplasmas, viruses and viroids.
Primary containment	The protection of hosts within the containment zone from exposure to plant pests. Primary containment is achieved through the use of good microbiological techniques that prevent the release of pests into the zone and through the use of appropriate primary containment devices such as BSCs and insect cages.
Program change	A change in a PPC-3 facility that relates to the nature of work or the procedures employed and that would increase the risk of pest escape from the facility.
Screenhouse	A structure with a roof, floor and screened walls, designed and used principally for growing plants in a protected environment.
Secondary containment	The protection of hosts outside the containment zone from exposure to plant pests. Secondary containment is provided by the resistance of the containment zone to the active or passive movement of pests combined with good operational practices.
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
Standard operating procedures (SOPs)	Documents that describe the procedures used for a specific task.
Validated	Demonstrated to be suitable for a specific purpose.



CHAPTER

9

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CHAPTER 9 – SELECTED REFERENCES

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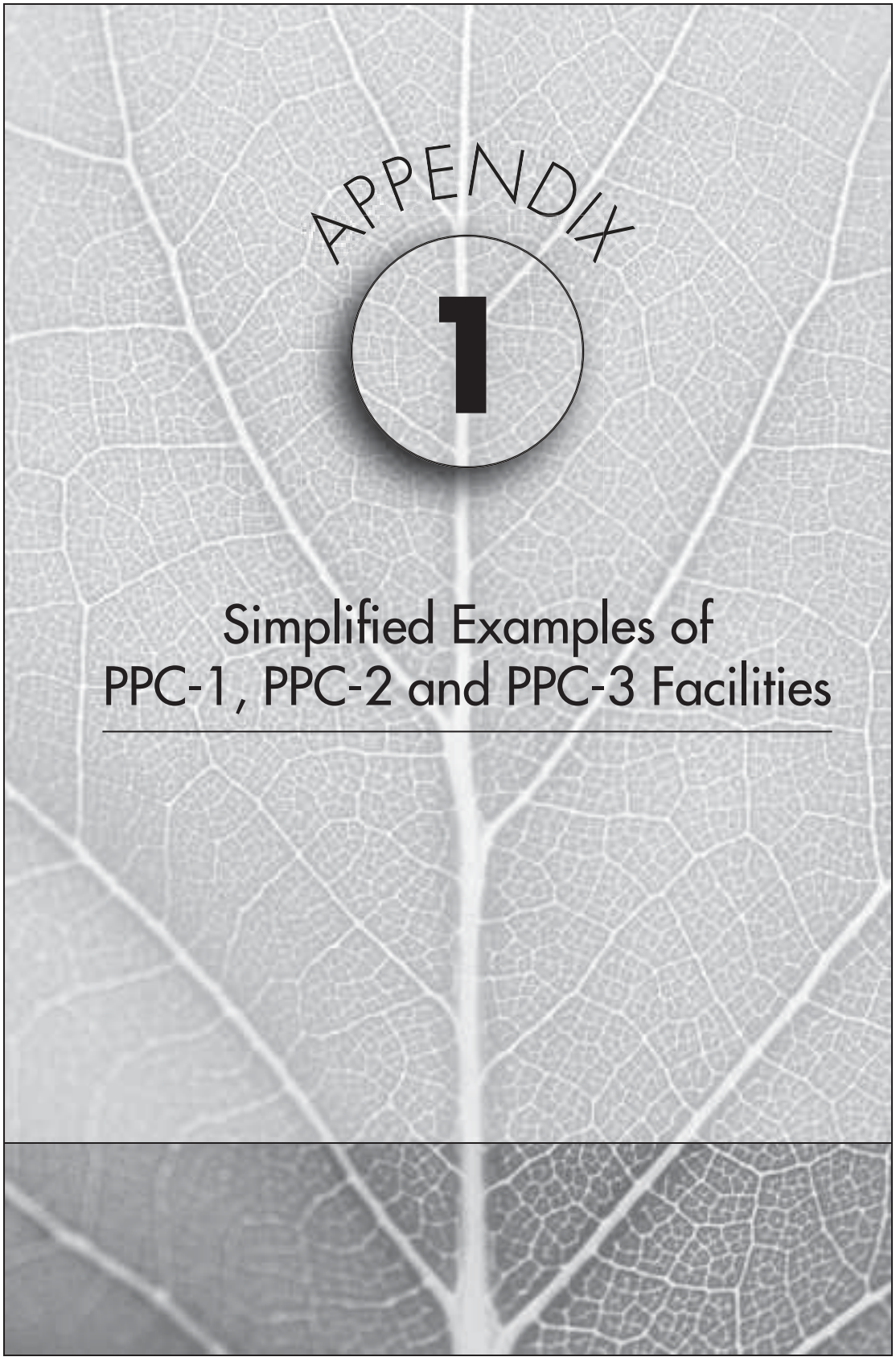
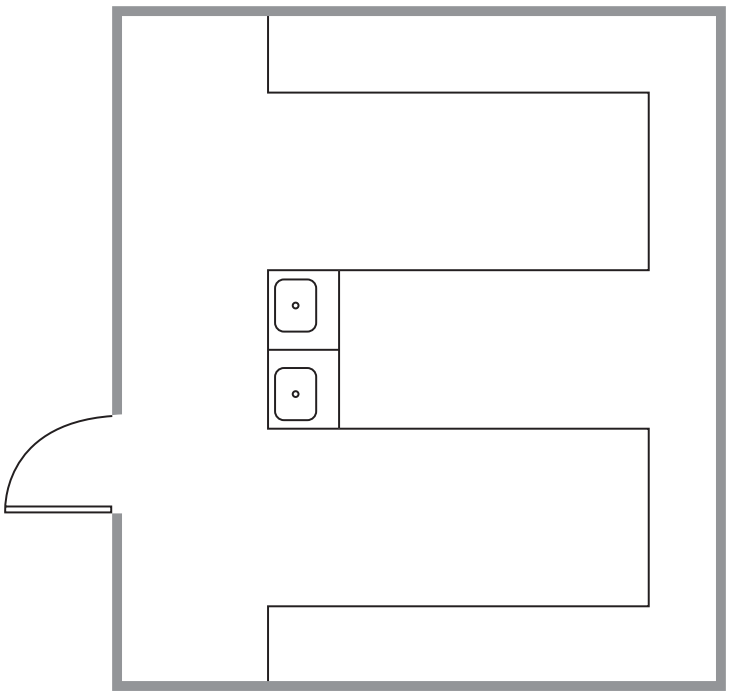


Simplified Examples of PPC-1, PPC-2 and PPC-3 Facilities

APPENDIX 1 – SIMPLIFIED EXAMPLES OF PPC-1, PPC-2 AND PPC-3 FACILITIES

PPC-1



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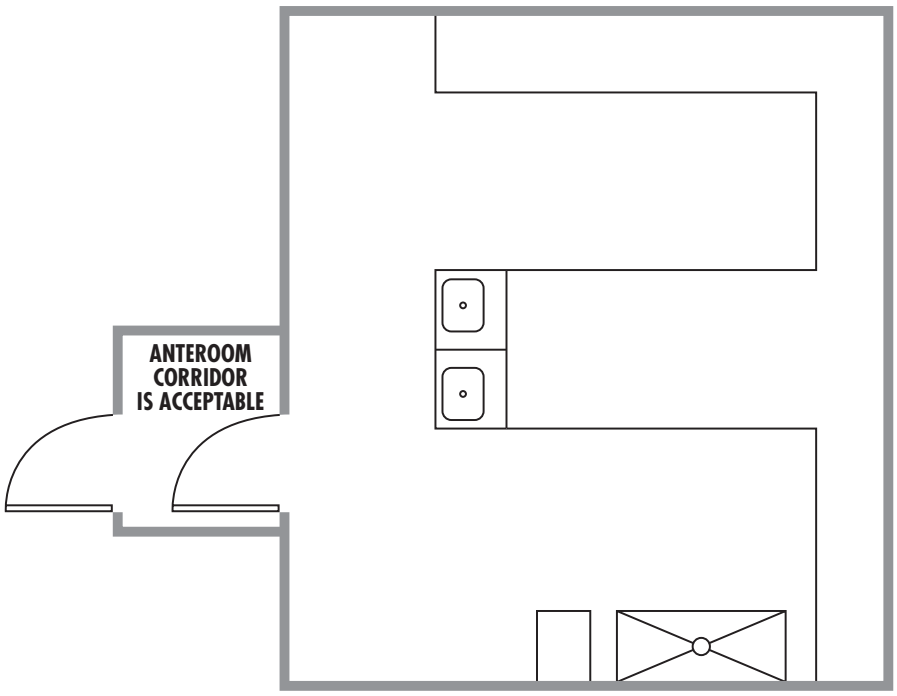
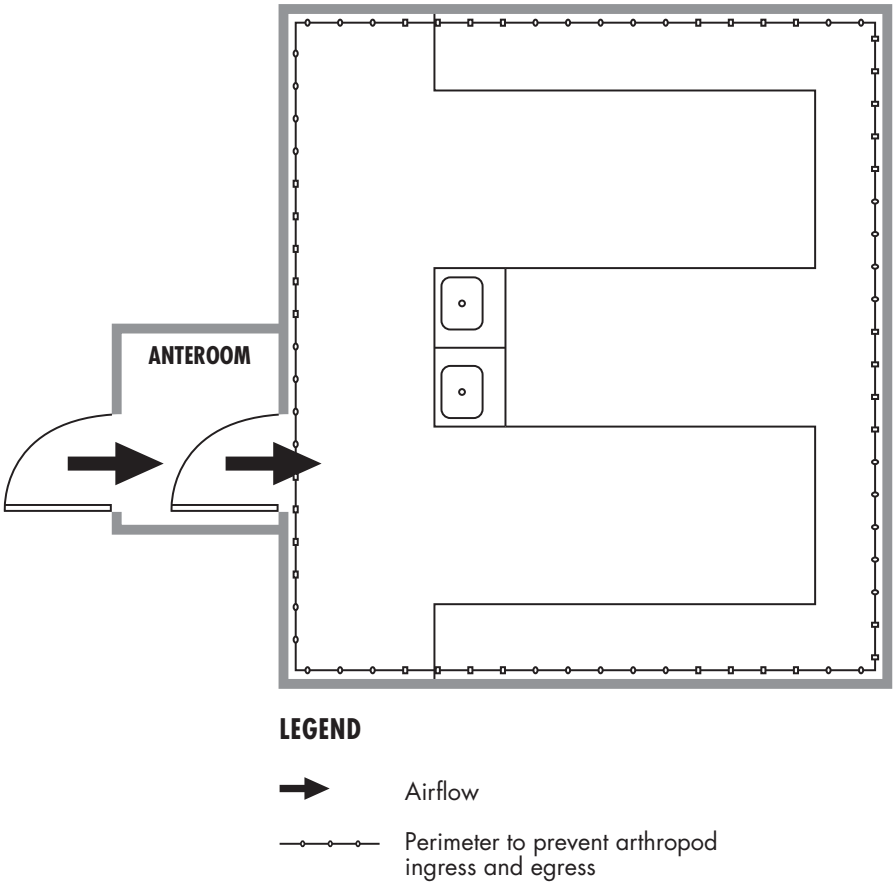


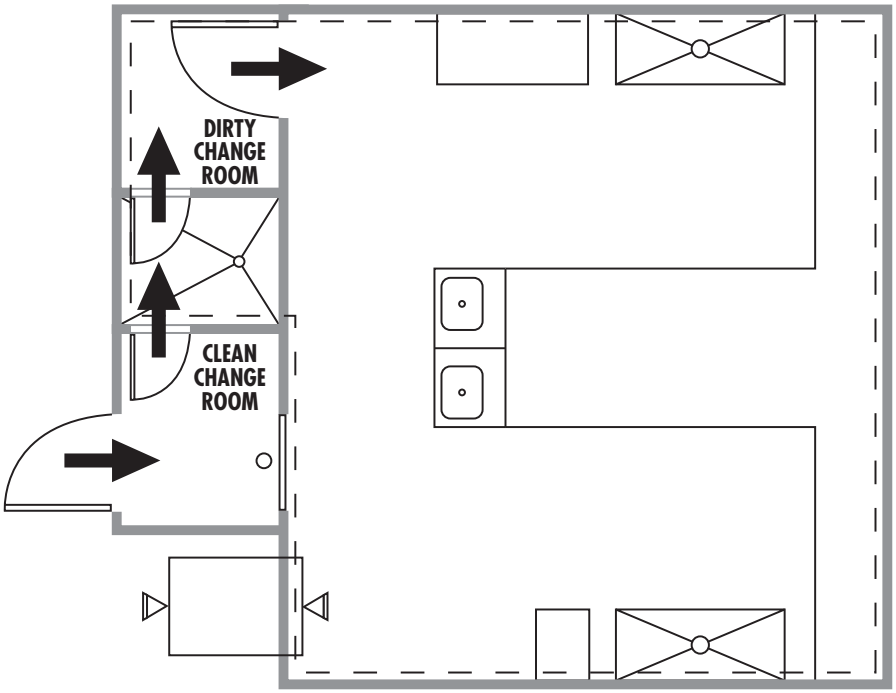
LEGEND

Biological Safety Cabinet

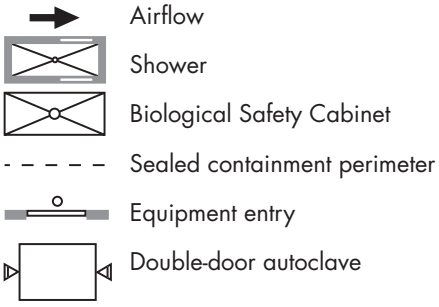
PPC-2 Arthropod

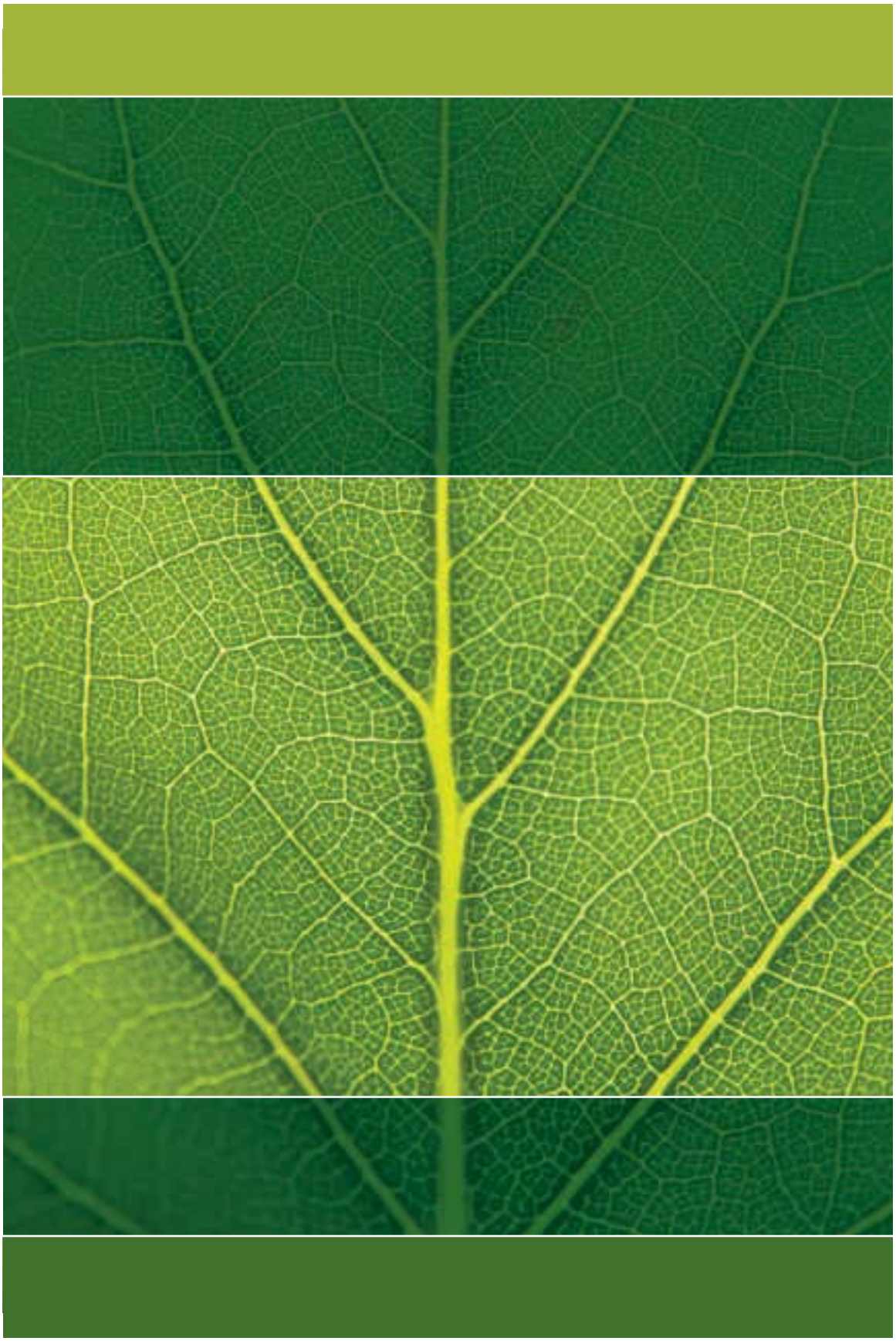


PPC-3


DIRTY
CHANGE
ROOM
CLEAN
CHANGE
ROOM

LEGEND


Airflow
Shower
Biological Safety Cabinet
Sealed containment perimeter
Equipment entry
Double-door autoclave



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