Handling, Packing, and Labelling Soil and Soil-related Matter at TRU

1.0 Scope

This document is meant to provide guidance to allow for the safe handling, packaging, and labelling of soil and soil-related matter, as defined by the Canadian Food Inspection Agency (CFIA) and the Transportation of Dangerous Goods Regulations (TDGR), at Thompson Rivers University (TRU). The regulations apply when soil and soil-related matter are handled, received and/or shipped by TRU personnel within Canada or internationally.

The legislation governing transportation of dangerous goods for the above listed procedures is governed by the following acts, regulations, and technical documents:

Plant Protection Act and Regulations (Canada 1990)
Transportation of Dangerous Goods Act and Regulations (Canada, 1992)
ICAO Technical Instructions for the Safe Transport of Dangerous Goods by Air
IATA Dangerous Goods Regulations (International Air Transport Association, 1999)
The Canadian Environmental Protection Act (Canada, 1999)
CNSC Transport Packaging of Radioactive Materials Regulation (Canada, 2000)
British Columbia Environmental Management Act (2003)
British Columbia Waste Discharge Regulation (2004)
IAEA Regulations for the Safe Transport of Radioactive Material TS-R-1 (2005)
International Standards for Phytosanitary Measures (2005)
Containment Standards For Facilities Handling Plant Pests (2008)
British Columbia Hazardous Waste Regulation (2009)
Human Pathogens and Toxins Act (2015)
Human Pathogens and Toxins Regulations (2015)
Canadian Biosafety Standard, 2nd ed. (2015)
Canadian Biosafety Handbook, 2nd ed. (2016)

2.0 Compliance

Department heads and directors are responsible for ensuring designated personnel responsible for safely handling dangerous goods as outlined in this document, comply with TDGR and are adequately trained.

3.0 Training

Biosafety and TDG training and demonstrated competency are mandatory for any individual handling, shipping, or receiving soil at TRU. Following training program completion, both Biosafety and TGD certificates are valid for 3 years. After expiry, retraining is required. Untrained individuals

may handle dangerous goods in the absence of certification, however, this is only permissible in the presence of a trained and certified individual.

Please contact the OSEM about Biosafety and TDG training at TRU.

4.0 Shipping and Receiving

At TRU, soil and soil-related matter may be handled, shipped, and/or received by adequately trained personnel or individuals under the supervision of trained individuals.

Prior to importation, as per Canada's Plant Protection Act and Directive 97-04, issuance of a Permit to Import is required prior to importing any soil or soil-related matter. The form for import can be found at www.inspection.gc.ca and must contain the following information:

- The name, complete address, telephone and, if possible, the facsimile number and e-mail address of the owner of the thing to be imported. In the case of an institution (e.g. University, College, Government department or agency, company), the application must state the legal name of the institution as that of the importer;
- The legal name, complete address, telephone, facsimile number and e-mail address of the exporter;
- A description, the common name and scientific name (genus and species), and type (i.e. seeds, rooted cuttings, bare root plants, etc.) of the thing being imported. Catalogues will not be accepted;
- The quantity being imported;
- The purpose (e.g. consumption, propagation, research, processing) of importation;
- The country and place of propagation or production of the thing, and the country from which it will be shipped to Canada;
- Any other requested information, such as precautions that will be taken to prevent the spread of a pest; and
- The printed name and signature of the applicant and the date of application.

The application can be faxed, mailed, or emailed to the following address:

Plant Health Import Permit Office
Canadian Food Inspection Agency
59 Camelot Drive
Ottawa, Ontario K1A 0Y9

Facsimile: 613-773-7229
E-mail: permitoffice@inspection.gc.ca

If approved, the soil or soil-related matter may be imported.

4.1 Damaged Packages

Damaged or non-compliant packages are to be accepted by TRU receivers.

However, after accepting the package, the receiver(s) should note any damage or non-compliance on the accompanying shipping document and report the same to the shipper for reimbursement if applicable.

If the package is damaged to such an extent that the contents are compromised, the package and its contents will be disposed of as hazardous waste as per TRU's waste disposal policies.

If the damage results in a large spill, contact the TRU OSEM.

4.2 Material Classification

Trained TRU personnel are responsible for proper material classification under Canada's TDGR. If unsure of the designation, related shipping documentation, Safety Data Sheets (SDS), contacting CFIA and OSEM consultation may aid in classifying the material in question. If infectious or toxic substance contamination is known or suspected, a guide to classifying infectious substances and toxin classifications can be found in this document in Appendix A. Those agents must be declared accordingly on internal and external packing.

Furthermore, if additional dangerous good contamination is known or suspected agents, those agents must be declared and the soil or soil-related material(s) should be classified accordingly.

Individuals shipping dangerous goods must keep a "proof of classification" for all dangerous goods offered for transport or imported into Canada for a 5-year period after shipping.

Proof of classification must include the date of classification, the technical name of the dangerous goods, and the classification of dangerous goods.

Proof of classification can include the following:
- A test report
- A lab report
- An SDS with a matching Chemical Abstracts Service (CAS) number or PSDS from the Public Health Agency of Canada (PHAC)

TDGR divide dangerous goods into 9 classes, based on the type of hazard they present. These divisions are outlined in Table 1 below:

Table 1: Classification of Dangerous Goods

Class	Division	Characteristics
1 Explosives (Sections 2.9 – 2.12)	1.1	A substance or article with a mass explosion hazard.
	1.2	A substance with a projection hazard but not a mass explosion hazard.
	1.3	A substance or article which has a fire hazard and either a minor blast hazard or a minor projection hazard, or both, but does not

		have a mass explosion hazard.
	1.4	A substance or article which presents no significant hazard beyond the package in the event of ignition or initiation during transport.
	1.5	A very insensitive substance with a mass explosion hazard.
	1.6	Extremely insensitive article with no mass explosion hazard.
2 Gases (Sections 2.13 – 2.17)	2.1	A flammable gas which is easily ignited and burns.
	2.2	A non-flammable, non-toxic, non-corrosive gas.
	2.3	A toxic gas.
3 Flammable Liquids (Sections 2.18 – 2.22)	None	A flammable liquid with a closed-cup flash point less than or equal to 60.0°C.
4 Flammable Solids (Sections 2.20 – 2.22)	4.1	A flammable solid which is readily combustible and may cause fire through friction or from heat retained from manufacturing.
	4.2	A spontaneously combustible substance that ignites when exposed to air.
	4.3	A water-reactive substance which emits flammable gas when it comes into contact with water.
5 Oxidizing Substances, Organic Peroxides (Sections 2.37 – 2.39)	5.1	An oxidizing substance which may yield oxygen and contribute to the combustion of other material.
	5.2	An organic peroxide which releases oxygen readily and may be liable to explosive decomposition, or sensitive to heat, shock, or friction.
6 Toxic and Infectious Substances (Sections 2.26 – 2.36)	6.1	A toxic substance that is liable to cause harm to human health.
	6.2	An infectious substance.
7 Radioactive Materials (Sections 2.37 – 2.39)	None	Radioactive materials as defined in the Packaging and Transport of Nuclear Substance Regulations.
8 Corrosive Substances (Sections 2.40 – 2.42)	None	Solids or liquids such as acids or alkali materials that cause destruction of the skin or corrode metals.
9 Miscellaneous Products, Substances, or Organisms	None	A regulated substance that cannot be assigned to any other class. It includes genetically modified organisms (GMOs), marine pollutants, and substances transported at elevated temperatures.

Some dangerous goods from each group are also assigned packing classes. These classes are determined by physical and chemical testing described in Part 2 of the TDGR. Table 2 below briefly outlines the packing classes used by Transport Canada to classify materials.

Table 2: Packing Groups

Packing Group	Level of Hazard
I	Very hazardous substance
II	Hazardous substance
III	Moderately hazardous substance

4.3 Packaging Regulations

As per TDGR, shipping of some dangerous goods above certain specified quantities, is prohibited in the absence of a developed Emergency Response Assistance Plan (ERAP). Consultation with the TDG Handbook will help determine if shipments fall under or are in excess of the value published in column 7 of schedule 1 within that handbook. If an ERAP is required, consultation with TRU's OSEM is required.

Means of transport determines the packaging that is required for shipment to be in compliance with TDGR. Packages shipped exclusively via terrestrial means must meet the packaging instructions as stated in the TDG Clear Language Regulation and Transport Canada's Standard: "Small containers for Transport of Dangerous Goods, Classes 3, 4, 5, 6.1, 8, and 9."

If transporting by air, the packaging must meet International Air Transport Association (IATA) requirements which can be purchased from IATA. OSEM can also be contacted to obtain the correct information.

If transporting via marine means, if solely domestic, the TDGR are adequate guidance for shipping and receiving dangerous goods. On the other hand, if the package it to be shipped internationally, the International Maritime Dangerous Goods (IMDG) code must also followed.

Importantly, the OSEM at TRU can always be contacted to aid in obtaining the required information, depending on the shipping circumstances and concerns.

4.4 Shipping Steps

Step 1: Determine the proper shipping name

The shipper must determine the proper shipping name of the materials according to TDGR, Schedule 1, Column 2. An example is provided in Figure 4.0 below:

Col.1 UN Number	Col.2 Shipping Name and Description	Col.3 Class	Col.4 Packing Group / Category	Col.5 Special Provisions	Col.6a Explosive Limit and Limited Quantity Index	Col.6b Excepted Quantities	Col.7 ERAP Index	Col.8 Passenger Carrying Ship Index	Col.9 Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index
UN2814	INFECTIOUS SUBSTANCE, AFFECTING HUMANS	6.2	Category A	16 38 84	0	E0	See SP84		0.05 kg or 0.05 L

Figure 4.0: Schedule 1 Infectious Substance, Affecting Humans Output

Step 2: Determine the class

Refer to TDGR Column 3 to identify the material classification and any subsidiary classification(s) of the material. An example is provided in Figure 4.1 below:

Col.1 UN Number	Col.2 Shipping Name and Description	Col.3 Class	Col.4 Packing Group / Category	Col.5 Special Provisions	Col.6a Explosive Limit and Limited Quantity Index	Col.6b Excepted Quantities	Col.7 ERAP Index	Col.8 Passenger Carrying Ship Index	Col.9 Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index
UN2814	INFECTIOUS SUBSTANCE, AFFECTING HUMANS	6.2	Category A	16 38 84	0	E0	See SP84		0.05 kg or 0.05 L

Figure 4.1: Schedule 1 Infectious Substance, Affecting Humans Output

Step 3: Select the UN Number

Refer to Column 1 in Schedule 1 in the TDGR for the required UN number. An example is provided in Figure 4.2 below:

Col.1 UN Number	Col.2 Shipping Name and Description	Col.3 Class	Col.4 Packing Group / Category	Col.5 Special Provisions	Col.6a Explosive Limit and Limited Quantity Index	Col.6b Excepted Quantities	Col.7 ERAP Index	Col.8 Passenger Carrying Ship Index	Col.9 Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index
UN2814	INFECTIOUS SUBSTANCE, AFFECTING HUMANS	6.2	Category A	16 38 84	0	E0	See SP84		0.05 kg or 0.05 L

Figure 4.2: Schedule 1 Infectious Substance, Affecting Humans Output

Step 4: Determine the mode(s) of transport to the final destination

The shipper must ensure that the shipment complies with various modal requirements which one can ship in the proposed manner and can affect packaging, quantity per package, markings, and shipping documentation.

Step 5: Determine and select proper packaging

Packaging requirements will vary depending on the utilized mode of transportation and both the type and nature of the material to be transported.

Some exemptions may apply (See Part 1 and Schedule 2 of the TDG Regulations). As may some incompatibilities.

Select a container safety standard from sections 5.10, 5.11, 5.12, or 5.14 the TDGR in conjunction with the National Standard of Canada. If your material is infectious (Division 6.2, consult section 5.16 and sections describing Type 1A, IB, and IC containers in the TDGR.

Step 6: Labelling the package

Once the correct packaging has been identified and selected, the shipper must first ensure that only relevant markings are present on the outside of the package. If markings exist that are unnecessary for shipment, these should be removed or obliterated. Once this is done, the following information must be clearly present and easy to read on the outside of the package:

Proper shipping name in upper case letters, Hazard class label(s), UN identification number, packing group, orientation label for liquids, the CORRECT standardized UN certification mark, and any additional required information, depending on the material.

None of the above information is to be obscured or placed in the incorrect orientation. They also must be able to withstand open weather exposure without a substantial reduction in effectiveness and be displayed on a background of contrasting colour. An example of a properly packaged and labelled dangerous good can be found in Figure 4.3 below.

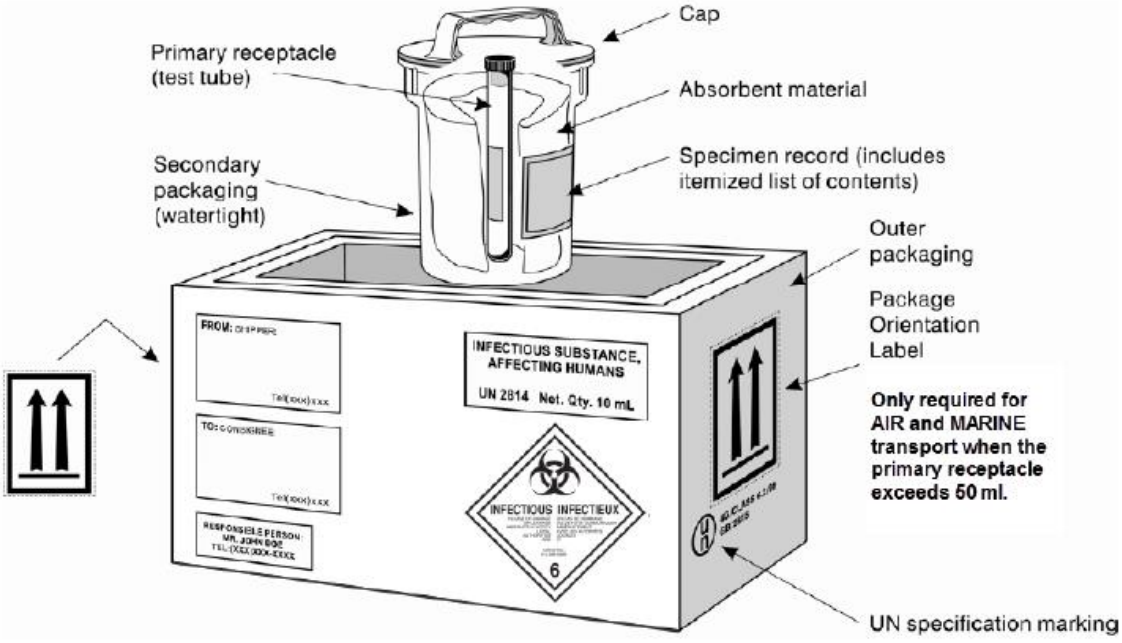


Figure 4.3: A properly packaged and labelled Small Means of Containment for a Category A Infectious Substance, affecting humans, UN2814 (Figure provided by IATA, Montreal, Canada).

Step 7: Documentation

Proper shipping documentation can only be signed by a trained employee, or an untrained employee working in the presence and under the supervision of a certificate holding individual. Depending on the nature of the goods being shipped, three documents may be necessary:

1. The Straight Bill of Lading Form which is required by Transport Canada for ground shipments.
2. The Shippers Declaration of Dangerous Goods Form which is required by IATA for air transport.
3. The Waste Manifest for shipments of hazardous waste which is required by both Transport Canada and the Province of British Columbia.

With respect to hazardous waste disposal at TRU, complete assistance to ensure compliance can be found here: https://acm.tru.ca/Page2802.aspx?PageMode=Hybrid.

5.0 Exemptions

5.1 Dry Ice

If used in a small means of containment as a refrigerant, TDGR do not apply to dry ice (UN1845). However, the words, “Dry ice as refrigerant” or “Neige carbonique comme réfrigérant,” must be included on the outside of the package. Also, the small means of containment must allow for the release of sublimating carbon dioxide, to prevent pressure build up.

5.2 Test Samples

This exemption applies to TDG ground transportation only and not to radioactive, infectious, and explosive materials. To qualify for this status, the gross package mass must be less than 10kg and must be goods used to classify, analyze, test, or demonstrate. The name of the consignor and the words “test samples” must also be on an accompanying shipping document. Additionally, the package itself must be designed, constructed, filled, closed, secured, and maintained to avoid any accidental release. Finally, the packaged must be externally marked with the words, “test samples”.

5.3 Limited Quantities

Except for radioactive, infectious, and explosive materials, some dangerous goods are partially exempt from TDG regulations. To qualify, the package must weigh less than or equal to 30kg and the package itself must be designed, constructed, filled, closed, secured, and maintained to avoid any accidental release. The respective masses or volumes to for materials to qualify for exempt status can be found in column 6 of Schedule 1 of the TDG regulations. If air travel is a component of shipping, section 2.6.4 of IATA Regulations must be consulted.

5.4 Dangerous Goods in an Instrument or in Equipment (ground and domestic marine shipping only)

TDG documentation, safety marks, and means of containment do not apply to the handling or offering for transport dangerous goods that are contained in and are not intended to be discharged from an instrument or equipment that is not dangerous goods itself and that is designed to perform a function other than solely to contain the dangerous goods. However, the good must have a number in column 6a of Schedule 1 in the TDGR and the amount of material must not exceed that quantity.

5.4 Dangerous Goods in Excepted Quantities by air (IATA compliant)

If shipping by air, guides regarding exempted quantities of certain goods can be found in section 2.6 in IATA's Shipping Regulations. However, the package itself must be marked with an Excepted Quantities Label in Figure 5.1 below. Extra care should be taken when assuming exception to IATA Regulations.

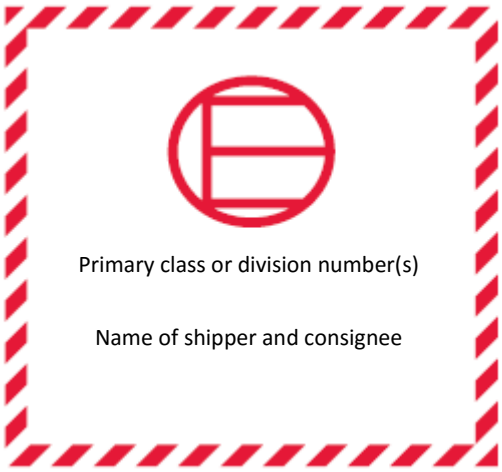


Figure 5.1: An IATA Excepted Quantity Package Mark

6.0 Packing and Labelling Requirements for Soil Known or Suspected to be Contaminated by Class 6 Dangerous Goods:

6.1 Packing and Labelling of Class 6 Dangerous Goods for Transport

- Packaging of toxins and infectious materials for transportation should be performed by or supervised by certified containment zone personnel in a containment zone of appropriate containment level;
- Final packaging (i.e. placement inside secondary shipping container, labelling) of sealed shipping containers of toxins or infectious materials may be acceptably performed outside of the containment zone – this is ONLY if the primary container is sealed and thoroughly surface decontaminated;
- In addition to receiving appropriate TDG training, personnel responsible for shipments involving security sensitive biological agents (SSBAs) require a valid Human Pathogens and Toxins Act Security Clearance issued by the PHAC;
- Packaging standards vary dependent on the biological material in specific categories with specific packaging requirements as outlined in section 5.6 in IATA Regulations and in Section 5.16 in Class 6.2, Infectious Substances;
- Guides to help identify Category A, B, and biological/clinical waste can be found Appendix 3 in Part 2 of TDG in SOR/2008-34;
- A list of Schedule 1 toxins in Canada can likewise be found in the Human Pathogens and Toxins Act (Subsections 3[1], 9[1] and [3] and [10]), however this is by no means an exhaustive list of toxins;

- Due to the large variety and different packing classes of toxic dangerous goods (class 6.1), packing instructions for these materials are not summarized in this document and can instead be found in section 5.6 in IATA Regulations;
- The three means of external containment (from most secure to least) for Class 6.2 Dangerous Goods (Infectious materials) set out by Transport Canada are Types 1A, 1B, and 1C, each with specific criteria to be met;
- In some cases, Type 1B and Type 1C packaging strategies may be appropriate, however Type 1A packaging can be used to package any infectious biological material for transport.

6.2 The following is a guide to Category A/Type 1A packaging:

- An inner packaging comprised of a primary receptacle and secondary packaging as well as an outer packaging;
- Either the secondary or the outer packaging shall be rigid;
- At least one outer packaging surface shall have a minimum dimension of 100 mm x 100 mm;
- For liquid infectious substances, both the primary receptacle and the secondary packaging will be leakproof;
- For solid infectious substances, both the primary receptacle and the secondary packaging will be siftproof;
- If multiple primary fragile primary receptacles are placed in the secondary packaging, each must be individually wrapped or otherwise separated to prevent contact between them;
- If the package is consigned to ambient or higher temperatures, primary packaging must be made of glass, metal, or plastics with a positive means of ensuring a leak-proof seal (e.g. a heat seal, a skirted stopper, or a metal crimp seal). Alternately, if screw caps are used, they shall be secured positive means themselves via tape, paraffin tape, or manufactured locking closure;
- Substances consigned in liquid nitrogen primary packaging must consist of plastic receptacles capable of withstanding very low temperature. The secondary packaging shall also be capable of withstanding very low temperatures, and in most cases will need to be fitted over the primary receptacle individually. Provisions for the consignment of liquid nitrogen shall also be fulfilled;
- Lyophilized substances may also be carried in primary receptacles that are flame-sealed glass ampoules or rubber-stoppered glass vials fitted with metal seals;
- Under normal conditions of transport, the primary packaging should be unable to break, be punctured, or leak their contents into the secondary packaging;
- The primary packaging must also withstand without leakage, an internal pressure differential of 95kPa in a range of -40°C to +55°C;
- Place the secondary container inside an outer package for protection from physical damage and water while in transit;
- If substances are to be shipped frozen or refrigerated, dry ice is to be placed outside of the secondary package which itself must have additional support to ensure no movement of the secondary package after the dry ice has dissipated;
- If the shipment is sent on dry ice by air, notification to that effect must appear on the outer package and accompanying documents. Containers shipped with dry ice must be designed to release carbon dioxide gas that could otherwise build up and cause the package to rupture;
- TDGR Type 1A packing instructions are identical to that of UN P620 instructions.

6.3 Specific Type Category A/1A Packing Instructions and Labelling:

- External marking shall be durable, legible, and placed in a location and of such a size as to be readily visible;
- For packagings with a gross mass of more than 30 kg, the marking (or a duplicate thereof) shall appear on the top or side of the packaging. For drums and Jerrycans with a removable head, the markings shall appear on the side;
- For packagings with a gross mass of 30 kg or less, the marking (or a duplicate thereof) shall appear on the top, side or bottom. For drums and Jerrycans with a removable head, the markings shall appear on the side or bottom;
- Letters, numerals and symbols comprising the markings shall be at least 12 mm high, except that the markings on packagings of 30 L maximum capacity or 30 kg gross mass or less shall be at least 6 mm high and the markings on packagings of 5 L maximum capacity or 5 kg gross mass or less shall be at least 3 mm high;
- The following outer packing markings are required and shall be displayed in the following sequence with each of the elements clearly separated from one another:
    a) the UN packaging symbol;
    b) the packaging code listed in UNECE Table 6.1.2.7 and, when applicable, the letter "U" or "W" assigned to the packaging code in accordance with NSA 5.1.4;
    c) the text: "CLASS 6.2";
    d) the last two digits of the year of manufacture of the package;
    e) the three-letter country code "CAN";
    f) the name or symbol of the manufacturer; and
    g) the Design Registration Number.

Example of UN marking:

Solid plastic box:

4H2/CLASS6.2/15 CAN/ABC 8-9999 as in 5.1.2 a), b), c), d) and e) as in 5.1.2 f) and g)

For a packaging with solid plastic box outer packaging, for infectious substances of Category A and manufactured in 2015. The design was registered in Canada, by the manufacturer identified as ABC under the registration number 8-9999.

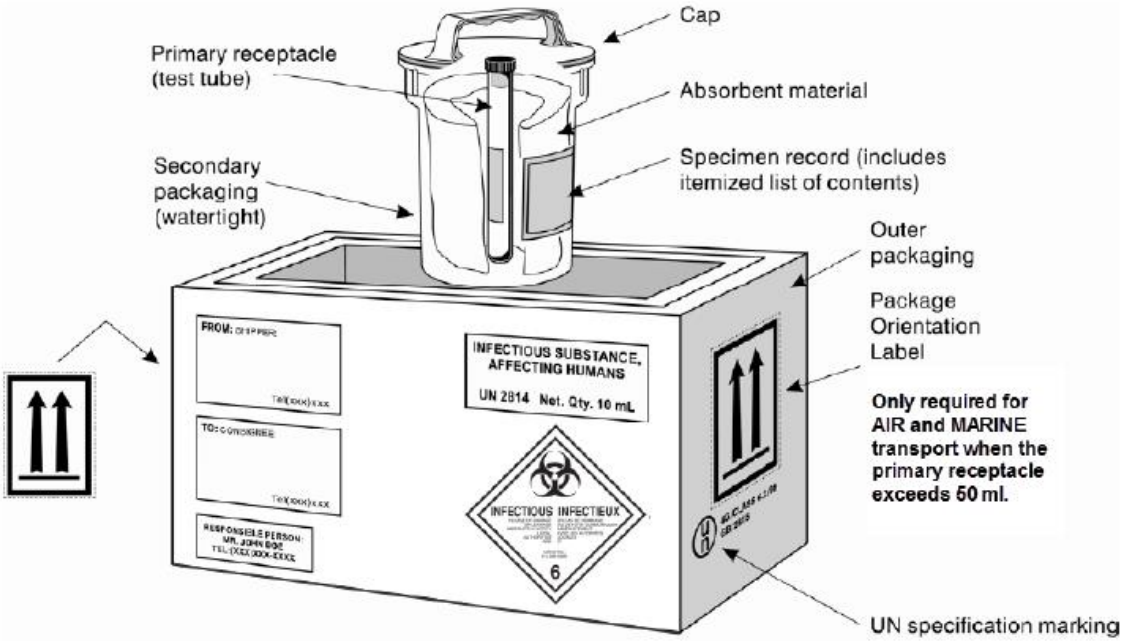
6.4 Additional labelling for Category A/Type 1A Packing:

- Sender's name and address;
- Recipient's name and address;
- Infectious substance label:
- Black: Symbol, number, text and line 5 mm inside the edge
- White: Background
- The symbol is three crescents superimposed on a circle
- The text is:
  INFECTIOUS IN CASE OF DAMAGE OR LEAKAGE IMMEDIATELY NOTIFY LOCAL AUTHORITIES AND
  INFECTIEUX EN CAS DE DOMMAGE OU DE FUITE COMMUNIQUER IMMÉDIATEMENT AVEC LES AUTORITÉS LOCALES ET

CANUTEC
1-888-CAN-UTEC (226-8832)
or
613-996-6666 (collect calls accepted)
or
*666 by cellular phone (in Canada Only) ;

- Proper shipping name, UN number (2814 if humans, 2900 if animals – if not one of these, the substance is Category B and the UN number is 3373 or 3291 for clinical waste), and net quantity of infectious substance;
- Name and telephone number of person responsible for shipment;
- Cargo Aircraft Only label when shipping over 50 ml or 50 g;
- Class 9 label, including UN 1845, and net weight if packaged with dry ice (IATA only);

Example Packing Category A/Type 1A Packing and Labelling (Figure provided by IATA, Montreal, Canada):



6.5 The following is a guide to Category B/Type 1B packaging:

- An inner packaging comprised of a primary receptacle and secondary packaging as well as an outer packaging;
- Either the secondary or the outer packaging shall be rigid;
- For liquid infectious substances, both the primary receptacle and the secondary packaging will be leakproof;
- For solid infectious substances, both the primary receptacle and the secondary packaging will be siftproof;
- If multiple primary fragile primary receptacles are placed in the secondary packaging, each must be individually wrapped or otherwise separated to prevent contact between them;
- Substances consigned in liquid nitrogen primary packaging must consist of plastic receptacles capable of withstanding very low temperature. The secondary packaging shall also be capable of withstanding very low temperatures, and in most cases will need to be fitted over the

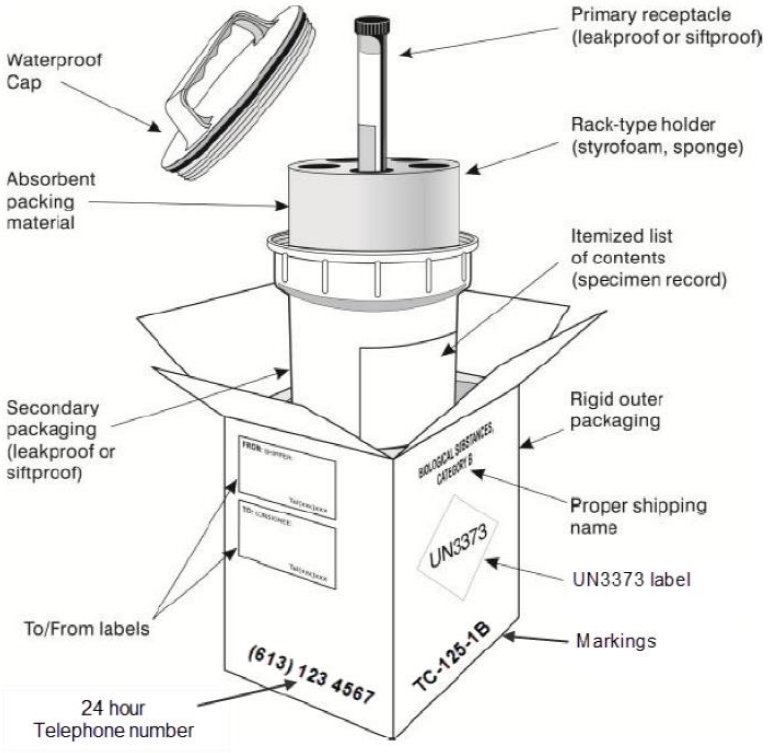
primary receptacle individually. Provisions for the consignment of liquid nitrogen shall also be fulfilled;

- Under normal conditions of transport, the primary packaging should be unable to break, be punctured, or leak their contents into the secondary packaging;
- The primary packaging must also withstand without leakage, an internal pressure differential of 95kPa in a range of -40°C to +55°C;
- Place the secondary container inside an outer package for protection from physical damage and water while in transit;
- If substances are to be shipped frozen or refrigerated, dry ice is to be placed outside of the
- secondary package which itself must have additional support to ensure no movement of the secondary package after the dry ice has dissipated;
- If the shipment is sent on dry ice, notification to that effect must appear on the outer package and accompanying documents. Containers shipped with dry ice must be designed to release carbon dioxide gas that could otherwise build up and cause the package to rupture;
- Please note: TDGR Type 1B Packing is NOT equivalent to UN P650 packing;
- See Section 6.7 for the differences – if shipping by air P650 is necessary.

6.6 Required labelling for Category B/Type 1B Packaging:

- Sender's name and address, recipient's name and address;
- A label with the words "Biological Substance, Category B";
- UN 3373 label;
- Class 9 label, including UN 1845, and net weight if packaged with dry ice (IATA only);
- External marking shall be durable, legible, and placed in a location and of such a size as to be readily visible;
- The marking shall be displayed on the external surface of the outer packaging on a background of a contrasting colour;
- The marking shall be in the form of a square set at an angle of 45° (diamond-shaped) with each side having a length of at least 50 mm; the width of the line shall be at least 2 mm and the letters and numbers shall be at least 6 mm high;
- An external marking: TC-125-1B + name and address or symbol of packaging manufacturer.

Example Category B/Type 1B Packing and Labelling (Figure provided by IATA, Montreal, Canada):



6.7 Type Category B/1B Packing differs from UN P650 Packing in the following ways:

Requirement	Type 1B CGSB-43.125 + 5.16.1 of the TDG Regulations	Packing Instruction 650
Triple packaging	Yes	Yes
Primary receptacle (inner) quantity limit	None	1 L (liquid) None for solids
Outer package quantity limit	None	4 L (liquid) 4 kg (solids)
Outer packaging specifications	Must be strong	Must be rigid; Must have minimum of size of 100 mm x 100 mm
Specification marking	TC-125-1B	None
Safety marks	Diamond mark with UN3373 inside, Proper shipping name	Diamond mark with UN3373 inside, Proper shipping name
Design Tests	Drop test (1.2m), pressure capable receptacle to 95kPa (5.16.1)	Drop test (1.2m), pressure capable receptacle to 95kPa
Competent Authority Registration *(i.e. TC Registration)*	None (Yes if a symbol is used to identify the manufacturer)	None
Refrigerated or Frozen Specimen	No requirements	Specific requirements

http://publications.gc.ca/collections/collection_2016/tc/T44-4-2-2015-3-eng.pdf

6.8 The following is a guide to Category C/Type 1C packaging:

Type 1C packaging is suitable for the transportation of most biomedical waste, however it must be decontaminated and declared as such by an informed authority.

6.9 A Category C/Type 1C container may consist of:

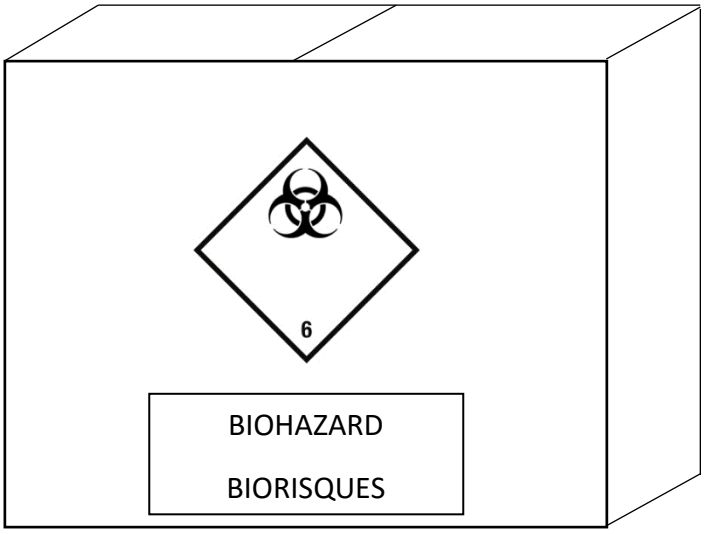
- UN11G intermediate bulk container tested to a Packing Group I or II performance level;
- UN1G fibre drum with a leak-tight liner tested to a Packing Group I or II performance level;
- A plastic film bag in a leak-tight, rigid, plastic outer packaging; or
- A plastic film bag in a fibreboard box;
- A sharps container;
- Plastic films/bags must pass the Elmendorf tear strength and the Dart impact strength tests as specified in the CAN/CGSB-43.125 standard.

***Consult the OSEM or the BSO before packaging any materials for shipping to ensure adherence to relevant Transport Canada Regulations.**

6.10 Required labelling for Category C/Type 1C Packaging:

- The biohazard symbol and the word "BIOHAZARD"

Example Category C/Type C Labelling:



Prior to shipping ANY infectious or biological materials, consultation with either the OSEM and/or the BSO is MANDATORY at TRU to ensure compliance with Transport Canada Rules and Regulations.

For extensive lists of Category A and B biological materials, please see Appendix 3 in Part 2 of the TDG Regulations. Those lists are by no means exhaustive or complete and are provided solely as a means of guidance. Expert opinions and/or professional judgements may be necessary to properly categorize certain infectious materials.

7.0 Safe Soil and Soil-Related Matter Handling at TRU:

Soil and soil-related matter handling and containment will depend on the presence of suspected plant pests, animal/human pathogens, or chemical contamination.

If chemical contamination is suspected, personnel and student will take appropriate protective precautions. This may include the use of select PPE and primary containment devices such as a fume hood.

If there is suspected human/animal pathogen contamination, Prior to initiation of work, the suspected pathogens must be identified and a local risk assessment will be carried out to determine the risk group, containment level, and necessary PPE required for safe work practices.

The Public Health Agency of Canada (PHAC) maintains a list of common animal and human pathogens whose risk groups are outlined. Additional characterizing information can also be found in the HPTA. However, if the necessary risk information is not found within these resources, independent research and a local risk assessment may be necessary to ensure safe work practices.

TRU containment level 1 and 2 (CL-1 and CL-2) work practices are outlined below. These containment and work practices must be applied to soil or soil-related matter suspected of such contamination. These practices are detailed in document SEM 20.10 – Microbiology Lab Safety; applicable insert is shown here however, SEM 20.10 will take precedence.

7.1 Containment Level 1 Laboratory Practices:

7.1.1 Laboratory doors should be kept closed and access to laboratory areas must be limited and controlled.

7.1.2 People must be advised of potential hazards before entering the work area.

7.1.3 Mouth pipetting is strictly prohibited.

7.1.4 Eating, drinking, smoking, vaping, applying cosmetics, handling contact lenses, chewing gum and/or storing food is not permitted in the laboratory areas.

7.1.5 Work surfaces should be decontaminated before and after work activities and after any spill.

7.1.6 Work areas should be clear of clutter.

7.1.7 Employees must wash their hands upon arrival at the laboratory, before and after putting on protective disposable gloves, after handling infectious materials, and before leaving the laboratory.

7.1.8 All spills, accidents and possible exposures to infectious materials must be reported immediately to the Laboratory Supervisor and the University Biosafety Officer.

7.1.9 The Lab Supervisor will ensure that training in laboratory safety for infectious materials is provided. This includes but is not limited to:

a) Technical training, exposure prevention precautions, and exposure evaluation procedures

b) Informational and technical updates and additional training when required.
c) Personal health precautionary materials, which can include relevant vaccine information, specialized risk precautions for pregnant or immunocompromised individuals
d) If a member of an increased risk group, encourage self-identification to campus Health Services for appropriate counseling and guidance.

7.1.10 All contaminated or infectious liquid or solid materials must be decontaminated before disposal or re-use.

7.1.11 Where infectious agents are used in a laboratory, a biohazard warning sign incorporating the universal biohazard symbol must be posted on the access door to the work area.

7.1.12 Decontaminate all cultures, stocks, and other potentially infectious materials before disposal using an effective method. If transporting waste prior to decontamination, ensure materials are placed in a durable, leak-proof container and packed in accordance with applicable institutional, local, provincial, and federal regulations.

7.1.13 Safe handling of sharps includes:

a) Disposable needles are not to be manipulated, bent, sheared, broken, removed from syringe base or recapped before disposal. Likewise, blades, broken glass or other sharps must also be treated with care and not handled or manipulated prior to disposal.
b) Used disposable needles and syringes must be carefully placed in a convenient, puncture resistant sharps container.
c) Non-disposable sharps are to be placed in a convenient hard walled container for transport to a decontaminating area.
d) Broken glass is not to be handled directly. Alternatively, all broken glass is to be collected with a broom and dustpan, tongs, or forceps. Substitute plastic for glass whenever possible.

7.1.14 An applied effective laboratory pest management program is required for safe laboratory operations.

7.1.15 Equipment must be decontaminated before removal from laboratory for service and/or repair.

7.1.16 Laboratory furniture must be in good repair.

7.2 Inoculation of Culture Media

7.2.1 For microbiological investigations it is essential to learn the skills of inoculating specimens onto culture media:

7.2.2 Always practice aseptic technique clean work area with supplied disinfectant before beginning your work and upon completion.

7.2.3 Ensure loops and picks are flamed upon completion of your work

7.2.4 Discard any waste bio-hazardous material in the appropriate area, to ensure adequate disinfection is completed.

7.3 Containment Level 1 Laboratory Personal Protective Equipment Practices.

7.3.1 At a minimum, a lab coat, closed-toe shoes, shoe covers, eye protection (when necessary), and protective, disposable gloves must be worn in any microbiology laboratory. This equipment prevents bio-hazardous materials from contact with the skin and eyes, including areas where there might be cuts, abrasions, or dermatitis. The shoe covers ensure no soil or soil-related matter is liberated from with the laboratory area.

7.4 Lab coats:

7.4.1 Must be worn by all personnel, including visitors, trainees and others entering or working in the laboratory.

7.4.2 Coats must be properly fastened.

7.4.3 If contaminated, lab coats should be decontaminated by autoclaving before being placed in the laundry. If decontamination is not possible, any contaminated coat should be placed in the biohazard waste container.

7.4.4 Other articles of clothing, if contaminated during the course of lab work must also be likewise decontaminated.

7.5 Gloves:

7.5.1 Must be worn for all procedures performed in the microbiology laboratories.

7.5.2 Glove selection should be based on appropriate risk assessment (Table 1).

7.5.3 Latex or nitrile gloves offer a high level of dexterity and a higher level of sensitivity; however, they do not offer a great deal of protection from needle sticks, animal bites or sharps.

7.5.4 Some procedures may require double gloving.

7.5.5 Change gloves periodically during work functions and also when they become contaminated, their integrity is compromised, or when otherwise necessary.

7.5.6 Do not wash or reuse disposable gloves.

7.5.7 Gloves must be removed prior to leaving the laboratory and placed in a biohazard waste receptacle for decontamination with other laboratory wastes before disposal.

7.5.8 Safe glove removal includes: grasping one glove at the top of your wrist, being careful not to touch bare skin. Peel this glove off, away from your body, turning it inside out. Hold that glove you just removed in your gloved hand. Insert non-gloved hand into the cuff of the glove at the top of your wrist. Turn this glove inside out while tilting it away from your body. Dispose of the gloves – do not reuse.

Table 1: Available glove types and their respective advantages and disadvantages.

TYPE	ADVANTAGES	DISADVANTAGES	FOR USE WITH:

Natural rubber latex and rubber blends	**Good Biological Protection.** Low cost, good physical properties, dexterity.	Poor for solvent use and ethidium bromide. May cause allergic reactions.	**Biological Materials.** Aqueous solutions, bases, acids, alcohols, dilute aqueous solutions.
Polyvinyl chloride (PVC)	**Good Biological Protection.** Low cost, very good physical properties, average chemical resistance.	Plasticizers can be stripped.	**Biological Materials.** Strong acids and bases, salts, aqueous solutions, alcohols, oils, greases and petroleum products.
Neoprene	**Good Biological Protection.** Average cost, average chemical resistance, average physical properties, high tensile strength, high heat resistance.	Poor vs. chlorinated hydrocarbons	Oxidizing acids, alcohols, anilines, phenol, glycol ethers, solvents, oils, mild corrosives
Nitrile	**Excellent Biological Protection.** **Best needle wiping capacity.** Low cost, excellent physical properties, dexterity.	Poor vs. chlorinated organic solvents	**Biological Materials.** **Syringe/Needle work.** Oils, greases, aliphatic hydrocarbons, xylene, perchloroethylene, trichloroethane, ethidium bromide. Fair vs. toluene.
Butyl	Good resistance to polar organics, high resistance to gas and water vapour	Expensive, poor vs. hydrocarbons, chlorinated solvents	Glycol ethers, ketones, esters, aldehydes, polar organic solvents
Polyvinyl alcohol (PVA)	Resists broad range of organics, good physical properties.	Very expensive. Water sensitive, poor vs. light alcohols, acids and bases.	Aliphatic and aromatic hydrocarbons, chlorinated solvents, ketones (except acetone), esters, ethers
Fluro-elastomer (Vitron®)	Good resistance to organic and aromatic solvents. Flexible.	Extremely expensive. Poor physical properties. Poor vs. some ketones, esters, amines	Aromatics and aliphatic hydrocarbons, chlorinated solvents, oils, lubricants, mineral acids, alcohols.

Norfoil, Silver Shield™, 4H™	Excellent chemical resistance.	Poor fit, stiff, easily punctures, poor grip.	Use for Hazmat work. Good for range of solvents, acids and bases.

7.6 **Protective Eyewear:**

7.6.1 The use of contact lenses in laboratories is discouraged. Instead wear safety glasses on top of prescription lensed glasses for work functions, or alternatively, use prescription safety glasses.

7.6.2 Protective eyewear must be worn when aerosols and splashes are a risk or when large volumes are being used.

7.6.3 Protective eyewear should fit comfortably and snugly while not interfering with personnel activities.

7.6.4 Safety glasses are sufficient protection for most laboratory activities.

7.6.5 If there is increased splash risk personnel should instead wear protective goggles or a full face shield.

7.6.6 Damaged eye protection should be replaced immediately.

7.7 Closed toed shoes:

7.7.1 Closed toed shoes are mandatory laboratory PPE.

7.7.2 Sandals and other similar open toed shoes are forbidden in laboratory areas.

7.7.3 Closed toed shoes should be non-slip and provide full foot protection.

7.7.4 Safety laboratory shoes are not required but provide additional protection from chemical, biological, thermal, electrical, and kinetic hazards.

7.7.5 Shoe covers are required when using soil samples to ensure their containment within the laboratory.

7.8 Containment Level 2 Laboratory Practices:

7.8.1 All containment level 1 practices detailed in section 5.1 and 5.2 are to be applied, however other precautions that are necessary follow below.

7.8.2 Personnel should be provided with appropriate medical surveillance and offered immunizations for infectious agents they may be exposed to during work activities.

7.8.3 Consideration for collection and storage of serum samples should be carried out for at-risk personnel.

7.8.4 Biosafety manual and approved certificate describing permissible laboratory activities must be made available to relevant personnel.

7.8.5 Adequate training for laboratory staff in standard and specialized microbiological techniques by the Laboratory Supervisor prior to working with BSL-2 materials.

7.8.6 Demonstrated competency by laboratory staff in regular and specialized microbiological techniques by the Laboratory Supervisor prior to working with BSL-2 materials.

7.8.7 Potentially infectious exposure incidents must be evaluated immediately and treated according to procedures described in the laboratory Biosafety Certificate. All such incidents must be recorded and reported to and addressed by the laboratory supervisor, the TRU Biosafety office, and health services.

7.8.8 Animals and plants not associated with the projects that are being conducted must not be permitted in the laboratory.

7.8.9 All procedures involving the manipulation of biological material that could generate an aerosol should be conducted within an operational, certified Biosafety Cabinet (BSC).

7.9 Additional Personal Protection, Safety Practices, and Equipment for Containment Level 2 Laboratory Operation:

7.9.1 All containment level 1 practices detailed in section 5.2 are to be applied, however other precautions that are necessary follow below.

7.9.2 Properly maintained and certified BSCs, other appropriate PPE, and other physical containment devices must be used during:

a) All work with human blood, blood fractions, cells, cell lines, tissues, and organs.

b) Procedures and activities where splash or aerosol generation could occur. This can include pipetting, centrifuging, grinding, blending, shaking, mixing, sonicating, opening containers, opening infectious materials, intranasally inoculating animals, and harvesting infected tissues from animals or eggs.

c) High concentrations or large volumes of infected materials are handled.

7.9.3 Additional protective gowns, aprons, coats, coveralls, smocks, or scrubs should be worn when available to prevent personnel contact with infectious agents or biological materials.

7.9.4 Contaminated protective clothing should be disposed of in the hazardous waste receptacles or laundered appropriately via institutional guidelines.

7.9.5 BSCs must be installed so that fluctuations in air supply and exhaust do not interfere with normal operations. They should also be away from doors, windows that open, heavy traffic areas, and other sources of possible airflow disruption.

7.9.6 BSC vacuum lines should be protected with disinfectant traps.

7.9.7 An eye wash station should be readily available.

7.9.8 Only HEPA filtered exhaust air from a certified and tested Class II BSC, can be safely recirculated back into the laboratory environment.

7.9.9 Lab doors must lock and laboratory furniture must be in good repair.

7.10 Inoculation of Culture Media in a BSC

7.10.1 Cabinet blowers should be engaged at least 5 minutes before initiating work in a BSC. Never operate BSC blower wish sash lowered completely.

7.10.2 Prior to engaging in work within the BSC, the interior surfaces of the BSC should be decontaminated with 70% isopropyl or ethyl alcohol or other specified decontaminant,

where effective for target organisms.

7.10.3 Decontaminant choice and contact times depend on the biological material in question and therefore, different decontamination protocols and materials may be required for safe BSC operation and decontamination. For a general guide to BSC decontamination with various biological materials, see Table 2.

7.10.4 According to the 2016 Canadian Biosafety Standard, published by PHAC, moist heat (autoclaving in excess of 121°C for 60 minutes) will permit adequate inactivation of most biological toxins. However, this is not suitable for inactivation of low-weight, heat-stable toxins (e.g. Anthrax). Similarly, 30 minutes of contact with a solution of 2.5% NaOCl and 0.25N NaOH is adequate for inactivation of most biological toxins.

7.10.5 In some cases, however, different protocols are required. Please see Table 3 in this document for some examples of effective biological toxin decontaminating agents. If the toxin in use does not appear on this list, please contact the Biosafety Office for decontamination protocols.

7.10.6 If unsure of anything to do with toxins, please contact the Biosafety Office – NEVER work with a biological toxin with which you are unsure of PPE or decontamination requirements and protocols.

7.10.7 If a 10% bleach solution is to be used to decontaminate the interior of the cabinet, its application should be followed by removal with abundant sterile water or 70% isopropyl or ethyl alcohol.

7.10.8 Materials that are to be placed inside the cabinet should be surface-decontaminated with 70% isopropyl or ethyl alcohol.

7.10.9 No paper or other objects should be allowed to obstruct the front grill of the BSC.

7.10.10 Do not use an open flame in a BSC.

7.10.11 Personnel should plan their work ahead such that sweeping arm movements within the cabinet are limited. This can be solved by dividing the interior of the cabinet into clean and dirty working areas.

7.10.12 While working, keep sash lowered enough to maintain BSC interior isolation, but also so that personnel can work comfortably.

7.10.13 Any materials that are removed from inside the cabinet should be surface-decontaminated with 70% isopropyl alcohol, unless otherwise specified.

7.10.14 Discard any waste bio-hazardous material in the appropriate area, to ensure adequate disinfection is completed.

7.10.15 Once work is completed, decontaminate the interior of the BSC as previous described, turn off the blower and completely lower the sash.

7.10.16 If UV lamps are used as an infection prevention device, they must be regularly cleaned and tested every 6 months to ensure adequate energy output. The sash must also be completely lowered if UV lighting is engaged.

7.10.17 The radiation output of the lamp must be measured routinely (at least twice yearly) with a UV meter to ensure that the proper intensity (40 μW/cm2) and wavelength

(254 nm) are being delivered to the work area.

Table 2: Disinfectant Selection for various pathogens.

Biological Material	Chlorine Compounds (10% household bleach, make fresh monthly)	Alcohols (70% solutions most effective)	Phenolics (dilute according to manufacturer's instructions – useful for organic matter clean up)	Quaternary Ammonium Compounds (cationic detergents)	Glutaraldehyde	Formaldehyde
Bacteria	Very good	Good	Good	Good for gram positive	Good	Good
Enveloped viruses	Very good	Good	Good	Good	Good	Good
Non-enveloped viruses	Very good	Virus-dependent	Virus-dependent	Ineffective	Fair, 20 min contact time	Good
Fungi	Good	Fair	Good	Fair	Good	Good
Bacterial spores	Good with high concentration	Ineffective	Ineffective	Ineffective	Fair, 30 min contact time	Good
Protozoal parasites	Moderate with high concentration and several hours of treatment	Ineffective	Ineffective	Fair at high concentrations	Good	Good
Prions	**Special** – require 1M of this or NaOH for 60 minutes and then autoclave for 1 hour at 121°C – preferable to use disposable instruments and lab ware	Ineffective	Ineffective	Ineffective	Ineffective	Good

Table 3: Example Toxin Inactivation Guide

Toxin	Autoclave, 60min, 121°C	NaOCl, 30 min	NaOCl + NaOH, 30 min	Remarks
Abrin	YES	0.1%	Not determined	

Anthrax Lethal Toxin	YES	0.5%	2.5% NaOCl +0.25 NaOH	
Botulinum neurotoxins	YES	0.1%	2.5% NaOCl +0.25 NaOH	
Brevetoxin	NO	2.5%	2.5% NaOCl +0.25 NaOH	
Cholera toxin	YES	0.5%	Not determined	
Conotoxin	NO	0.5%	Not determined	30 minute treatments of 1% (v/v) solutions of glutaraldehyde or formaldehyde are also effective.
Deoxinalenol	NO	2.5%	2.5% NaOCl +0.25 NaOH	
Diacetoxyscirpenol	NO	NO	2.5% NaOCl +0.25 NaOH	
Diphtheria toxin	YES	0.5%	2.5% NaOCl +0.25 NaOH	
Microcystin	NO	0.5%	2.5% NaOCl +0.25 NaOH	
Ricin		0.1%	2.5% NaOCl +0.25 NaOH	
Saxitoxin	NO	0.1%	2.5% NaOCl +0.25 NaOH	
Shigatoxin and Shiga-like ribosome inactivating proteins	YES	0.1%	2.5% NaOCl +0.25 NaOH	
Staphylococcal enterotoxins	YES	0.5-1.0%	Not determined	60 minute contact time required
T-2 mycotoxin	NO	NO	***2.5% NaOCl +0.25 NaOH	2-8 hour soak required for gross contamination
Tetanus toxin	YES	0.5%	Not determined	
Tetrodotoxin	YES	1.0%	2.5% NaOCl +0.25 NaOH	

8.0 Plant Pest Risk Assessment, Containment Level Requirements, and Work Practices at TRU

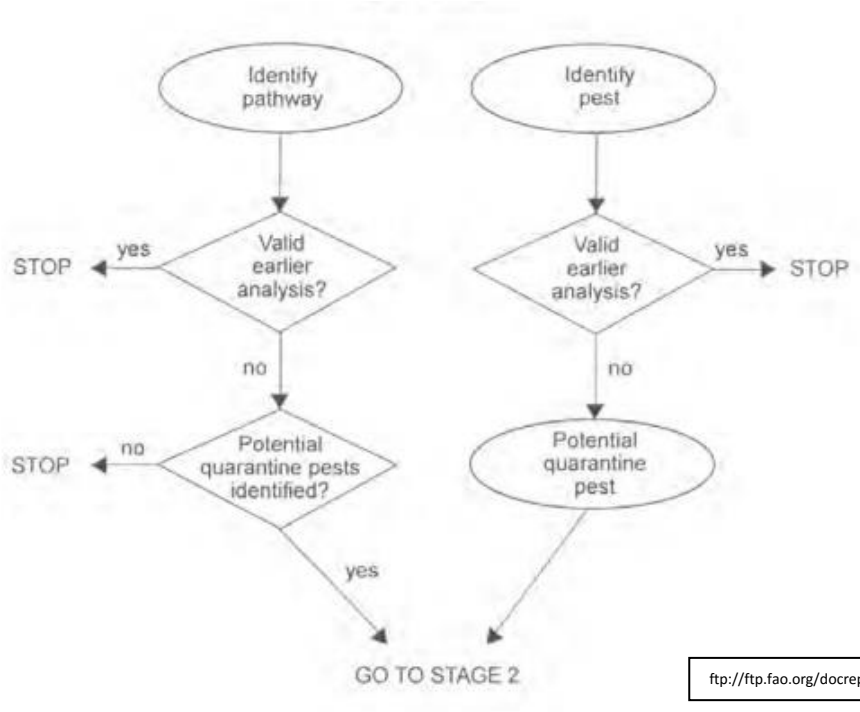
8.1 Suspected Plant Pest Contamination Procedures

With respect to known or suspected contamination by plant pests, many agents deemed undesirable in Canada, are natural inhabitants of other countries and territories. As such, they are not categorized as hazardous, since these agents are more environmental risks than human or animal health risks. As such, they are not regulated under the TDGR and their import is instead monitored by the CFIA.

The CFIA Packaging and labelling requirements necessary when there is risk of plant pests are outlined in the Plant Protection Act and Regulations and summarized below:

- When possible, obtain a Phytosanitary Certificate from the exporting party to ensure absence of quarantine pests within the sample;
- If the above is not possible, under the authority of the Plant Protection Act and Regulations, a CFIA inspector must inspect the facility and verify that procedures are in place to sterilize the soil and/or to prevent the potential spread of soil pests;
- The respective risk of any plant pests and their management will be determined by a risk assessment consisting of Pest identification, Pest Risk Assessment, and Pest Risk Management:

Stage 1 – Pest identification:



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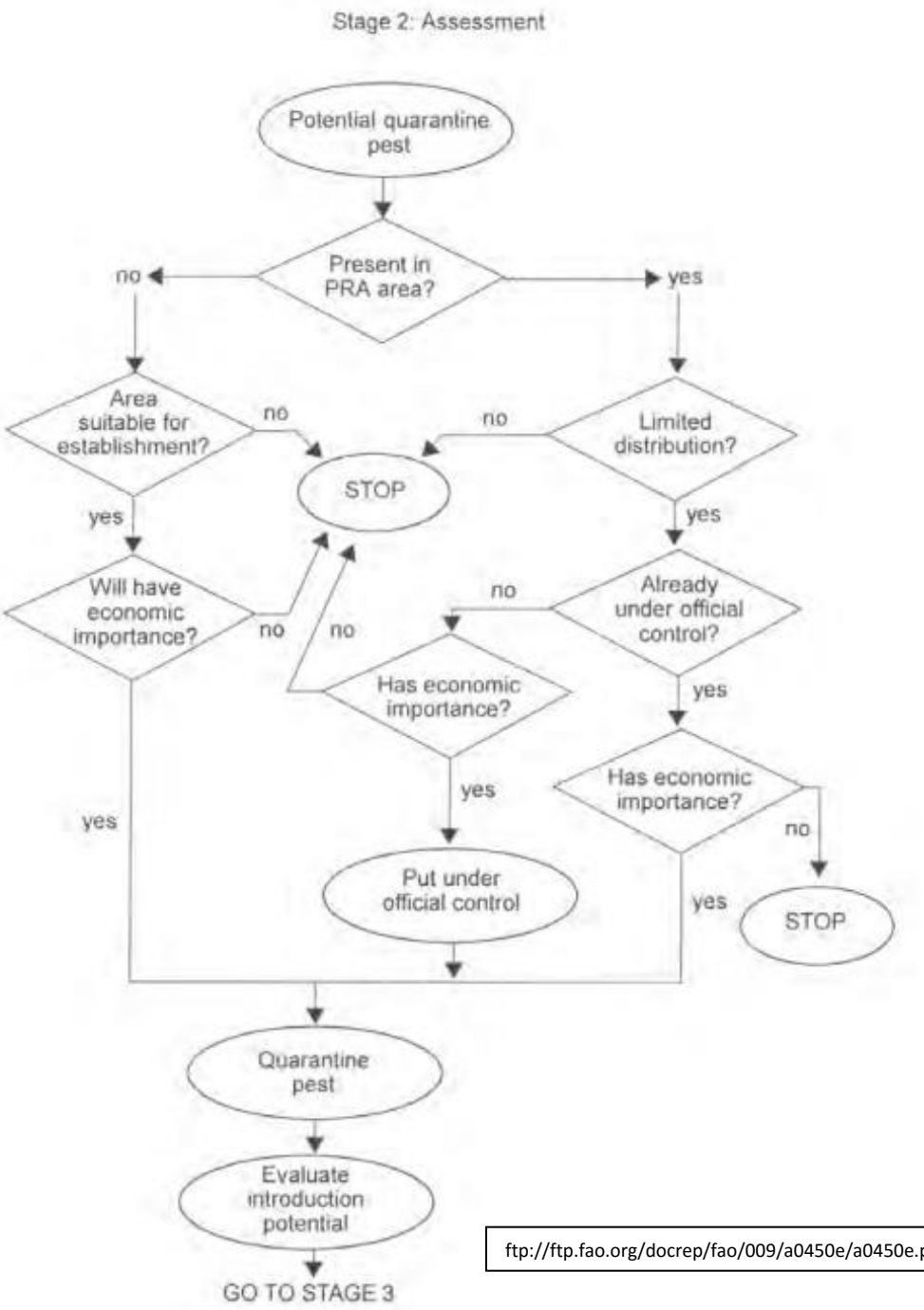
- Proceed to stage 2 only if the identified pest has potential economic importance within the area within it may be released and is therefore characterized as a quarantine pest;

Stage 2 – Pest Risk Assessment:



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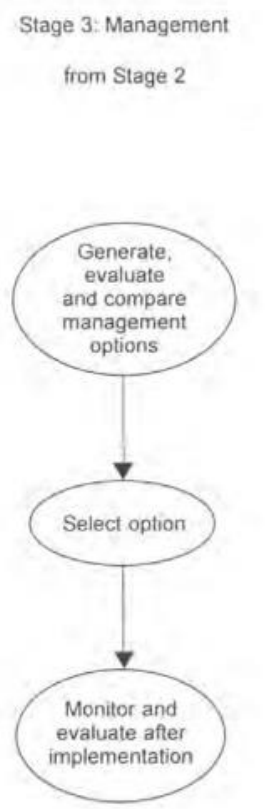
- Expert judgement is required to determine where in the above flowchart the assessment stops and whether stage 3 considerations are required;

Stage 3 – Pest Risk Management is initiated:



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- If deemed necessary, the above process should be proportional to the risk identified in Stage 2 and must also be documented in its entirety;
- A list of options for reducing risks to an acceptable level should also be assembled;
- A list of options and their respective efficacies and impacts should likewise be manufactured;

Further CFIA requirements consist of the following:

- Material must be routed directly to the importer's plant, premises, research facility or laboratory. A Movement Certificate is required to transport the materials to destinations other than those specified in the Permit to Import;
- Material must be packaged and transported in sturdy leak-proof containers. The material must be contained until processed. All residue, other than residue from destructive analysis, must be treated to prevent the potential introduction and spread of pests into Canada. The transport containers and packaging material must be treated or disposed of in a manner that will prevent pest introduction;
- The material shall be clearly and uniquely identified at all times (i.e. during importation, transportation, testing, processing, research, storage and disposal);
- The importer shall keep a log book of all importations. This book shall indicate the date soil was received, the Import Permit number, the country of origin, where the soil is in the facility and its

status (e.g., treated, stored, disposal method, date);

- Material must be treated to destroy living stages of pests before disposal in a manner approved in writing by the CFIA. Any movement of soil outside the facility prior to disposal must be authorized by the CFIA;

- When methods have been used that mitigate potential pest risks associated with the soil (e.g., sterilization by heat, digestion by laboratory acids or chemicals), the disposal of the soil and soil-related matter may not require CFIA supervision. The processes must be described in the operating procedures and approved by CFIA as appropriate for mitigating potential pest risks;

If there is suspected plant pest contamination and risk assessment and management has been completed, appropriate containment level precautions will be used. These requirements are outlined in: Containment Standards For Facilities Handling Plant Pests (1st edition, 2008). For quick reference, CFIA maintains a list of common plant pests and the specific directives which list required importation practices. However, this list may not be complete. If the necessary risk information is not found within these resources, independent research and a local risk assessment may be necessary to ensure safe work practices.

At TRU, provided arthropods are not being utilized in the studies, 3 levels of plant pests may be managed if present within soil and soil-related matter: Basic, Plant Pest Containment Level 1 (PPC-1), and Plant Pest Containment Level 2 (PPC-2). PPC-1 and PPC-2 are complimentary to the Containment Level 1 and 2 requirements and practices described in section 7.0 of this document.

The TRU containment requirements and work practices for these three levels of plant pests are outlined below:

8.2 Basic containment

8.2.1 Basic containment is the lowest containment level for plant pests and it provides simple, but adequate, barriers to pest escape;

8.2.2 Containment of plant pests is achieved through sanitation, 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;

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

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

8.3 Plant Pest Containment Level 1 (PPC-1)

8.3.1 PPC-1 containment is the next highest containment level for plant pests;

8.3.2 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;

8.3.3 An autoclave must be available to treat waste and waste water must be treated to kill pests where appropriate;

8.3.4 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;

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

8.3.6 • inoculating host plants with isolates of plum pox or other plant viruses in the absence of the vectors of those viruses;

a) importing low-risk tropical insects into butterfly houses for study, display or rearing; or
b) studying and rearing nematodes of quarantine concern in Canada that have low spread potential (e.g. Globodera rostochiensis and Ditylenchus destructor).

8.4 Plant Pest Containment Level 2 (PPC-2)

8.4.1 Containment is achieved through facility design, operational procedures and the use of specialized equipment;

8.4.2 All PPC-1 physical and operational requirements also apply to this containment level;

8.4.3 Key additional operational practices include:

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

8.4.4 Key additional physical requirements include:

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

8.5 PPC-1 Work Practices at TRU

8.5.1 Limit access to containment zone and support areas to authorized personnel only;

8.5.2 Designate and name a contact person for the facility, or one for each area or experiment;

8.5.3 Keep an up-to-date inventory of all imported plant material and plant pests, which themselves must be properly labelled, stored, and separated from other samples. These

materials must also not be permitted to leave the premises without proper authorization;

8.5.4 Personnel must be provided with training on pest-associated hazards and the precautions necessary to prevent the release of contained pests;

8.5.5 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;

8.5.6 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 consisting of: a knee length, properly fastened lab coat, closed toed shoes, long pants, and disposable shoe covers when deemed necessary;

8.5.7 Potentially contaminated laboratory clothing must not be worn in non-laboratory areas if this presents a risk of inadvertently disseminating pests;

8.5.8 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;

8.5.9 Comply with all conditions stipulated on Permits to Import;

8.5.10 Render all organisms non-viable prior to disposal via decontamination with an effective decontaminant;

8.5.11 Employ good laboratory practices to prevent the escape of pests;

8.5.12 Keep doors closed to reduce the potential movement of plant pests;

8.5.13 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;

8.5.14 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;

8.5.15 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);

8.5.16 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;

8.5.17 Containers may only be opened within a facility that provides the appropriate containment level for the pest in question;

8.5.18 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;

8.5.19 Keep workplace exposure to any plant pest at the lowest practical level and avoid the generation of aerosols when manipulating pests or inoculating plants;

8.5.20 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;

8.5.21 Contaminated materials and equipment must be properly cleaned and decontaminated before leaving the facility for servicing or disposal;

8.5.22 Render non-viable all unintentionally introduced pests, including those contaminating cultures, as soon as they are detected;

8.5.23 Where practical, confine all arthropods in cages or other containers that prevent escape;

8.5.24 Where applicable, disinfectants that are effective against the organisms in use must be available at all times when plant pests are handled or stored;

8.5.25 Sanitation practices should be implemented when working with plants and plant pests. These practices include:

a) 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;

b) washing hands upon lab entrance, 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;

c) using decontaminated soil, soil-less potting mix or inert growing media, and cleaning up spilled soil or growing medium;

d) watering plants carefully, avoiding soil and water splash, and avoiding touching plants with the hose;

e) avoiding the use of automated watering systems where their use presents a risk of disseminating pests;

f) cleaning and decontaminating work surfaces as appropriate with a suitable disinfectant;

g) disinfecting items such as clippers, pruners and knives during and after use, as appropriate, to avoid plant-to-plant transfer of pests;

h) cleaning and decontaminating pots, stakes and saucers after use, or using disposables that are decontaminated and discarded after use;

i) surface sterilizing plant material before planting or transferring to tissue culture;

j) maintaining obligate parasites (e.g. viruses, nematodes) in tissue culture plantlets where possible;

k) eliminating unwanted pests by heat or cold therapy, surface sterilization, meristem culture or other suitable means;

l) inspecting for, and removing and destroying, host plants infected or infested with unwanted organisms;

m) using good housekeeping practices to keep the area neat, clean and free of

dead plant material and unwanted plants and pests; and

n) using dedicated cleaning equipment (e.g. brooms, mops, garbage cans) within containment zones.

8.5.26 Work surfaces that have become permeable (i.e., cracked, chipped, or loose) must be repaired, sealed or replaced;

8.5.27 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);

8.5.28 Monitoring records must be kept for three years;

8.5.29 When autoclaving soil or soil-related matter soil must not be more than 4.5cm in thickness;

8.5.30 Loss of containment must be reported immediately to the laboratory supervisor and remedied as soon as possible;

8.5.31 Written reports of such incidents must be maintained for three years, and the results of incident investigations used for continuing education;

8.5.32 Maintain an effective bird, rodent, weed and plant pest control program to prevent entry and eliminate undesired pests from the containment zone;

8.5.33 Greenhouse personnel who apply pesticides must be appropriately trained and protected.

8.6 PPC-2 Work Practices at TRU

8.6.1 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;

8.6.2 Containment zone entry is restricted to authorized laboratory and maintenance staff and other persons on official business;

8.6.3 Access to specific areas within these containment zones shall be granted on an “as needed” basis only;

8.6.4 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;

8.6.5 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;

8.6.6 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;

8.6.7 Personnel working in the containment zone must be trained in, and follow, the Standard Operating Procedures for the area;

8.6.8 Trainees must be supervised by a trained staff member;

8.6.9 Visitors, maintenance staff, janitorial staff and others must be provided with training and/or supervision commensurate with their anticipated activities in the containment zone;

8.6.10 Personnel entering the containment zone are required to wear, at minimum, a properly fitted, knee length, fastened lab coat and closed toed shoes. Gloves, shoe covers, and eye protection necessities will be decided via individual risk assessments. All protective clothing must be removed prior to exiting the containment zone;

8.6.11 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;

8.6.12 Where such footwear is used, it must be removed for reuse or decontamination prior to exiting the containment zone;

8.6.13 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;

8.6.14 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;

8.6.15 Laboratory doors must be kept closed as required by the facility design;

8.6.16 To minimize places where plant pests can persist, avoid using containment zones for general storage of items not used in that area;

8.6.17 To facilitate minor repairs, a basic tool kit should always be available inside the containment zone;

8.6.18 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;

8.6.19 If footwear contamination is suspected, 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;

8.6.20 If there is a risk of disseminating pests with the movement of paper, use the computer in S365B to transfer information and data from the containment zone;

8.6.21 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;

8.6.22 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;

8.6.23 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;

8.6.24 Supply and exhaust filters, pre-filters and screens are to be inspected and cleaned or replaced by a designated person on a regular basis;

8.6.25 If undesired laboratory pests are detected, contact the OSEM or facilities to initiate pest control procedures;

8.6.26 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;

8.6.27 Where appropriate, staff must examine themselves, or be examined by others, for hitchhiking arthropods prior to exiting the containment zone;

8.6.28 Hitchhiking arthropods must be removed or killed before exit.