

Lash Miller Laboratories St. George Campus

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Purpose

To provide instruction on the requirements for the safe transport of dangerous goods (also referred to as hazardous materials).

Scope

This SOP applies to all individuals in Lash Miller who will be transporting, offering for transport or receiving dangerous goods as defined in the Transportation of Dangerous Goods Regulations (TDGR) which applies to many kinds of shipments of hazardous materials, including chemicals, radioactive and biohazardous materials.

This SOP is intended to supplement the required certification [training](#) in Transport of Dangerous Goods (TDG), and to provide information to those who may be involved in the transport of dangerous goods exempted from TDGR. It does not alter, satisfy, or influence any regulatory requirements.

Definitions/Acronyms

TDG: Transportation of dangerous goods

dangerous good: a product, substance or organism defined or classified by the federal Transportation of Dangerous Goods Act and Regulations which pose significant hazards during transport.

United Nations (UN) numbers: are four-digit numbers used worldwide in the framework of international transport that identify dangerous goods during transport by sea, air, road, rail and inland waterways. To avoid confusion with other number codes the 4 numbers are preceded by the letters "UN" (for example, "UN2789"). The numbers are assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods.

handling: means loading, unloading packing or unpacking dangerous goods in a means of containment for the purposes of, during or following transportation and includes storing them in the course of transportation only.

siftproof: a container designed so that dry contents i.e., powdery or granular substances cannot sift out or pass through the container during transit. This includes the original filling substance as well as for finer fractions produced during transport. Leaks may be generated during transport due to pressure changes or friction from vibration.

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Requirements/Policies/Regulations

- IATA Dangerous Goods Regulations, International Air Transport Association
- Transportation of Dangerous Goods Act, 1992, S.C. 1992, c.34
- [CAN/CGSB-43.125](#) standard
- Nuclear Safety and Control Act, S.C. 1997, c. 9
- Occupational Health and Safety Act (OHSA), R.S.O. 1990
- Dangerous Goods Transportation Act, R.S.O. 1990, c D.1
- Environmental Protection Act, R.S.O. 1990
- Workplace Safety and Insurance Act, R.S.O. 1997
- University of Toronto [Biosafety Permit](#)

Safety Precautions

- The shipper is required to place the dangerous goods in the appropriate type of packaging, and carriers have the responsibility of refusing to transport any container that is damaged, leaking, or inappropriate for the goods within.
- Carrying dangerous goods should be avoided by using certified carriers, however if a suitable alternative does not exist, always ensure the shipment is well secured and will not spill during transport, that the vehicle is in good working order, and that adequate automobile insurance coverage is in place.
- Items classified as dangerous goods cannot be handled or mailed by University of Toronto Mail Services, Canada Post or UPS ground services.
- FedEx Express and Purolator are the contracted shippers for the University
- Consignment of dangerous goods (either shipping or receiving) will be via the Chem Stores.

Procedure: SHIPPING – General Instructions

1. Classify the Material

Contact chem.safety@utoronto.ca prior to shipping any dangerous good. They will assist with classification and provide a recommendation on the type of packaging that should be used. They will also provide the required shipping documentation and labels when you are ready to send out your package.

NOTE – if you do not have current TDG training and certification, you cannot send, carry, or receive a shipment of a regulated dangerous good. Chem Stores manager is available to coordinate shipments for those who do not have the required certification.

2. Package the Material

The exact nature of the packaging will depend on the goods being shipped. The packaging must protect the material from damage during shipping and conform to UN requirements (must have the UN safety mark on the outside) and must meet the shipping criteria of the International Civil Aviation Organization (ICAO). In most

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circumstances, we use combination packaging – basically a leak-proof container which cushions and stabilizes the contents from shifting or movement inside a box. The dangerous good(s) are within a sealed container, which is then placed in an outer package that protects it from damage.



Figure 1 Combination Packaging Examples

3. Apply Labels

There is a set of requirements for what must appear on the outside of a package of dangerous goods which include:

- Shipping Name
- UN Identification Number
- Hazard Class Label(s)
- Packaging Certification Mark
- Ship to address

The figure below depicts the required labels on a shipment of glacial acetic acid. The manufacturer of the carton will typically print on the orientation mark and packaging certification – the shipper usually applies the shipping name, UN number, the hazard class label stickers and the shipping address.

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Figure 2 TDG Label Requirements

4. Shipping Documents

Chem Stores can provide you with assistance with labelling and packaging materials.

For most shipments the form must include:

- Date prepared,
- Telephone number of a responsible person, knowledgeable about the shipment,
- Shipping description for each dangerous good in the shipment, in the following order:
 - Shipping Name (and technical name if required),
 - Hazard Class (and subsidiary class if required),
 - UN Identification Number,
 - Packing Group

For the shipment of glacial acetic acid example above, the chemical is classified by TDGR as both corrosive (primary hazard) and flammable (subsidiary hazard), so the name on the shipping document would appear as:

Table 1 Shipping document classification example

Shipping Name	Primary Class	Subsidiary Class	UN Number	Packing Group	Quantity
Acetic Acid, Glacial	8	3	UN2789	11	2L

For some materials, extra documentation is required. Import permits are required for importing aquatic animal pathogens and plant pests. Please see the [Biosafety website](#) for links and more information. If importing human and indigenous or established animal pathogens, contact the Biosafety Office. Import permits are also required for

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Schedule 2 and 3 chemicals as per Chemical Weapons Convention (CWC) regulations. Highly hazardous chemicals also require a permit to import. Please refer to the [Chemical Security SOP](#) for details on included chemicals and how to submit the required import form.

If you wish to obtain or provide proprietary material from a third party (ex. chemicals synthesized in labs), a [Material Transfer Agreement](#) is required. It is a contract between the provider of material and the recipient. It grants the recipient a license to use the proprietary material and ensures that both parties understand how the materials can be used.

5. Contact Courier Service

Once the material has been classified, packaged and labelled, and you have the shipping documents completed, you are ready to ship. Contact a carrier to arrange the pickup and be sure to provide the details of what you are shipping.

There are 2 qualified shippers:

- Federal Express (1-800-463-3339),
- Purolator Courier (1-888-744-7123)

Bring the parcel and paperwork to the Chem Stores for pick up by the courier. Chem Store is the facility designated for handling dangerous goods and pickups for courier (Room LM 20).

EXAMPLE - Shipping an Infectious Substance

This is an example to demonstrate how a microorganism is classified, and the process to determine the packaging, labeling and documentation requirements.

In this example scenario, a culture of *E. coli* is being shipped to a colleague elsewhere in Canada.

Does it qualify as an 'Infectious Substance'?

Risk Group 1 microorganisms are exempt from TDG regulations and can be shipped by road without documentation or TDG training. Anything in Risk Group 2 qualifies as an Infectious Substance. In the example of *E. coli*, it is an 'infectious substance' because *E. coli* is a Risk Group 2 organism.

Is it 'Category A' or 'Category B'?

Class 6.2, Infectious Substances, are assigned to Category A or B rather than to packing groups. To determine whether an organism is Category A or B, consult [Appendix 3 SOR/2008-34](#) of the TDGR. Infectious substances included in Category A are transported in a form that poses the highest risk of infection during transportation. They are capable

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of causing permanent disability, life-threatening or fatal disease in otherwise healthy animals or humans.

The proper shipping name of a Category A infectious substance is:

- UN2814, Infectious substance, affecting humans, or
- UN2900, Infectious Substance, affecting animals only.

NOTE: Category A infectious substances that are infectious to both humans and animals are classified as UN2814.

Category B infectious substance may be responsible for causing disease in humans or animals, but the conditions in transport are such that the likelihood of contracting the disease upon exposure is extremely remote. The proper shipping name of a Category B infectious substance is:

- UN3373, Biological Substance, Category B

For the example, *E. coli* is listed as Category B (see item 41 in the UN3373, [Bacteria table](#)), and thus UN3373 would be the correct shipping name.

Note that any material identified as an 'infectious substance' (either Category A or B) must be shipped by someone with valid TDG certification, using a carrier also certified in TDG. Shipment of Risk Group 2 material to or from the university also requires Import/Export documents or in this example a [Biohazard External Transfer Notification](#) since the shipment is to a colleague within Canada. Contact the University of Toronto Biosafety Officer (BSO) for assistance.

What type of packaging is needed to ship infectious substances?

There are 3 types of packaging available:

- Type P620 (used for UN2814, 2900, 3291 and 3373);
- Type P650 (used for UN3291 and 3373); or
- Standardized and non-standardized packaging permitted in Part III of the [CAN/CGSB-43.125](#) standard for the transport of infectious substances intended for disposal (UN2841 or 2900) or clinical, (bio) medical or regulated waste (UN3291).

In the example, *E. coli* is Category B, so Type P650 packaging is required. Type P650 packaging must meet strict performance criteria including drop testing, puncture testing, a pressure testing, and a stacking test. It is a triple packaging system of primary, secondary, and outer packaging. The primary receptacle is restricted to contain less than 1 L, and absorbent material must be placed between the primary and secondary

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packaging in sufficient quantity to absorb the entire contents of the primary receptacle. The outer packaging must not contain more than 4 L for liquids or 4 KG for solids.

What are the basic features of a Type P650 Packaging?

Type P650 packaging shall consist of:

- i. Inner packaging comprising:
 - a. Primary receptacle(s) (leakproof or siftproof);
 - b. Secondary receptacle(s) (leakproof or siftproof) with a list of contents on the outside of the secondary receptacle is required;
- ii. An outer packaging with at least one surface having a minimum dimension of 100 mm x 100 mm designed to protect contents from outside influences, such as physical damage, while in transit.

Note: Either the secondary packaging(s) or the outer packaging shall be rigid.

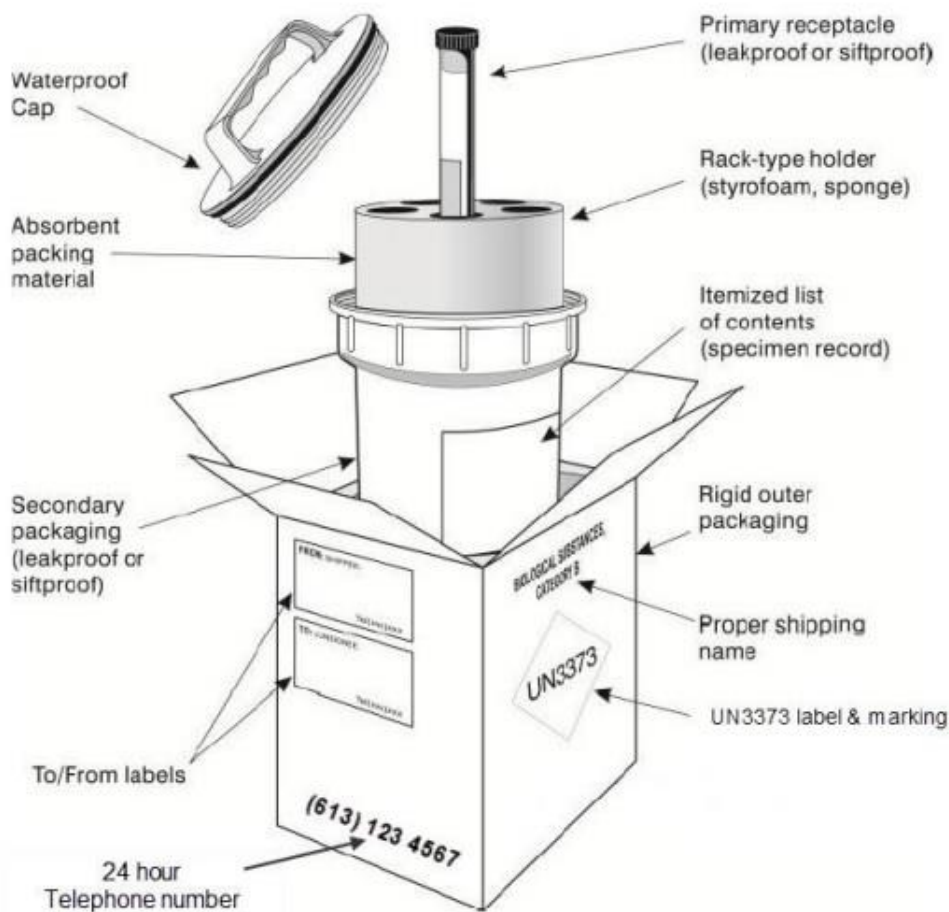


Figure 3 Example of Type P-650 Packaging

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What labels are required?

The labeling requirements are dictated by the classification of the contents. Shipments of Category B, Infectious Substances must have diamond hazard label identifying the UN number on the outer container. The UN3373 marking must be in the form of a square set at an angle of 45 degrees. Each side of the UN3373 diamond should measure a minimum of 5 cm (2"). The width of the diamond rule line must be a minimum of 2 mm, and the letters and numbers must be at least 6 mm high. The shipping name, Biological Substance, Category B must be written in font at least 6mm high, instead of displaying the Class 6.2, Infectious Substances label. In the case of Category B materials, a 24h emergency response number must also be provided. This would be the telephone number of a responsible person, knowledgeable about the shipment.

Here is an example package of *E. coli* culture shipment should look like:



Figure 4 Labeled TDG package

Containers and UN-approved packaging are available from the [Compliance Center](#).

What documentation is needed by the carrier?

Shipments of Category B, Biological Substance are exempt from documentation requirements, providing the outer package is at least 10 cm x 10 cm and meets the packaging certification and labeling requirements described above.

Procedure: RECEIVING – General Instructions

1. Examine Package

Each package containing dangerous goods will be visually inspected to ensure that the packaging is intact and undamaged, and that no leaks or spills have occurred during transport. If anything arrives damaged, Chem Stores personnel will: either accept or deny the shipment based on its condition, will contact the consignor (shipper) before accepting if there are concerns, and will ensure the supplier is notified if dangerous goods arrive that are not in compliance. See “Contingency Plan and Reporting” on page 12 for more information.

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In addition to being free from damage and leaks, packages should have the appropriate safety marks and labels. During the visual inspection of the packages, Chem Stores personnel will quickly check the exterior of the packages to confirm that labeling is in place. They will let the carrier know if you notice any deficiencies.

After a shipment has been received, TDG labeling requirements no longer apply, and hazardous materials within a workplace are subject to [WHMIS Labeling](#) requirements, and internal HECHMET inventory management system. Once the goods have been removed from the package, deface or remove all labels on the shipping carton to avoid any future confusion.

2. Confirm Contents

After the visual inspection, review the shipping document and check the contents of the shipment against the contents listed on the shipping paperwork. Any omissions or errors must be reported to the carrier.

Store the packages in a safe and suitable location until they are delivered to their destination or used. Ensure that incompatible chemicals (e.g., flammables and oxidizers; acids and bases) are well separated.

3. Document Retention

The receiver must retain shipping documents for at least two years.

EXEMPTIONS

The advantages of exemptions are:

- TDG certification is not necessary,
- no TDG shipping documentation may be required, and
- eliminates obstacles relating to automobile insurance coverage.

The exemptions most applicable to Lash Miller shipments are: Test samples, Limited Quantities, Liquid Nitrogen Dry Shippers, and Dry Ice.

Test Samples

- Test samples are not subject to TDGR. Test samples include any sample being transported to a laboratory for the purposes of classifying, testing or analysis, but excludes samples of infectious substances (e.g., Risk Group 2 or higher) (TDG Class 6.2), radioactive materials (TDG Class 7), or explosives (TDG Class 1).
- The packaging of test samples must be adequate to protect the contents during normal transport and handling, and the package must be securely stowed in the vehicle.
- The exterior of the package must be labeled 'Test Samples'.

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- The total quantity of test samples must not exceed 10 kg.

Limited Quantities – small shipments

The limited quantity amount is listed in Schedule 1 of the TDGR – the value indicated is to be interpreted as volume in litres for liquids and gases, and weight in kilograms for solid materials. This is the amount of material permitted in each inner package (e.g. plastic bottle). In all cases the maximum package weight cannot exceed 30kg. For example, a shipment of 6 x 1L bottles of a 37% formaldehyde solution (UN2209 - which has a limited quantity index of 5L) is not subject to TDGR, however certain conditions still apply:

The inner package must be of good quality and placed in combination packaging with cushioning to immobilize and protect the items during transport.

- Until December 31, 2020, the words ‘Consumer Commodity’ or ‘Limited Quantity’ or the abbreviation ‘Ltd. Qty.’ can be written clearly on the outside of the completed package.
- After the Dec 2020 date the Limited Quantities Mark must be displayed on one side of a means of containment to comply with the Limited Quantities Exemption (Section 1.17). There are 2 international safety marks to indicate limited quantity of a dangerous good.

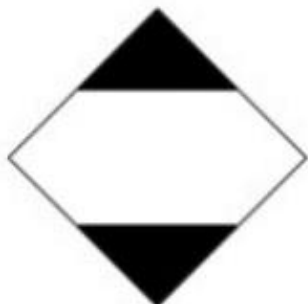


Figure 5 Limited Quantities Mark



Figure 6 ICAO Limited Quantities Mark

- At the University of Toronto all packages should be prepared, regardless of transport mode, according to the higher International Civil Aviation Organization (ICAO) shipping standards which ensures safe transport of dangerous goods by air, and thus would supply the label diagramed in Figure 6.

Liquid Nitrogen Dry Shippers

There are commercially available specimen transporters that are not subject to TDGR. These shippers are considered ‘dry’ because the liquid nitrogen is absorbed by a solid matrix and there is no free liquid available to spill. The limited quantity exemption for liquid nitrogen (UN1977) is only 125 mL, so the use of a dry shipper eliminates the

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need for shipper/carrier certification, TDG labeling and shipping documentation, as well as circumventing insurance issues that arise when carrying dangerous goods in University of Toronto vehicles. Note: the dry shipper should be carried in the back of a pick-up truck, so the nitrogen gas released as the vessel warms is free to escape to the atmosphere.

Dry Ice

Dry ice, Class 9; Miscellaneous Products Substances or Organisms is considered an explosion hazardous during transportation as it releases a large volume of carbon dioxide gas as it sublimates. Special Provision 18 allows a complete exemption for dry ice (UN1845) provided the package is properly vented i.e. if the means of containment is designed and constructed to permit the release of carbon dioxide to prevent the build-up of pressure that could rupture the means of containment that is transported by a road vehicle or a railway vehicle.

If it is shipped by air, it requires a Class 9 Hazard label and safety marks on the bill of lading.

A shipper's declaration of dangerous goods is not required unless the dry ice is used as a refrigerant for other dangerous goods. Otherwise only an air waybill is required with the following information: Dry Ice or Carbon dioxide, solid, Class 9, UN1845, number of packages and the net quantity of dry ice in each package.

Contingency Plan and Reporting

The Transportation of Dangerous Goods Act, 1992 (TDG Act) provides that any person who has the charge, management or control of a means of containment shall report any release or anticipated release (e.g. spills, accidents), loss or theft of dangerous goods that is or could be in excess of a quantity or concentration specified by regulation from the means of containment if it endangers, or could endanger, public safety. The TDG Act also provides for the development of regulations that prescribe who will receive reports, the manner of making the reports, the information to be included and the circumstances in which such reports are not required.

Loss, theft or unlawful interference of dangerous goods:

Dangerous goods that have been lost, stolen or unlawfully interfered with, are to be [reported](#) to CANUTEC and, if applicable, to Natural Resources Canada (NRC) or the Canadian Nuclear Safety Commission (CNSC). The report is to include following information:

- The name, telephone number and address of the place of business of the person making the report;

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- The name and address of the place of business of the consignor, the consignee and the carrier;
- Whether the dangerous goods were lost or stolen, or detailed description of the unlawful interference;
- The classification of the dangerous goods;
- The quantity of dangerous goods lost or stolen;
- A description of the type of means of containment containing the dangerous goods and a description or photograph of the certification safety marks; and
- The approximate date, time and geographic location of the loss or theft, or unlawful interference.

Waste Management and Environmental Responsibility

After a shipment has been received, TDG labeling requirements no longer apply, and the hazardous materials are subject to WHMIS labeling requirements.

Dispose of the unused, used products or byproducts according to WHMIS guidelines.

- Once the goods have been removed from the package, deface or remove all labels on the shipping carton to avoid any future confusion.
- Dispose of dry ice in shipping containers by letting it sublimate in a well-ventilated area.
- Gel packs filled with a non-toxic salt solution can be thawed, cut open and poured down the drain with hot water to dissolve the gel. Recycle the exterior with other plastics. If you are unsure, check with the manufacturer of the thermal control packing material for their reuse guidelines and disposal instructions.
- Polystyrene packing peanuts are not recyclable thus disposed of in the garbage.
- The University does not recycle Styrofoam, shrink wrap, wrappers, bubblewrap, or bags. These go into the garbage stream.
- Styrofoam or expanded polystyrene (EPS) shipping container can be recycled. Make sure all containers are clean, empty, and free of tape, labels, plastic film, or other contamination. Because Styrofoam needs to be recycled at specialized facilities, you need to find a drop-off location. In Toronto, EPS shipping boxes can be brought to (place name).
- Some shippers/suppliers have a mail back option for EPS shipping containers.

References/Material/Resources

- Safety Data Sheets
- APPENDIX 3 SOR/2008-34 [Guide to Category A and Category B Assignment](#)
- CANUTEC [Emergency Response Guidebook 2020](#)
- Transport Canada [Guide for Reporting Dangerous Goods Incidents](#)
- IATA Dangerous Goods Regulations, International Air Transport Association

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- AECB Transport Packaging of Radioactive Materials Regulations, 1990
- World Health Organization Laboratory Biosafety Manual. – 3rd edition, 2004
- WHO/HSE/GCR/2015.2 Guidance on regulations for the transport of infectious substances 2015–2016
- Specimen Collection & Transport Products Catalog, Fisher Healthcare
- AAC (Advanced Analysis Centre) Transportation of Dangerous Goods SOP
- [Fedex Packaging UN3373 Shipments](#)
- [Fedex Packaging Perishables](#)
- [Purolator Shipping Dangerous Goods Information and Forms](#)