1.0 Statement

All shipments of open source nuclear substances to and from Memorial University shall be handled as detailed in this procedure to ensure compliance with appropriate regulations and in a manner to minimize exposures to personnel and the environment.

2.0 Definitions

2.1 Consignor
The shipper of the shipment.

2.2 Consignee
The recipient of the shipment.

2.3 TDG Certification
TDG class 7 certification is **mandatory** for anyone receiving and opening/unpacking packages containing nuclear substances and radiation devices (Dangerous Goods Class 7) other than Excepted Packages. The certification expires after 3 years and must be renewed.

TDG class 7 AND TDG – Road certifications are **mandatory** for anyone required to package, offer for transport or transport packages containing nuclear substances and radiation devices. This includes individuals who transport nuclear substances and radiation devices between MUN buildings.

2.4 Excepted Package
Excepted packages present a very low radiological risk and are not required to meet the same design and documentation requirements as other types of packages for nuclear substances and radiation devices transport. An "excepted" package is characterized by the following:

a) Package can contain up to certain limited amount of radioactivity specified by IAEA regulation (Contact RSO for limits).
b) A properly sealed sturdy cardboard carton.
c) No external radiation warning signs on the carton.
d) No special dangerous goods documentation required.
e) Shipping document (see appendix for instructions) must include the statement "UN2910: Radioactive Material, Excepted Package."
f) Surface dose rate on the shipping package is less than 5µSv/hour.
g) External surface contamination is less than 4 Bq/cm^2 (0.4 Bq/cm^2 for alpha emitters) (averaged over 300 cm^2).
h) Radiation level at any point on the external surface of article (after unpack) does not exceed 5 µSv/hour.
i) The safety mark "Radioactive" must be visible on opening the package.

2.5 **Type A Package -** As specified by IAEA regulations:

a) Package may contain up to 10^4 times the maximum amount of radioactivity permitted in an excepted package.
b) Surface contamination level is less than 4 Bq/cm^2 (0.4 Bq/cm^2 for alpha emitters) (averaged over 300 cm^2).
c) Packages are specially designed to withstand typical accident conditions and prototypes have successfully passed prescribed tests to demonstrate physical integrity (Must be purchased from certified company).

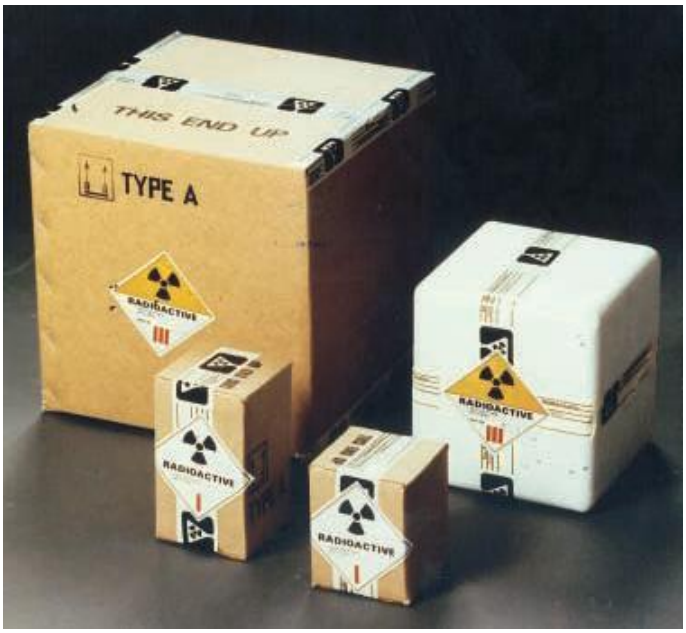
d) The smallest overall external dimension of the package shall be ≥ 10 cm.
e) Must be properly labeled with radiation warning signs and other information on the outside of the package.
   a) Shipping name(s)
   b) UN number
   c) Name and address of consignor and consignee (include institution names)
   d) Permissible gross weight (if exceeding 50 kg)
   e) Name of manufacturer, or other packaging identification specified by the competent authority
   f) "Type A"
   g) The identification mark allocated to that design by the competent authority (i.e. certificate of approval number) For example –USA/9283/A-85
   h) one of the 3 hazardous labels (see IDENTIFYING TYPE A RADIOACTIVE PACKAGES below), must be plainly marked by permanent means, resistant to effects of fire and water on the outer most surface. The regulation requires that if the dangerous goods are included in Class 7, Radioactive Materials, two labels must be displayed in the small means of containment for the primary class. The labels must be displayed on two opposite sides of the outer surface of the small means of containment, other than the side on which it is intended to rest or be stacked during transport.
f) Type A packages have higher permissible external dose rates/Transport Index and are differentiated accordingly.

IDENTIFYING TYPE A RADIOACTIVE PACKAGES

Category I – White	**Category II-Yellow**	**Category III-Yellow**
		
Dose rate does not exceed 5µSv/hr at any location on the external surface of the package.	Dose rate does not exceed 500µSv/hr at any location on the external surface of the package and the transport index does not exceed 1.	Dose rate does not exceed 2 mSv/hr at any location on the external surface of the package and the transport index does not exceed 10.

Transport Index

The transport index for a package is the maximum radiation dose rate in microsieverts per hour at one meter from the external surface of the package, divided by 10 (TI < 0.05 = 0).



Typical Type A Packages with Prescribed Safety Markings

Accidental release
Is defined as the accidental release of nuclear substances and radiation devices resulting in following levels of radiation levels:

a) Greater than 2 mSv/hour on the external surface of a package
b) Greater than 0.1 mSv/hour at a distance of 1m from the package.

4.0 Responsibilities

Everyone handling radioactive shipments (consignor, carrier and consignee) have the following responsibilities to implement an appropriate radiation safety program in accordance with relevant Canadian Nuclear Safety Commission (CNSC) and Transport of Dangerous Goods (TDG) regulations, including:

a) Optimization of occupational and public radiation dose.
b) Management control of work practice.
c) Worker training and certification.
d) Appropriate record keeping.
e) The legal duty to report lost, stolen damaged and leaking shipments of radioactive material when such events occur.

4.1 Permit Holder responsibilities:

a) Ensure that all packages of nuclear substances and radiation devices ordered on their permit are received in accordance with this procedure.
b) Ensure that all receivers are trained as outlined in this procedure.
c) Report all incidents to the Radiation Safety Officer as outlined in this procedure.

4.2 Consignor (shipper) responsibilities:

a) All shipments containing radioactive materials must be prepared in consultation with Memorial's Radiation Safety Officer, 864-8250
b) Act in accordance with CNSC and TDG regulations
c) Ensure that the intended recipient has a valid license authorizing the possession of the nuclear substances and radiation devices being transported.
d) Advise the consignee that the nuclear substances and radiation devices will be transported.
e) Ensure that the packaging material meets the CNSC requirements.
f) Fulfill all packing requirements.
g) Ensure that all package closures are correctly closed.
h) Ensure that any non-fixed radioactivity on the exterior surface of the package is less than 4 Bq/cm^2 (0.4 Bq/cm^2 for alpha emitters) when averaged over any area of 300 cm^2 of any part of the surface.
i) Correctly apply all necessary safety marks to the package.
j) Supply the carrier with <u>two</u> copies of the necessary <u>shipping documentation</u> (see Appendix for instructions on completing the shipping document).
k) Provide a telephone number at which the shipper could be reached for information regarding damaged or defective packages.
l) Retain a copy of shipping document for at least two years (forward one copy to the RSO.
m) Not to send radioactive packages in the regular mail.
n) Maintain all required transfer documentation (and forward copies to the RSO):
    a. name, quantity and form of the nuclear substance
    b. model and serial number of each sealed source, if applicable
    c. radiation device model and serial number, if applicable
    d. activity associated with the radiation device, if applicable
    e. date of transfer or disposal
    f. recipient's name, address and CNSC license number
    g. name and address of the destination
    h. verification of safe arrival

4.3 Carrier Responsibilities:

a) Only accept radioactive consignments properly packaged with appropriate documentation.
b) Never load nuclear substances and radiation devices into a compartment reserved for passengers.
d) Transport the material in accordance with the consignor's instructions.
e) Transport the shipment in a safe and secure manner.
f) Properly display and comply with all required package safety marks.
g) Display "radioactive" vehicle placards when appropriate.
h) Ensure that all relevant shipping documents accompany the consignment.
i) Pass copies of shipping documents to succeeding carriers or to consignee taking delivery of the shipment.
j) Notify the consignor, consignee and the CNSC if a consignment cannot be delivered to the consignee, and place the consignment in a secure location until it can be delivered to the consignor or consignee.
k) Retain a copy of the shipping document for two years.

4.4 Consignee (recipient) Responsibilities:

a) Take appropriate reporting action when the radioactive package is discovered to be lost or stolen during transit.

b) Upon receipt, first examine the transport documents and package labeling.
c) Before opening and while opening the package, visually examine it for evidence of tampering, damage and/or leaking of contents.
d) Perform required dose survey and leak test on external and internal package walls. Enter data into "package check-in" section of HSMS.
e) Take appropriate radiation safety measures (see below) when a radioactive package that has been delivered shows evidence of tampering, damage or loss of containment.
f) Retain a copy of the shipment document until at least one (1) year after expiry of the current CNSC license.

The Radiation Safety Officer provides TDG training as an integral part of the mandatory radiation safety training available to all authorized nuclear substance users. However, this training is limited to the receipt, un-packaging and documentation of Class 7 radioactive "dangerous goods". Those who wish to consign or ship nuclear substances and/or radiation devices back to the original consignor or to a third party are required to have further training. Please contact the Radiation Safety Officer for assistance or additional training.

5.0 Procedure

5.1 Receiving Radioactive Shipments

a) Type A packages containing nuclear substances shall only be opened by workers trained in TDG Class 7 (This certification not required (but is recommended) for individuals who receive excepted packages)

b) Packages containing nuclear substances and/or radiation devices shall never be left unsecured.

c) Upon receipt, unopened packages of nuclear substances and/or radiation devices shall be promptly delivered to the recipient by placing them on a cart or other device to increase the distance between people and the package in order to minimize radiation exposure.

d) Shipments of nuclear substances and/or radiation devices shall only be received by persons that have been certified as having received training in receiving Class 7 (Nuclear substances and radiation devices). Non-certified personnel may receive packages of nuclear substances and radiation devices that are shipped as "Excepted Packages".

5.1.2 Opening Radioactive Shipments

a) Assume the package may be contaminated until you have proven otherwise. Unpack urgently and carefully.

b) Check the package to confirm it is addressed to you. Take your gloves off. Sign for the package as required by the courier.

c) Wear a lab coat and disposable gloves while handling the package. Place the package in a fume hood if receiving potentially volatile materials (NaI or S-35 labeled proteins). If the materials are not potentially volatile open packages behind appropriate shielding.

d) Verify if packing slip on exterior corresponds with your order.

e) Check the exterior of the package for possible damage or leakage (if damaged, report to RSO).

    a. Monitor the radiation fields around the package, compare with the units stated on the package labels (Type A package); or for an excepted package verify that the

radiation field is **below 5 uSv/hr**. A Survey Meter that is appropriately calibrated to measure dose is available from the Environmental Health and Safety (EHS). Enter results into the "package check-in" section of HSMS.

b. Perform wipe testing to monitor for radioactive contamination on the exterior surface of the package.

c. When there is evidence of leakage caused by accidental release take immediate steps to limit the spread of any nuclear substances and radiation devices and isolate the package. Place signs at every port of entry to the affected area/fume hood. Monitor your hands and clothing for radioactive contamination.

d. Contact the RSO and report the leakage. Radiation safety personnel will also assist you in radiation field measurements if necessary.

f) If the external wipe confirms contamination is less than 0.5 Bq/cm^2 open the outer package and check for possible damage to the contents as apparent by broken seals or by discoloration of packing materials. Wipe test the interior packaging to ensure it is less than 0.5 Bq/cm^2. Enter results into the "package check-in" section of HSMS.

a) If contamination is detected, monitor all packaging and if appropriate, all areas coming into contact with the package for further evidence of contamination.

b) Contain the contamination, decontaminate and dispose in accordance with the conditions of the CNSC radioisotope license. Contact RSO and report the incident along with your measurements.

g) Remove the inner vial or primary container. Avoid unnecessary direct contact with unshielded containers.

h) Verify the radioisotope, the activity, and other details on the primary container with the information on the packing slip and your copy of the purchase order. Log the pertinent data in your HSMS inventory.

i) If the packaging is free of contamination, remove or deface all radiation warning symbols or text before discarding into trash.

j) Report any anomalies (radiation levels in excess of the package labeling, incorrect transport index, contamination, leakage, short or wrong shipment) immediately to your supervisor and to the RSO (864-8250).

5.1.3 Reporting Requirements

a. In case of accidental release, a preliminary **verbal** report to the CNSC and Provincial environmental authorities, as well as the consignor or vendor is required as soon as possible. Contact the RSO to initiate the process.

b. Within 21 days, the consignor, carrier and consignee shall submit a full **written** "Dangerous Occurrence" report to the CNSC. Radiation Safety Office personnel will assist you in preparing and filing the report.

c. A Dangerous Occurrence report shall also be filed if the radioactive package is lost or stolen during the shipping process. Normally, this would be the responsibility of the vendor.

Appendix: Transportation of Dangerous Goods shipping document: instructions

Transport via Ground

1. Provide the complete printed name and address for the consignor (sender) and consignee (recipient). Include the institution name if applicable.
2. Include the number of packages included in the shipment.
3. List the specific UN number, shipping name and UN class, in this order (from TDG regulations schedule). Include the Transport Index.
    i. NOTE: if shipping special form radioactive materials, please reference the special form certificate number
4. Provide the mass (kg) of the package
5. Enter the carrier name (e.g. Purolator, FedEx) and any special instructions.
6. Provide you telephone number, the date for shipment and sign the document.

Memorial University of Newfoundland
St. John's, NL A1C 5S7

Shipper's Declaration of Dangerous Goods - Road

Consignor: 1		**Consignee:** 1
Carrier: 5		**Special Instructions:** 5
No. of Packages	**Description of Articles**	**Weight or Volume of Package**
2	3	4

Consignor's Certification:

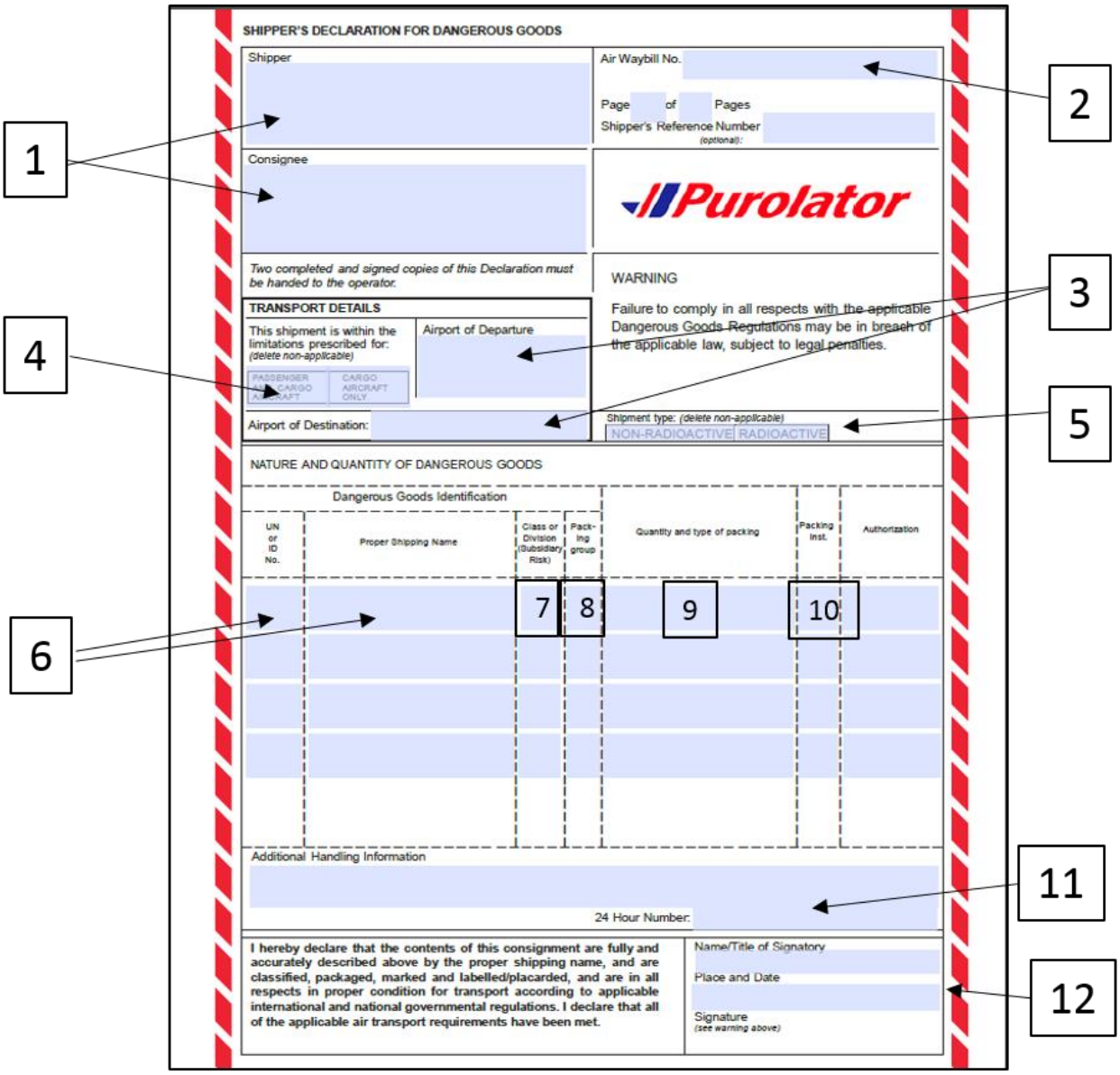
"I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, are properly classified and packaged, have dangerous goods safety marks properly affixed or displayed on them, and are in all respects in proper condition for transport according to the Transportation of Dangerous Goods Regulations."

Emergency Response Telephone Number(s): **CANUTEC: (613) 996-6666**	**Shipper's Signature:**
Memorial University Radiation/Biosafety Control Officer: (709) 864-8250	**Telephone:**
Memorial University Campus Enforcement & Patrol: (709) 864-4100	**Date of Shipment:**

6

Transport via Air

1. Provide the complete printed name and address for the consignor (sender) and consignee (recipient). Include the institution name if applicable.
2. Provide the associated Air waybill number.
3. Provide airport codes for the airport of departure AND destination
4. Strikethrough the type of aircraft not applicable for the shipment.
5. Strikethrough “non-radioactive” to indicate that it is a radioactive shipment.
6. Provide the specific UN number and shipping name, in this order (from the TDG regulations schedule). Include the Transport Index.
    i. NOTE: if shipping special form radioactive materials, please reference the special form certificate number
7. Provide the TDG class and division, if applicable.
8. Provide the TDG packing group, if applicable.
9. Identify the quantity of the radioactive substance being shipped as well as the type of package.
10. Include any packing instructions, if applicable
11. Provide the CANUTEC contact number 1 (613) 996-6666
12. Provide the consignor’s name, place and date and signature
    NOTE: must be printed in color


SHIPPER'S DECLARATION FOR DANGEROUS GOODS
Shipper
Air Waybill No.
Page of Pages
Shipper's Reference Number (optional):
Consignee
Purolator
Two completed and signed copies of this Declaration must be handed to the operator.
WARNING
Failure to comply in all respects with the applicable Dangerous Goods Regulations may be in breach of the applicable law, subject to legal penalties.
TRANSPORT DETAILS
This shipment is within the limitations prescribed for: (delete non-applicable)
PASSENGER AND CARGO AIRCRAFT
CARGO AIRCRAFT ONLY
Airport of Departure
Airport of Destination:
Shipment type: (delete non-applicable)
NON-RADIOACTIVE
RADIOACTIVE
NATURE AND QUANTITY OF DANGEROUS GOODS
Dangerous Goods Identification
UN or ID No.
Proper Shipping Name
Class or Division (Subsidiary Risk)
Packing group
Quantity and type of packing
Packing Inst.
Authorization
7
8
9
10
Additional Handling Information
24 Hour Number:
I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labelled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations. I declare that all of the applicable air transport requirements have been met.
Name/Title of Signatory
Place and Date
Signature
(see warning above)
1
2
3
4
5
6
11
12