1.0 Purpose

To ensure that all shipments of Open Source radioactive material are received and transported from the University in compliance with appropriate regulations and in a manner to minimize exposures to personnel and the environment.

2.0 Policy

All shipments of Open Source radioactive materials to and from The University of Manitoba shall be handled as detailed in this procedure to ensure compliance with the appropriate regulations and in a manner to minimize exposures to personnel and the environment.

3.0 Definitions

**Consignor:** The shipper of the shipment

**Consignee:** The recipient of the shipment

**EHSO:** The University of Manitoba Environmental Health and Safety Office [added April 17, 2012]

**IAEA:** International Atomic Energy Agency [added April 17, 2012]

**TDG:** Transportation of Dangerous Goods [added April 17, 2012]

**TDG Certification:** TDG certification is mandatory for anyone receiving and un-packaging packages containing radioactive materials (Dangerous goods Class 7) other than Excepted Packages. The certification expires after 3 years and must be renewed.

**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 radioactive materials transport. An “excepted” package is characterized by the following:
a) Package can contain up to certain limited amount of radioactivity specified by IAEA regulation. Most common isotopes used at the University are listed in Table 1 (on page 9). (Approved by RPCtee December 1, 2011). Contact the EHSO for more information.

b) A properly sealed sturdy cardboard carton that is capable of retaining its contents under normal conditions of transport. [revised February 29, 2012]

c) No external radiation warning signs on the carton.

d) No special dangerous goods documentation required.

e) Shipping document must include the statement “Radioactive Material, Excepted Package” and the letters “UN” followed by the UN number. [revised February 29, 2012]. Some useful UN numbers are listed in 5.2.1.

f) Surface dose rate on the shipping package is less than 5uSv/hour.

g) External surface contamination is less than 4Bq/cm\(^2\) averaged over 300cm\(^2\). (Replaced 0.4Bq/cm\(^2\) approved by RSCtee November 5, 2008).

h) Radiation level at 10 cm from any point on the external surface of article (after un-packaging does not exceed 0.1 mSv/hour).

i) The exterior of the package is legibly and durably identified with the consignor, or consignee, or both. The only marking on the exterior of the package that identifies the nature of the contents shall be the 4 digit UN number, prefaced by the letters UN. [revised February 29, 2012]

j) The safety mark “Radioactive” must be visible on opening the package.

Type A package as specified by IAEA regulation:

a) Package may contain up to 10 000 times the maximum amount of radioactivity permitted in an excepted package.

b) Surface contamination level is less than 4Bq/cm\(^2\)

c) Packages are specially designed to withstand typical accident conditions and prototypes have successfully passed prescribed tests to demonstrate physical integrity.

d) The smallest overall external dimension of the package shall not be less than 10cm.

e) Must be properly labelled with radiation warning signs and other information on the outside of the package.
f) Type A packages have higher permissible external dose rates/Transport Index and are differentiated accordingly.

**IDENTIFYING TYPE A RADIOACTIVE PACKAGES**

**Category I – White**

Dose rate does not exceed 5µSv/hr at any location on the external surface of the package.

**Category II-Yellow**

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.

**Category III-Yellow**

Dose rate does not exceed 2mSv/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 metre from the external surface of the package, divided by 10.

**Typical Type A Package with Prescribed Safety Markings** (replaced picture, approved by Nov 5, 2008)
Accidental release: Is defined as the accidental release of radioactive material 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, and
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 radioactive material 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 Environmental Health and Safety Office (EHSO) as outlined in this procedure.

4.2 Consignor (shipper) responsibilities:
a) Act in accordance with CNSC and TDG regulations
b) Ensure that the intended recipient has a valid licence authorizing the possession of the radioactive material being transported.
c) Advise the consignee that the radioactive material will be transported.
d) Ensure that the packaging material meets the CNSC requirements.
e) Fulfill all packing requirements.
f) Ensure that all package closures are correctly closed.
4.3 Carrier Responsibilities

a) Only accept radioactive consignments properly packaged with appropriate documentation.
b) Never load radioactive materials into a compartment reserved for passengers.
c) Transport the material in accordance with the consignor’s instructions.
d) Transport the shipment in a safe and secure manner.
e) Properly display and comply with all required package safety marks.
f) Display “radioactive” vehicle placards when appropriate.
g) Ensure that all relevant shipping documents accompany the consignment.
h) Copies of shipping documents are passed to succeeding carriers or to consignee taking delivery of the shipment.
i) If a consignment cannot be delivered to the consignee, notify the consignor, consignee and the CNSC and place the consignment in a secure location until it can be delivered to the consignor or consignee.
j) 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 labelling.
c) Before opening and while opening the package, visually examine it for evidence of tampering, damage and/or leaking of contents.
d) Take appropriate radiation safety measures (see below) when a radioactive package that has been delivered shows evidence of tampering, damage or loss of containment.
e) Effective November 30, 2012 — retain a copy of the shipment document for eight years (was: two years).
The TDG training provided by EHSO as an integral part of the Radiation Safety Workshop is limited to the receipt, un-packaging and documentation of Class 7 radioactive “dangerous goods”. Those who wish to consign or ship radioactive material back to the original consignor or to a third party are required to have further training. Please contact the Environmental Health and Safety Office for assistance or additional training.

5.0 Procedure

5.1 Receiving Radioactive Shipments:
   a) Packages of Radioactive Material shall never be left insecure.
   b) Upon receipt, unopened packages of radioactive material should 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.
   c) Shipments of radioactive materials may only be received by persons that have been certified as having received training in receiving Class 7 (Radioactive Materials). Non-certified personnel may receive packages of radioactive materials that are shipped as “Excepted Packages”.

5.1.2 Opening Radioactive Shipments:
   1. Assume the package may be contaminated until you have proven otherwise. Unpack urgently.
   2. Check the package to confirm it is addressed to you. Take your gloves off. Sign for it as required by the courier.
   3. 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.
   4. Check the exterior of the package for possible damage or leakage. If no damage is apparent, proceed to step 5. If damage or leakage is obvious:
      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 5uSv/hour. A Survey Meter that is appropriately
calibrated to measure dose is available from EHSO and after normal business hours may be accessed by contacting Security Services.

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

c. When there is evidence of leakage caused by accidental release take immediate steps to limit the spread of any radioactive material and isolate the package.

d. Place signs at every port of entry to the affected area/fume hood. Monitor your hands and clothing for radioactive contamination.

e. Contact Radiation Safety Officer and report the leakage. Radiation safety personnel will also assist you in radiation field measurements if necessary.

5. Verify if packing slip on exterior corresponds with your order.

6. 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/cm² or 300 DPM on wipe.

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 licence. Contact Radiation Safety Officer and report the incident along with your measurements.

7. Remove the inner vial or primary container. Avoid unnecessary direct contact with unshielded containers. Wipe test the primary container. Write the results on the provided Radioisotope Inventory Form.

8. 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 Radioisotope Inventory Form.

9. If the packaging is free of contamination, remove or deface all radiation warning symbols or text before discarding into trash.
10. Report any anomalies (radiation levels in excess of the package labelling, incorrect transport index, contamination, leakage, short or wrong shipment) immediately to the project supervisor and to Radiation Safety (789-3613 or 789-3654).

5.1.3 Reporting Requirements:

a) In case of accidental release, preliminary **verbal** report to the Canadian Nuclear Safety Commission and Manitoba Department of Environment as well as the consignor or vendor must be made **immediately**.

b) **Within 21 days**, the consignor, carrier and consignee must submit a full **written** “Dangerous Occurrence” report to the CNSC and Transport Canada. It is preferable to the federal agencies if it is filed as a joint report. Radiation Safety personnel will assist you in preparing and filing the report.

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

5.2. Preparing radioactive packages for shipment [here to end added Nov 15, 2011]

*Only a TDG certified personnel can prepare for shipment and/or ship Type A packages.*

*This section will apply for Excepted packages only. To ship Type A packages, EHSO must be consulted.* [double underline revised April 17, 2012]

*Definition of Excepted Package, the package design and labeling is outlined in section 3.0*

5.2.1. Shipping Documents for Excepted Packages

1. **Electronic Waybills** should bear only the appropriate 6-character alphanumeric **United Nations (UN) code** (below), or

2. **Paper shipping documents** should bear the appropriate UN code number, as well as text bearing the words “**Radioactive Material – Excepted Package**”,
3. No other special documentation is required.

Table 1. Radioactivity Limits for Excepted Packages

<table>
<thead>
<tr>
<th>Radionuclides</th>
<th>IAEA ST-1 (2005)</th>
<th>CNSC Amended PTNSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Activity Limit (GBq)</td>
<td>Excepted Package (LIQUIDS, from IAEA Table 3)</td>
</tr>
<tr>
<td>Calcium-45</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Carbon-14</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Chromium-51</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Cobalt-57</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fluorine-18</td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Hydrogen-3 (Tritium)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Iodine-125</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Iodine-131</td>
<td>0.07</td>
<td></td>
</tr>
<tr>
<td>Phosphorus-32</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Phosphorus-33</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Sodium-22</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Sulphur-35</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Technetium-99m</td>
<td>0.4</td>
<td></td>
</tr>
</tbody>
</table>
### Example of Shipping Document

<table>
<thead>
<tr>
<th>Consignor: (shipper’s name and address)</th>
<th>Consignee: (recipient’s name and address)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carrier:</th>
<th>Shipping document#: (any number helping to track the shipment)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of packages</th>
<th>Description of Articles</th>
<th>Weight or Volume of Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RADIOACTIVE MATERIAL - Excepted Package, limited quantity of material, UN 2910</td>
<td>kg</td>
</tr>
</tbody>
</table>

**Special Handling:** No special handling required.

**24 hour Emergency Response Telephone Numbers:** (204) 474 9341

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**Consignors Declaration:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled/placarded, and are in all respects in the proper condition for transport by road according to the applicable international and national governmental regulations.

**Name:**

**Signature:**

(approved by RPCttee December 1, 2011)