

Radioactive Materials: Procurement and Shipping

Purpose

This document describes the requirements and the procedures for procuring and shipping radioactive materials as well as handling radioactive packages, in order to comply with the terms of the Provincial Health Services Authority (PHSA) Canadian Nuclear Safety Commission Licenses.

Site Applicability

This procedure is applicable to all staff involved in procuring, shipping and receiving packages containing radioactive materials within Lower Mainland Medical Imaging (LMMI) across Fraser Health (FH), Providence Health Care (PHC), Provincial Health Services Authority (PHSA), and Vancouver Coastal Health (VCH).

Practice Level

MI Staff: Nuclear Medicine Technologists.

Requirements

Overall Responsibilities

Regional RSOs have the overall responsibility to define the rules for procurement and shipping of radioactive materials in NM Departments in compliance with the PHSA CNSC Licenses and all applicable regulations.

Specific Responsibilities

All employees involved in the procurement and shipping of radioactive materials must be familiar with and follow this procedure. TDG training (offered on Learning Hub) must also be completed. Upon completion, Site RSOs must issue a *TDG training certificate card*. See [Training and Certification of workers](#) for details.

All records and procedures must be available for inspection upon the request of the CNSC.

Need to Know

The CNSC regulates the use of radioactive material in Canada. A licence from the CNSC is required in order to receive, handle, or ship quantities of radioactivity in excess of the Nuclear Substances and Radiation Devices (NSRDR) definition of an exemption quantity. All radioactive materials used in Nuclear Medicine (NM) Departments are regulated by the terms and conditions stipulated in the PHSA CNSC Licences that require compliance with the *Packaging and Transport of Nuclear Substances Regulations, 2015*, and the Transport Canada's Transportation of Dangerous Goods Regulations (TDGR).

Procedure

To ensure the security of the material and the safety of workers and the public, only trained and authorized workers should open packages containing nuclear substances and radiation device.

1. Receiving Radioactive Materials

Procurement of radioactive materials must comply with the regulatory requirements. All employees acquiring radioactive materials should ensure that the site is licensed to possess and where applicable, to import any radioactive material intended to be brought onto the site. They should also ensure that the acquired isotope does not exceed the license limit for that isotope.

The process of receiving radioactive materials is described in Appendix A: [Receiving Radioactive Materials](#).

2. Shipping Radioactive Materials

All radioactive materials shipped from a NM Department site must be shipped in compliance with PHSA CNSC Licences. When shipping radioactive materials to a different institution, it is necessary for the consignor to obtain a copy of that institution's or individual's radioisotope licence – failure to do so can jeopardize the status of the PHSA CNSC Licences. In addition, exporting radioactive materials outside of Canada must comply with the PHSA CNSC Licences.

The process of shipping radioactive materials is described in Appendix C: [Packaging and Shipping Radioactive Materials](#)

Once the package has been shipped:

- Notify the consignee that the a radioactive package has been shipped
- Ask the consignee to confirm when they receive the package

3. Transferring Sealed Sources to another Licensee

When transferring a sealed source to a different licensee, it is necessary for the consignor to obtain a copy of that consignee's CNSC licence (or equivalent). The consignor must fill out the form: [Transfer of sealed sources to a different licensee](#), both consignor and consignee must sign the form when the transfer is completed.

4. Radioactive Materials: Inter-facility Transport using a Personal Vehicle

NM technologists may be required to transport radioactive packages using a personal vehicle. NM technologists transporting radioactive packages must ensure that they maintain current Transportation of Dangerous Goods (TDG) certification, valid driver's license and valid vehicle insurance.

The process for transporting radioactive packages using a personal vehicle is described in the procedure: [Radioactive Materials: Inter-facility Transport using a Personal Vehicle](#)

5. Retain Shipping Document Information

According to TDG Regulations:

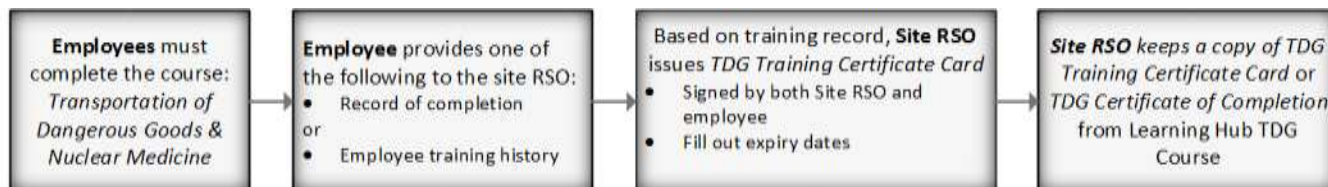
A consignor must be able to produce a copy of any shipping document

- for two years after the date the shipping document or an electronic copy of it was prepared or given to a carrier by the consignor;
- for dangerous goods imported into Canada, for two years after the date the consignor ensured that the carrier, on entry into Canada, had a shipping document or an electronic copy of one; and
- within 15 days after the day on which the consignor receives a written request from an inspector.


6. Training and Certification of Workers

According to TDG Regulation, a person who handles, offers for transport or transports dangerous goods must be adequately trained and hold a training certificate. All such employees must complete the course: *Transportation of Dangerous Goods & Nuclear Medicine* available on the Learning Hub. All employees should provide their record of completion to the site RSO in order to receive their official [TDG Training Certificate Card](#).

The training and certification process is summarized below:



Site RSO must issue a *TDG Training Certificate Card* that must be signed by both employer and employee. The Air TDG Training expires 24 months after its date of issuance, while the TDG Road Training expires 36 months after its date of issuance.

	
Vancouver Coastal Health, 601 W. Broadway, Vancouver, BC, V5Z 4C2	
TRAINING CERTIFICATE TRANSPORTATION OF DANGEROUS GOODS	
Employee: (Name)	_____
Employee: (Signature)	_____
Employer: (Title)	<u>Radiation Safety Officer or Designate</u>
Employer: (Signature)	_____
The holder of this certificate has completed adequate training, according to the requirements of the Canadian Transportation of Dangerous Goods Act (1992) and Part 6 of the Regulations. Training Topics: Classification, Shipping names, Documentation, Safety Marks, Packaging Requirements, Means of Containment, Emergency Procedures, Accidental Release Report Requirements, Safety equipment use and utilization, and TDG Variations to ICAO. Valid for transport via: <input type="checkbox"/> Air Training Date: _____ Expires On: _____ <input type="checkbox"/> Road Training Date: _____ Expires On: _____ Class 6.2: Infectious Substances, Class 7: Radioactive Materials	

In the case of an inspection:

- All trained employees who handle, offer for transport or transport dangerous goods must be able to produce their *TDG Training Certificate Card*, or a copy of it, to an inspector immediately on request
- Site RSOs must be able to provide a copy of the following:
 - Each employee's *TDG Training Certificate Card* or *TDG Certificate of Completion* from the Learning Hub TDG Course
 - employee's training record of completion or employee training history
 - Records above must be retained for two years following the date of expiring

7. Type A Package Records

For all Type A packages used for transporting radioactive materials, keep the following records:

- Technical specification of its design
- the type, quantity and physical state of the radioactive material that it is designed to contain
- any document that demonstrates that the package meets the requirements of the PTNS Regulations

8. Dangerous Occurrences

In case of any dangerous occurrences as described in PTNS Regulations-Section 36 when shipping or opening a package, the Site RSO shall immediately report the incident to the Regional Radiation Safety Officer, who in turn will immediately report to the CNSC and file a full report with the commission within 21 days. The report shall be consistent with the requirements of the PTNS Regulations.

Related Documents

[Nuclear Medicine Radiation Safety Manual](#)

[Nuclear medicine Emergency Responders Manual](#)

[Radioactive Materials: Inter-facility Transport using a Personal Vehicle](#)

[Shipper's Declaration of Dangerous Goods by Road fillable](#)

[Shipping Document for Excepted package and/or Blood Sample fillable UN 2908](#)

[Shipping Document for Excepted package and/or Blood Samples fillable UN 2910](#)

[Transfer of sealed sources to a different licensee fillable](#)

Radioactive Package Receipt and Monitoring Log

References

[Nuclear Substance and Radiation Devices Regulations](#)

[Nuclear Substances and Radiation Devices, Licence Application Guide, REGDOC-1.6.1](#)

[IAEA Regulations for the safe transport of radioactive material](#)

Appendices

- [Appendix A: Receiving Radioactive Materials](#)
- [Appendix B: Radioactive Package Receipt and Monitoring Log](#)
- [Appendix C: Packaging and Shipping Radioactive Materials](#)
- [Appendix D: Determine Shipping Category and Container](#)
- [Appendix E: Guidelines for Shipping Blood Samples](#)

Appendix A: Receiving Radioactive Materials

Procedure for Receiving Packages:

1. Ensure the site has a CNSC licence to possess the radioactive material being received.
2. Confirm that the shipping documents are included with the package (ex: Bill of lading, Shipper's declaration of dangerous goods). If no documents are available, contact the carrier/shipper.
3. Verify that the shipping documents match the package labels.
4. Wear protective clothing, including disposable gloves while handling the package.
5. Ensure the package is intact and undamaged. If damage is present, isolate the package and follow [Procedure for Handling Damaged Packages](#).
6. If the material is volatile or in a powder form, open the package in a fume hood.
7. Using a survey meter, measure the maximum dose rate ($\mu\text{Sv/h}$) on the external surface of the package
8. For Type A packages: Using a survey meter, measure the maximum dose rate ($\mu\text{Sv/h}$) at 1 m from the external surface of the package then, verify the transport index. Transport index = dose rate at 1 m in $\mu\text{Sv/h}$ divided by 10
9. Confirm that radiation levels comply with the package labeling:

UN 2910 Radioactive Material, Excepted Package, limited quantity of material

Excepted Package

Does not exceed $5 \mu\text{Sv/h}$ at any location on the external

UN 2915 Radioactive Material, Type A Package



Category I-WHITE
Does not exceed $5 \mu\text{Sv/h}$ at any location on the external surface of the package



Category II-YELLOW
Does not exceed $500 \mu\text{Sv/h}$ at any location on the external surface of the package and the transport index does not exceed 1



Category III-YELLOW
Does not exceed 2 mSv/h at any location on the external surface of the package and the transport index does not exceed 10

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Appendix A: Receiving Radioactive Materials (cont'd)

10. Wipe all six sides of the external surface of the package (approx 50cm² for each side, 300cm² in total)
11. Record measurements and package details on the [Radioactive Package Receipt and Monitoring Log](#) available (NMIS log is acceptable). If wipe test results exceed the trigger limit, inform Site RSO.
12. Open the package and follow site procedures for adding into inventory.
13. Report any anomalies or dangerous occurrences to the Site RSO.

Procedure for Handling Damaged Packages

1. Open the outer package and check for possible damage to the contents, broken seals, or discoloration of packing materials. If the contents appear to be damaged, isolate the package to prevent further contamination and notify the Site Radiation Safety Officer.
2. If no damage is evident, wipe test the inner package or primary container which holds the unsealed nuclear substance. If contamination is detected, monitor all packaging and, if appropriate, all locations in contact with the package, for contamination. Contain the contamination, decontaminate, and dispose in accordance with the conditions of the Nuclear Substances and Radiation Devices licence.

Appendix B: Radioactive Package Receipt and Monitoring Log

Date Received	Supplier	Damage/Leak (Yes/No)		Type of Package	Activity	Dose rate on the external surface (μSv/h)	Dose rate 1m from the container (μSv/h)	Measured TI	Pckg TI	Radiation levels comply with type of pkg (yes/no)	Wipe counts (outside)	Notes	Checked by
		Yes	No	Excepted									
				I-W II-Y III-Y									
		Yes	No	Excepted									
				I-W II-Y III-Y									
		Yes	No	Excepted									
				I-W II-Y III-Y									
		Yes	No	Excepted									
				I-W II-Y III-Y									
		Yes	No	Excepted									
				I-W II-Y III-Y									
				I-W II-Y III-Y									
				I-W II-Y III-Y									

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Appendix C: Packaging and Shipping Radioactive Materials

1. Determine the shipping category and container

See **Appendix D: [Determine Shipping Category and Container](#)** and **Table 1** to determine the shipping category and container.

Table 1

Isotope	Exempt consignment limit MBq	Excepted package-Liquids limit ($10^{-4}A_2$) MBq	Excepted package – Solids limit ($10^{-3}A_2$) MBq	A2 - Type A limit MBq
Co-57	1	1,000	10,000	10,000,000
Cs-137	0.01	60	600	600,000
Ga-67	1	300	3,000	3,000,000
I-123	10	300	3,000	3,000,000
I-125	1	300	3,000	3,000,000
I-131	1	70	700	700,000
In-111	1	300	3,000	3,000,000
Mo-99	1	60	600	600,000
Ra-223	0.1	40	400	400,000
Tc-99m	10	400	4,000	4,000,000
Y-90	0.1	30	300	300,000

2. Requirements for consignee and carriers

- Ensure the consignee has a CNSC license to possess the radioactive material being shipped.
- Ensure that the carrier can accept radioactive dangerous goods.
- Inform the carrier that the package contains radioactive materials.

3. Packaging

3.1 Packaging an Exempt Consignment

Package the activity in any suitable package¹. No special labeling or marking is required.

3.2 Packaging an Excepted Package

- Place activity in any suitable package. Secure the contents to minimize movement during transport.
- UN2908 only: Wipe the internal surface of the package and ensure that removable contamination does not exceed 100 times the trigger limit for the isotope to be shipped. The trigger limits can be found in the QC Report for your site specific equipment. Record the wipe test results in the [Shipping Document for Excepted Package and/or Blood samples](#).

¹ Suitable package - any package that will accommodate the weight and the volume of the material being shipped and that will keep its integrity during transport

Appendix C: Packaging and Shipping Radioactive Materials (cont'd)

- UN2910 only: Place "RADIOACTIVE" label inside the package so it is visible upon opening.
- Close the package. Measure the maximum dose rate on the external surface of the package to ensure it is less than 5 $\mu\text{Sv/h}$. If the dose rate exceeds 5 $\mu\text{Sv/h}$, use shielding to ensure the dose rate is less than 5 $\mu\text{Sv/h}$.
- Seal the package and wipe all six sides of the external surface of the package (approx 50cm² for each side, 300cm² in total). Ensure that removable contamination does not exceed the trigger limit for the isotope to be shipped. Record the wipe test results in the [Shipping Document for Excepted Package and/or Blood samples](#).
- Label the package with the consignee and consignor address, UN Number and Proper Shipping Name.
- When shipping biological specimens label the package: Exempt Human Specimen.
- Complete the [Shipping Document for Excepted Package and/or Blood samples](#). If the carrier requires a separate Bill Of Lading/Air Waybill/Waybill² include the UN Number and Proper Shipping Name in the Description Section.

3.3 Packaging a Type A Package

- Place the radioactive material in a Type A Package. Secure the contents to minimize movement during transport.
- Close and seal the package.
- Measure maximum dose rate on the external surface of the package, and from that point, measure the dose rate at 1m to determine the shipping category: I-White, II-Yellow or III-Yellow. Refer to [Appendix D](#) for TI and surface dose rate measurements.
- Wipe all six sides of the external surface of the package (approx 50cm² for each side, 300cm² in total) and ensure that removable contamination does not exceed the trigger limit of the isotope to be shipped. The trigger limits can be found in the QC Report for your site specific equipment. Record the wipe test results in the [Shipper's Declaration for Dangerous Goods by Road](#).
- Label the package with the consignee and consignor address.
- Label the package with the UN Number and Proper Shipping Name: UN 2915, Radioactive Material, Type A Package
- Label two appropriate Class-7 labels with the radioisotope, activity and Transport Index (TI). TI = dose rate at 1m in $\mu\text{Sv/h}$ divided by 10. Reminder: For I-White Package the TI does not apply.

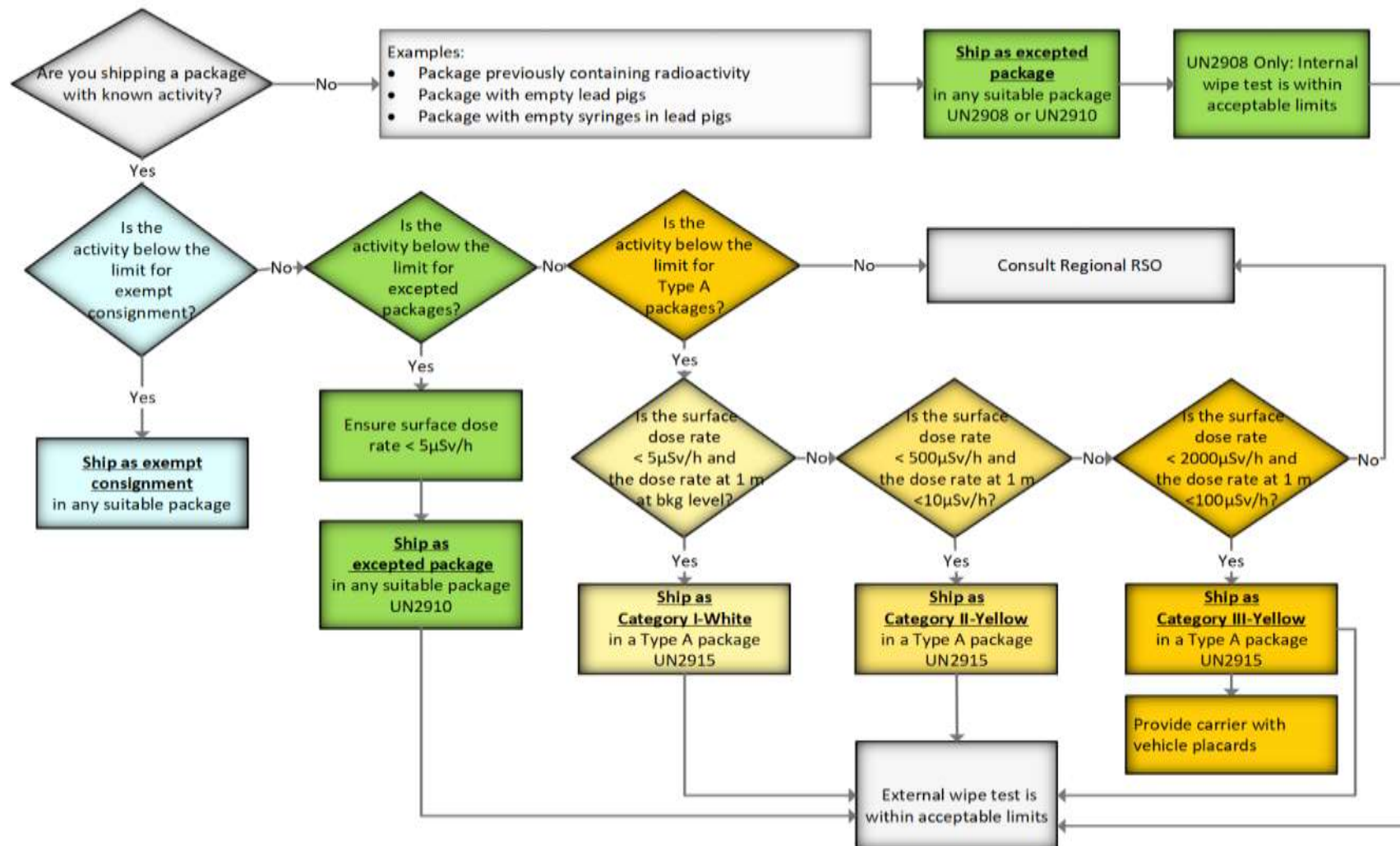


² Bill Of Lading/Air Waybill/Waybill - a shipping document given by the carrier to the consignor to complete

Appendix C: Packaging and Shipping Radioactive Materials (cont'd)

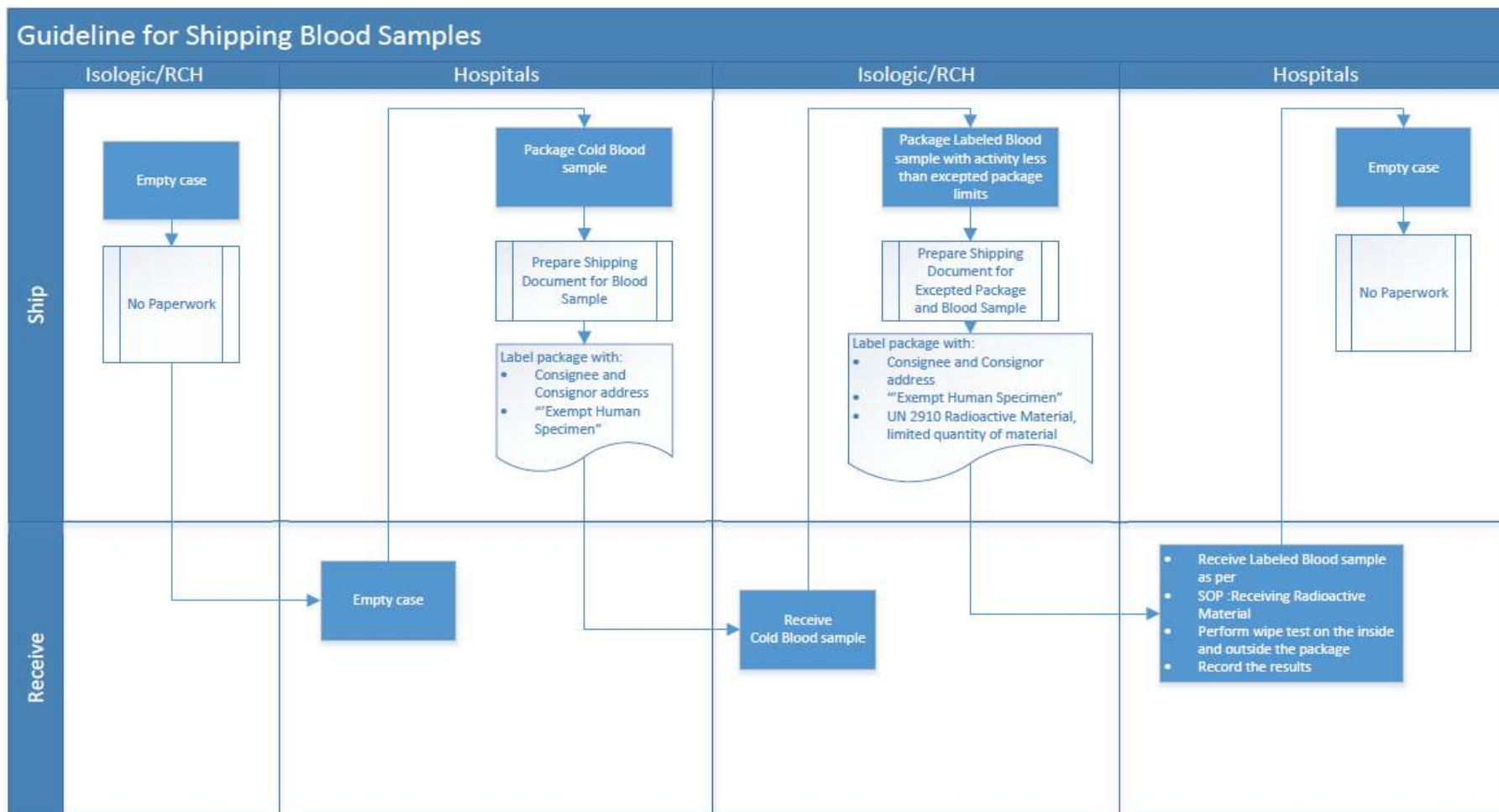
- Place the labels on 2 opposite sides of the package.
- If shipping by road, complete the [Shipper's Declaration for Dangerous Goods by Road](#) (first page goes with the package, first and second page are kept for site records). If the carrier requires a separate Bill Of Lading/Air Waybill/Waybill, include "Dangerous Goods as per attached Shipper's Declaration" in the description section.
- If shipping III-Yellow Radioactive Packages by road, provide carrier with vehicle placards.
- If shipping by air, complete the Shipper's Declaration for Dangerous Goods by Air, printed with a red-hatched border. Ensure the air waybill includes "Dangerous Goods as per attached Shipper's Declaration" in the description section. Contact the Regional Radiation Safety Officer prior to shipping the package.
- Notify the consignee that the radioactive package has been shipped.

APPENDIX D: Determine Shipping Category and Container



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APPENDIX E: Guidelines for Shipping Blood Samples



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	1.0	15-APR-2019	Initial release	Roxana Ralea - RRSO M. Gonzalez – RRSO R. Hollerbaum - RPL Annie Wong - WPH Minh Lu – Site RSO
	2.0	17-NOV-2022	Updated title; Added as appendixes: Appendix A: Receiving Radioactive Materials Appendix B: Radioactive Package Receipt and Monitoring Log Appendix C: Packaging and Shipping Radioactive Materials Appendix D: Determine Shipping Category and Container Included details about wiping all sides of the package; included clarification about I-White Packages (Transport index is not applicable)	Roxana Ralea Erin Dahlen Rhonda Hollerbaum

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