

Guidelines for the packaging and transportation of radioactive materials

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Abstract

This document sets out the packaging and transportation requirements of radioactive materials being transported to laboratories in Canada's National Nuclear Forensics (NF) Laboratory Network, either directly from the scene of a radiological or nuclear (RN) event, from a mobile laboratory, or from one laboratory to another. It has been developed under the Canadian Safety and Security Program (CSSP) as part of the Canadian National Nuclear Forensics Capability Project (CSSP-2012-TI-1119), and provides a summary of the policy and guidance provided by the Canadian Nuclear Safety Commission and Transport Canada.

Significance to defence and security

These guidelines are intended for the National CBRNE Response Team, which is made up of members of both the Royal Canadian Mounted Police and the Canadian Armed Forces' Canadian Joint Incident Response Unit, as well as for laboratories within the National NF Laboratory Network. Following an incident involving the malicious use of RN materials, samples collected by the National CBRNE Response Team may need to be sent to fixed laboratories for further analysis; in such an event, this document will help facilitate the safe and secure transport of such samples.

Résumé

Le présent document énonce les exigences relatives à l'emballage et au transport de matières radioactives qui sont transportées aux laboratoires du Réseau national de laboratoires d'analyse nucléo-légale du Canada, soit directement à partir de l'endroit où a eu lieu un incident radiologique ou nucléaire, à partir d'un laboratoire mobile ou d'un laboratoire à un autre. Il a été rédigé dans le cadre du Projet national sur la capacité d'analyse nucléo-légale du Canada (PCSS-2012-TI-1119) du Programme canadien pour la sûreté et la sécurité (PCSS) et offre un résumé de la politique et des lignes directrices qui proviennent de la Commission canadienne de sûreté nucléaire et de Transports Canada.

Importance pour la défense et la sécurité

Ces lignes directrices ont été rédigées à l'intention de l'équipe nationale d'intervention CBRNE, qui est composée de membres de la Gendarmerie royale du Canada et de l'Unité interarmées d'intervention du Canada des Forces armées canadiennes, ainsi que des laboratoires du Réseau national de laboratoires d'analyse nucléo-légale. À la suite d'un incident mettant en cause l'utilisation malveillante de matières radiologiques ou nucléaires, des échantillons recueillis par l'Équipe nationale d'intervention CBRNE pourraient être envoyés à des laboratoires fixes pour une analyse approfondie; dans une telle situation, le présent document facilitera le transport en toute sécurité de ces échantillons.

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1 Introduction

1.1 Background

These guidelines were developed to set out the packaging and transportation requirements for radioactive materials (typically samples) being transported to laboratories within the National Nuclear Forensics Laboratory Network. They have been developed as part of the Canadian National Nuclear Forensics Capability Project (CSSP-2012-TI-1119), a targeted investment project within the Canadian Safety and Security Program, which is administered by Defence Research and Development Canada's Centre for Security Science.

1.2 Scope

In Canada, there are two federal organizations that regulate the transport of radioactive materials: Transport Canada and the Canadian Nuclear Safety Commission (CNSC). Transport Canada's Transportation of Dangerous Goods (TDG) Regulations [1] promote the safe transport of all nine classes of dangerous goods, while the CNSC's Packaging and Transport of Nuclear Substances Regulations 2015 (PTNS 2015) [2] governs the transport and packaging of radioactive material. Both the TDG and PTNS Regulations apply to all persons who handle, offer for transport, transport or receive nuclear substances.

These guidelines outline the requirements applicable to the packaging and transportation of radioactive materials that are to be transported to labs within the Nuclear Forensics Laboratory Network. As well as providing procedures to ensure the integrity and security of samples and evidence, they also establish safety standards which provide an acceptable level of control of the radiological, thermal, and criticality hazards to persons, property and the environment which may be encountered in the transport of radioactive material. Additional information on packaging requirement for radioactive samples can be found in Reference Document DRDC-RDDC-2016-D021, *Guidelines for the sampling of radiological and nuclear materials*.

2 Terminology

2.1 Definitions

The definitions below are used throughout this document.

Carrier

Any person who, whether or not for hire or reward, has possession of dangerous goods while they are in transport.

Consignee

Any person, organization or government that is entitled to take delivery of a consignment.

Consignment

Any package or packages, or load of radioactive material, presented by a consignor for transport.

Consignor

A person in Canada who

- a. is named in a shipping document as the consignor;
- b. imports or who will import dangerous goods into Canada; or
- c. if paragraphs a. and b. do not apply, has possession of dangerous goods immediately before they are in transport.

Exempt Shipments

A consignment that contains a low amount of radioactivity. The activity is below the limits specified in Paragraph 236 in the IAEA Regulations SSR-6, meets all other regulatory requirements and can transported without special packaging, labelling or documentation. For transportation purposes an exempt consignment is not considered a dangerous good.

Fissile Material

Fissile nuclides shall mean uranium-233, uranium-235, plutonium-239 and plutonium-241.

Fissile material shall mean a material containing any of the fissile nuclides. The following are excluded from this definition:

- a. natural uranium or depleted uranium that has not been irradiated;
- b. natural uranium or depleted uranium that has been irradiated in thermal reactors only;
- c. material with fissile nuclides less than a total of 0.25 g;
- d. any combination of a., b. and/or c.

Nuclear Substance

Nuclear substances include the following:

- a. Deuterium, thorium, uranium or an element with an atomic number greater than 92.
- b. A derivative or compound of deuterium, thorium, uranium or of an element with an atomic number greater than 92.
- c. A radioactive nuclide.
- d. A substance that is prescribed as being capable of releasing nuclear energy or as being required for the production or use of nuclear energy.

- e. A radioactive by-product of the development, production or use of nuclear energy.
- f. A radioactive substance or radioactive thing that was used for the development or production, or in connection with the use, of nuclear energy.

Package

Packaging with its radioactive contents, as presented for transport.

Packaging

One or more receptacles and any other components or materials necessary for the receptacles to perform the containment and other safety functions.

Special Arrangement

Those provisions, approved by the competent authority, under which consignments, that do not satisfy all the applicable requirements of the IAEA SSR-6 Regulations, may be transported.

Specific Activity

Specific activity of a radionuclide shall mean the activity per unit mass of that nuclide. The specific activity of a material shall mean the activity per unit mass of the material in which the radionuclides are essentially uniformly distributed.

Transport Index

Assigned to a package, overpack or freight container, or to unpackaged LSA-I or SCO-I, shall mean a number which is used to provide control over radiation exposure.

2.2 Abbreviations

CNSC	Canadian Nuclear Safety Commission
DFAIT	Department of Foreign Affairs and International Trade
DND	Department of National Defence
ERAP	Emergency Response Assistance Plan
IAEA	International Atomic Energy Agency
IP	Industrial Package
LSA	Low Specific Activity
PTNS	Packaging and Transport of Nuclear Substances Regulations
SCO	Surface Contaminated Object
TDG	Transportation of Dangerous Goods Regulations
TI	Transport Index

3 Summary of requirements

3.1 General

The Canadian Nuclear Safety Commission (CNSC) may act as a resource and direct the network regarding packaging and transportation requirements which may include the Transportation of Dangerous Goods Regulations [1]; IAEA Specific Safety Requirements, Regulations for the Safe Transport of Radioactive Material [3]; and the Packaging and Transport of Nuclear Substances (PTNS) Regulations, 2015 [2].

3.2 Exemptions

The Transportation of Dangerous Goods Act does not apply to “any activity or thing under the sole direction or control of the Minister of National Defence” [4]. Despite this exemption, DND does follow the TDG regulations, although it has its own rules, guidelines, and certification processes, most of which are more stringent than the civilian requirements. There are also exemptions in both the PTNS and TDG regulations that deal with the transport of radioactive material by peace officers. To take advantage of the exemptions, it must be ensured that all the conditions outlined under each exemption are complied with at all times.

3.2.1 Packaging and Transport of Nuclear Substances (PTNS) Regulations, 2015 exemption

The PTNS Regulations, Section 2(2) (p) states that the Regulations, except for Sections 6 and 7, do not apply to the packaging and transport of a nuclear substance that is being transported by a peace officer to a location for proper characterization, if all of the following conditions are met:

- a. it is a forensic sample;
- b. the peace officer has reason to believe that it is radioactive material;
- c. the maximum dose rate on contact is less than or equal to 2 mSv/h on any external surface of the container;
- d. there is no loss or dispersal of the material during the transport; and
- e. the Commission is advised immediately of the transport.

3.2.2 Transportation of Dangerous Goods (TDG) Regulations exemption

The TDG Regulations, Section 1.19, states that the regulations do not apply to samples of goods, including forensic samples, that are reasonably believed to be dangerous goods if, for the purposes of inspection or investigation duties under an Act of Parliament or of a provincial legislature, the samples are:

- a. in transport under the direct supervision of a federal, provincial or municipal government employee acting in the course of employment; and
- b. in one or more means of containment designed, constructed, filled, closed, secured and maintained so that under normal conditions of transport, including handling, there will be no accidental release of the dangerous goods that could endanger public safety.

If the radioactive materials to be transported do not fall under the exemptions listed above, the Transportation of Dangerous Goods Regulations and the Packaging and Transport of Nuclear Substances Regulations must be complied with.

3.3 Packaging and transportation requirements for substances not transported pursuant to the exemptions

3.3.1 Training

Part 6 of the TDG Regulations requires that all persons who handle, offer for transport, or transport dangerous goods must be adequately trained and hold a training certificate or perform those activities in the presence and under the direct supervision of an adequately trained person and who holds a training certificate.

3.3.2 Classification

Before radioactive materials can be transported, the material must be properly classified. Refer to Section 4 of the PTNS to determine the classification of the material. Possible classifications include low specific activity material (LSA), surface contaminated object (SCO), special form radioactive material, low dispersible radioactive material, or fissile material. To properly classify the material, the following information is required:

- Radionuclides present
- Total activity of each radionuclide
- Activity concentration of each radionuclide
- Dose rate on surface of package
- Contamination levels

Once the material is classified, it must be packaged in a proper package and the appropriate safety marks selected.

If the radioactive material to be transported also meets any of the other hazard classes, the classification of the material must reflect this as stated in special provision 72 and 74 of the TDG Regulations.

Note that proof of classification should be documented as required by Section 2.2.1 of the TDG Regulations.

3.3.3 Packaging

As per Section 26 of the PTNS, radioactive materials must be transported in one of the following types of package:

- An excepted package
- A Type IP-1, Type IP-2 or Type IP-3
- A Type A package
- A Type B or C package of a certified design
- A package of a certified design used to transport fissile material

The activity, radiation level, or mass of the radioactive material must be within the applicable limits for each type of package. It should also be confirmed that the contamination, if any, on the exterior surface of the package is below regulated limit as set by sub-paragraph 28(1)(c) of the PTNS.

All packages must meet the specific standard for that package as set out in the regulations. As per Section 10 of the PTNS, the design of a Type B package, Type C package or a package used for fissile material must be certified by the CNSC prior to being used.

Also, as stated in Section 19 of the PTNS, all persons who want to use a package of a certified design must also apply to the CNSC to become a register user of the package prior to using the package. For those packages that do not require certification, the person preparing the package must ensure that all documents required by Section 42 of the PTNS are maintained.

The Nuclear Forensics Laboratory Network maintains an inventory of the Type A and Type B containers available at each laboratory in the network. In the event that the material to be transported requires a Type A or B package for transport, contact the laboratory network coordinator to see if a suitable container is available.

3.3.4 Dangerous goods safety marks

All packages must be marked and labelled in accordance with Part 4 of the TDG Regulations and Section 28 of the PTNS.

Placards must be displayed on the transport vehicle in accordance with Part 4 of the TDG Regulations.

3.3.5 Documentation

All shipments of radioactive material must be accompanied by a shipping document. The regulations do not prescribe a set format for a shipping document, however all information required by Part 3 of the TDG Regulations and Section 29 of the PTNS must be present and the description of the dangerous goods must be in the order set out in Part 3.5(c).

A copy of the shipping document must be provided to the carrier, and must be located in the prescribed location during transport.

3.3.6 Emergency Response Assistance Plan (ERAP)

Part 7 of the Transportation of Dangerous Goods (TDG) Regulations [1] states that an Emergency Response Assistance Plan (ERAP) is required, prior to the transport of certain quantity of dangerous goods, to ensure there is immediately available a suitable response to emergency situations involving the dangerous goods.

It is the responsibility of the person offering for transport or importing dangerous goods to establish the ERAP if required and to have the plan approved by Transport Canada before the material is transported.

3.3.7 Transport by air or international movements by ship

Part 12 of the TDG Regulations requires that if any dangerous goods (includes any radioactive materials) are to be transported by air, the ICAO Technical Instructions for the Safe Transport of Dangerous Goods [5] must be complied with. Also Part 11 of the TDG Regulations requires that for international shipments by ship, the International Maritime Dangerous Goods Code [6] must be complied with.

3.3.8 Authorization and notifications

3.3.8.1 Notification to consignees

Subsection 25(3) of the PTNS Regulations states that every consignor shall advise the consignee that material is going to be transported.

3.3.8.2 Notification to CNSC

As per Subsection 25(2), the CNSC must be notified prior to certain shipments.

3.3.8.3 Licence to transport

Fissile material may require a Licence to Transport (LTT). The consignor must adhere to Section 6 the PTNS and Nuclear Security Regulations Schedule 1 [7]. If an LTT is required it must be obtained before shipment.

3.3.8.4 Import and export

Nuclear Safety and Control Act [7] describes the requirements for when an import and export licence is required for nuclear substances. The Department of Foreign Affairs and International Trade (DFAIT) Export Control List [8] describes the items requiring an Export Permit.

An Import Licence, Export Licence or Export Permit must be obtained prior to any international shipment.

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References

- [1] Transport Canada, Transportation of Dangerous Goods Regulations.
- [2] Packaging and Transport of Nuclear Substances Regulations, 2015 (SOR/2015-145).
- [3] IAEA, Regulations for the Safe Transport of Radioactive Material (SSR-6).
- [4] Transportation of Dangerous Goods Act, 1992.
- [5] International Civil Aviation Organization (ICAO), Technical Instructions for the Safe Transport of Dangerous Goods by Air.
- [6] International Maritime Organization, International Marine Dangerous Goods (IMDG) Code.
- [7] Nuclear Safety and Control Act (S.C. 1997, c.9).
- [8] Department of Foreign Affairs and International Trade (DFAIT), Export Control List.

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transportation of radioactive materials; TDG