



Atomic Energy
Control Board
Ottawa, Canada
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Commission de contrôle
de l'énergie atomique

Office Consolidation

Transport Packaging of Radioactive Materials Regulations

With amendments to:
February 27, 1992

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**Extract
Canada Gazette, Part II**



**Extrait
Gazette du Canada, Partie II**

**Registration
SOR/83-740 29 September, 1983**

ATOMIC ENERGY CONTROL ACT

**Transport Packaging of Radioactive Materials
Regulations**

P.C. 1983-2984 29 September, 1983

His Excellency the Governor General in Council, on the recommendation of the Minister of Energy, Mines and Resources, pursuant to section 9 of the Atomic Energy Control Act, is pleased hereby to approve the annexed Regulations made by the Atomic Energy Control Board respecting the packaging and safety marking of radioactive materials preparatory to transport, effective November 1, 1983.

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ATOMIC ENERGY CONTROL ACT

**Transport Packaging of Radioactive Materials
Regulations**

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ATOMIC ENERGY CONTROL ACT

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Regulations, amendment**

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ATOMIC ENERGY CONTROL ACT

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ATOMIC ENERGY CONTROL ACT

**Transport Packaging of Radioactive Materials
Regulations, amendment**

P.C. 1992-332 27 February, 1992

REGULATIONS RESPECTING THE PACKAGING AND
SAFETY MARKING OF RADIOACTIVE MATERIALS
PREPARATORY TO TRANSPORT

Short Title

1. These Regulations may be cited as the *Transport Packaging of Radioactive Materials Regulations*.

Interpretation

2. In these Regulations,

- "A₁" means the lowest activity limit or value for
- (a) a single radionuclide of known identity listed in Column III of Part I of Schedule I,
 - (b) a single radionuclide of known identity not listed in Part I of Schedule I but derived in accordance with Item 1 of Part II of Schedule I,
 - (c) a single radionuclide of unknown identity derived in accordance with Item 2 of Part II of Schedule I,
 - (d) a mixture of radionuclides of known identity derived in accordance with Item 3 of Part II of Schedule I,
 - (e) a mixture of radionuclides of unknown identity derived in accordance with Item 4 of Part II of Schedule I, or
 - (f) radioactive decay chains, irradiated thorium, or irradiated uranium, derived in accordance with Item 5, 6 or 7 respectively of Part II of Schedule I; (A₁)
- "A₂" means the lowest activity limit or value for
- (a) a single radionuclide of known identity listed in Column IV of Part I of Schedule I,
 - (b) a single radionuclide of known identity not listed in Part I of Schedule I but derived in accordance with Item 1 of Part II of Schedule I,
 - (c) a single radionuclide of unknown identity derived in accordance with Item 2 of Part II of Schedule I,
 - (d) a mixture of radionuclides of known identity derived in accordance with Item 3 of Part II of Schedule I,
 - (e) a mixture of radionuclides of unknown identity derived in accordance with Item 4 of Part II of Schedule I, or
 - (f) radioactive decay chains, irradiated thorium, or irradiated uranium, derived in accordance with Item 5, 6 or 7 respectively of Part II of Schedule I; (A₂)

"accident conditions of transport" means conditions similar to those resulting from the combination of the mechanical, thermal, and water immersion tests described in Part II of Schedule II as applied to a package; (*conditions d'accident de transport*)

"activity" means the number of nuclear transformations occurring per unit of time; (*activité*)

"allowable number" means the maximum number of Fissile Class II packages and Fissile Class III packages that can be grouped together for transport and the value of which is derived in accordance with Schedule X; (*nombre admissible*)

"authorized officer" means

(a) the President or Secretary of the Board, or

(b) any other officer or employee of the Board who is authorized by the Board to act on its behalf in the administration of these Regulations;

(*agent autorisé*)

"competent authority in a foreign country" means a recognized and established authority in a foreign country exercising in that country a jurisdiction respecting the transportation of radioactive materials similar to that exercised in Canada by the Board or by the Minister of Transport; (*autorité compétente d'un pays étranger*)

"containment system" means the components of packaging that restrain the fissile material from leakage; (*système de confinement*)

"criticality" means a self-sustaining chain process of nuclear fission that can be maintained without an additional source of neutrons; (*criticalité*)

"depleted uranium" means uranium containing less than 0.72 per cent by weight of uranium 235 and no other isotope of uranium except uranium 238 and trace quantities of uranium 234; (*uranium appauvri*)

"enriched uranium" means uranium containing more than 0.72 per cent by weight of uranium 235 and no other isotope of uranium except uranium 238 and trace quantities of uranium 234; (*uranium enrichi*)

"exclusive use" means material, a package or transport container caused to be transported by a single person in

(a) a vehicle,

(b) a transport container having at least one outer dimension equal to or greater than 1.5 m or an internal volume equal to or greater than 3 m³,

(c) an aircraft,

(d) a hold or compartment of an inland waterway craft, or

(e) a hold, compartment, or deck area of a seagoing vessel of which an individual person has sole and exclusive use and with respect to which all loading and unloading is in the control of that person or of the intended recipient of the material, package or transport container being transported; (*usage exclusif*)

"Fissile Class I package" means a package that conforms to the requirements applicable to a Fissile Class I package set out in Schedule X; (*colis de classe fissile I*)

"Fissile Class II package" means a package that conforms to the requirements applicable to a Fissile Class II package set out in Schedule X; (*colis de classe fissile II*)

"Fissile Class III package" means a package that has been approved as such in writing by the Board or an authorized officer; (*colis de classe fissile III*)

"fissile material" means plutonium 238, plutonium 239, plutonium 241, uranium 233, uranium 235, or any material containing any of the foregoing, but does not include unirradiated natural uranium or depleted uranium; (*matière fissile*)

"Group I low specific activity material" means materials described in paragraph (a), (b), (c), (d) or (e) of the definition "low specific activity material"; (*matériel de faible activité spécifique du groupe I*)

"in bulk" means confined only by the permanent structures of a transport container or means of transport, without intermediate containment or packaging; (*chargement en vrac*)

"low-level solid radioactive material" or "LLS" means

(a) a solid throughout which radioactive material is dispersed and in which

(i) the activity under tested conditions of transport is, and remains, uniformly distributed throughout the solid,

(ii) all radioactive material within the solid is insoluble to the extent that if the solid were totally immersed in water for a period of one week the loss of radioactive material would be limited to less than $0.1 A_2$, and

(iii) the average specific activity throughout the solid does not exceed $2 \times 10^3 A_2$ per gram, or

(b) non-radioactive material in solid form contaminated by residual trace amounts of radioactive material present in a non-readily dispersible form if the activity averaged over any area of 300 cm^2 of any part of the surface of the non-radioactive material does not exceed

(i) 740 kBq/cm^2 where the radioactive material is

(A) a beta or gamma emitter,

(B) natural uranium,

(C) natural thorium,

(D) uranium 235,

(E) uranium 238,

(F) thorium 228 or thorium 230 when contained in ores or physical concentrates,

(G) thorium 232, or

(H) a radionuclide with a half-life less than 10 days, and

(ii) 74 kBq/cm^2 for all other alpha emitters;

(*matière radioactive solide de faible activité* or *MSFA*)

"low specific activity material" or "LSA" means

(a) uranium or thorium ore and physical or chemical concentrates of those ores,

(b) unirradiated natural or depleted uranium or unirradiated natural thorium,

(c) material in which the activity is uniformly distributed and which if reduced to the minimum possible volume during normal transport would have an average specific activity throughout its mass not greater than $0.1 A_2$ per kilogram,

(d) non-radioactive material contaminated by residual trace amounts of radioactive material set out in column I

of an item of Schedule III if the non-fixed radioactive material on the surface of the non-radioactive material does not exceed 10 times the applicable maximum permissible level set out in column II of that item and the radioactive material if reduced to the minimum possible volume during normal transport would have an average specific activity throughout its mass not greater than $0.1 A_2$ per kilogram,

(e) tritium oxide in aqueous solution if the concentration of tritium oxide is not sufficient to yield an activity greater than 370 GBq from the tritium oxide per litre of solution,

(f) material in which the activity under tested conditions of transport is, and remains, uniformly distributed and in which the average specific activity throughout the material does not exceed $0.1 A_2$ per kilogram, or

(g) non-radioactive material in solid form contaminated by residual trace amounts of radioactive material present in a non-readily dispersible form if the activity averaged over any area of 300 cm^2 of any part of the surface of the non-radioactive material does not exceed

(i) 37 kBq/cm^2 where the radioactive material is

(A) a beta or gamma emitter,

(B) natural uranium,

(C) natural thorium,

(D) uranium 235,

(E) uranium 238,

(F) thorium 228 or thorium 230 when contained in ores or physical concentrates,

(G) thorium 232, or

(H) a radionuclide with a half-life less than 10 days, and

(ii) 3.7 kBq/cm^2 for all other alpha emitters;

(*matière de faible activité spécifique* or *MFAS*)

"maximum normal operating pressure" means the maximum pressure above atmospheric pressure at mean sea level that would develop in a package in a period of one year under the conditions of temperature and solar radiation encountered during normal transport in the absence of venting, external cooling by an ancillary system, or operational controls during transport; (*pression maximale d'utilisation normale*)

"means of transport" means any road or railway vehicle, aircraft, water-borne craft, pipeline or any other contrivance that is or may be used to carry persons or goods whether or not the goods are in packaging or transport containers; (*moyen de transport*)

"natural thorium" means thorium consisting of thorium 232 with trace quantities of thorium 228; (*thorium naturel*)

"natural uranium" means uranium containing 0.72 per cent by weight of uranium 235 and no other isotope of uranium except uranium 238 and trace quantities of uranium 234; (*uranium naturel*)

"non-fixed radioactive material" means radioactive material that can be readily removed in a manner set out in Schedule III; (*matière radioactive non fixée*)

"normal transport" means transport of a package without any accidents or unusual or abnormal incidents; (*cours normal de transport*)

"package" means packaging and any radioactive material contained therein; (*colis*)

"packaging" means any receptacle or enveloping material designed or used to contain or protect radioactive materials, but does not include a transport container or means of transport; (*emballage*)

"private road" means a road owned by a person who is not

(a) the Queen in the right of Canada or a province, or

(b) a municipality;

(*chemin privé*)

"radiation level" means the corresponding radiation dose-equivalent rate determined by an appropriate instrument, by calculation, or, for neutron flux densities, through conversion as set out in Table 2 of Schedule V; (*intensité de rayonnement*)

"radioactive material" means any prescribed substance having a specific activity greater than 74 kBq/kg ; (*matière radioactive*)

"safety mark" includes any design, symbol, device, sign, label, placard, letter, word, number, abbreviation or any combination thereof that is to be displayed pursuant to section 20 on radioactive materials or transport containers, packages, or packaging; (*marque de sécurité*)

"special form radioactive material" means radioactive material that

(a) meets the requirements for special form radioactive material set out in Schedule XII, and

(b) conforms to the configuration of a radioactive material specified in a certificate issued by the Board or an authorized officer under subsection 22(1) or a certificate or similar document referred to in paragraph 21(1)(b); (*matière radioactive sous forme spéciale*)"

"specific activity" means activity per unit of mass; (*activité spécifique*)

"tested conditions of transport" means conditions similar to those resulting from the combination of the water spray, free drop, compression, and penetration tests described in Part I of Schedule II; (*conditions éprouvées de transport*)

"transport container" means a receptacle used as an article of transport equipment, including one that is carried on a chassis, that is strong enough to be suitable for repeated use and is designed to facilitate the transportation of goods by one or more means of transport without intermediate reloading, but does not include a vehicle; (*conteneur de transport*)

"transport index" means the number for a package or transport container derived in accordance with the procedures described in Schedule XI; (*indice de transport*)

"Type A package" means a package that conforms to the requirements of Schedule VIII; (*colis de type A*)

"Type B(M) package" means a package that conforms to the requirements of Part I of Schedule IX; (*colis de type B(M)*)

"Type B(U) package" means a package that conforms to the requirements of Part II of Schedule IX; (*colis de type B(U)*)

"unirradiated thorium" means thorium containing not more than 10^{-7} kg of uranium 233 per kilogram of thorium 232; (*thorium non irradié*)"

"unirradiated uranium" means uranium containing not more than 10^{-6} kg of plutonium per kilogram of uranium 235 and a fission product activity not greater than 9.25 GBq of fission products per kilogram of uranium 235. (*uranium non irradié*)

PART I

EXEMPTIONS

General

3. (1) Subject to subsection (2), these Regulations apply to the intraprovincial, interprovincial and international transport of radioactive materials by any means of transport.

(2) Subsection (1) does not apply to

(a) the transport of radioactive material over a private road where access by the public is under the control of the owner or lessee of the road;

(b) the transport of radioactive material within private property by a licensee and for the purpose of an activity, as licensed under the *Atomic Energy Control Act*; or

(c) an individual who has radioactive material in their body as a result of

(i) implantation of a radioisotope cardiac pacemaker or other prosthetic device, or

(ii) treatment with a radio-pharmaceutical.

3.1 No person shall transport, or cause to be transported, any radioactive material except in accordance with the requirements of these Regulations and the *Transportation of Dangerous Goods Regulations*.

3.2 An inspector appointed pursuant to section 12 of the *Atomic Energy Control Regulations* shall have the same powers and duties to enforce these Regulations as are provided for an inspector who is appointed under the *Atomic Energy Control Regulations* to enforce the *Atomic Energy Control Regulations*.

Nonconforming Packages

4. (1) The Board or an authorized officer may, on receiving an application or on its own initiative, authorize the transportation of radioactive material in a packaging or a transport container that does not conform to the applicable requirements of these Regulations if

(a) conformity to those requirements would be impracticable; and

(b) suitable measures to compensate for the known or anticipated inconformities are available.

(2) An application under subsection (1) shall be in writing and shall include the applicable fee as set out in the *AECB Cost Recovery Fees Regulations* and:

(a) a description of the manner and degree of the inconformities;

(b) the reasons why conformance with the applicable requirements would be impracticable;

(c) the measures that are proposed to compensate for the inconformities; and

(d) any other information that the Board or an authorized officer decides is necessary to evaluate the application.

(3) An authorization issued by the Board or an authorized officer pursuant to subsection (1) shall be

(a) in writing;

"(b) subject to the terms and conditions that the Board or an authorized officer may impose in the interests of health, safety, security or of the protection of the environment; and

(c) published, together with a statement of the reasons of the Board or the authorized officer for issuing the authorization, in the *Canada Gazette* within 60 days after the date of issuance of the authorization."

"(4) A person who transports, or causes to be transported, radioactive material pursuant to an authorization issued by the Board or an authorized officer under subsection (1) shall comply with the terms and conditions imposed in the authorization."

(5) The Board or an authorized officer may amend, suspend or revoke an authorization issued pursuant to subsection (1) if the holder of the authorization has

(a) requested the amendment, suspension or revocation, and paid the applicable fee set out in the *AECB Cost Recovery Fees Regulations*;

(b) consented to the amendment, suspension or revocation; or

(c) been given a reasonable opportunity to make representations to the Board or an authorized officer prior to the amendment, suspension or revocation.

(6) Notwithstanding subsection (1), any person may transport, or cause to be transported, by any means of transport, radioactive material in a packaging or a transport container that does not conform to the applicable requirements of these Regulations if

(a) the packaging or transport container conforms to the applicable requirements of the *Regulations for the Safe Transport of Radioactive Material*, 1985 Edition (as amended 1990), as published by the International Atomic Energy Agency, for the preparation and transport of the radioactive material;

(b) the transport document contains the statement "Conforms to IAEA Safety Standards Series No. 6 (1990)"; and

(c) before the transportation of the radioactive material is initiated, the requirements of paragraphs 17(d) and (e) have been complied with.

(7) No person shall transport, or cause to be transported, any fissile material in a package, or any radioactive material in a Type B(M) package or Type B(U) package, pursuant to subsection (6) unless

(a) the design for the class of package is the subject of

(i) a package design approval certificate issued by the Board or an authorized officer pursuant to section 15, or

(ii) an endorsement issued by the Board or an authorized officer pursuant to section 16;

(b) the person has advised the Board or an authorized officer in writing of the person's intended use of the certificate or endorsement;

(c) the person has certified that the person possesses the necessary instructions for preparation of the package for shipment; and

(d) the person has received written notice from the Board or an authorized officer that permits the person's use of the certificate or endorsement."

(8) Any person who transports or causes to be transported any fissile material in a package, or any radioactive material in a Type B(M) package or Type B(U) package, pursuant to subsection (7) shall comply with any limitation, term or condition imposed in the package design approval certificate or endorsement issued by the Board or an authorized officer with respect to that package.

(9) Any person who causes radioactive material to be transported in a Type A package pursuant to subsection (6) shall ensure that the information used to determine that the package conforms to the design requirements of paragraph (6)(a) for that Type A package is maintained on record for two years and is available for inspection at all reasonable times by the Board or an authorized officer.

Radioactive Material of Limited Activity

5. Radioactive material set out in column I of an item of Schedule IV, the activity of which does not exceed the relevant limit set out for that material in column III of that item, and fissile material set out in paragraph 9(2)(a) may be transported in a package if"

(a) the radiation level at any point on the external surface of the package does not exceed $5\mu\text{Sv/h}$;

(b) the activity of non-fixed radioactive material set out in column I of an item of Schedule III on any external surface of the package does not exceed the levels set out for that material in column II of that item;

(c) the package does not release any of its contents during normal transport;

(d) the radioactive material is not explosive;

(e) the package and packaging conform to the general design requirements of Schedule VII; and

(f) the packaging bears the safety mark "RADIOACTIVE" in such a manner that the mark is immediately visible and legible to a person opening the package.

Instruments and Manufactured Articles

"6. An instrument or manufactured article having as a component part radioactive material set out in column I of an item of Schedule IV, the activity of which does not exceed the relevant limit set out for that material in column II of that item under the heading "Item Limits" and fissile material set out in paragraph 9(2)(a) may be transported in a package if"

(a) the radiation level at any point on the external surface of the package does not exceed $5\mu\text{Sv/h}$;

(b) the activity of non-fixed radioactive material set out in column I of an item of Schedule III on any external surface of the package does not exceed the level set out for that material in column II of that item;

(c) the radiation level at 10 cm from any point on the external surface of the unpacked instrument or article does not exceed $100\mu\text{Sv/h}$;

(d) the total activity of radioactive material set out in column I of an item of Schedule IV within the package does not exceed the relevant limit set out in column II of that item under the heading "Package Limits";

(e) the radioactive material is not explosive;

(f) the package and packaging conform to the general design requirements of Schedule VII; and

(g) the instrument or article bears the safety mark "RADIOACTIVE" in an easily visible location.

7. An instrument or manufactured article in which the sole radioactive material is natural or depleted uranium or natural thorium may be transported in a package if

- (a) the radiation level at any point on the external surface of the package does not exceed $5\mu\text{Sv/h}$;
- (b) the activity of non-fixed radioactive material set out in column I of an item of Schedule III on any external surface of the package does not exceed the levels set out for that material in column II for that item;
- (c) the radioactive material is not explosive;
- (d) the package and packaging conform to the general design requirements of Schedule VII; and
- (e) the uranium or thorium is enclosed in an inactive sheath constructed of metal or other substantial material.

Empty Packages

8. A package that has contained radioactive material and is still contaminated by residual trace amounts of that radioactive material left as a reasonable result of a packing or transportation occurrence involving that package and radioactive material may be transported if

- (a) the radioactivity of any residue of non-fixed radioactive material inside the package does not exceed 100 times the levels set out for that material in column II of Schedule III;
- (b) the radiation level at any point on the external surface of the package does not exceed $5\mu\text{Sv/h}$;
- (c) the activity of non-fixed radioactive material set out in column I of an item of Schedule III on any external surface of the package does not exceed the levels set out in column II of that item;
- (d) the packaging is of solid construction, retains its structural integrity during normal transport, is in good condition, and is securely closed;
- (e) all safety marks affixed to the package pursuant to these Regulations as a result of the usage of that package in the transport of radioactive material have been removed or securely covered; and
- (f) the label illustrated and described in Figure 6 of Schedule VI is affixed to the outside surface of the package in an easily visible location on the package.

PART II

PACKAGING REQUIREMENTS

Fissile Material

9. (1) Notwithstanding any other provision of these Regulations and subject to subsection (2), no person shall, except as permitted by subsection 4(6), transport, or cause to be transported, any fissile material by any means of transport unless

(a) the fissile material is contained in a Fissile Class I package, Fissile Class II package or Fissile Class III package, and the design for the class of package is the subject of

(i) a package design approval certificate issued by the Board or an authorized officer pursuant to section 15, or

(ii) an endorsement issued by the Board or an authorized officer pursuant to section 16;

(b) the person has advised the Board or an authorized officer in writing of the person's intended use of the certificate or endorsement;

(c) the person has certified that the person possesses the necessary instructions for preparation of the package for shipment; and

(d) the person has received written notice from the Board or an authorized officer that permits the person's use of the certificate or endorsement.

(2) The following fissile material is not subject to the requirements of subsection (1):

"(a) 15 g or less of uranium 233, uranium 235, plutonium 238, plutonium 239, plutonium 241 or any combination of those radionuclides, if"

(i) the fissile material is in a package that has no external dimension less than 0.1 m,

(ii) the package containing the fissile material is not part of an individual shipment containing more than 0.1 kg of fissile material, and

(iii) the total quantity of fissile material that is not subject to the requirements of subsection (1), caused to be transported by a person in any 24 hour period with the same carrier does not exceed 0.1 kg;

(b) natural or depleted uranium that has been irradiated in a thermal reactor; or

(c) uranium enriched to not greater than one per cent by weight uranium 235 and with a total plutonium and uranium 233 content not greater than one per cent of the amount of uranium 235 present, if the fissile material is homogeneously distributed and any uranium 235 present in metallic or oxide form does not form a lattice arrangement within the package.

(3) Any person who transports or causes to be transported any fissile material in a Fissile Class I package, Fissile Class II package or Fissile Class III package pursuant to subsection (1) shall comply with any limitation, term or condition imposed in the package design approval certificate or endorsement issued by the Board or an authorized officer with respect to that package.

Type B(M) Packages and Type B(U) Packages

10. (1) Except as otherwise permitted by these Regulations, no person shall transport, or cause to be transported, any radioactive material by any means of transport unless

(a) the material is contained in a Type B(M) package or Type B(U) package, and the design for that class of package is the subject of

(i) a package design approval certificate issued by the Board or an authorized officer pursuant to section 15, or

(ii) an endorsement issued by the Board or an authorized officer pursuant to section 16;

(b) the person has advised the Board or an authorized officer in writing of the person's intended use of the certificate or endorsement;

(c) the person has certified that the person possesses the necessary instructions for preparation of the package for shipment; and

(d) the person has received written notice from the Board or an authorized officer that permits the person's use of the certificate or endorsement."

(2) Any person who transports or causes to be transported any radioactive material in a Type B(M) package or Type B(U) package pursuant to subsection (1) shall comply with any limitation, term or condition imposed in the package design approval certificate or endorsement issued by the Board or an authorized officer with respect to that package.

Type A Packages

11. (1) Any person may transport, or cause to be transported, by any means of transport in a Type A package,

(a) radioactive material of A₂ or less; or

(b) special form radioactive material of A₁ or less.

(2) A person causing radioactive material to be transported in a Type A package pursuant to subsection (1) shall ensure that the information used to determine that the package conforms to the requirements of Schedule VIII is maintained on record for two years and is available for inspection by the Board or an authorized officer.

Low Specific Activity Material

12. (1) Any person may transport, or cause to be transported, Group I low specific activity material in bulk if

(a) the material is exclusive use excluding aircraft;

(b) the total activity within

(i) the vehicle, where the material is transported in a vehicle,

(ii) the hold, compartment or deck area of the seagoing vessel, where the material is transported in a seagoing vessel, or

(iii) the hold or compartment of the inland waterway craft, where the material is transported in an inland waterway craft

does not exceed the relevant limit for that material set out in Table 1 of Schedule V;

(c) under normal transport, there is no leakage of the material from

(i) the transport container where the material is transported in a transport container,

(ii) the vehicle, where the material is transported in a vehicle,

(iii) the hold, compartment or deck area of the seagoing vessel, where the material is transported in a seagoing vessel, or

(iv) the hold or compartment of the inland waterway craft, where the material is transported in an inland waterway craft; and

(d) the material is unirradiated natural or depleted uranium or unirradiated natural thorium

(i) in massive form and, it is loaded, packed, or stowed in a manner that prevents movement that could cause abrasion of the material, or

(ii) in solid form, other than massive form, and it is placed in an inert metal container or other substantial sheath and the surface of the material is not exposed.

(2) Any person may transport, or cause to be transported, Group I low specific activity material in an exclusive package by any means of transport if

the case of air transport, the activity of non-fixed radioactive material set out in column I of an item of Schedule III on any external surface of the package does not exceed the levels set out for that material in column II of that item;

(i) the material is unirradiated natural or depleted uranium or unirradiated natural thorium

(i) in massive form and it is loaded, packed, or stowed in a manner that prevents movement that could cause abrasion of the material; or

(ii) in solid form, other than massive form, and it is placed in an inert metal container or other substantial sheath and the surface of the material is not exposed;

except where the material is fissile material, the package is stencilled or otherwise marked with the notation "MFAS RADIOACTIVE LSA/EXCLUSIVE USE/USAGE EXCLUSIF"; and

(i) the total activity within

(i) the vehicle, where the material is transported in a vehicle,

(ii) the hold, compartment or deck area of the seagoing vessel, where the material is transported in a seagoing vessel; or

(iii) the hold or compartment of the inland waterway craft, where the material is transported in an inland waterway craft

does not exceed the relevant limit for that material set out in table I of Schedule V.

Any person may transport, or cause to be transported, Group I low specific activity material in packaging by any means of transport if

(a) the package conforms to the general design requirements set out in Schedule VII and item 2 of Schedule III;

(b) the package is sealed in such a manner that any opening of the package is evident;

(c) the external surface of the package is free of any protruding feature that is not designed to facilitate transport;

(d) the packaging can withstand variations in temperature from 70° C to -40° C and is resistant to brittle fracture over this temperature range;

(e) the design, fabrication and manufacturing of welded, brazed or other fusion joints meets generally acceptable engineering standards;

(f) the package is capable of withstanding the effects of any acceleration, vibration or vibration resonance that may arise during normal transport;

(g) the materials, structures and components of the package are physically and chemically compatible with each other and with the package contents under normal conditions, including irradiation;

(h) forces in tie-down attachments on the package do not, during transport, impair the conformity of the package to these Regulations;

(i) no loss or dispersal of any radioactive material nor any increase in the maximum radiation level at the external surface of the package results if the package is subjected to tested conditions of transport;

(j) the material is unirradiated natural or depleted uranium or unirradiated natural thorium

(i) in massive form and it is loaded, packed, or stowed in a manner that prevents movement that could cause abrasion of the material; or

(ii) in solid form, other than massive form, and it is placed in an inert metal container or other substantial sheath and the surface of the material is not exposed; and

(k) the package bears safety marks in accordance with the categories and requirements set out in Schedule VI and, except where the material is fissile material, the contents are indicated as "MFAS—LSA" on the appropriate safety mark.

(4) Any person may transport, or cause to be transported, low specific activity material that is not Group I low specific activity material in a package if

(a) the package is exclusive use;

"(b) the package conforms to the general design requirements set out in Schedule VII and item 2 of Schedule VIII;"

(c) the activity of non-fixed radioactive material set out in column I of an item of Schedule III on any external surface of the package does not exceed the levels set out for that material in column II of that item; and

(e) except where the material is fissile material, the package is stencilled or otherwise marked with the notation "MFAS RADIOACTIVE LSA/EXCLUSIVE USE/USAGE EXCLUSIF".

Low-level Solid Radioactive Material

13. Any person may transport, or cause to be transported, low-level solid radioactive material in a package by any means of transport if the material is exclusive use and

"(a) the package conforms to the general design requirements set out in Schedule VII and item 2 of Schedule VIII;"

(b) no loss or dispersal of any radioactive material or any increase in the maximum radiation level on the external surface of the package results if the package is subjected to the free drop and compression tests described in Part I of Schedule II; and

(c) except where the material is fissile material, the package is stencilled or otherwise marked with the notation "MSFA RADIOACTIVE LLS/EXCLUSIVE USE/USAGE EXCLUSIF".

Other Materials and Package Categorization

14. (1) No person shall transport, or cause to be transported, any radioactive material in a package containing other material unless that other material is

- (a) contained within the package in accordance with these Regulations;
- (b) permitted pursuant to any other provision of these Regulations to be contained within the package;
- (c) normally associated with or used in conjunction with the radioactive material; or
- (d) packed in such a way that there can be no interaction between the material and the packaging or contents that could reduce the level of safety of the package from the level of safety that would be provided by compliance with these Regulations.

(2) A person who causes radioactive material to be transported in a package pursuant to sections 10, 11, 12 or 13 shall ensure that the characteristics of the package are such that the package may be categorized as a Category I-WHITE, a Category II-YELLOW, or a Category III-YELLOW package, as those categories are described in Schedule VI.

Package Design Approval Certificates

15. (1) The Board or an authorized officer may, on application, issue a package design approval certificate attesting that the design of a package meets the requirements of these Regulations for a Type B(M) package, Type B(U) package, Fissile Class I package, Fissile Class II package or Fissile Class III package and, in so doing, may impose such limitations, terms or conditions on the use or transportation of the package as are necessary in the interests of health, safety, security or of the protection of the environment.

(1.1) Without limiting the generality of subsection (1), the limitations, terms or conditions referred to therein may be in respect of

- (a) the procedures to be followed in preparing the package for transport;
- (b) the radioactive material the package may contain; or
- (c) the maintenance of the package.

(3) The Board or an authorized officer shall not issue a package design approval certificate unless

- (a) the design, construction and maintenance of the packaging have been subjected to a reliable quality assurance program;

(b) the designer, manufacturer or distributor of the packaging has set out satisfactory and detailed written instructions respecting the proper use of the packaging including directions as to its loading, closing, sealing, handling, opening, unloading and routine examinations and maintenance, and those instructions are made available to the Board or an authorized officer and any persons using that packaging to transport radioactive material; and

(c) the Board or an authorized officer has been provided adequate access to the packaging at all stages of its construction and has had reasonable opportunity to witness any tests conducted to demonstrate compliance with these Regulations.

(4) An application for a package design approval certificate shall be in writing and shall include the applicable fee as set out in the *AECB Cost Recovery Fees Regulations* and:

(a) a complete description of the intended radioactive material the package is to contain, with particular details as to chemical and physical form, quantities, and the nature of the radiation emitted from the material;

(b) complete engineering drawings of the package;

(c) a description of the materials and method of construction and assembly of the package;

(d) an analysis of predicted performance of the package if subjected to accident conditions of transport, together with an elaboration of all tests and calculations pertaining to the analysis;

(e) full details of the quality assurance program imposed with respect to the design, construction and use of the package;

(f) a copy of proposed operating and maintenance instructions pertaining to the package;

(g) calculations or test data demonstrating compliance of the package with the requirements of these Regulations;

(h) a reproducible illustration not greater than 21 cm by 28 cm suitable for showing the construction of the package; and

(i) such other information as the Board or an authorized officer may require in order to be satisfied that the package meets all the applicable requirements of these Regulations.

(5) The Board or an authorized officer may amend, suspend or revoke a package design approval certificate issued pursuant to subsection (1) where the holder of the certificate has

(a) requested the amendment, suspension or revocation and paid the applicable fee set out in the *AECB Cost Recovery Fees Regulations*;

(b) consented to the amendment, suspension or revocation; or

(c) been given a reasonable opportunity to make representations to the Board or an authorized officer prior to the amendment, suspension or revocation.

Endorsement of Foreign Certificates

*16. (1) The Board or an authorized officer may, on application, issue an endorsement of a certificate or similar document issued by a competent authority in a foreign country where the certificate or document attests that the design of a package meets requirements that are substantially

PART III

GENERAL

Before Transportation

equivalent to the requirements of these Regulations for a Type B(M) package, Type B(U) package, Fissile Class I package, Fissile Class II package or Fissile Class III package, and, in so doing, may impose such limitations, terms or conditions on the use or transportation of the package as are necessary in the interests of health, safety, security or of the protection of the environment.

(1.1) The certificate or similar document referred to in subsection (1) shall be

(a) in either of Canada's official languages; or
(b) accompanied by a translation thereof in either of Canada's official languages and an affidavit of the person who prepared the translation, attesting that

(i) the person understands the languages in which the certificate or similar document and the translation are written,

(ii) the person has carefully compared the certificate or similar document and the translation, and

(iii) the translation is in all respects an accurate translation of the certificate or similar document.

(1.2) Without limiting the generality of subsection (1), limitations, terms or conditions referred to therein may in respect of

a) the procedures to be followed in preparing the package for transport;

b) the radioactive material the package may contain; or

c) the maintenance of the package.

(3) An application for an endorsement shall

a) be in writing;

b) include the applicable fee set out in the *AECB Cost Recovery Fees Regulations*; and

c) include the information enumerated in subsection 5(4) as the Board or an authorized officer may require in order to be satisfied that the package meets requirements that are substantially equivalent to the requirements of these Regulations for a Type B(M) package, Type B(U) package, Fissile Class I package, Fissile Class II package or Fissile Class III package, as the case may be.

4) The Board or an authorized officer may amend, suspend or revoke an endorsement issued pursuant to subsection (1) where the holder of the endorsement has

a) requested the amendment, suspension or revocation and paid the applicable fee as set out in the *AECB Cost Recovery Fees Regulations*;

b) consented to the amendment, suspension or revocation; or

c) been given a reasonable opportunity to be heard by the Board or an authorized officer prior to the amendment, suspension or revocation.

17. A person who causes radioactive material to be transported by any means of transport shall ensure that before the transportation of the material is initiated

(a) all closures, valves or other openings of the package are properly closed in accordance with instructions set out by the designer, manufacturer or distributor of the package;

(b) any feature of the package that could be used as a point of attachment for lifting purposes but which is not designed, intended or suitable for that purpose has been removed or rendered unusable;

(c) in the case of a Type B(M) package or Type B(U) package, thermal equilibrium has essentially been attained;

(d) the intended recipient of the radioactive material has been advised of the transport of the material to him, has made reasonable arrangements for receipt of the material, and has received a copy of any applicable package design approval certificate; and

(e) any person engaged in the transport of goods for hire or reward to whom the radioactive material is offered or delivered for transport has been advised of the nature of the material, and has received a copy of any applicable package design approval certificate.

Receipt of Packages

18. A person to whom radioactive material is transported in a package shall as soon as practicable on receipt of the package and before opening it

(a) examine it for evidence of damage or leakage of the contents;

(b) if there appears to be damage to the package or leakage of the contents, measure

(i) the radiation level at the surface of the package,

(ii) where the result of the measurement made pursuant to subparagraph (i) exceeds 2 mSv/h, the radiation level at 1 m from the surface of the package, and

(iii) the activity of any non-fixed radioactive material on the external surface of the package;

(c) determine whether the measurements referred to in paragraph (b) are within the applicable limits imposed by these Regulations, taking into account the safety marks borne by the package and whether it was exclusive use;

(d) notify the Board and the person who caused the radioactive material to be transported

(i) forthwith upon discovery of any crack, split, wasting of material due to corrosion or other defect which calls into question the integrity or soundness of the packaging,

(ii) forthwith where the radiation level is determined to exceed 10 mSv/h at the surface of the package or 200 μ Sv/h at 1 m from the surface of the package,

(iii) within five days, excluding holidays, where the radiation level at the surface or at 1 m from the surface of the package, or the activity of any non-fixed radioactive material on the external surface of the package, was determined to exceed the applicable limits imposed by these Regulations;

(e) provide, in respect of any notification made pursuant to paragraph (d), full particulars of the packaging and the manner in which the package failed to satisfy any applicable requirements of these Regulations; and

(f) keep records of all observations made pursuant to paragraphs (a) and (b) and retain those records in a form suitable for inspection for a period of at least two years and if requested to do so, provide the Board or an inspector appointed under the *Atomic Energy Control Regulations* with full access to these records.

Non-Fixed Radioactive Material

19. A person who transports, or causes to be transported, any radioactive material in a package or transport container by any means of transport shall ensure that the activity of any non-fixed radioactive material set out in column I of an item of Schedule III on the external surface of the package or transport container is as low as practicable and during normal transport does not exceed the level set out for that material in column II of that item.

Safety Marks

20. (1) Subject to subsections (2) and (3), a person who transports, or causes to be transported, any radioactive material by any means of transport shall ensure that any package, packaging or transport container containing the radioactive material bears safety marks in accordance with the characteristics set out in Schedule VI.

(2) Subsection (1) does not apply to a person who

- (a) pursuant to subsection 12(2), transports, or causes to be transported, Group 1 low specific activity material, other than fissile material, in an exclusive use package; or
- (b) pursuant to section 5, 6 or 7, transports, or causes to be transported in a package, any radioactive material or an instrument or manufactured article containing radioactive material.

(3) A person who causes a package to be transported and transports the package is not required to label the package in accordance with item 2 of Schedule VI if the package is

- (a) a device;
- (b) exclusive use;
- (c) plainly and durably marked on the exterior surface of the package with
 - (i) the word "RADIOACTIVE",
 - (ii) the trefoil symbol set out in Figure 1 of that Schedule, and
 - (iii) the name, address and telephone number of the person licensed under the *Atomic Energy Control Regulations* to possess the device or the radioactive material; and
- (d) plainly and durably marked on the exterior surface of the package or on a steel or brass tag that is securely attached to the exterior of the package with
 - (i) the name and mass number of the radionuclide, and
 - (ii) the maximum permissible activity of the package."

"Special Form Radioactive Material

21. (1) No person shall cause special form radioactive material to be transported unless that person possesses for the material

- (a) a special form radioactive material certificate issued by the Board or an authorized officer pursuant to subsection 22(1); or

(b) a certificate or similar document issued by a competent authority in a foreign country that attests that the material meets requirements that are substantially equivalent to the requirements for special radioactive material set out in Schedule XII.

(2) The certificate or similar document referred to in paragraph (1)(b) shall be

- (a) in either of Canada's official languages; or
- (b) accompanied by a translation thereof in either of Canada's official languages and an affidavit of the person who prepared the translation attesting that
 - (i) the person understands the languages in which the certificate or similar document and the translation are written,
 - (ii) the person has carefully compared the certificate or similar document and the translation, and
 - (iii) the translation is in all respects an accurate translation of the certificate or similar document.

22. (1) The Board or an authorized officer may, on application, issue a special form radioactive material certificate attesting that the configuration of the material specified in the application meets the requirements for special form radioactive material set out in Schedule XII.

"(2) An application for a special form radioactive material certificate shall be in writing and shall include the applicable fee set out in the *AECB Cost Recovery Fees Regulations* and:

- (a) a complete description of the radioactive material, with precise details regarding the chemical and physical form of the material and the quantity and nature of the radiation emitted therefrom;
- (b) complete engineering drawings of the radioactive material and of any capsule that contains the material;
- (c) a description of the materials and method of construction and assembly of the radioactive material and of any capsule that contains the material;
- (d) an analysis of the predicted performance of the radioactive material and of any capsule that contains the material if subjected to the tests referred to in items 2 and 3 of Schedule XII, together with an elaboration of all tests and calculations pertaining to the analysis;
- (e) full details of the quality assurance program implemented with respect to the radioactive material and any capsule that contains the material;
- (f) calculations or test data demonstrating that the radioactive material and any capsule that contains the material meet the requirements for special form radioactive material set out in Schedule XII; and
- (g) such other information as the Board or an authorized officer may require in order to be satisfied that the radioactive material and any capsule that contains the material meet the requirements for special form radioactive material set out in Schedule XII.

3) The Board or an authorized officer may amend, suspend or revoke a special form radioactive material certificate issued pursuant to subsection (1) where the holder of the certificate has

a) requested the amendment, suspension or revocation and paid the applicable fee set out in the *AECB Cost Recovery Fees Regulations*;

b) consented to the amendment, suspension or revocation; or

c) been given a reasonable opportunity to make representations to the Board or an authorized officer prior to the amendment, suspension or revocation."

-SCHEDULE I

(Section 2)

ACTIVITY LIMITS

PART I

Activity Limits for Single Radionuclides

Column I <i>Element (and its atomic number)</i>	Column II <i>Symbol of Radionuclide</i>	Column III <i>A₁ (in gigabecquerels)</i>	Column IV <i>A₂ (in gigabecquerels)</i>
Actinium (89)	Ac 227	37,000	0.111
	Ac 228	370	148
Americium (95)	Am 241	740	0.296
	Am 243	296	0.296
Antimony (51)	Sb 122	1,110	1,110
	Sb 124	185	185
	Sb 125	1,480	1,110
Argon (18)	Ar 37	37,000	37,000
	Ar 41 (uncompressed) (1)	740	740
	Ar 41 (compressed) (1)	37	37
Arsenic (33)	As 73	37,000	14,800
	As 74	740	740
	As 76	370	370
	As 77	11,100	11,100
Astatine (85)	At 211	7,400	259
Barium (56)	Ba 131	1,480	1,480
	Ba 133	1,480	370
	Ba 140	740	740
Berkelium (97)	Bk 249	37,000	370
Beryllium (4)	Be 7	11,100	11,100
Bismuth (83)	Bi 206	185	185
	Bi 207	370	370
	Bi 210 (RaE)	3,700	148
	Bi 212	222	222
Bromine (35)	Br 77	2,590	1,480
	Br 82	222	222
Cadmium (48)	Cd 109	37,000	2,590
	Cd 113m	11,100	11,100
	Cd 115	2,960	2,960
	Cd 115m	1,110	1,110
Calcium (20)	Ca 45	37,000	1,480
	Ca 47	740	740
Californium (98)	Cf 249	74	0.074
	Cf 250	259	0.259
	Cf 252	74	0.333
Carbon (6)	C 11	740	740
	C 14	37,000	3,700
Cerium (58)	Ce 139	3,700	3,700
	Ce 141	11,100	7,400
	Ce 143	2,220	2,220
	Ce 144	370	259
Cesium (55)	Cs 129	1,480	1,480
	Cs 131	37,000	37,000
	Cs 134	370	370
	Cs 134m	37,000	37,000
	Cs 135	37,000	3,700
	Cs 136	259	259
	Cs 137	1,110	740
Chlorine (17)	Cl 36	11,100	1,110
	Cl 38	370	370
Chromium (24)	Cr 51	22,200	22,200
Cobalt (27)	Co 56	185	185
	Co 57	3,330	3,330
	Co 58	740	740
	Co 58m	37,000	37,000
	Co 60	259	259
Copper (29)	Cu 64	2,960	2,960
	Cu 67	7,400	7,400
Curium (96)	Cm 242	7,400	7.4
	Cm 243	333	0.333
	Cm 244	370	0.37
	Cm 245	222	0.222
	Cm 246	222	0.222

SCHEDULE I—Continued
ACTIVITY LIMITS—Continued

PART I—Continued

Activity Limits for Single Radionuclides—Continued

Column I	Column II	Column III	Column IV
<i>Element (and its atomic number)</i>	<i>Symbol of Radionuclide</i>	<i>A₁ (in gigabecquerels)</i>	<i>A₂ (in gigabecquerels)</i>
Dysprosium (66)	Dy 165	3,700	3,700
	Dy 166	37,000	7,400
Erbium (68)	Er 169	37,000	11,100
	Er 171	1,850	1,850
Europium (63)	Eu 152	740	740
	Eu 152m	1,110	1,110
	Eu 154	370	185
	Eu 155	14,800	3,330
Fluorine (9)	F 18	740	740
Gadolinium (64)	Gd 153	7,400	3,700
	Gd 159	11,100	11,100
Gallium (31)	Ga 67	3,700	3,700
	Ga 68	740	740
	Ga 72	259	259
Germanium (32)	Ge 68	740	370
	Ge 71	17,000	37,000
Gold (79)	Au 193	7,400	7,400
	Au 194	1,110	1,110
	Au 195	37,000	37,000
	Au 196	1,110	1,110
	Au 198	1,480	1,480
	Au 199	7,400	7,400
Hafnium (72)	Hf 181	1,110	1,110
Holmium (67)	Ho 163	37,000	37,000
	Ho 166	1,110	1,110
Hydrogen (1)—see Tritium	H 3	—	—
Indium (49)	In 111	1,110	1,110
	In 113m	2,220	2,220
	In 114m	1,110	740
	In 115m	3,700	3,700
	I 123	1,850	1,850
Iodine (53)	I 125	37,000	2,590
	I 126	1,480	370
	I 129	37,000	74
	I 131	1,480	370
	I 132	259	259
	I 133	1,110	1,110
	I 134	296	296
	I 135	370	370
	Ir 190	370	370
	Ir 192	740	740
	Ir 194	370	370
	Fe 52	185	185
Iron (26)	Fe 55	37,000	37,000
	Fe 59	370	370
	Kr 85 (uncompressed) (1)	37,000	37,000
	Kr 85 (compressed) (1)	185	185
Krypton (36)	Kr 85m (uncompressed) (1)	3,700	3,700
	Kr 85m (compressed) (1)	111	111
	Kr 87 (uncompressed) (1)	740	740
	Kr 87 (compressed) (1)	22.2	22.2
	La 140	1,110	1,110
Lanthanum (57)	La 140	1,110	1,110
Lead (82)	Pb 201	1,110	1,110
	Pb 210	3,700	7.4
	Pb 212	222	185
Lutetium (71)	Lu 174	7,400	1,850
	Lu 177	11,100	11,100
Magnesium (12)	Mg 28	222	222
Manganese (25)	Mn 52	185	185
	Mn 54	740	740
	Mn 56	185	185
Mercury (80)	Hg 194	1,110	1,110
	Hg 197	7,400	7,400
	Hg 197m	7,400	7,400
	Hg 203	2,960	2,960
Molybdenum (42)	Mo 99	3,700	3,700
Neodymium (60)	Nd 147	3,700	3,700
	Nd 149	1,110	1,110

SCHEDULE I—Continued
ACTIVITY LIMITS—Continued

PART I—Continued

Activity Limits for Single Radionuclides—Continued

Column I <i>Element (and its atomic number)</i>	Column II <i>Symbol of Radionuclide</i>	Column III <i>A₁ (in gigabecquerels)</i>	Column IV <i>A₂ (in gigabecquerels)</i>
Neptunium (93)	Np 237	185	0.185
	Np 239	7,400	7,400
Nickel (28)	Ni 59	37,000	33,300
	Ni 63	37,000	3,700
	Ni 65	370	370
Niobium (41)	Nb 93m	37,000	7,400
	Nb 95	740	740
	Nb 97	740	740
Nitrogen (7)	N 13	740	740
Osmium (76)	Os 185	740	740
	Os 191	22,200	14,800
	Os 191m	7,400	7,400
	Os 193	3,700	3,700
Palladium (46)	Pd 103	37,000	25,900
	Pd 109	3,700	3,700
Phosphorus (15)	P 32	1,110	1,110
Platinum (78)	Pt 191	3,700	3,700
	Pt 193m	7,400	7,400
	Pt 197	11,100	11,100
	Pt 197m	11,100	11,100
Plutonium (94)	Pu 238	111	0.111
	Pu 239	74	0.074
	Pu 240	74	0.074
	Pu 241	37,000	3.7
	Pu 242	111	0.111
Polonium (84)	Po 210	7,400	7.4
Potassium (19)	K 42	370	370
	K 43	740	740
Praseodymium (59)	Pr 142	370	370
	Pr 143	11,100	7,400
Promethium (61)	Pm 147	37,000	2,960
	Pm 149	3,700	3,700
Protactinium (91)	Pa 230	740	29.6
	Pa 231	7.4	0.074
	Pa 233	3,700	3,700
Radium (88)	Ra 223	1,850	7.4
	Ra 224	222	18.5
	Ra 226	370	1.85
	Ra 228	370	1.85
Radon (86)	Rn 222	370	74
Rhenium (75)	Re 186	3,700	3,700
	Re 187	Unlimited	Unlimited
	Re 188	370	370
	Re (natural)	Unlimited	Unlimited
Rhodium (45)	Rh 103m	37,000	37,000
	Rh 105	7,400	7,400
Rubidium (37)	Rb 81	1,110	1,110
	Rb 86	1,110	1,110
	Rb 87	Unlimited	Unlimited
	Rb (natural)	Unlimited	Unlimited
Ruthenium (44)	Ru 97	2,960	2,960
	Ru 103	1,110	1,110
	Ru 105	740	740
	Ru 106	370	259
Samarium (62)	Sm 147	Unlimited	Unlimited
	Sm 151	37,000	3,330
	Sm 153	11,100	11,100
Scandium (21)	Sc 46	296	296
	Sc 47	7,400	7,400
	Sc 48	185	185
Selenium (34)	Se 75	1,480	1,480
Silicon (14)	Si 31	3,700	3,700
Silver (47)	Ag 105	1,480	1,480
	Ag 108m	370	370
	Ag 110m	259	259
	Ag 111	3,700	3,700
Sodium (11)	Na 22	296	296
	Na 24	185	185

SCHEDULE I—Continued

ACTIVITY LIMITS—Continued

PART I—Continued

Activity Limits for Single Radionuclides—Continued

Column I <i>Element (and its atomic number)</i>	Column II <i>Symbol of Radionuclide</i>	Column III <i>A₁ (in gigabecquerels)</i>	Column IV <i>A₁ (in gigabecquerels)</i>
Strontium (38)	Sr 85	1,110	1,110
	Sr 85m	2,960	2,960
	Sr 87m	1,850	1,850
	Sr 89	3,700	1,480
	Sr 90	370	14.8
	Sr 91	370	370
	Sr 92	370	370
Sulphur (16)	S 35	37,000	11,100
Tantalum (73)	Ta 179	7,400	7,400
	Ta 182	740	740
Technetium (43)	Tc 96	222	222
	Tc 96m	37,000	37,000
	Tc 97	37,000	14,800
	Tc 97m	37,000	7,400
	Tc 99	37,000	2,960
	Tc 99m	3,700	3,700
	Tc 125m	37,000	3,700
Tellurium (52)	Te 127	11,100	11,100
	Te 127m	11,100	1,480
	Te 129	3,700	3,700
	Te 129m	1,110	1,110
	Te 131m	370	370
	Te 132	259	259
	Tb 160	740	740
Terbium (65)	Tb 160	740	740
	Tl 200	7,400	7,400
	Tl 201	1,480	1,480
	Tl 202	11,100	1,110
Thallium (81)	Tl 204	7,400	7.4
	Th 227	222	0.296
	Th 228	111	0.111
	Th 230	37,000	37,000
	Th 231	Unlimited	Unlimited
	Th 232	370	370
	Th 234	Unlimited	Unlimited
Thorium (90)	Th (natural)	Unlimited	Unlimited
	Th (irradiated) (2)	—	—
	Tm 170	11,100	1,480
	Tm 171	37,000	3,700
Thulium (69)	Tm 170	11,100	1,480
	Tm 171	37,000	3,700
	Tm 171	37,000	37,000
Tin (50)	Sn 113	2,220	2,220
	Sn 119m	3,700	3,700
	Sn 125	370	370
Tritium (1)	T (uncompressed) (1)	37,000	37,000
	T (compressed) (1)	37,000	37,000
	T (activated luminous paint)	37,000	37,000
	T (adsorbed on solid carrier)	37,000	37,000
	T (initiated water)	37,000	37,000
	T (other forms)	740	740
	T (other forms)	740	740
Tungsten (74)	W 181	7,400	3,700
	W 185	37,000	3,700
	W 187	1,480	1,480
	W 187	1,480	1,480
Uranium (92)	U 230	3,700	3.7
	U 232	1,110	1.11
	U 233	3,700	3.7
	U 234	3,700	3.7
	U 235	3,700	7.4
	U 236	7,400	7.4
	U 238	Unlimited	Unlimited
	U (natural)	Unlimited	Unlimited
	U (enriched) (less than 20%)	Unlimited	Unlimited
	U (enriched) (20% or greater)	3,700	3.7
	U (depleted)	Unlimited	Unlimited
	U (irradiated) (2)	—	—
Vanadium (23)	V 48	222	222
	V 49	37,000	37,000

SCHEDULE I—Concluded

ACTIVITY LIMITS—Concluded

PART I—Concluded

Activity Limits for Single Radionuclides—Concluded

Column I <i>Element (and its atomic number)</i>	Column II <i>Symbol of Radionuclide</i>	Column III <i>A₁ (in gigabecquerels)</i>	Column IV <i>A₂ (in gigabecquerels)</i>
Xenon (54)	Xe 127 (uncompressed) (1)	2,590	2,590
	Xe 127 (compressed) (1)	185	185
	Xe 131m (uncompressed) (1)	3,700	3,700
	Xe 131m (compressed) (1)	370	370
	Xe 133 (uncompressed) (1)	37,000	37,000
	Xe 133 (compressed) (1)	185	185
	Xe 135 (uncompressed) (1)	2,590	2,590
	Xe 135 (compressed) (1)	74	74
Ytterbium (70)	Yb 169	2,960	2,960
Yttrium (39)	Yb 175	14,800	14,800
	Y 87	740	740
	Y 90	370	370
	Y 91	1,110	1,110
	Y 91m	1,110	1,110
	Y 92	370	370
	Y 93	370	370
Zinc (30)	Zn 65	1,110	1,110
	Zn 69	11,100	11,100
	Zn 69m	1,480	1,480
Zirconium (40)	Zr 93	37,000	37,000
	Zr 95	740	740
	Zr 97	740	740

Notes:

- (1) "Uncompressed" means that the pressure within the package at the time and place that the package is closed for transportation does not exceed the ambient atmospheric pressure; "compressed" means that the pressure within the package at the time and place that the package is closed for transportation exceeds the ambient atmospheric pressure.
- (2) For the procedures for deriving the values of A₁ and A₂ in respect of
 - (a) irradiated thorium, refer to item 6 of Part II; and
 - (b) irradiated uranium, refer to item 7 of Part II."

PART II

Procedures for Deriving A_1 and A_2

1. Unlisted single radionuclide of known identity

The values of A_1 and A_2 for a single radionuclide not listed in Part I of this Schedule but whose identity is known shall be derived as follows, but A_1 shall not exceed 37,000 GBq:

(1) for a gamma emitter,

$$A_1 = \frac{90 \text{ GBq}}{\Gamma}$$

where Γ is the gamma ray constant expressed in milligrays per hour, at 1 m from one gigabecquerel of that radionuclide;

(2) for X-ray emitters,

$A_1 = 37,000 \text{ GBq}$ for radionuclides of atomic number equal to or less than 55,

$A_2 = 7,400 \text{ GBq}$ for radionuclides of atomic number greater than 55;

(3) for beta emitters, A_1 is based on maximum beta energy as follows

Maximum beta energy in million electron volts

A_1 in gigabecquerels

less than 0.5	37,000
from 0.5 to less than 1.0	11,100
from 1.0 to less than 1.5	3,700
from 1.5 to less than 2.0	1,110
greater than 2.0	370

(4) for alpha emitters, A_1 is based on both atomic number and half-life of the radionuclide as follows

$A_1 = 1\,000 A_2$, where A_2 is determined from the following table

Atomic Number	Half-life less than 1000 days	Half-life from 1000 days to 10 ⁶ years	Half-life greater than 10 ⁶ years
from 1 to 81	111 GBq	1.85 GBq	111 GBq
82 and greater	0.074 GBq	0.074 GBq	111 GBq

(5) for radionuclides emitting different kinds of radiation, A_1 shall be the lowest value of A_1 derived pursuant to (1), (2), (3), or (4) above;

(6) if a parent radionuclide decays into a shorter-lived daughter of half-life equal to or less than 10 days, A_1 shall be derived for both the parent and the daughter, and the lesser value shall be assigned to the parent radionuclide;

(7) A_2 shall be the lesser of A_1 or A_3 determined under the table set out in (4) above.

2. Single radionuclide of unknown identity

The values of A_1 and A_2 for a single radionuclide of unknown identity shall be taken to be 74 GBq and 0.074 GBq respectively except that if the atomic number of the radionuclide is known to be less than 82, the value of A_1 and A_2 shall be taken to be 370 GBq and 14.8 GBq respectively.

3. Mixtures of radionuclides of known identity

(1) Where the activity of each radionuclide is known, A_1 and A_2 for the mixture shall be derived as follows:

$A_1 = \text{total activity of the mixture}$

$$\frac{a_1}{A_{11}} + \frac{a_2}{A_{12}} + \frac{a_n}{A_{1n}}$$

$A_2 = \text{total activity of the mixture}$

$$\frac{a_1}{A_{21}} + \frac{a_2}{A_{22}} + \frac{a_n}{A_{2n}}$$

where n is the total number of radionuclides;

a_1, a_2, \dots, a_n is the activity of each radionuclide 1, 2, \dots n ;

$A_{11}, A_{12}, \dots, A_{1n}$ and $A_{21}, A_{22}, \dots, A_{2n}$ are the appropriate values of A_1 and A_2 respectively of each radionuclide 1, 2, \dots n .

(2) Where the individual activity of some of the radionuclides is not known but their total activity is known, these radionuclides shall be classed as a single radionuclide whose activity is their total activity and whose A_1 and A_2 values are the lowest values of A_1 and A_2 respectively of any radionuclide of unknown activity present in the mixture. A_1 and A_2 for the mixture shall then be derived in accordance with the procedures described in (1) above.

(3) Where the individual activity of none of the radionuclides is known, the values of A_1 and A_2 for the mixture shall be the lowest values of A_1 and A_2 respectively of any radionuclide present in the mixture.

4. Mixture of radionuclides of unknown identity

(1) For mixed fission products, the following may be assumed if a detailed analysis of the mixture is not carried out:

$A_1 = 370 \text{ GBq}$,

$A_2 = 14.8 \text{ GBq}$

(2) For mixtures of radionuclides that are not fission products,

$A_1 = 74 \text{ GBq}$

$A_2 = 0.074 \text{ GBq}$, except

that if alpha emitters are not present in the mixture,

$$A_2 = 14.8 \text{ GBq.}$$

5. Radioactive decay chains

(1) A single radioactive decay chain in which the radionuclides are present in their naturally-occurring proportions and in which no daughter radionuclide has a half-life either longer than 10 days or longer than that of the parent radionuclide shall be considered a single radionuclide for which A_1 and A_2 respectively shall be A_1 and A_2 of the parent radionuclide.

(2) A single radioactive decay chain in which the radionuclides are present in their naturally occurring proportions and in which any daughter radionuclide has a half-life either longer than 10 days or longer than that of the parent radionuclide shall be considered a mixture of the parent radionuclide and all such daughter radionuclides.

6. Irradiated Thorium

Values for A_1 and A_2 for irradiated thorium shall be derived in accordance with the procedures described in this Part for mixtures of different radionuclides, taking into account the activity of the fission products and of the uranium 233 in addition to that of the thorium.

7. Irradiated Uranium

Values for A_1 and A_2 for irradiated uranium shall be derived in accordance with the procedures described in this Part for mixtures of different radionuclides, taking into account the activity of the fission products and plutonium isotopes in addition to that of the uranium.

SCHEDULE II

(s.2, 13)

PART I

Tested Conditions of Transport

1. Water spray test:

The exposed surface of the package is uniformly subjected to a spray equivalent to a rainfall of 50 mm/h impinging at an angle of 45° for a period of at least one hour. During this test, the package is supported so that it does not rest in a pool of water, and the spraying arrangement is such that at the conclusion of the test, the entire surface of the package is wet.

2. Free drop test:

The package is dropped onto a flat essentially unyielding horizontal surface, striking the surface in a manner that results in maximum damage to the package. The height of fall measured from the lowest point of the package to the surface is not less than 1.2 m except that for a package weighing more than 5 000 kg, the height of the fall is not less than the free fall distance hereafter set out:

Package weight (kilograms)	Free fall distance (metres)
5,000 to less than 10,000	0.9
10,000 to less than 15,000	0.6
more than 15,000	0.3

For a Fissile Class II package, this test is preceded by a free drop from a height of 0.3 m onto each corner or, in the case of a cylindrical package, onto each of the quarters of each rim.

For a fibreboard or wood rectangular package not exceeding 50 kg in weight, a separate specimen shall be subjected to a free drop onto each corner from a height of 0.3 m.

For a fibreboard cylindrical package not exceeding 100 kg in weight, a separate specimen shall be subjected to a free drop onto each of the quarters of each rim from a height of 0.3 m.

3. Compression test:

The package is subjected for a continuous period of 24 hours to a compressive load equal to the greater of

- (a) five times the weight of the actual package; and
- (b) 1 300 kg/m² multiplied by the maximum horizontal cross-section of the package.

The load is applied uniformly against the top and bottom of the package in the position in which the package would normally be transported.

4. Penetration test:

The package is positioned on a flat essentially unyielding horizontal surface. A steel bar of 32 mm diameter with a hemispherical end and weighing 6 kg is dropped from a height of 1 m onto the exposed surface of the package that is the most vulnerable to puncture. Prior to dropping, the longitudinal axis of the bar is perpendicular to the surface of the package. The steel bar is not significantly deformed by the test performance.

5. The free drop, compression and penetration tests shall be preceded in each case by the water spray test. One prototype, model or specimen may be used for all tests. The time interval between the conclusion of the water spray test and the succeeding test must be such that the water has soaked in to the maximum extent, without appreciable drying of the exterior. In the absence of any evidence to the contrary, this interval should be taken to be approximately two hours if the water spray is applied from four directions simultaneously. No time interval should elapse, however, if the water spray is applied from each of the four directions consecutively.

6. For Type A packages containing liquids or gases, a separate package shall be subjected to the more severe of the modified free drop and penetration tests hereafter set out.

Modified free drop test:

The package is dropped in accordance with the normal free drop test except that the height of fall measured from the lowest part of the package to the surface is 9 m.

Modified penetration test:

The package is subjected to the normal penetration test except that the height of fall is 1.7 m.

If it is impossible to determine which test is more severe, separate packages must be submitted to each test.

PART II

Accident Conditions of Transport

1. Mechanical Test:

The package is subjected to two drops onto a target as described hereafter in the order that results in damage leading to maximum damage from a subsequent thermal test.

The package is dropped onto a flat essentially unyielding horizontal surface striking the surface in a manner that results in maximum damage to the package. The height of fall measured from the lowest point of the package to the surface is not less than 9 m.

The package is dropped onto the top end of a vertical cylindrical mild steel bar mounted on an essentially unyielding horizontal surface. The height of fall measured from the lowest point of the package to the top end of the bar is not less than 1 m. The circular section of the steel bar is 15 cm in diameter. The edge of the top of the bar is rounded off to a radius of not more than 6 mm. The bar's length is 20 cm unless a longer bar would cause greater damage in which case a bar of sufficient length to cause maximum damage is used. The orientation of the package at the point and time of impact is such as to cause maximum damage to the package.

2. Thermal Test:

This test is performed on a package that has been subjected to the mechanical test. The package is subjected to a heat flux, incident directly on the package, not less than that which would result from exposure for 30 minutes of the entire package to a radiation environment of 800°C with an emissivity coefficient of at least 0.9. For purposes of calculation the surface absorptivity is the greater of that value that the package would possess if exposed to a fire, or 0.8. When significant, convective heat input is accounted for on the basis of still ambient air at a temperature of 800°C during the relevant 30 minute period.

The package is not cooled artificially until three hours after the test period or until all temperatures on the inside of the package have begun to fall.

Any combustion of materials of the package is allowed to proceed for at least three hours after the cessation of external heating to the package.

3. Water immersion test:

The package is immersed in water to the extent that all portions of the package are under at least 15 m for a period of not less than eight hours. An external pressure of water of 150 kPa gauge meets this condition.

PART III

Test for Special Form Radioactive Material

1. Impact test:

The material is dropped a distance of 9 m onto a flat essentially unyielding horizontal surface striking the surface in a position that results in maximum damage to the material.

2. Percussion test:

The material is placed on a lead sheet which is supported by a smooth essentially unyielding surface and struck by the flat face of a steel billet so as to produce an impact equivalent to that resulting from a free fall of 1.4 kg through 1 m. The flat face of the billet is 25 mm in diameter with the edges rounded off to a radius of 3 mm. The lead, of hardness number 3.5 to 4.5 on the Vickers scale and not more than 25 mm thick, covers an area greater than that covered by the material. A fresh surface of lead is used for each impact. The billet strikes the material so as to cause maximum damage.

3. Bending test:

This test is performed only on long slender material with a minimum length of 10 cm and a length to minimum width ratio of not less than 10. The material is rigidly clamped in a horizontal position so that one half of its length protrudes from the face of the clamp. The orientation of the material is such that the package suffers maximum damage when its free end is struck by the flat face of a steel billet. The billet strikes the material so as to produce an impact equivalent to that resulting from a free vertical fall of 1.4 kg through one metre. The flat face of the billet must be 25 mm in diameter with the edges rounded off to a radius of 3 mm.

4. Heat test:

The material is heated in air to a temperature of 800°C and maintained at that temperature for a period of 10 minutes. The material is then allowed to cool.

5. Leaching test number one:

The material is immersed for seven days in water at ambient temperature. The water has a pH value in the range 6 to 8 inclusive and a maximum conductivity of one millisiemens per metre (1 mS/m) at 20°C. The water with material is then heated to a temperature of 50°C and maintained at this temperature for four hours. The resulting activity in the water must not exceed 1.85 kBq.

The material is then stored for at least seven days in still air of humidity not less than 90 per cent at 30°C. This is followed by immersion and heating in the same manner prescribed above and again, the resulting activity in the water must not exceed 1.85 kBq.

6. Leaching test number two:

The encapsulated material is immersed in water at ambient temperature. The water has a pH value in the range 6 to 8 inclusive and a maximum conductivity of one millisiemens per metre (1 mS/m) at 20°C. The water with material is then heated to a temperature of 50°C and maintained at this temperature for four hours. The resulting activity in the water must not exceed 1.85 kBq. The encapsulated material is then stored for at least seven days in still air at a temperature not less than 30°C. This is followed by immersion and heating in the same manner prescribed above and again, the resulting activity in the water must not exceed 1.85 kBq.

PART IV

1. Compliance with the test requirements of this Schedule may be established by

(a) satisfactory performance of tests with prototype of the packaging together with contents that reasonably simulate radioactive material to be packaged,

(b) satisfactory performance of tests with appropriately scaled models or specimens incorporating all significant features providing such tests are suitable for design purposes and test parameters have been suitably adjusted, or

(c) recorded calculation deriving from reliable and conservative procedures, parameters, and hypotheses

and the means of establishing compliance shall be recorded and the results retained in a form suitable for review by the Board.

2. Except for the water immersion test, the package must be, or assumed to be, initially in equilibrium at an ambient temperature of 38°C.

3. Prior to testing, the presence or absence of the following, as they relate to the packaging or prototype, shall be recorded:

(a) divergences from available manufacturers' or designers' specification or drawing;

(b) defects in construction;

(c) evidence of corrosion or other deterioration; and

(d) distortion of features.

SCHEDULE III

(ss. 2, 5, 6, 7, 8, 12 and 19)

MAXIMUM PERMISSIBLE LEVELS OF NON-FIXED RADIOACTIVE MATERIAL

Item	Column I	Column II
	<i>Radioactive Material</i>	<i>Maximum permissible level⁽¹⁾ in (Bq/cm²) measured over areas not exceeding 300 cm²</i>
1	Beta and gamma emitters	3.7
2	natural uranium, natural thorium, uranium 235, uranium 238, thorium 232; and thorium 228 and thorium 230 when contained in ores or physical concentrates	3.7
3	radionuclides with a half-life of less than 10 days	3.7
4	all other alpha emitters	0.37

Notes:

- The level of non-fixed radioactive material may be determined by wiping an area of 300 cm² of the surface by hand with a dry filter paper, or wad of dry cotton wool, or any other material of this nature, taking into account the collection efficiency of the material used.

SCHEDULE IV

(ss. 5 and 6)

LIMITS

Item	Column I	Column II	Column III
	<i>Radioactive material⁽¹⁾</i>	<i>Instruments and articles</i>	<i>* Material</i>
		<i>Item Limits</i>	<i>Package Limits⁽²⁾</i>
1	<i>In solid form</i>		
	(a) Special form radioactive material	(a) 10 ⁻² A ₁	(a) 10 ⁻² A ₁
	(b) All other solids ⁽²⁾	(b) 10 ⁻² A ₂	(b) 10 ⁻² A ₂
2	<i>In liquid form</i>		
	(a) Tritiated water of total radioactivity		(a)
	(i) less than 3.7 gigabecquerels per litre		(i) 37,000 GBq
	(ii) between 3.7 and 37 gigabecquerels inclusive per litre		(ii) 3,700 GBq
	(iii) greater than 37 gigabecquerels per litre		(iii) 37 GBq
	(b) All other liquids ⁽²⁾	(b) 10 ⁻³ A ₂	(b) 10 ⁻⁴ A ₂
3	<i>In gaseous form</i>		
	(a) Tritium ⁽²⁾	(a) 740 GBq	(a) 740 GBq
	(b) Special form radioactive material	(b) 10 ⁻² A ₁	(b) 10 ⁻² A ₁
	(c) All other gases	(c) 10 ⁻² A ₂	(c) 10 ⁻² A ₂

Notes:

- For purposes of this Schedule, the form of radioactive material is that form in which the material would exist if it were at a temperature of 20°C and subject to a pressure of 101.33 kPa.
- In the case of tritium, limits that apply to tritium in gaseous form also apply to tritium in activated luminous paint and tritium absorbed on solid material.
- Where there are two or more radionuclides within a package, all radionuclides may be treated as being within a mixture of these radionuclides for the purposes of calculating A₁ or A₂.

SCHEDULE V

(ss. 2 and 12)

TABLE 1

Activity Limits for Transport of Low Specific Activity Material

Nature of material	Vehicle, aircraft, hold compartment or deck area of a seagoing vessel	Hold or compartment of inland waterway craft
Solids	no limit	100 x A ₂
Tritiated water	1850 TBq	185 TBq
Other liquids and gases	100 x A ₂	100 x A ₂

TABLE 2

Neutron Flux Densities to be Regarded as Equivalent to a Radiation Level of 10 µSv/h

Neutron Energy	Flux density equivalent to 10 µSv/h (neutrons per square centimetre second)
Thermal	268
5 keV	228
20 keV	112
100 keV	32
500 keV	12
1 MeV	7.2
5 MeV	7.2
10 MeV	6.8

Note:

- Flux densities equivalent for energies between those listed are to be established by interpolation.

TABLE 3

Insolation Data

Form and location of surface	Insolation in watts per square metre / 12 hours per day
Flat surfaces transported horizontally	
—base	none
—other surfaces	800
Flat surfaces not transported horizontally	
—each surface	200 ⁽¹⁾
Curved surfaces	400 ⁽¹⁾

Note:

- Alternatively, a sine function may be used, adopting an absorption coefficient and neglecting the effects of possible reflection from neighbouring objects.

TABLE 4

Activity Limits for Loss of Radioactive Contents from Type B(M) Packages⁽¹⁾

Conditions	Type B(M) packages not designed for continuous venting	Type B(M) packages specially designed to allow continuous venting
Tested Conditions of transport	$A_2 \times 10^{-4}$ per hour	$A_2 \times 10^{-5}$ per hour
Accident conditions of transport	Krypton-85: 10A ₂ in seven days Other radionuclides: A ₂ in seven days	Krypton-85: 10A ₂ in seven days Other radionuclides: A ₂ in seven days

Note:

(1) The A₂ values for noble gases are those for the uncompressed state of those gases.

***SCHEDULE VI**

(Sections 8, 12, 14 and 20)

Safety Marks for Packages and Transport Containers Containing Radioactive Materials

1. For the purposes of this Schedule, packages and transport containers containing radioactive materials are categorized according to the following table:

TABLE

Item	Column I Category	Column II Package Characteristics	Column III Transport Container Characteristics
1.	I—WHITE	<p>(a) The radiation level originating from the package at any time during normal transport does not exceed 5 uSv/h at any location on the external surface of the package;</p> <p>(b) the package is not a Fissile Class II package or a Fissile Class III package; and</p> <p>(c) the package is not transported subject to an authorization issued by the Board or an authorized officer pursuant to section 4 of these Regulations.</p>	<p>(a) The transport container contains a package or packages containing radioactive materials, none of which is in a category higher than Category I—WHITE; and</p> <p>(b) the transport container is not transported subject to an authorization issued by the Board or an authorized officer pursuant to section 4 of these Regulations.</p>
2.	II—YELLOW	<p>(a) The radiation level originating from the package at any time during normal transport exceeds 5 uSv/h except in the case of Fissile Class II packages, but does not exceed 300 uSv/h at any location on the external surface of the package;</p> <p>(b) the transport index of the package does not exceed 1.0 at any time during normal transport;</p> <p>(c) the package is not a Fissile Class III package; and</p> <p>(d) the package is not transported subject to an authorization issued by the Board or an authorized officer pursuant to section 4 of these Regulations.</p>	<p>(a) The transport container contains no Fissile Class III packages;</p> <p>(b) the transport index of the transport container does not exceed 1.0 at any time during normal transport; and</p> <p>(c) the transport container is not transported subject to an authorization issued by the Board or an authorized officer pursuant to section 4 of these Regulations.</p>
3.	III—YELLOW	<p>(a) The radiation level originating from the package at any time during normal transport exceeds 0.5 mSv/h, except in the case of Fissile Class III packages, but does not exceed 2 mSv/h at any location on the external surface of the package;</p> <p>(b) the transport index of the package does not exceed 10 at any time during normal transport;</p> <p>(c) the package is exclusive use and the radiation level originating from the package at any time during normal transport does not exceed 10 mSv/h at any location on the external surface of the package; or</p> <p>(d) the package is transported subject to an authorization issued by the Board or an authorized officer pursuant to section 4 of these Regulations.</p>	<p>(a) The transport container contains a Fissile Class III package;</p> <p>(b) the transport index of the transport container exceeds 1.0 at any time during normal transport; or</p> <p>(c) the transport container is transported subject to an authorization issued by the Board or an authorized officer pursuant to section 4 of these Regulations.</p>

2. Each package or transport container containing radioactive material shall be labelled as follows:

(a) A Category I—WHITE package or transport container shall bear labels that conform to the model illustrated and described in Figure 2 of this Schedule.

(b) A Category II—YELLOW package or transport container shall bear labels that conform to the model illustrated and described in Figure 3 of this Schedule.

(c) A Category III—YELLOW package or transport container shall bear labels that conform to the model illustrated and described in Figure 4 of this Schedule.

(d) A package containing radioactive material shall bear labels required pursuant to paragraph (a), (b) or (c) affixed to two opposite sides of the external surface of the package.

(e) A transport container containing radioactive material shall bear labels required pursuant to paragraph (a), (b) or (c) affixed on the outside of all four sides or quadrants of the transport container.

(f) Each label affixed to a package or transport container pursuant to paragraph (a), (b), or (c) shall contain, in the appropriate space on the label indicated in Figures 2, 3, or 4 of this Schedule, the following informations:

(i) Contents

(A) the name and mass number of the radionuclide or its symbol as stated in Schedule I. For mixtures of radionuclides, the most significant nuclides must be listed.

(B) MFAS-LSA, if the radioactive material within the package or transport container is low specific activity material.

(C) MSFA-LLS, if the radioactive material within the package or transport container is low-level solid radioactive material.

(ii) Activity

the activity of the contents in appropriate units. For fissile radioactive materials, the mass of fissile radionuclides must be included.

(iii) Transport Index.

(g) All labels on an exclusive use package or transport container shall be additionally marked by overstamp or legible writing with the words "Exclusive Use—Usage Exclusif".

3. Each package or transport container containing radioactive material shall bear safety marks in accordance with the following requirements:

(a) Each package whose mass exceeds 50 kg shall have plainly and durably marked on its outside surface its gross mass in kilograms.

(b) A Type A package shall be plainly and durably marked with the words "Type A" on the outside of the package.

(c) A Type B(M) package or a Type B(U) package shall, on the outside of the outermost receptacle which is resistant to the effects of fire and water, be plainly marked by embossing, stamping, or other means resistant to the effects of fire and water, with

(i) the words "Type B(M)" or "Type B(U)" as appropriate,

(ii) the model and serial number assigned to that package by the manufacturer of the package,

(iii) the certificate number stipulated on any package design approval certificate issued by the Board or an authorized officer pursuant to section 15 of these Regulations with respect to that package,

"(iv) the identification mark stipulated on any endorsement issued by the Board or an authorized officer pursuant to section 16 of these Regulations with respect to that package,"

(v) the word "RADIOACTIVE" in such a manner that the word is readily visible and legible, and

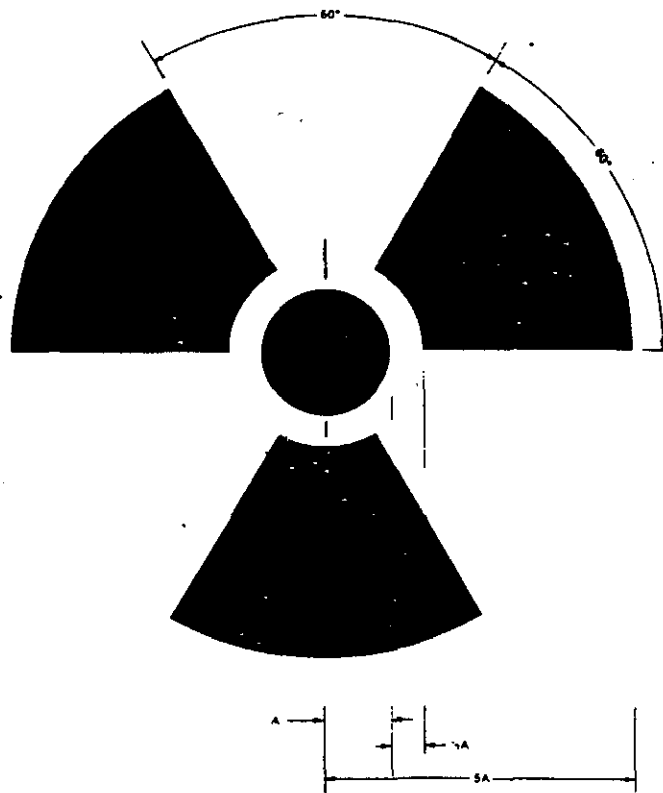
(vi) the trefoil symbol illustrated and described in Figure 1 of this Schedule.

For purposes of this requirement, "resistant to the effects of fire and water" means capable of withstanding the thermal and water immersion tests described in Part II of Schedule II.

(d) If a package contains fissile material, the word "Fissile" or the letter "F" shall be marked on the package in association with any mark indicating the type of package in a manner that is not more prominent than but is at least equivalent to that mark.

(e) A transport container having at least one outer dimension equal to or greater than 1.5 m or an internal volume equal to or greater than 3 m³ shall bear the placard illustrated and described in Figure 5 of this Schedule affixed on the outside of all four sides or quadrants of the transport container.

FIGURE I
Trefoil Symbol



A = Radius of the central disc

Note: Construction lines do not appear in the actual symbol

1. The symbol shall be as prominent as is practical and of a size consistent with the size of the package or container to which it is affixed or attached, and shall be of such size as to permit the symbol to be read from a safe distance, but the proportions set out are to be maintained.

2. Unless the circumstances do not permit, the symbol shall be oriented with one blade pointed downward and centered on the vertical axis.

3. No wording shall be superimposed on the symbol.

4. The three blades and the centre disc of the symbol shall be

(a) black; and

(b) located on a yellow background.

FIGURE 2
Category I—WHITE Label



Note: Construction lines do not appear in the actual label.

1. The label shall be prominent and its size sufficiently large to readily convey all the information on the label, but the proportions set out are to be maintained, and the dimensions shall be not less than those shown.

2. Unless the circumstances do not permit, the label shall be oriented as illustrated.

3. The trefoil symbol shall be coloured black and located on a white background, and the remainder of the label shall be white except

- (a) the roman numeral I, which shall be coloured red; and
- (b) all other numbering and lettering, which shall be coloured black.

FIGURE 3

Category II—YELLOW Label



Note: Construction lines do not appear in the actual label.

1. The label shall be prominent and its size sufficiently large to readily convey all the information on the label, but the proportions set out are to be maintained, and the dimensions shall be not less than those shown.

2. Unless the circumstances do not permit, the label shall be oriented as illustrated.

3. The trefoil symbol shall be coloured black and located on a yellow background, and the remainder of the label shall be white except

(a) the roman numeral II, which shall be coloured red; and

(b) all other numbering and lettering, which shall be coloured black.

FIGURE 4

Category III—YELLOW Label



Note: Construction lines do not appear in the actual label.

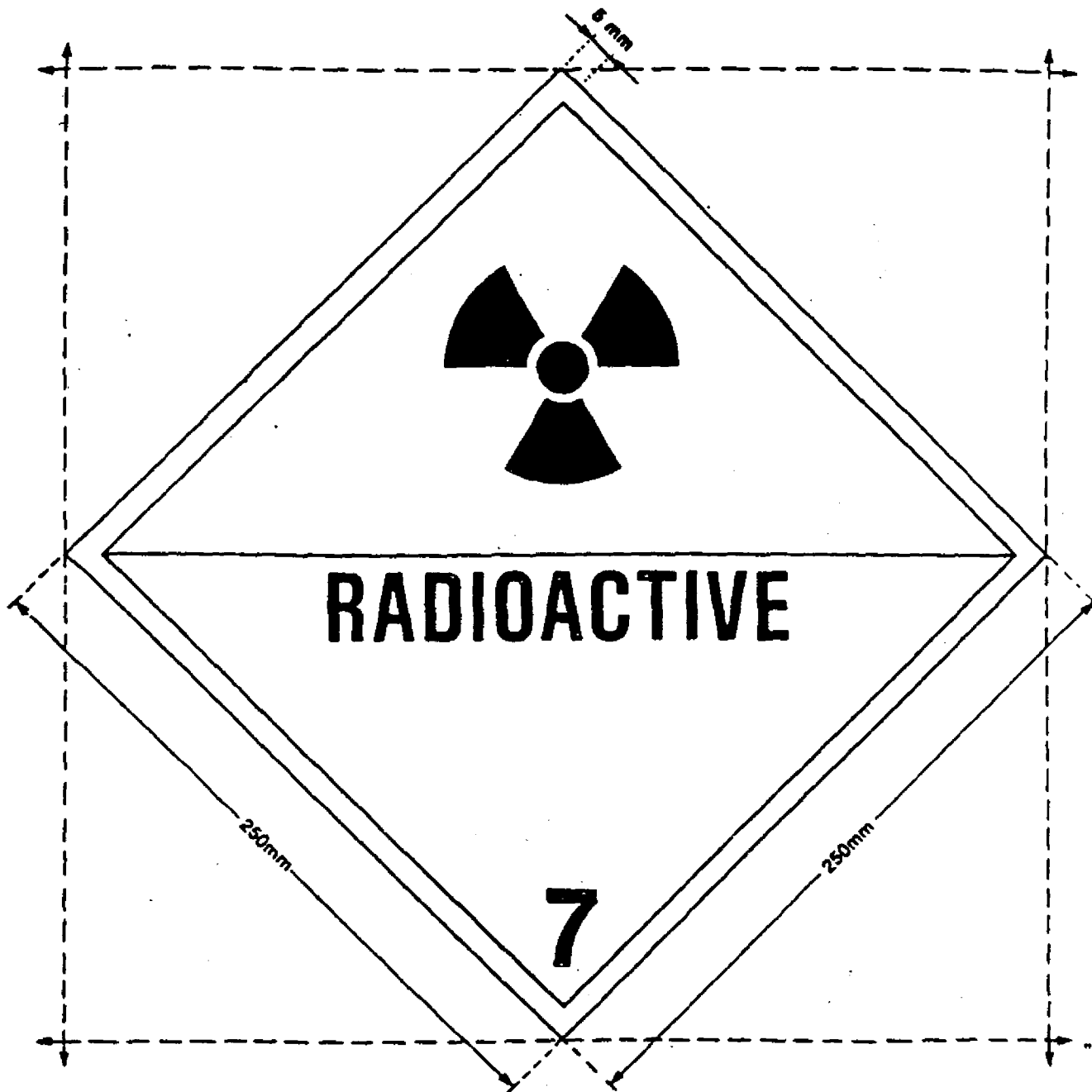
1. The label shall be prominent and its size sufficiently large to readily convey all the information on the label, but the proportions set out are to be maintained, and the dimensions shall be not less than those shown.

2. Unless the circumstances do not permit, the label shall be oriented as illustrated.

3. The trefoil symbol shall be coloured black and located on a yellow background, and the remainder of the label shall be white except

- (a) the roman numeral III, which shall be coloured red; and
- (b) all other numbering and lettering, which shall be coloured black.

Placard for Transport Container



Note: Construction lines do not appear in the actual label.

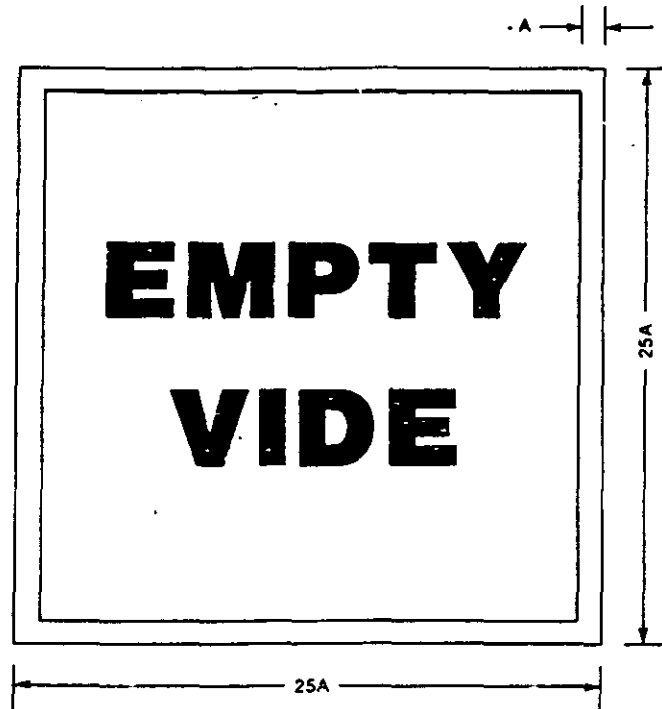
1. The placard shall be prominent and its size sufficiently large to readily convey all the information on the placard, but the proportions set out are to be maintained, and the dimensions shall be not less than those shown.

2. The placard shall be oriented as illustrated.

3. The trefoil symbol shall be coloured black and located on a yellow background, the trefoil symbol shall bear the same approximate proportion to the placard as that illustrated and the remainder of the background of the placard shall be white except for the number 7 and any safety marks required by the *Transportation of Dangerous Goods Regulations* which shall be coloured black.

4. The word "RADIOACTIVE" is not required but, if it is used, it shall be coloured black."

FIGURE 6
Empty Label



A = Width of the margin

1. The label shall be prominent and its size sufficiently large to readily convey all the information on the label, but the proportions set out are to be maintained, and the width of the margin shall be not less than 4 mm.

2. Unless the circumstances do not permit, the label shall be oriented as illustrated.

3. The lettering shall be coloured black and shall be of sufficient size to be readily visible and legible from a reasonable distance.

SCHEDULE VII

(ss. 5, 7, 12 and 13)

GENERAL DESIGN REQUIREMENTS FOR ALL PACKAGING AND PACKAGES

1. The packaging shall be so designed that the package can be easily handled and can be secured in or on the means of transport during normal transport.

2. A package of gross mass 10 kg or more and up to 50 kg is provided with means for manual handling.

3. A package of gross mass in excess of 50 kg is so designed as to enable safe handling to be done by mechanical means.

4. The design of the packaging shall be such that any lifting attachment on the package, when used in the intended manner, does not impose unsafe stresses on the structure of the package, taking into account appropriate safety factors to cover sudden lifting.

5. Any attachment or other feature on the external surface of the packaging that could be used to lift the package but that is not designed to support the weight of the package in accordance with the requirement of item 4 shall be removable or shall otherwise be rendered inoperable for lifting, and shall, before transport, be removed or otherwise rendered inoperable for lifting.

6. The outer layer of packaging shall be designed to avoid, as far as practicable, the collection and retention of water.

7. The external surface of the packaging shall be, as far as practicable, designed and finished to be easily decontaminated of radioactive material.

8. Any feature added to the package at the time of transport that is not a component part of the package shall not be such as to reduce the safety of the package.

*SCHEDULE VIII

(Sections 2, 11, 12 and 13)

REQUIREMENTS FOR TYPE A PACKAGES*

1. A Type A package shall conform to the general design requirements set out in Schedule VII.

2. The smallest external dimension of the package shall be not less than 0.1 m and the package shall be sealed in such a manner that any opening of the package shall be evident.

3. The external surface of the package shall be free of any protruding feature that is not designed to facilitate transport.

4. The packaging shall be able to withstand variations in ambient temperatures from 70°C to -40°C and resistant to brittle fracture over this temperature range.

5. The design, fabrication, and manufacturing of welded, brazed, or other fusion joints shall be in accord with generally accepted engineering standards.

6. The package shall be capable of withstanding the effects of any acceleration, vibration, or vibration resonance that may arise during normal transport.

7. The packaging shall be equipped with a fastening device that can securely close the package and that can not be unfastened unintentionally or by any pressure from within the package.

8. The materials, structures, and components of the packaging shall be physically and chemically compatible with each other and with the package contents under normal conditions, including irradiation.

9. The radiolytic decomposition of liquids and other vulnerable materials and the generation of gas by chemical reaction and radiolysis shall be taken into account in the design of the packaging.

10. The package shall retain its radioactive contents under a reduction of ambient pressure to 25 kPa.

11. All valves on the package, other than pressure relief valves, through which radioactive contents could escape shall be protected against unauthorized operation and enclosed in such a manner as to retain any leakage from the valve.

12. Any radiation shield forming part of the package shall be capable of being securely closed by a fastening device that is independent of any other packaging structure and that can not be unfastened unintentionally or by any pressure from within the package.

13. Forces in tie-down attachments on the package shall not, during transport, impair the package's conformity to these Regulations.

14. No loss or dispersal of any radioactive material nor any increase in the maximum radiation level at the external surface of the package shall result if the package is subjected to tested conditions of transport.

15. If the radioactive contents are in liquid form, no loss or dispersal of any radioactive material nor any increase in the maximum radiation level at the external surface of the package shall result if the package is subjected to the modified free drop and modified penetration tests described in Schedule II.

*16. If the radioactive contents are in liquid form of a volume equal to or less than 50 mL, the package shall contain absorbent material sufficient to absorb twice the volume of the liquid contents and the relative positioning of the liquid contents and the absorbent material within the package shall be such that, in the event of leakage of the liquid contents from their inner container, the liquid will be fully absorbed by the absorbent material.

17. If the radioactive contents are in liquid form of a volume greater than 50 mL, the package shall contain absorbent material in the manner described in item 16 or shall include an inner containment component within which the contents are normally contained and an outer containment component, each containment component being designed to assure retention of the liquid contents within the outer containment component in the event of leakage from the inner containment component.

18. If the radioactive contents are in gaseous form, except for tritium or argon 37 of activity less than 7,400 GBq, no loss or dispersal of any radioactive material or no increase in the maximum radiation level at the external surface of the package shall result if the package is subjected to the modified free drop and modified penetration tests described in Part I of Schedule II."

SCHEDULE IX

(s.2)

REQUIREMENTS FOR TYPE B(M) PACKAGES AND TYPE B(L) PACKAGES

PART I

Type B(M) Packages

1. A Type B(M) package shall conform to the requirements set out in items 1 to 13 of Schedule VIII.

2. When the package contains a quantity of iridium 192 sufficient to produce a radiation level of 100 μ Sv/h at 1 m from the surface of the package and is subjected to accident conditions of transport, the package shall retain sufficient radiation shielding to ensure that the radiation level at 1 m from the surface of the package does not exceed 10 mSv/h⁽¹⁾.

3. Under ambient conditions of 38°C and insolation in accordance with Table 3 of Schedule V

(a) heat generated within the package by the radioactive contents shall not, under tested conditions of transport, adversely affect the package in such a way that it will, if left unattended for a period of one week⁽²⁾, fail to meet the requirements for containment and shielding set out in these Regulations; and

(b) unless the package is exclusive use, the temperature of any accessible surface of the package shall not exceed 50°C in the shade.

4. (1) Any thermal protection required to meet the requirements of this Schedule shall remain effective if the package is subjected to tested conditions of transport and the mechanical test described in Schedule II.

(2) Any protection on the exterior of a package shall not be rendered ineffective by conditions commonly encountered in normal handling or in accidents such as ripping, cutting, skidding, abrasion or rough handling which conditions are simulated in the tests referred to in this item.

5. Under tested or accident conditions of transport, the activity of radioactive contents lost from the package shall not be greater than the limits specified in Table 4 of Schedule V.

6. If under tested or accident conditions of transport the pressure in the package could result in a stress exceeding the minimum yield strength of any structural material of the package at the temperature that it could reach under these conditions, the package is equipped with a pressure relief system sufficient to ensure that the minimum yield strength is not exceeded.

PART II

Type B(U) Packages

1. A Type B(U) package shall conform to requirements set out in items 1, 2, 3 and 4 of Part I.

2. Under tested conditions of transport, the activity of radioactive contents lost from the package shall not be greater than $A_2 \times 10^{-4}$ per hour taking into account any non-fixed radioactive material on the external surface of the package.

3. Under accident conditions of transport, the activity of radioactive contents lost from the package shall not be greater than $A_2 \times 10^{-3}$ in a period of seven days⁽³⁾.

4. The package shall not incorporate a feature that is intended or could be used to effect continuous venting during normal transport.

5. The package shall not include a pressure relief system that allows the release of radioactive material under tested or accident conditions of transport.

6. Where the sum of the maximum normal operating pressure of the package and any differential pressure below mean sea-level atmospheric pressure to which the package may be subjected during normal transport exceeds 35 kPa gauge, the package shall be capable of withstanding a pressure of one and one-half times the sum of those pressures, and the stress on the package at this pressure shall not be greater than 75 per cent of the minimum yield strength and not greater than 40 per cent of the ultimate strength of the package at the maximum temperature reached during transport.

7. When the package at the maximum normal operating pressure is subjected to the thermal test described in Schedule II, the pressure in any component of the packaging required to contain the radioactive contents shall not exceed the pressure that corresponds to the minimum yield strength of that component at the maximum temperature reached during the test.

8. The maximum normal operating pressure of the package shall not be greater than 700 kPa gauge.

9. The maximum temperature of any package surface readily accessible during normal transport shall not exceed 82°C in the shade during normal transport.

10. A package containing liquid radioactive material shall remain in conformity with the requirements of these Regulations if the package is subjected to a temperature of -40°C during normal transport.

Notes:

(1) Iridium 192 may be replaced as a reference source by another radionuclide if the use of the package is restricted to that particular radionuclide. Similarly, a neutron source may be used as a reference source if the use of the package is restricted to neutron emitters.

(2) Particular attention should be directed to heat effects that may

(a) alter the arrangement, the geometric form, or the physical state of the radioactive contents or, if the material is enclosed in a can or receptacle, cause the can, receptacle or material to melt or be damaged;

- (b) lessen the level of conformity of the packaging with the requirements of these Regulations through differential thermal expansion, cracking or melting of the radiation shielding material; or
 - (c) in combination with moisture, significantly accelerate corrosion.
- (3) Compliance with these limits may not be achieved through reliance on a filter or a mechanical cooling system. The A_2 value for noble gases are those for the uncompressed state.

SCHEDULE X

(s.2)

REQUIREMENTS FOR PACKAGES CONTAINING FISSILE MATERIAL

1.1. (1) All fissile material, except fissile material subject to subsection 9(2) of these Regulations, that is transported or caused to be transported by any means of transport shall be packaged in a Fissile Class I package, Fissile Class II package or Fissile Class III package, as classified in this Schedule, in such a manner that criticality involving that fissile material cannot be attained during transport."

(2) In determining criticality by calculation or experiment, separate allowance shall be made for any inaccuracy in the data and any uncertainty concerning the validity of the data.

(3) For irradiated nuclear fuel or unspecified fissile material, the following assumptions shall be made in assessing criticality:

- (a) irradiated nuclear fuel for which the degree of irradiation is not known and whose reactivity decreases with burn-up must be regarded as unirradiated for criticality control, but if its reactivity increases with burn-up, it must be regarded as irradiated to the point of its maximum reactivity; and
- (b) for unspecified fissile materials, such as residues or scrap whose enrichment, mass, concentration, moderation ratio or density is not known, each unknown parameter must be assigned a value that results in the maximum credible reactivity during transport.

(4) The following contingencies shall be considered for the purposes of subsection (1):

- (a) water leaking into or out of the package;
- (b) a loss of efficiency of built-in neutron absorbers or moderators;
- (c) possible rearrangement of contents into more reactive arrays, either within the package or as a result of loss from the package;
- (d) reduction of spacing between packages or contents;
- (e) the package becomes immersed in water or buried in snow;
- (f) possible increase of reactivity due to temperature changes; and
- (g) possible increase of reactivity from other possible contingencies such as delays in transportation, climactic changes or formation of frost on the package.

"2. Packages of fissile material are classified as follows:

(a) a Fissile Class I package is a package that cannot give rise to a criticality incident involving its contents during transport

(i) because of its contents, configuration or any other characteristic, and

(ii) either by itself or in association with any number of identical packages in any possible arrangement;

(b) a Fissile Class II package is a package that cannot give rise to a criticality incident involving its contents during transport

(i) because of its contents, configuration or any other characteristic, and

(ii) either by itself or in association with a limited number of identical packages in any possible arrangement; and

(c) a Fissile Class III package is a package that, because of the limitations, terms or conditions that the Board or an authorized officer imposes on the use or transportation of the package pursuant to section 15 or 16 of these Regulations, cannot give rise to a criticality incident involving its contents during transport."

3. The requirements applicable to a Fissile Class I package are that

(a) a Fissile Class I package shall be designed, constructed and assembled so that under tested conditions of transport water will not leak into or out of any part of the package⁽¹⁾ and the configuration of the contents and the geometry of the containment system are not altered in a way that significantly increases the reactivity;

(b) the package shall be sub-critical⁽²⁾ under the following conditions:

(i) either tested conditions of transport and the cumulative effects of the mechanical and thermal tests described in Part II of Schedule II followed by a leakage test⁽³⁾⁽⁴⁾, which may be made of a separate specimen, or tested conditions of transport and the water immersion test described in Part II of Schedule II, whichever series of tests is the most limiting,

(ii) water can leak into or out of all void spaces⁽⁵⁾ of the package,

(iii) the fissile material is in its most reactive configuration and moderation reasonably foreseeable under the condition subparagraph (i) or (ii), and

(iv) there is close full water reflection of the containment system or such greater reflection of the containment system as may additionally be provided by any part of the remainder of the surrounding material of the package;

(c) if the package is stacked together in any arrangement with any number of identical packages, the stack shall remain sub-critical⁽¹⁾⁽²⁾ and

(d) a stack that includes in any arrangement 250 such packages individually subjected to condition of subparagraph (b)(i) shall remain sub-critical⁽²⁾ if moderated and subject to close full water reflection on all sides.

"4. The requirements applicable to a Fissile Class II package are that

(a) a Fissile Class II package shall be designed, constructed and assembled so that under tested conditions of transport

(i) neither the volume nor any spacing on the basis of which assessments on criticality have been carried out can be reduced by five per cent or more,"

(ii) the geometry and construction of the package do not permit the entry of a cube measuring 0.1 m per side when the package is closed.

(iii) water does not leak into or out of any part of the package⁽¹⁾.

(iv) the configuration of the contents and the geometry of the containment system are not altered in a way that significantly increases the reactivity of the package:

(b) the package shall be sub-critical⁽²⁾ under the following conditions:

(i) either tested conditions of transport and the cumulative effects of the mechanical and thermal tests described in Part II of Schedule II followed by a leakage test⁽³⁾⁽⁴⁾, which may be made of a separate specimen or tested conditions of transport and the water immersion test described in Part II of Schedule II, whichever series of tests is the most limiting.

(ii) water can leak into or out of all void spaces⁽⁵⁾ of the package.

(iii) the fissile material is in its most reactive configuration and moderation reasonably foreseeable under condition of subparagraph (i) or (ii), and

(iv) there shall be a close full water reflection of the containment system or such greater reflection of the containment system as may be additionally provided by any part of the remainder of the surrounding material of the package:

(c) (c) Fissile Class II packages of a single particular design shall not be grouped together in numbers exceeding the allowable number of that package design;

(d) for the purposes of paragraph (c), the allowable number of a Fissile Class II package shall be the lesser of

(i) that number of packages that would remain sub-critical⁽¹⁾⁽²⁾ if stacked together in any arrangement without anything between the packages, and the stack were

subject to close full water reflection on all sides, divided by five; and

(ii) that number of packages individually subjected to the condition of subparagraph 4(b)(i) of this Schedule that when stacked together in any arrangement and the stack is moderated in accordance with item 6 and closely reflected on all sides, remain sub-critical⁽²⁾, divided by two;

(e) for the purposes of paragraph (c), where a group consists of packages of different designs, the maximum permissible number of packages shall be such that

$$\frac{n_1}{N_1} + \frac{n_2}{N_2} + \dots + \frac{n_n}{N_n} \text{ shall not exceed one}$$

where n_1, n_2, \dots are the number of packages for which the corresponding allowable numbers are N_1, N_2, \dots respectively.

5. (1) Notwithstanding subparagraphs 3(b)(iii) and 4(b)(iii), physical and chemical characteristics of the packaging and contents shall be taken into account including any changes to those characteristics that could occur under the stated conditions of test.

(2) Notwithstanding subparagraphs 3(b)(iii) and 4(b)(iii), where any material escapes under the stated conditions of test, that material shall remain sub-critical⁽²⁾ assuming the most reactive configuration and moderation credible, when subjected to close full water reflection.

6. (1) Notwithstanding paragraph 3(d) and paragraph 4(d), water leakage into or out of the packages consistent with test results shall be assumed to the extent that results in maximum reactivity.

(2) Notwithstanding paragraph 3(d) and paragraph 4(d), hydrogenous moderation consisting of either a uniform layer of full density water surrounding each package or water at an appropriate density homogeneously interspersed between packages shall be assumed to the extent that results in maximum reactivity.

Notes:

(1) Water leakage of any part is not prohibited if water leakage into or out of that part, to the optimum foreseeable extent, is assumed to determine sub-criticality.

(2) Sub-criticality should be attained by an adequate margin.

(3) If water leakage to the optimum foreseeable extent is assumed in determined sub-criticality, a leakage test is not required.

(4) In the leakage test, the package is immersed under a head of water of at least 0.9 m for a period not less than eight hours and in the position for which maximum leakage is expected. For this test, an ambient temperature of 30°C is not required.

(5) Water leakage into or out of void spaces need not be considered for packages that have special features to prevent leakage if

(a) the special features remain leaktight if the package is subjected to the conditions of subparagraph 3(b)(i) of this Schedule; or

(b) the packaging is subjected to a high degree of quality control during construction and maintenance and special tests to demonstrate effective closure are carried out on the package before transport.

SCHEDULE XI

(s. 2)

PROCEDURES FOR DERIVING TRANSPORT INDEX

1. For a package, the transport index is

(a) the maximum radiation level in microsieverts per hour at 1 m from the external surface of the package, divided by 10; or

(b) for Fissile Class II packages and Fissile Class III packages, the larger of

- (i) the maximum radiation level in microsieverts per hour at 1 m from the external surface of the package, divided by 10, or
- (ii) 50 divided by the allowable number of the package.

2. For a transport container

(a) not containing a Fissile Class III package, the transport index is the sum of the transport indices of all packages within the transport container;

(b) containing a Fissile Class III package, the transport index is the greater of

- (i) 50, and
- (ii) the sum of the transport indices of all packages within the transport container.

3. For an exclusive use transport container not containing a Fissile Class II package or Fissile Class III package, the transport index is the maximum radiation level in microsieverts per hour at 1 m from the external surface of the transport container, divided by 10, and multiplied by the multiplication factor applicable to the maximum cross-sectional area of the transport container and set out in column II of an item of the Table of this Schedule applicable to the maximum cross-sectional area of the transport container set out in column I of that item of the Table.

4. The number expressing the transport index shall be rounded up to the first decimal place.

TABLE

Multiplication Factors

Item	Column I	Column II
	Cross-sectional area of the transport container parallel to the surface on which the label is affixed	Multiplication factor
1	1 m ² and less	1
2	greater than 1 m ² up to and including 5 m ²	3
3	greater than 5 m ² up to and including 20 m ²	6
4	greater than 20 m ²	19

*SCHEDULE XII

(Sections 2, 21 and 22)

REQUIREMENTS FOR SPECIAL FORM RADIOACTIVE MATERIAL

1. The requirements for special form radioactive material are that the radioactive material

- (a) meets the requirements of item 2; or
- (b) is encapsulated

(i) in a capsule that, when it contains the radioactive material, meets the requirements of item 3, and

(ii) in such a manner that it cannot be removed from the capsule unless the capsule is destroyed.

2. Special form radioactive material shall

(a) be in a solid, indispersible form having at least one outer dimension not less than 5 mm;

(b) not melt, sublime or ignite if heated in air to a temperature of 800°C and maintained at that temperature for a period of at least 10 minutes;

(c) not shatter or crumble if subjected to the impact, percussion and bending tests described in Part III of Schedule II; and

(d) not yield water activities greater than 1.85 kBq if, after being subjected to the impact, percussion, bending and heat tests described in Part III of Schedule II, it is subjected to leaching test number one described in that Part.

3. The capsule referred to in subitem 1(b) shall

(a) have at least one outer dimension not less than 5 mm;

(b) not melt, sublime or ignite if heated in air to a temperature of 800°C and maintained at that temperature for a period of at least 10 minutes;

(c) not shatter or crumble if subjected to the impact, percussion and bending tests described in Part III of Schedule II; and

(d) not yield water activities greater than 1.85 kBq if, after being subjected to the impact, percussion, bending and heat tests described in Part III of Schedule II, it is subjected to leaching test number two described in that Part."

URANIUM AND THORIUM MINING REGULATIONS

RÈGLEMENT SUR LES MINES D'URANIUM ET DE THORIUM

NOT CONSOLIDATED

SOR/88-243 21 April, 1988

Amendments:

SOR/90-193 22 March, 1990

SOR/93-463 23 September, 1993

SOR/94-653 18 October, 1994

NON CONSOLIDÉES

DORS/88-243 21 avril 1988

Modifications :

DORS/90-193 22 mars 1990

DORS/93-463 23 septembre 1993

DORS/94-653 18 octobre 1994

Registration
SOR/90-193 22 March, 1990

ATOMIC ENERGY CONTROL ACT

Uranium and Thorium Mining Regulations,
amendment

P.C. 1990-538 22 March, 1990

His Excellency the Governor General in Council, on the recommendation of the Minister of Energy, Mines and Resources, pursuant to section 9 of the Atomic Energy Control Act, is pleased hereby to approve the amendments made on March 15, 1990 by the Atomic Energy Control Board to the Uranium and Thorium Mining Regulations, approved by Order in Council P.C. 1988-722 of April 21, 1988*, in accordance with the schedule hereto, effective April 1, 1990.

SCHEDULE

1. All that portion of subsection 7(1) of the *Uranium and Thorium Mining Regulations* preceding paragraph (a) thereof is revoked and the following substituted therefor:

"7. (1) Subject to subsection (2), the Board or a designated officer, on receipt of a written application made in accordance with section 11, 12 or 15, may issue a licence to"

2. Subsection 8(1) of the said Regulations is revoked and the following substituted therefor:

"8. (1) Subject to subsection (2), the Board, on receipt of a written application made in accordance with section 13 or 14, may issue a licence to site, construct or operate a mine or mill, as the case may be."

3. All that portion of subsection 11(1) of the said Regulations preceding paragraph (a) thereof is revoked and the following substituted therefor:

"11. (1) An application for a licence to remove uranium or thorium at a removal site shall include the applicable fee set out in the *AECB Cost Recovery Fees Regulations*, and include the following information:"

4. All that portion of subsection 12(1) of the said Regulations preceding paragraph (a) thereof is revoked and the following substituted therefor:

"12. (1) An application for a licence to excavate uranium or thorium at an excavation site shall include the applicable fee set out in the *AECB Cost Recovery Fees Regulations* and include the following information:"

5. Subsection 13(1) of the said Regulations is revoked and the following substituted therefor:

* SOR/88-243, 1988 *Canada Gazette* Part II, p. 2361

Enregistrement
DORS/90-193 22 mars 1990

LOI SUR LE CONTRÔLE DE L'ÉNERGIE ATOMIQUE

Règlement sur les mines d'uranium et de
thorium—Modification

C.P. 1990-538 22 mars 1990

Sur avis conforme du ministre de l'Énergie, des Mines et des Ressources et en vertu de l'article 9 de la Loi sur le contrôle de l'énergie atomique, il plaît à Son Excellence le Gouverneur général en conseil d'agréer, conformément à l'annexe ci-après et à compter du 1^{er} avril 1990, les modifications apportées par la Commission de contrôle de l'énergie atomique le 15 mars 1990 au Règlement sur les mines d'uranium et de thorium, agréé par le décret C.P. 1988-722 du 21 avril 1988*.

ANNEXE

1. Le passage du paragraphe 7(1) du *Règlement sur les mines d'uranium et de thorium* qui précède l'alinéa a) est abrogé et remplacé par ce qui suit :

"7. (1) Sous réserve du paragraphe (2), la Commission ou le fonctionnaire désigné peut, sur réception d'une demande écrite conforme aux articles 11, 12 ou 15, délivrer un permis pour l'une ou l'autre des activités suivantes :

2. Le paragraphe 8(1) du même règlement est abrogé et remplacé par ce qui suit :

"8. (1) Sous réserve du paragraphe (2), la Commission peut, sur réception d'une demande écrite conforme aux articles 13 ou 14, délivrer un permis autorisant le choix du site, la construction ou l'exploitation d'une mine ou d'une usine de concentration."

3. Le passage du paragraphe 11(1) du même règlement qui précède l'alinéa a) est abrogé et remplacé par ce qui suit :

"11. (1) La demande de permis pour extraire de l'uranium ou du thorium d'un site d'extraction est accompagnée des droits prévus par le *Règlement sur les droits pour le recouvrement des coûts de la CCEA* et contient les renseignements suivants :

4. Le passage du paragraphe 12(1) du même règlement qui précède l'alinéa a) est abrogé et remplacé par ce qui suit :

"12. (1) La demande de permis d'excavation pour prélever de l'uranium ou du thorium d'un site d'excavation est accompagnée des droits prévus par le *Règlement sur les droits pour le recouvrement des coûts de la CCEA* et contient les renseignements suivants :

5. Le paragraphe 13(1) du même règlement est abrogé et remplacé par ce qui suit :

* DORS/88-243, *Gazette du Canada* Partie II, 1988, p. 2361

"13. (1) An application for a licence to site or construct a mine or mill shall include the applicable fee set out in the *AECB Cost Recovery Fees Regulations* and include the information set out in Schedule I, as applicable."

6. Subsection 14(1) of the said Regulations is revoked and the following substituted therefor:

"14. (1) An application for a licence to operate a mine or mill shall include the applicable fee set out in the *AECB Cost Recovery Fees Regulations* and the information set out in Schedule II, as applicable."

7. Subsection 15(1) of the said Regulations preceding paragraph (a) thereof is revoked and the following substituted therefor:

"15. (1) An application for a licence to suspend or cease the licensed activity at a mining facility or a part thereof or to decommission a mining facility or a part thereof shall include the applicable fee set out in the *AECB Cost Recovery Fees Regulations* and the following information:"

8. Section 17 of the said Regulations is amended by adding thereto the following subsection:

"(9) Where a fee set out in the *AECB Cost Recovery Fees Regulations* in respect of a licence is not paid within 30 days after the payment date described for that fee under those Regulations, the Board or a designated officer may, by notice in writing to the holder of the licence, amend, revoke or suspend the licence."

9. Subsection 18(1) of the said Regulations is revoked and the following substituted therefor:

"18. (1) Where a licensee applies to the Board for an amendment of any term or condition of the licence, the licensee shall inform the Board in writing of the reasons for the amendment and pay the applicable fee therefor set out in the *AECB Cost Recovery Fees Regulations*."

REGULATORY IMPACT ANALYSIS STATEMENT

(This statement is not part of the Regulations.)

Description

Treasury Board has directed the Atomic Energy Control Board (AECB) to recover the costs of its regulatory activities from its licensees. Accordingly, the AECB prepared the *AECB Cost Recovery Fees Regulations*, pursuant to the *Atomic Energy Control Act*, which prescribed the legal obligations to pay fees that would be imposed on applicants for, and holders of AECB licences and approvals.

To ensure compliance with these Regulations, subsections 7(1), 8(1), 11(1), 12(1), 13(1), 14(1), 15(1) and 18(1) and section 17 of the *Uranium and Thorium Mining Regulations* are amended to require the payment of fees for licences and approvals issued by the AECB.

"13. (1) La demande de permis pour choisir le site ou construire une mine ou une usine de concentration est accompagnée des droits prévus par le *Règlement sur les droits pour le recouvrement des coûts de la CCEA* et contient les renseignements pertinents indiqués à l'annexe I."

6. Le paragraphe 14(1) du même règlement est abrogé et remplacé par ce qui suit :

"14. (1) La demande de permis pour exploiter une mine ou une usine de concentration est accompagnée des droits prévus par le *Règlement sur les droits pour le recouvrement des coûts de la CCEA* et contient les renseignements pertinents indiqués à l'annexe II."

7. Le passage du paragraphe 15(1) du même règlement qui précède l'alinéa a) est abrogé et remplacé par ce qui suit :

"15. (1) La demande pour suspendre ou cesser l'activité autorisée de tout ou partie d'une installation minière, ou pour déclasser tout ou partie d'une installation minière, est accompagnée des droits prévus par le *Règlement sur les droits pour le recouvrement des coûts de la CCEA* et contient les renseignements suivants :

8. L'article 17 du même règlement est modifié par adjonction de ce qui suit :

"(9) La Commission ou le fonctionnaire désigné peut, par avis écrit au titulaire, modifier, révoquer ou suspendre le permis dont les droits, prévus par le *Règlement sur les droits pour le recouvrement des coûts de la CCEA*, n'ont pas été payés dans les 30 jours suivant la date de paiement fixée par ce règlement."

9. Le paragraphe 18(1) du même règlement est abrogé et remplacé par ce qui suit :

"18. (1) Le titulaire d'un permis qui demande à la Commission d'en modifier les conditions doit justifier sa demande par écrit et payer les droits prévus par le *Règlement sur les droits pour le recouvrement des coûts de la CCEA*."

RÉSUMÉ DE L'ÉTUDE D'IMPACT DE LA RÉGLEMENTATION

(Ce résumé ne fait pas partie du règlement.)

Description

Le Conseil du Trésor a demandé à la Commission de contrôle de l'énergie atomique (CCEA) de recouvrer de ses titulaires de permis les coûts de ses activités réglementaires. Par conséquent, la CCEA a établi le *Règlement sur les droits pour le recouvrement des coûts de la CCEA*, en conformité avec la *Loi sur le contrôle de l'énergie atomique*, lequel précise les obligations légales de payer des droits qui seraient imposées aux requérants ou titulaires de permis et d'approbations.

Pour assurer la conformité au règlement, les paragraphes 7(1), 8(1), 11(1), 12(1), 13(1), 14(1), 15(1) et 18(1) et l'article 17 du *Règlement sur les mines d'uranium et de thorium* sont modifiés pour exiger le paiement des droits de permis et d'acceptation délivrés par la CCEA.

Alternatives Considered

These amendments are consequential to the *AECB Cost Recovery Fees Regulations*.

Consistency with Regulatory Policy and Citizens' Code

These amendments are consequential to the *AECB Cost Recovery Fees Regulations*. Early notice of the initiative was published in the 1989 Federal Regulatory Plan (886-AECB). In March 1989, all organizations licensed by the AECB, and other interested parties were notified of the proposed schedule. Additional notice is given in the prepublication in the *Canada Gazette Part I*.

Anticipated Impact

The amendment is a means of enforcing compliance with the *AECB Cost Recovery Regulations*.

Paperburden

None.

Consultation

The draft AECB cost-recovery documents, as well as the proposed amendment to section 27 of the *Atomic Energy Control Regulations*, were distributed to all 2,607 organizations licensed by the Atomic Energy Control Board as of March 1989, as well as to various public interest groups and industry associations. The documents were issued for public consultation for a period of 60 days.

In addition, on January 13, 1990, the AECB prepublished, in the *Canada Gazette Part I* for a period of 30 days, amendments to subsections 7(1), 8(1), 11(1), 12(1), 13(1), 14(1), 15(1) and 18(1) and section 17 of the *Uranium and Thorium Mining Regulations*. No comments were received.

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Options étudiées

Ces modifications ont été apportées pour tenir compte du *Règlement sur les droits pour le recouvrement des coûts de la CCEA*.

Compatibilité avec la Politique de réglementation et le Code d'équité du citoyen

Ces modifications ont été apportées pour tenir compte du *Règlement sur les droits pour le recouvrement des coûts de la CCEA*. L'annonce du programme a été publiée dans les Projets de réglementation fédérale 1989 (886-CCEA). En mars 1989, tous les organismes qui détenaient des permis de la CCEA et tous les autres intéressés ont été avisés du projet de barème. Un autre avis est donné sous forme de publication préalable dans la *Gazette du Canada Partie I*.

Incidences prévues

Cette modification est un moyen d'assurer la conformité au *Règlement sur les droits pour le recouvrement des coûts de la CCEA*.

Paperrasserie

Aucune.

Consultation

Les projets de documents sur le recouvrement des coûts de la CCEA, ainsi que le projet de modification à l'article 27 du *Règlement sur le contrôle de l'énergie atomique* ont été envoyés à tous les 2 607 organismes qui détenaient un permis de la CCEA au mois de mars 1989, ainsi qu'aux divers groupes d'intérêt public et aux diverses associations industrielles. Ces documents ont été diffusés durant 60 jours, aux fins des consultations publiques.

En plus, la CCEA a publié sous leur forme préalable, le 13 janvier 1990 pour une période de 30 jours, les modifications aux paragraphes 7(1), 8(1), 11(1), 12(1), 13(1), 14(1), 15(1) et 18(1) et l'article 17 du *Règlement sur les mines d'uranium et de thorium*. La CCEA n'a reçu aucun commentaire.

Pour de plus amples renseignements, veuillez communiquer avec :

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Information on training should include an outline of the program and topics together with a preliminary schedule. The qualification and experience requirements for the training personnel must also be provided.

3.11 Safety Report

The Safety Report for this phase of the licensing process constitutes a comprehensive summary of the results and status of all the activities leading up to the application for a construction approval. It must be supported by the more specific reports and information that it summarizes and each of these documents must be individually identified in a list to be contained in the Safety Report together with the 'issue' or 'revision' number to be considered.

Areas covered by the Safety Report should include:

- a general description of the facility;
- the site, its characteristics and their evaluation;
- the components, structures and systems which make up the facility, their design bases, operating characteristics and safety implications;
- the results of safety analyses, the individual and combined failure modes assumed and a general discussion of the course of each accident together with the data and calculation base;

- staffing and training;

- quality assurance.

The applicant is required to prepare preliminary versions of the Safety Report in the course of the design and to submit these for review by AECB staff starting one year after the letter of intent and continuing with a maximum frequency of once-a-year thereafter.

This will allow advance feedback of concerns and information requirements and facilitate the final review.

3.12 Formal Application for Construction Approval

This step represents formal notification of the AECB by the applicant that he believes all the requirements for a construction approval to have been fulfilled.

The application consists of a letter to the AECB President, together with the Safety Report, requesting issue of a construction approval.

3.13 AECB Staff Review

The duration and complexity of this 'final' review will depend on the extent to which applicant staff have consulted with AECB staff in the course of the preparatory work leading up to the application. In the ideal situation, this step will constitute no more than a formal review of decisions made during the

course of a continuous series of consultations and discussions between AECB and applicant staff.

Recognizing that, in practice, points of unresolved disagreement may exist, the AECB will consider an application under these conditions with a view to a conditional construction approval. In most cases this will allow construction to proceed with the exception of certain structures or systems. The main consideration in granting such an approval will be the agreement by the applicant on a course of action to resolve the points of contention. The AECB must be satisfied that the action can be completed by the applicant within a reasonable period of time and that an outcome that is unfavourable to the applicant will not result in the need to make significant modifications to other systems or components which would at that time be partially or fully constructed.

4. OPERATING LICENCE

During this phase of the licensing process, the AECB's main concerns are to ensure that the design continues to meet the AECB safety requirements as details develop; to ensure that the facility as constructed matches the design and safety analysis; and, to ensure that the facility can be commissioned and operated in a manner that will meet the AECB safety requirements. This is done by monitoring and reviewing the completion of the detailed design and safety analyses required for an operating licence; by monitoring construction; procurement and manufacturing together with their quality assurance programs; by monitoring the results of commissioning and its quality assurance program to

ensure as far as possible that the results of the safety analyses are corroborated; and, by assuring that all key positions are appropriately staffed. The operating licence is granted in two steps. A provisional licence is issued first which permits the applicant to start the reactor up for the first time, to operate at low power levels and, subject to subsequent AECB staff approval at each stage, permits the reactor power to be increased in specified stages up to full power. A full operating licence may be issued after AECB staff review of full power operation.

4.1 Meeting of AECB and Applicant Staff

This meeting is similar in purpose to those described in sections 2.3 and 3.1. The object is to reach agreement on the manner in which the activities that lead to an operating licence are to be handled. Figure 4 should form the basis of the agenda for this meeting and one outcome should be the preliminary allocation of time estimates and key dates. As with the construction approval phase schematic, it is anticipated that the applicant will draw up a more detailed licensing schedule based on figure 4 which will be incorporated into his own project schedules. This meeting will also provide the opportunity to update the list of documents produced by the applicant on whose distribution the AECB is to be included.

This meeting is not a prerequisite to the start of any of the activities shown on figure 4. It is intended that the meeting be held shortly after the construction licence has been issued.

4.2 Safety Analyses and Completion of Detailed Design

The basis for the required safety analyses and the major part of the analyses themselves will have been completed as part of the application for a construction approval. These analyses will be updated as the remaining detailed design is completed during the construction phase. In addition, the results of various commissioning tests will be used to verify certain of the assumptions and data used in the analyses. Depending on the results of these tests, the AECB may require certain analyses to be refined or additional analyses to be carried out. The design documentation to be submitted to the AECB should include: design manuals, design flowsheets and the overpressure protection report.

4.3 Commissioning Program

Prior to the start of any commissioning activities, the AECB requires the applicant to submit details of his planned commissioning program. The information submitted should:

- describe the philosophies and policies to be followed in commissioning;
- identify the commissioning manuals that are to be prepared and the major steps envisaged in the commissioning of each system;
- identify the tests that are planned, particularly those in support of the safety analyses;

- include an overall commissioning schedule;
- include a description of the commissioning quality assurance program.

AECB staff will review these documents and discuss their comments with applicant staff. The AECB is primarily concerned that adequate tests are planned during commissioning to verify the results of and the assumptions used in certain of the safety analyses.

4.4 Commissioning Activities

The applicant is required to inform AECB staff regularly of commissioning progress. This is done by means of two types of document:

- reports of the results of commissioning tests;
- reports of any unexpected, unusual or significant events that occur during the course of commissioning.

4.5 Operating Policies and Principles

This document is prepared by the applicant and outlines overall constraints that govern the operation of the facility. As such, it not only provides guidance for the preparation of operating procedures, but it also constitutes a commitment by the applicant that will become a condition of his operating

licence. AECB staff will review this document to ensure it contains adequate expression of the safety requirements. Revisions may later prove necessary in the light of commissioning experience.

Operating procedures and the operating manuals when complete are to be submitted for review by AECB staff. Included with this series of documents should be the test program for special safety and safety-support systems together with the preventative maintenance program.

4.6 Radiation Protection

An outline is to be prepared for early approval by AECB staff of the radiation protection measures to be taken as they apply to both the station staff and the public. This should include:

- a statement of the radiation protection policy and an outline of the radiation protection regulations to be established;
- the radiological zones to be established and their rationale;
- special measures to be taken during the commissioning of multi-unit facilities;
- the applicant's radiation protection organization showing the responsibilities of the positions identified;
- plans for internal and external dosimetry of station personnel and visitors, including the records system;

- plans for acquisition of radiation protection equipment including the type and quantity of each item;
- plans for maintenance and testing of instruments and protective equipment;
- description of decontamination facilities for personnel and equipment;
- radioactive waste management plans;
- on-site and off-site environmental monitoring equipment and programs;
- station liquid and gaseous effluent monitoring programs, equipment and associated laboratory facilities;
- the radiation protection training programs to be established;
- a schedule for the preparation and implementation of the above.

4.7 Emergency Plans

The applicant is required to develop detailed plans and procedures to handle emergency situations which may require action on-site and to cooperate with other organizations in the preparation of off-site plans and procedures. Before

preparing the detailed procedures, an outline is to be developed for discussion with and approval by AECB staff. The outline prepared by the applicant should include:

- a description and definition of what are to constitute the emergency situations to be considered;
- definition of the distinction between an on-site and off-site emergency;
- a description of the manner in which an on-site emergency is to be handled;
- the external (other than applicant's on-site organization) organizations to be involved in an off-site emergency;
- plans for periodic emergency drills;
- the role of the applicant's organization during an off-site emergency.

AECB staff cooperate with the external organizations involved in the preparation of an off-site emergency plan to ensure that all the necessary actions have been identified, that the responsibilities for carrying out these actions have been clearly allocated to identifiable individuals or permanently staffed positions and that the actions can be efficiently coordinated during an emergency situation.

4.8 AECB Examinations and Staff Authorization

Shift supervisors and control room operators are required to pass examinations covering knowledge in the areas of 'conventional' process plant operation, nuclear plant operation and radiation protection. Each of the three areas is covered by two examinations: a 'general' examination which covers the topics as they relate to nuclear generating stations in general; and, a 'specific' examination which requires a detailed knowledge of the station to be licensed. 'Specific' examinations must be passed within one year of the individual actively taking up the position for which he is being authorized. Individuals who have previously passed the 'general' examinations when at another station need only pass the 'specific' series.

The AECB must also authorize the senior health physicist, the station manager and the production manager (or their equivalents) although examinations are generally not required.

4.9 Quality Assurance Program

AECB staff start to monitor the quality assurance program for procurement and construction activities that was established during the construction approval phase as soon as it is implemented by the applicant. The program for commissioning must be established by the applicant and submitted for review and approval by AECB staff before the start of commissioning. In addition, an 'operation' or 'in-service' program must also be established and submitted for AECB staff approval prior to issue of a provisional operating licence. It is also necessary for any prerequisites to the in-service quality assurance program, such as 'baseline' measurements, to have been completed.

4.10 Safeguards Program

As a signatory of the Treaty on the Non-Proliferation of Nuclear Weapons and as a result of the subsequent agreement with the International Atomic Energy Agency (IAEA), Canada has certain international safeguards obligations which the applicant must meet. A design description must be prepared by the applicant for submission to the IAEA on which the IAEA then bases its requirements for a safeguards program and specifies the 'facility attachments' required. AECB staff act in a co-ordinative role between the applicant and the IAEA. The AECB uses the safeguards requirements set by the IAEA as a base and may impose additional requirements over and above those of the IAEA.

4.11 Security Plan

The AECB requires the applicant to prepare a security plan which specifies the measures to be taken to maintain the physical security of the facility. The object is to prevent loss, theft or unauthorized use of nuclear material and to provide protection against sabotage. The security plan is to be submitted for review and approval by AECB staff and should include descriptions of:

- the security organization;
- the facility layout including features of the site, buildings and separation of systems that are significant for security;
- access control systems;

- response mechanisms in relation to unauthorized personnel, material or activities;
- security assessment systems, central alarms and communication systems;
- test, inspection and maintenance systems to ensure adequacy of security;
- measures for restricting dissemination of security related information;
- security awareness program.

Sufficient details must be provided to allow evaluation and analysis by AECB staff.

4.12 Safety Report

As with the application for a construction approval, the Safety Report constitutes a comprehensive summary of all the activities leading up to the application for a provisional operating licence together with a list of all the supporting documents. The Safety Report at this stage thus constitutes an updated and necessary expansion of the contents submitted at the construction approval stage together with additional sections covering operating policies and principles, radiation protection and emergency plans.

Preliminary versions of the Safety Report must continue to be submitted for review once-a-year, starting one year after the issue of the construction approval.

4.13 Formal Application for Provisional Operating Licence

The applicant must formally apply for a provisional operating licence by means of a letter to the AECB officer identified as the senior project officer for the facility in question together with the Safety Report.

Because the application for a provisional operating licence is made in advance of the time it is required, certain activities which are required to be complete for the issue of the licence may in fact be in progress. These will mainly consist of commissioning activities. The application must therefore include a list which identifies all such activities together with any other prerequisites to the issue of the provisional operating licence.

4.14 Completion Assurances

The Board's decision to issue a provisional operating licence will be contingent on the applicant certifying the completion of the prerequisites identified in the application and also providing assurances of a more general nature. These can be classified as follows:

Design Assurance - certification that the 'as-built' design is in accordance with the Safety Report and its additional supporting and reference documentation and that the design has been completed in conformance with the required codes, regulations and standards;

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Construction Assurance - certification that construction has been in accordance with the design described above with reference being given to relevant inspection, test or other construction reports; any outstanding construction work must be identified and similar future assurance given;

Commissioning Assurance - certification that the pre-critical (Phase 'A') commissioning has been completed and that future commissioning will be carried out in accordance with this program and published commissioning procedures, AECB staff to be notified of any changes in advance of their implementation;

Prerequisite Completion - certification that the prerequisites identified in the application for a provisional operating licence has been completed.

The provisional operating licence will come into effect once the applicant has provided written certification of all the above and when these assurances have been accepted in writing by the AECB staff member designated as senior project officer for the facility and who would normally be resident at the site.

4.15 Application to Acquire Fuel and Heavy Water

Separate applications should be made for licences to acquire fuel and heavy water. Each application should include information regarding the method of acquisition, transportation, on-site storage and security precautions. The fuel application should also include information on the fuel composition and its design and, where the fuel is enriched, information on criticality safety. These licences becomes redundant once the provisional operating licence is issued.

4.16 Application to Load Fuel and Heavy Water

The applicant must apply in writing to the AECB for approval to load fuel or heavy water. Separate applications should be made for each loading operation, e.g., fuel, booster fuel, moderator and heat transport water. Each application must contain an overall schedule of all the loading operations together with details of the special precautions to be taken in conjunction with and subsequent to the loading operation in question.

4.17 Provisional Operating Licence

This licence is issued by the Board and comes into effect once AECB site-based staff have verified completion of the prerequisites. The licence authorizes the applicant to start the reactor up for the first time and to run low power tests and measurements (Phase 'B' commissioning). Operation at a higher power level will be contingent on the review by AECB staff of the results of these low power commissioning activities and tests. AECB site-based staff will meet with the applicant's operations personnel and agree on any actions or prerequisites to be completed before a power increase is authorized. These prerequisites, together with the planned stages in which reactor power is to be increased, are to be incorporated into the commissioning schedule. No increase in power from one stage to the next is permitted without the written authorization of the site-based AECB staff.

4.18 Full Operating Licence

A full operating licence may be issued by the Board on the recommendation of AECB staff when all outstanding safety-related matters have been satisfactorily cleared and continuous full power generation has been demonstrated. For a multi-unit facility, this licence will be for all the component units. The full licence is issued for a limited period of time, before the end of which, the licensee must apply for renewal.