SCHEDULE 8

Regulations 31(2)(c), 32(2), 41(2)(b) and (c) and others 50, 55(1)(b), 58(1) and 60(1)(a)

REQUIREMENTS FOR RADIOACTIVE MATERIALS AND FOR PACKAGINGS AND PACKAGES

PART I

REQUIREMENTS FOR LSA-III MATERIAL

LSA-III material must be a solid of such a nature that if the entire contents of a package were subjected to the test specified in paragraph Part I of Schedule 9 the activity in the water would not exceed 0.1 A_2.

PART II

REQUIREMENTS FOR SPECIAL FORM RADIOACTIVE MATERIAL

1. Special form radioactive material must have at least one dimension not less than 5 mm.

2. Special form radioactive material must be of such a nature or must be so designed that if it is subjected to the tests specified in Part II of Schedule 9, it meets the following requirements—

(a) it would not break or shatter under the impact, percussion and bending tests in paragraphs 4, 5, 6 and 8(a) of that Part of that Schedule as applicable;

(b) it would not melt or disperse in the heat test in paragraphs 7 and 8(b) of that Part of that Schedule as applicable; and

(c) the activity in the water from the leaching tests specified in paragraphs 9 and 10 of that Part of that Schedule would not exceed 2 kBq; or alternatively for sealed sources, the leakage rate for the volumetric leakage assessment test specified in the ISO leak test document would not exceed the applicable acceptance threshold acceptable to the Secretary of State.

3. When a sealed capsule constitutes part of the special form radioactive material, the capsule must be so manufactured that it can be opened only by destroying it.

PART III

REQUIREMENTS FOR LOW DISPERSIBLE RADIOACTIVE MATERIAL

Low dispersible radioactive material must be such that the total amount of this radioactive material in a package must meet the following requirements—

(a) the radiation level at 3 m from the unshielded radioactive material does not exceed 10 mSv/h;

(b) if subjected to the tests specified in paragraphs 25 and 26 of Part IV of Schedule 9, the airborne release in gaseous and particulate forms of up to 100 μm aerodynamic equivalent diameter would not exceed 100 A_2. A separate specimen may be used for each test; and

(c) if subjected to the test specified in Part I of Schedule 9 the activity in the water would not exceed 100 A_2. In the application of this test, the damaging effects of the tests specified in (b) above must be taken into account.

PART IV

GENERAL REQUIREMENTS FOR PACKAGINGS AND PACKAGES

1. A package must be so designed in relation to its mass, volume and shape that it can easily and safely be handled and transported and so that it can be properly secured in or on the vehicle during transport.

2. The design of a package must be such that any lifting attachments on it will not fail when used in the intended manner and such that, if failure of the attachments should occur, the ability of the package to meet other requirements of these Regulations would not be impaired, taking into account appropriate safety factors to cover snatch lifting.

3. Any attachment or other feature on the outer surface of a package which could be used to lift it but is not designed to support its mass in accordance with paragraph 2 above must be removed or otherwise rendered incapable of being used during transport.

4. As far as reasonably practicable, packaging must be so designed and finished that the external surfaces are free from protruding features and can easily be decontaminated.

5. As far as reasonably practicable, the outer layer of a package must be so designed as to prevent the collection and retention of water.

6. No feature, not forming an integral part of a package, is to be added to the package at the time of transport if it will reduce the safety of the package.

7. A package must be capable of withstanding the effects of any acceleration, vibration or vibration resonance which may arise under routine conditions of transport without any deterioration in the effectiveness of the closing devices on the various receptacles or in the integrity of the package as a whole, and in particular nuts, bolts, and other securing devices must be so designed as to prevent them from becoming loose or being released unintentionally, even after repeated use.

8. The materials of the packaging and any components or structures thereof must be physically and chemically compatible with each other and with the radioactive contents, taking into account their behaviour under irradiation.

9. All valves through which radioactive contents could otherwise escape must be protected against unauthorised operation.

10. The design of the package must take into account ambient temperatures and pressures that are likely to be encountered in routine conditions of transport.

11. For radioactive material having other dangerous properties, the package design must take into account those properties; see regulations 6(2) and 36.

PART V

REQUIREMENTS FOR EXCEPTED PACKAGES

The package must comply with Part IV of this Schedule.

PART VI

REQUIREMENTS FOR AN INDUSTRIAL PACKAGE TYPE 1 (IP-1)

An industrial package Type 1 (IP-1) must be designed to meet the requirements of Part IV of this Schedule and the smallest overall external dimension must not be less than 10 cm.

PART VII

REQUIREMENTS FOR AN INDUSTRIAL PACKAGE TYPE 2 (IP-2)

1. An industrial package Type 2 (IP-2) must be designed to meet the requirements of Part VI of this Schedule and, when subjected to the tests specified in paragraphs 10 and 11 of Part IV of Schedule 9, it must prevent—

(a) the loss or dispersal of the radioactive contents; and

(b) the loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the package; or alternatively paragraph 2.

2. An industrial package Type 2 (IP-2) must be designed—

(a) to meet the requirements of Part VI of this Schedule and

(b) to conform to the standards prescribed in chapter 6.1 of ADR, or other requirements at least equivalent to those standards, and

(c) when subjected to the tests required for UN packing group I or II in chapter 6.1 of ADR, must prevent:

(i) the loss or dispersal of the radioactive contents; and

(ii) the loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the package; or alternatively meet the requirements of paragraph 3, 4, 5 or 6.

3. A tank container may be used as an industrial package Type 2 (IP-2) provided that it is designed—

(a) to meet the requirements of Part VI of this Schedule, and

(b) to conform to the standards prescribed in the Chapter 6.8 of ADR, or other requirements at least equivalent to those standards, and is capable of withstanding a test pressure of 265kPa, and

(c) so that any additional shielding which is provided is capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing a loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the tank container.

4. A tank may be used as an industrial package Type 2 (IP-2) provided that it conforms to standards at least equivalent to those required in the case of tank containers by paragraph 3, but substitute the ADR reference in paragraph 3(b) for "Chapter 6.7 of ADR", and it is limited to transporting LSA-I or LSA-II liquids or gases as prescribed in Table IV of Schedule 1.

5. A freight container may be used as an industrial package Type 2 (IP-2) provided that—

(a) it is designed to meet the requirements of Part VI of this Schedule and

(b) it is designed to conform to the requirements prescribed in the ISO freight containers document, and

(c) the radioactive contents are restricted to solid materials, and

(d) if it were subjected to the tests prescribed in ISO freight containers document and the accelerations occurring during routine conditions of transport, it would prevent—

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the freight container.

6. An intermediate bulk container may be used as an industrial package Type 2 (IP-2) provided that—

(a) it is designed to meet the requirements of Part VI of this Schedule and

(b) it is metal, and

(c) it is designed to conform to the requirements prescribed Chapter 6.1 of ADR, and if it were subjected to the tests for UN Packing Group I or II prescribed in that document, but with the drop test conducted in the most damaging orientation, it would prevent—

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the intermediate bulk container.

PART VIII

REQUIREMENTS FOR AN INDUSTRIAL PACKAGE TYPE 3 (IP-3)

1. An industrial package Type 3 (IP-3) must be designed to meet the requirements of Part VI of this Schedule and, in addition the requirements of paragraphs 2 to 15 of Part X of this Schedule; or alternatively may meet the requirements of paragraphs 2,3,4 or 5.

2. A tank container may be used as an industrial package Type 3 (IP-3) provided that it is designed—

(a) to meet the requirements of Part VI of this Schedule, and

(b) to conform to the standards prescribed in the Chapter 6.8 of ADR, or other requirements at least equivalent to those standards, and is capable of withstanding a test pressure of 265 kPa, and

(c) so that any additional shielding which is provided must be capable of withstanding the static and dynamic stresses resulting from handling and routine conditions of transport and of preventing a loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the tank container.

3. A tank may be used as an industrial package Type 3 (IP-3) provided that it conforms to standards at least equivalent to those required in the case of tank containers by paragraph 2, but substitute "to conform to the standards prescribed in chapter 6.7 of ADR" for paragraph 2(b), and it must be limited to transporting LSA-I or LSA-II liquids or gases as prescribed in Table IV of Schedule 1.

4. A freight container may be used as an industrial package Type 3 (IP-3) provided that—

(a) it is designed to meet the requirements of Part VI of this Schedule and

(b) it is designed to conform to the requirements prescribed in the ISO freight containers document, and

(c) the radioactive contents are restricted to solid materials, and

(d) if it were subjected to the tests prescribed in ISO freight containers document and the accelerations occurring during routine conditions of transport, it would prevent:

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the freight container.

5. An intermediate bulk container may be used as an industrial package Type 3 (IP-3) provided that—

(a) it must be designed to meet the requirements of Part VI of this Schedule and

(b) it is metal, and

(c) it is designed to conform to the requirements prescribed Chapter 6.1 of the Dangerous Goods Recommendations, and if it were subjected to the tests for UN Packing Group I or II prescribed in that document, but with the drop test conducted in the most damaging orientation, it would prevent—

(i) loss or dispersal of the radioactive contents; and

(ii) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the intermediate bulk container.

PART IX

REQUIREMENTS FOR PACKAGES CONTAINING URANIUM HEXAFLUORIDE

1. The package must also meet the requirements prescribed elsewhere in these Regulations which pertain to the radioactive and fissile properties of the material. Except as allowed in paragraph 4, uranium hexafluoride in quantities of 0.1 kg or more must also be packaged and transported in accordance with the provisions of the International Organisation for Standardisation document ISO 7195:, "Packaging of uranium hexafluoride (UF_6) for transport", and the requirements of paragraphs 2 and 3.

2. Each package designed to contain 0.1 kg or more of uranium hexafluoride must be designed so that it would meet the following requirements—

(a) withstand without leakage and without unacceptable stress, as specified in the International Organization for Standardization document ISO 7195 , the structural test as specified in paragraph 6 of Part IV of Schedule 9;

(b) withstand without loss or dispersal of the uranium hexafluoride the test specified in paragraph 10 of Part IV of Schedule 9; and

(c) withstand without rupture of the containment system the test specified in paragraph 16 of Part IV of Schedule 9.

3. Packages designed to contain 0.1 kg or more of uranium hexafluoride must not be provided with pressure relief devices.

4. Subject to the approval of the competent authority, packages designed to contain 0.1 kg or more of uranium hexafluoride may be transported if—

(a) the packages are designed to requirements other than those given in ISO 7195 and paragraphs 2-3 but, notwithstanding, the requirements of paragraphs 2-3 are met as far as practicable;

(b) the packages are designed to withstand without leakage and without unacceptable stress a test pressure less than 2.76 MPa as specified in paragraph 6 of Part IV of Schedule 9; or

(c) for packages designed to contain 9000 kg or more of uranium hexafluoride, the packages do not meet the requirement of paragraph 2(c).

PART X

REQUIREMENTS FOR TYPE A PACKAGES

1. A Type A package must meet the requirements of Part IV of this Schedule.

2. The smallest overall external dimension of the package must not be less than 10 cm.

3. The outside of the package must incorporate a feature such as a seal, which is not readily breakable and which, while intact, will be evidence that it has not been opened.

4. Any tie-down attachments on the package must be so designed that, under both normal and accident conditions of transport, the forces in those attachments do not impair the ability of the package to meet the requirements of these Regulations.

5. The design of the package must take into account temperatures ranging from −40°C to 70°C for the components of the packaging, giving attention to freezing temperatures for liquid contents and to the potential degradation of packaging materials within the given temperature range.

6. The design and manufacturing techniques must be in accordance with national or international standards, or other requirements, acceptable to the Secretary of State

7. The design must include a containment system securely closed by a positive fastening device which cannot be opened unintentionally or by a pressure which may arise within the package.

8. Special form radioactive material may be considered as a component of the containment system.

9. If the containment system forms a separate unit of the package, it must be capable of being securely closed by a positive fastening device which is independent of any other part of the packaging.

10. The design of any component of the containment system must take into account, where applicable, the radiolytic decomposition of liquids and other vulnerable materials and the generation of gas by chemical reaction and radiolysis.

11. The containment system must retain its radioactive contents under a reduction of ambient pressure to 60 kPa.

12. All valves, other than pressure relief valves, must be provided with an enclosure to retain any leakage from the valve.

13. A radiation shield which encloses a component of the package specified as a part of the containment system must be so designed as to prevent the unintentional release of that component from the shield. Where the radiation shield and such component within it form a separate unit, the radiation shield must be capable of being securely closed by a positive fastening device which is independent of any other packaging structure.

14. A package must be so designed that, if it were subjected to the tests specified in paragraphs 7 to 12 of Part IV of Schedule 9, it would prevent—

(a) loss or dispersal of the radioactive contents; and

(b) loss of shielding integrity which would result in more than a 20% increase in the radiation level at any external surface of the package.

15. The design of a package intended for liquid radioactive material must make provision for ullage to accommodate variations in the temperature of the contents, dynamic effects and filling dynamics.

16. A Type A package designed to contain liquids must,in addition—

(a) be adequate to meet the conditions specified in paragraph 14 if the package is subjected to the tests specified in paragraph 13 of Part IV of Schedule 9; and

(b) either—

(i) be provided with sufficient absorbent material to absorb twice the volume of the liquid contents (such absorbent material must be suitably positioned so as to contact the liquid in the event of leakage); or

(ii) be provided with a containment system composed of primary inner and secondary outer containment components designed to ensure retention of the liquid contents, within the secondary outer containment components, even if the primary inner components leak.

17. A package designed for gases must prevent loss or dispersal of the radioactive contents if the package were subjected to the tests specified in paragraph 13 of Part IV of Schedule 9. A package designed for tritium in gaseous form or for noble gases with contents not exceeding A_2 is excepted from this requirement.

PART XI

REQUIREMENTS FOR TYPE B(U) PACKAGES

1. A Type B(U) package must be designed to meet the requirements of Part IV, and of paragraphs 2 to 13, and 15, of Part X, and of paragraph 14 of Part X except as specified in paragraph 7(a) below.

2. A package must be so designed that, under the ambient conditions specified in paragraphs 4 and 5, heat generated within the package by the radioactive contents must not, under normal conditions of transport, as demonstrated by the tests in paragraphs 7 – 12 of Part IV of Schedule 9, adversely affect the package in such a way that it would fail to meet the applicable requirements for containment and shielding if left unattended for a period of one week. Particular attention is to be paid to the effects of heat which may—

(a) alter the arrangement, the geometrical form or the physical state of the radioactive contents or, if the radioactive material is enclosed in a can or receptacle (for example, clad fuel elements), cause the can, receptacle or radioactive material to deform or melt; or

(b) lessen the efficiency of the packaging through differential thermal expansion or cracking or melting of the radiation shielding material; or

(c) in combination with moisture, accelerate corrosion.

3. A package must be so designed that, under the ambient condition specified in paragraph 4, the temperature of its accessible surfaces must not exceed 50°C, unless the package is transported under exclusive use.

4. The ambient temperature must be assumed to be 38°C.

5. The solar insolation conditions must be assumed to be as specified in Table IX of Schedule 1.

6. A package which includes thermal protection for the purpose of satisfying the requirements of the thermal test specified in paragraph 16 of Part IV of Schedule 9 must be so designed that such protection will remain effective if the package is subjected to the tests specified in paragraphs 7 – 12 and 15(a) and (b) or 15(b) and (c) of Part IV of Schedule 9, as appropriate. Any such protection on the exterior of the package must not be rendered ineffective by ripping, cutting, skidding, abrasion, or rough handling.

7. A package must be so designed that, if it were subjected to—

(a) the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9, it would restrict the loss of radioactive contents to not more than $10^{-6}A_2$ per hour; and

(b) the tests specified in paragraphs 14, 15(b), 16 and 17 of that Part of that Schedule and the test in paragraph—

(i) 15(c) of that Part of that Schedule, when the package has a mass not greater than 500 kg, an overall density not greater than 1000 kg/m^3 based on the external dimensions, and radioactive contents greater than 1000 A_2 not as special form radioactive material, or

(ii) 15(a) of that Part of that Schedule for all other packages,

it would retain sufficient shielding to ensure that the radiation level at 1 metre from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain and it would restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A_2 for krypton-85 and not more than A_2 for all other radionuclides. Where mixtures of different radionuclides are present, the provisions of parts 4 and 5 of regulation 29 must apply except that for krypton-85 an effective A_2(i) value equal to 10 A_2 may be used. For the purposes of sub-paragraph (a) above, the evaluation must take into account the requirements of regulation 37(2)(a).

8. A package for radioactive contents with activity greater than 105 A_2 must be so designed that if it were subjected to the water immersion test specified in paragraph 18 of Part IV of Schedule 9, there would be no rupture of the containment system.

9. Compliance with the permitted activity release limits must not depend either upon filters or upon a mechanical cooling system.

10. A package must not include a pressure relief system from the containment system which would allow the release of radioactive material to the environment under the conditions of the tests specified in paragraphs 7 – 12 and 14 – 17 of Part IV of Schedule 9.

11. A package must be so designed that if it were at the maximum normal operating pressure and it were subjected to the tests specified in paragraphs 7 – 12 and 14 – 17 of Part IV of Schedule 9, the level of strains in the containment system would not attain values which would adversely affect the package in such a way that it would fail to meet the applicable requirements.

12. A package must not have a maximum normal operating pressure in excess of a gauge pressure of 700 kPa.

13. The maximum temperature of any surface readily accessible during transport of a package must not exceed 85°C in the absence of insolation under the ambient condition specified in paragraph 4. Account may be taken of barriers or screens intended to give protection to persons without the need for the barriers or screens being subject to any test.

14. A package containing low dispersible radioactive material must be so designed that any features added to the low dispersible radioactive material that are not part of it, or any internal components of the packaging must not adversely affect the performance of the low dispersible radioactive material.

15. A package must be designed for an ambient temperature range from −40°C to +38°C.

PART XII

REQUIREMENTS FOR TYPE B(M) PACKAGES

1. A Type B(M) package must meet the requirements of Part XI, except that for packages to be transported within the United Kingdom or between the United Kingdom and another State, conditions other than those given in paragraph 5 of Part X, paragraph 4, 5 and 8-15 of Part XI may be assumed with the approval of the Secretary of State and the competent authority of any State through

or to which it is be transported. As far as reasonably practicable the requirements of paragraphs 8-15 of Part XI must be met.

2. Intermittent venting of Type B(M) packages may be permitted during transport, provided that the operational controls for venting are acceptable to the Secretary of State.

PART XIII

REQUIREMENTS FOR TYPE C PACKAGES

1. A Type C package must be designed to meet the requirements of Part IV, and of paragraphs 2 to 13, and 15, of Part X, of paragraph 14 of Part X except as specified in paragraph 3(a) below, of paragraphs 2-5 and 9-15 of Part XI.

2. A package must be capable of meeting the assessment criteria prescribed for tests in paragraphs 7(b) and 11 of Part XI after burial in an environment defined by a thermal conductivity of 0.33 W/m.K and a temperature of 38°C in the steady state. Initial conditions for the assessment must assume that any thermal insulation of the package remains intact, the package is at the maximum normal operating pressure and the ambient temperature is 38°C.

3. A package must be so designed that, if it were at the maximum normal operating pressure and subjected to—

(a) the tests specified in paragraphs 7-12 of Part IV of Schedule 9, it would restrict the loss of radioactive contents to not more than 10^{-6} A_2 per hour; and

(b) the test sequences in paragraph 22 of Part IV of Schedule 9:

(c) it would retain sufficient shielding to ensure that the radiation level at 1 metre from the surface of the package would not exceed 10 mSv/h with the maximum radioactive contents which the package is designed to contain and it would restrict the accumulated loss of radioactive contents in a period of one week to not more than 10 A_2 for krypton-85 and not more than A_2 for all other radionuclides.

Where mixtures of different radionuclides are present, the provisions of paragraphs (4) and (5) of regulation 29 must apply except that for krypton-85 an effective A_2(i) value equal to 10 A_2 may be used. For the purposes of sub-paragraph (a) above, the evaluation must take into account the requirements of regulation 37(2)(a).

4. A package must be so designed that there will be no rupture of the containment system following performance of the enhanced water immersion test specified in paragraph 18 of Part IV of Schedule 9.

PART XIV

REQUIREMENTS FOR PACKAGES CONTAINING FISSILE MATERIAL

1. Fissile material must be packaged and shipped in such a manner that subcriticality is maintained under conditions likely to be encountered during normal and accident conditions of transport. The following contingencies must be considered—

(a) water leaking into or out of packages;

(b) the loss of efficiency of built-in neutron absorbers or moderators;

(c) rearrangement of the radioactive contents either within the package or as a result of loss from the package;

(d) reduction of spaces within or between packages;

(e) packages becoming immersed in water or buried in snow; and

(f) temperature changes.

2. A package containing fissile material must meet the requirements of paragraph 2 of Part X and those requirements prescribed elsewhere in these Regulations which pertain to the radioactive properties of the material.

3. Packages are excepted from meeting the requirements of paragraphs 4- 10 where they are transported in a consignment meeting one of the exception criteria (a), (b), (c) or (d)—

(a) the mass of fissile material in the consignment is controlled such that—

$$\frac{\text{mass of uranium 235 (g)}}{X} - \frac{\text{mass of other fissile material (g)}}{Y} \quad (1$$

where X and Y are the mass limits defined in Table X of Schedule 1, and the mass of beryllium and deuterium is controlled such that it does not exceed 0.1% of the fissile material mass allowed and provided that either—

(i) for packaged material each package contains individually not more than 15g of fissile material, or

(ii) for unpackaged material the vehicle contains not more than 15g of fissile material, or

(iii) the fissile material is a homogeneous hydrogenous solution or mixture where the ratio of fissile nuclides to hydrogen is less than 5% by mass, or

(iv) there is not more than 5g of fissile material in any 10 litre volume of material.

b) each package containing uranium enriched in uranium-235 to a maximum of 1% by mass, and with a total plutonium and uranium-233 content not exceeding 1% of the mass of uranium-235, provided that the fissile material is distributed essentially homogeneously throughout the material; provided also that if uranium-235 is present in metallic, oxide, or carbide forms, it does not form a lattice arrangement.

c) each package containing liquid solutions of uranyl nitrate enriched in uranium-235 to a maximum of 2% by mass, with a total plutonium and uranium-233 content not exceeding 0.002% of the mass of uranium-235, and with a minimum nitrogen to uranium atomic ratio (N/U) of 2.

d) each package containing individually not more than 1 kg of total plutonium, of which not more than 20% by mass may consist of plutonium-239, plutonium-241, or any combination of those radionuclides.

4. A packaging for fissile material must be so designed that, if it were subjected to the tests specified in paragraphs 7 -12 of Part IV of Schedule 9 the construction of the packaging would prevent the entry of a 10 cm cube.

5. For the purposes of this Part:

"undamaged", in relation to a package means the evaluated or demonstrated condition of the package if it had been subjected to the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9;

"damaged", in relation to a package, means the evaluated or demonstrated condition of the package if it had been subjected to whichever of the following combination of tests is the more limiting—

(a) the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9 followed by the tests specified in paragraphs 15 and 16 of that Part of that Schedule and completed by the tests specified in paragraphs 19 – 21 of that Part of that Schedule (the mechanical test

of paragraph 15 of that Part of that Schedule must be the tests specified in paragraphs 15(b)) and the test in paragraph—

(i) 15(c) of that Part of that Schedule, when the package has a mass not greater than 500 kg and an overall density not greater than 1000 kg/m^3 based on the external dimensions, or

(ii) 15(a) of that Part of that Schedule for all other packages, or

b) the tests specified in paragraphs 7 – 12 of Part IV of Schedule 9 followed by the test in paragraph 17 of Part IV of Schedule 9.

6. In determining the subcriticality of individual packages in isolation for the purposes of this Schedule, it must be assumed that water can leak into or out of all void spaces of the package, including those within the containment system. However, if the design incorporates special features to prevent such leakage of water into or out of certain void spaces, even as a result of human error, absence of leakage may be assumed in respect of those void spaces. Special features shall include the following—

(a) multiple high standard water barriers, each of which would remain watertight if the package were damaged; a high degree of quality control in the production and maintenance of packagings; and special tests to demonstrate the closure of each package before shipment; or

(b) for packages containing uranium hexafluoride only—

(i) where for damaged packages there is no physical contact between the valve and any other component of the packaging other than its original point of attachment and where, in addition, following the test specified in paragraph 16 of Part IV of Schedule 9 the valves remain leaktight; and

(ii) a high degree of quality control in the production and maintenance and repair of packagings; and special tests to demonstrate the closure of each package before each shipment

7. The individual package damaged or undamaged must be subcritical under the conditions specified in paragraphs 5 and 6 taking into account the physical and chemical characteristics including any change in those characteristics which could occur when the package is damaged and with the conditions of moderation and reflection as specified below.

For all material within the confinement system: the material arranged in the confinement system—

(a) in the configuration and moderation that results in maximum neutron multiplication; and

(b) with close reflection of the containment system by water 20 cm thick (or equivalent), or such greater reflection of the containment system as may additionally be provided by the surrounding material of the packaging unless it can be demonstrated that the confinement system remains within the damaged packaging;

8. An array of packages must be subcritical. A number, “N” must be derived assuming that if packages were stacked together in any arrangement with the stack closely reflected on all sides by water 20 cm thick (or its equivalent) both of the following conditions would be satisfied—

(a) five times “N” undamaged packages without anything between the packages would be subcritical; and

(b) two times “N” damaged packages with hydrogenous moderation between packages to the extent which results in the greatest neutron multiplication would be subcritical and, in addition if any part of the fissile material escapes from the containment system: that material, from two times “N” damaged packages must be subcritical when arranged in—

(i) the configuration and moderation that results in maximum neutron multiplication; and

(ii) with close reflection of that material by water 20 cm thick (or equivalent).

9. In evaluating the subcriticality of fissile material in its transport configuration, the following must apply—

(a) the determination of subcriticality for irradiated fissile material must be based on an isotopic composition demonstrated to provide—

(i) the maximum neutron multiplication during the irradiation history, or

(ii) a conservative estimate of the neutron multiplication for the package assessments. After irradiation but prior to shipment, a measurement must be performed to confirm the conservatism of the isotopic composition; and

(b) for fissile material whose chemical or physical form, isotopic composition, mass or concentration, moderation ratio or density, or geometric configuration is not known, each parameter that is not known must have the value which gives the maximum neutron multiplication consistent with the known conditions and parameters in paragraphs 5 to 8.

10. The package must be designed for an ambient temperature range of −40°C to +38°C unless the Secretary of State specifies otherwise in the certificate of approval for the package design.