**Code of practice for the carriage of radioactive materials by road.**

DEPARTMENT OF THE ENVIRONMENT

# Code of Practice

## for the Carriage of

# Radioactive Materials by Road



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# Code of Practice

## for the Carriage of Radioactive Materials by Road

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# PREFACE

The carriage of radioactive materials by road in Great Britain is governed by the Radioactive Substances (Carriage by Road) (Great Britain) Regulations, 1970 which are made under section 5(2) of the Radioactive Substances Act, 1948. These regulations are mainly and purposely in general terms, requiring a proper course of conduct on the part of those concerned, but do not for the most part lay down precise technical requirements. Provisions for the control of radiation doses received by road transport workers in certain circumstances are contained in the Radioactive Substances (Road Transport Workers) (Great Britain) Regulations 1970. Advice on the storage of radioactive material in transit is contained in a Code of Practice issued jointly by the Department of the Environment, the Department of Trade and Industry and the Department of Employment. Additional advice on regulations which may need to be complied with when a vehicle enters a port, dock or harbour will be found in the Code of Practice for Conveyance through Ports of Radioactive Materials issued by the former Ministry of Transport.

The Code of Practice set out in the following pages is intended to assist all concerned, and consignors in particular, to discharge their obligations under the law. Although many of the provisions of the Code are explicitly dealt with in the Regulations, the Code does not purport to be the Regulations nor to give a legal interpretation of them. But, with that reservation, the Code is commended to those concerned as a proper standard by which to determine their course in order to fulfil their statutory obligations.

The Code conforms generally to the International Atomic Energy Agency's Regulations for the Safe Transport of Radioactive Materials, as amended in 1967.

Any consignment, except a 'special arrangement', which satisfies the provisions of this Code will normally be accepted in this country for carriage by rail, sea or air, but confirmation of this from the British Railways Board or the shipping agent, as appropriate, should first be sought. Consignors of radioactive materials to destinations abroad should enquire about regulations or conditions of carriage in countries in or through which consignments are to be transported.

The international carriage of radioactive substances in Europe is regulated by the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR). The United Kingdom has ratified the Agreement which to all intents and purposes is

the same as this Code of Practice. Copies of ADR may be obtained from Her Majesty's Stationery Office.

Penalties for contravention of the Regulations are fixed by section 8 of the Radioactive Substances Act, 1948. The provisions of the Act and of any Regulations made under it, including the Radioactive Substances (Road Transport Workers) (Great Britain) Regulations, 1970, do not relieve any person of any obligations under other Acts or legal codes which may in any instance apply, for example:

(a) the Road Traffic Acts, and Regulations made under them, as to licences, construction and equipment of vehicles or their safe use and maintenance, and insurance;
(b) the Nuclear Installations Act 1965 where nuclear matter, e.g. fissile and irradiated material, are concerned;
(c) the Radioactive Substances Act, 1960, as to material and waste to which it applies;
(d) the Factories Act and any regulations made under it including The Ionising Radiations (Sealed Sources) Regulations, 1969 and The Ionising Radiations (Unsealed Radioactive Substances) Regulations 1968.

Neither do they relieve any person of any obligation under the general law relating to theft, damage to property, liability for negligence, etc. (All the Acts, Regulations and Codes referred to in this Preface can be purchased from Her Majesty's Stationery Office).

**SPECIAL NOTE:**

1. This Code has been prepared to help those concerned to fulfil their obligations under the Regulations mentioned in the first paragraph of this Preface. In the case of Northern Ireland, which is excluded from the provisions of those Regulations, the Code may equally well be used as a means of guidance in the appropriate circumstances. Due regard has therefore been paid to this possibility in the wording of the relevant sections of the Code.

2. The functions of the Radiological Protection Service have been absorbed by the National Radiological Protection Board by virtue of the Radiological Protection Act, 1970.

# GLOSSARY

**Allowable Number** The number of Fissile Class II packages calculated in accordance with IAEA regulations, which expresses, in respect of the package design in question, the maximum number of such packages which may be transported together in any one consignment. (See Annex V, Pt. 1, paragraphs 1(b) and 6).

**BS 3895** British Standard on 'Methods of Assessment of Packaging for the Transport of Radioactive Materials' (published by the British Standards Institution, British Standards House, 2 Park Street, London, W.1.).

**Curie** (Ci) The rate at which nuclear transformations occur in a material is a measure of the activity in that material. The unit of radioactivity is the curie and is such that 1 curie $= 3{\cdot}7 \times 10^{10}$ (37 thousand million) disintegrations per second.

A millicurie (mCi) is one thousandth of a curie.

A microcurie ($\mu$Ci) is one millionth of a curie.

It should be noted that the hazard from a radionuclide is not solely related to its activity.

**Capsule** A sheathing, usually metallic or ceramic, enclosing radioactive material so as to prevent the dispersion of the material during severe accident conditions.

**Containment Vessel** The receptacle which is intended to retain the radioactive material during transport even if receptacles within the containment vessel should break or leak.

**Contamination** Unwanted radioactive material deposited on surfaces such as the outside of packages, or on floors. Contamination can be 'fixed', and therefore very difficult to remove or may be 'non-fixed' and therefore removable by washing or other means of decontamination.

**Depleted uranium** Uranium element with a uranium-235 content less than 0·72 per cent.

**Enriched uranium** Uranium element with a uranium-235 content in excess of 0·72 per cent.

**Fissile** Capable of undergoing fission, a process in which the atoms of the fissile radionuclide are split by neutron bombardment into two approximately equal parts (fission products), with the attendant release of more neutrons and of energy in the form of heat and ionising radiations.

**Full Load Consignment** See B.3.1.2.

**IAEA Regulations** The 'Regulations for the Safe Transport of Radioactive Materials', published by the International Atomic Energy Agency, as Safety Series No. 6 1967 Edition. The regulations can be purchased from Her Majesty's Stationery Office.

**Large Radioactive Source** See B.4.1.

**Low Specific Activity Materials** See B.3.2.1.

**NAIR-National Arrangements for Incidents involving Radioactivity** The system by means of which assistance may be obtained to deal with accidents or incidents involving packages of radioactive material. On being informed of any such emergency the police will initiate whatever action is necessary to summon quickly specialist advice to deal with any radiological hazards which may arise during transport operations. There are two stages of assistance, the first (Stage I) generally being provided by physicists from local hospitals and the second (Stage II) by the United Kingdom Atomic Energy Authority, Central Electricity Generating Board, South of Scotland Electricity Board and the Radiological Protection Service.

**Natural Uranium** Uranium as found in nature, i.e. uranium element with a uranium-235 content of 0·72 per cent.

**Package** The packaging plus its radioactive contents as presented for transport.

**Packaging** The assembly of the components necessary to ensure compliance with the packaging requirements of the IAEA Regulations. It may, in particular, consist of one or more receptacles, absorbent material, spacing structures, radiation shielding and devices for cooling, for absorbing mechanical shocks and for thermal insulation.

**Radionuclide** A shortened form of 'Radioactive Nuclide', practically synonymous with radioisotope or radioactive isotope. A radionuclide consists of identical atoms all having the same atomic mass and atomic number and is radioactive; a particular chemical element may have a number of nuclides, some of which may be radionuclides, characterised by the name of the chemical element followed by a number denoting the atomic mass of the nuclide in question e.g. Cobalt–60, Uranium–235.

**Radiation Dose Rate** In the context of this Code, the dose rate at a particular distance from a radioactive source is a measure of the external radiation hazard, particularly to personnel and undeveloped photographic film, and is reduced either by increasing the distance from the source or by interposing

radiation shielding. It is expressed in millirem per hour (see definition for Units of Measuring Dose Rate).

**Routine White or Yellow Label Package** Any White or Yellow Label package which is not a Large Radioactive Source (see B.4.1) or a Special Arrangement (see B.5).

**Special Form Radioactive Material** Radioactive material which meets the requirements of Appendix III.

**Specific Activity** Means in relation to a radioactive nuclide, the activity of the radioactive nuclide per unit mass of that nuclide. The specific activity of a radioactive material is the activity per unit mass of that material in which radioactive nuclides are uniformly distributed.

**Transport Index** See B.2.7.3.

**Units for Measuring Dose Rates** In this Code the rem is the unit of dose equivalent and is introduced to give a measure, for protection purposes, of biological effect, independent of the nature of the radiation and conditions of radiation. The number of millirem per hour is the total of:

(a) for gamma and/or X-radiation the number of milliroentgen per hour;

(b) for beta radiation the number of millirads per hour in air;

(c) for neutrons the number of millirem per hour or the number of milliroentgen per hour derived from Table III, Annex I of the IAEA regulations.

In any transport documents in which the wording used is 'milliroentgen per hour', 'millirad per hour', 'mR/h', 'mR/h or equivalent', 'mrem/h', or 'mr/h' such wording shall be assumed to be equivalent to millirem per hour.

**Vehicle** A road vehicle which includes an articulated vehicle, i.e., a combination of tractor and semi-trailer, but a drawbar trailer is treated as a separate vehicle.

# INTRODUCTION

(This introduction, apart from paragraphs 1–9, is framed mainly to assist carriers and others who are unfamiliar with the technicalities of the subject.)

**Layout of Code**

1. This Code is in four parts.

2. *Part A* contains provisions of general application which can effect *everybody*. It includes:

scope and certain interpretations (A.1).
prohibitions (A.2), and
exempted persons and classes of articles, packages or consignments (A.3).

3. *Part B* deals with the particular responsibilities of consignors, including the limits on contents, external radiation and contamination of packages, as well as labelling, marking and sealing of packages.

4. *Part C* deals with the responsibilities of *carriers*.

5. *Part D* deals with the responsibilities of *drivers*.

6. The obligations on carriers make the minimum reference to technical matters, and those on drivers wholly exclude them. The term 'consignor' in Part B includes any person (which in turn includes an undertaking or other body) having need to send radioactive materials in any form from an establishment in Great Britain by road or for export. Many such persons are both consignors and carriers of the same consignment, that is to say they transport their own goods in their own vehicles and must therefore observe Parts A, B and C of the Code. Some may be consignors, carriers and drivers, like some of the professional users referred to in A.3.8, and must comply with all relevant parts of the whole Code.

7. In the case of imported consignments, the responsibility for proper packing, and labelling, and the provision of the necessary transport documents rests on the foreign consignor. The position is set out in C.2 and C.3 of the Code.

**Aims of the Code**

8. This Code of Practice sets out the minimum precautions to be taken and the control measures to be applied to avoid injury to health from ionising radiations in the transport of radioactive materials by road.

9. This is achieved by the following treatment of consignments. There are five categories of consignments:

(a) consignments of unlabelled exempt packages (see e.g. A.3.2—A.3.5);

(b) consignments as routine White or Yellow Label Packages;
(c) consignments as a 'Full Load' consignment;
(d) consignments as a 'Large Radioactive Source';
(e) consignments as a 'Special Arrangement'.

Consignments of (a), (b) and (c) can be carried by road routinely and without consent from any authority being required for the movement. For large radioactive sources and special arrangements as they are termed in this Code, the prior consent of the Secretary of State for the Environment as the competent authority for the purpose of the IAEA Regulations is usually required, and the consignments are treated under the Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1970, as specially approved consignments. In the case of some imported Large Radioactive Sources however, the Secretary of State's consent is replaced by that of the appropriate foreign competent authority.

**Radioactive Materials and Radiation**

10. The use of radioactive materials for industrial, medical, research and other purposes is increasing steadily. These materials must be moved about, often by road. They can be dangerous if mishandled; but, as with other dangerous goods, there is little risk in transporting them provided proper safeguards are observed.

11. Radioactive materials emit ionising radiations, such as gamma rays which are similar to X-rays. Limited doses of ionising radiation are regarded as acceptable, but excessive exposure could be harmful. The risk is usually greater if the radioactive material actually comes into contact with the skin or is swallowed or inhaled.

12. In the transport of radioactive materials, protection from excessive exposure to radiation is largely given by the use of packaging specially designed to prevent the material getting out and to limit the radiation dose rate i.e. the strength of any emission of radiation from the package. Consignors are responsible for safe packaging but those responsible for the actual carriage must also play their part, for example, by seeing that packages are not subjected to unnecessary risks, that certain of them are properly stowed on the vehicle, and that incidents, should they occur, are sensibly dealt with.

**Categories of Consignments**

13. *Unlabelled Exempt Packages* Very small quantities of radioactive material, sometimes incorporated in a larger article such as a clock with a luminous dial, are so harmless that no special precautions at all on the carrier's part are needed. The consignor is obliged, however, to use good packaging and to ensure that the dose rate at the surface of the package is minimal. Consignments

may need to be declared as radioactive on the consignment note but they need not be specially labelled and may be carried as ordinary non-dangerous goods.

14. *Routine White and Yellow Label Packages* Radioactive materials which do not fall within the exempt category are normally carried in a package bearing either white or yellow labels as shown in Appendix VIII. The outer packing may appear to be a metal canister, a heavy wooden box or merely an ordinary fibreboard case; but whatever its outward appearance it must include a strong leak-proof receptacle specially designed and properly packed to prevent radioactive material escaping. The package may in practice be any size above 10 cm. (4 in.) in each direction, and of any weight. Packages bearing white labels (one red stripe) are, if intact, quite safe to handle for prolonged periods without any risk to health. Packages with yellow labels, whether Category II (two red stripes) or Category III (three red stripes) emit higher dose rates of ionising radiation, but so long as they are intact are still safe to handle for short periods which are sufficient for all normal purposes in connection with transport, including loading and unloading.

**NOTE**

*Fissile Material* Some White or Yellow Label packages may be declared as fissile but (see Appendix V) this does not mean that there is any special risk for carriers and drivers. All the necessary precautions against possible hazards due to the presence of fissile materials are taken care of either in the make-up of the package, or by a limitation of the number of such packages transported together. Such a limitation is controlled by the Transport Index which is marked on the label (see B.2.7.3). No special precautions need be taken by carriers or drivers beyond those which they are bound to take for other labelled packages of radioactive materials.

15. *'Full Load' Consignments of Low Specific Activity Materials* Certain materials of low specific radioactivity, including certain ores, concentrates and wastes, may alternatively be presented for transport as full loads. Such consignments may consist of a number of sacks, drums, tanks or similar containers, or may be simply liquid material for bulk transport in road tankers. The vehicle in which they are carried must bear appropriate labels as shown in Appendix VIII and must be used only for the Full Load Consignment and any other goods loaded by or on behalf of the consignor.

16. *Large Radioactive Sources* When the activity in curies of a radioactive material contained in one package exceeds a given amount, it is treated as a 'Large Radioactive Source'. The conditions for consignment are more stringent and usually the Secretary

of State's consent for movement is necessary (in which case under the Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1970, it is treated as a specially approved consignment); but the packages are labelled with White or Yellow labels and are just as safe to handle as those routinely carried. In some cases the Secretary of State may impose special provisions for the transportation; such provisions may include the taking of temperature or pressure measurements, or the periodic venting of fuel flasks, and may include special instructions to ensure that speedy action by experts can be taken after any severe accident in which the large radioactive source is involved.

17. *Special Arrangements* Any consignment (not exempt) which does not satisfy all the conditions on which Routine White Label or Yellow Label Packages, Full Load Consignments of low specific activity material or Large Radioactive Sources can be carried may be transported by road only as a specially approved consignment for which the prior consent of the Secretary of State must be obtained. Consent is subject to any conditions which the Secretary of State may attach. Compliance with the conditions will make the transportation as safe as if all the normal provisions for safety had been complied with.

18. *Advice*

Advice on any matter in connection with the Code can be obtained from:

The Radiological Adviser
Department of the Environment
St. Christopher House
Southwark Street
London SE1

Advice is also obtainable as follows:

(a) In emergency, the police (in case of a road accident or incidents involving suspect damage to a radioactive consignment);
Under the scheme known as National Arrangements for Incidents involving Radioactivity (NAIR), the police will obtain whatever assistance, technical or otherwise is needed to deal with the emergency. (See Glossary).

(b) Generally, from

The Radiological Protection Service
Clifton Avenue
Belmont
Sutton
Surrey

Queen Elizabeth Hospital
Edgbaston
Birmingham B15 2TH

Regional Physics Department
9–13 West Graham Street
Glasgow C4

Leeds Regional Centre
29 Clarendon Road
Leeds 2

Manchester Regional Centre
Christie Hospital and Holt Radium Institute
Withington
Manchester 20

The Department of the Environment
(formerly the Ministry of Housing and
Local Government)
Whitehall
London SW1 (A.3.7, C.12.1 of Code only)

Department of Employment
1–13 Chepstow Place
Westbourne Grove
London W2 (Factories Regulations, classified workers)

Scottish Development Department
21 Hill Street
Edinburgh EH2 3JY (A.3.7 and C.12.1 of Code only)

Welsh Office
Cathays Park
Cardiff

Ministry of Home Affairs
Stormont
Belfast
BT4 3SU

Ministry of Health and Social Services
Lindsay House
Callander Street
Belfast
BT1 5DU

# PART A
# GENERAL PROVISIONS

## A.1 Scope, Interpretation, etc.

**A.1.1** The provisions of this Code apply to the carriage of radioactive materials in a vehicle by road in Great Britain. 'Road' includes any highway, and any other road to which the public has access, except when the road is within the boundaries of an aerodrome.

**A.1.2** For purposes of regulations and of this Code, a substance is not regarded as radioactive at all unless it has an activity of more than 0·002 microcurie per gramme. At this level, the activity is so low that it can be ignored with complete safety.

**A.1.3** Permissible activity limits depend on the radiotoxicity and radiation hazard of the radionuclide. For transport purposes, radionuclides are classified according to these factors into seven groups. An alphabetical list of radionuclides showing group classification, and rules governing the application of the activity limits and the calculation and measurement of radiation dose rates are given in Appendix I.

## A.2 Prohibitions

**A.2.1** *General*

**A.2.1.1** The rules in A.2.2–A.2.8 must be observed by everybody —consignors, carriers, drivers, and other people including the general public. *They do not apply to cases covered by the exemptions in A.3.2–A.3.6.*

**A.2.2** *Public Transport*

**A.2.2.1** Radioactive materials must not be carried on a bus, coach, trolleybus or tram.

**A.2.3** *Dangerous Goods*

**A.2.3.1** Radioactive materials must not be carried with dangerous goods which could adversely affect the integrity of the package in an accident. They must not be carried with substances which are explosive, highly inflammable (other than the vehicle's fuel), spontaneously combustible, corrosive (nitric acid more than 70% purity, or mixtures of nitric and sulphuric acid with more than 30% pure nitric acid) oxidising, or organic peroxides. (This prohibition can be waived only by consent of the Secretary of State for the Environment).

**A.2.4** *Removal of Material from Vehicle*

**A.2.4.1** Radioactive materials must not be removed from a vehicle

during a journey except in accordance with instructions of the carrier, the consignor, the consignee or for reasonable cause.

**A.2.5** *Altering Position of Package on Vehicle*

**A.2.5.1** The position of any package or full load consignment as stowed under the direction of the carrier or consignor must not be altered during the journey, except in accordance with the instructions of the carrier, the consignor, the consignee or for reasonable cause.

**A.2.6** *Damaging or Opening Package*

**A.2.6.1** Packages must not be wilfully damaged nor opened during the journey.

**A.2.7** *Defacing or Removing Labels*

**A.2.7.1** Labels and warning signs on packages (or inner containers) containing radioactive materials and labels or notices on vehicles carrying radioactive materials which warn of the presence of those materials must not be wilfully defaced or removed.

**A.2.8** *Persons Travelling in Vehicle*

**A.2.8.1** Persons must not travel in a vehicle carrying radioactive materials except with the carrier's permission.

## A.3 Exemptions

**A.3.1** *General*

**A.3.1.1** A package may contain so little radioactive material or the material may be so diluted that the contamination hazard is negligible; or the material may already be subject to statutory or other recognised form of control. In such cases, conditional exemptions from the full requirements of the Code may be permissible. The exemptions so permitted are given below, indicating in each case the extent and conditions of exemption. (Only the consignor is normally concerned with the technical details—see B.1.3.1.)

**A.3.2** *Exempt Packages*

**A.3.2.1** A package containing a small quantity of radioactive material within specified limits is exempt from all the requirements of the Code except that the consignor must ensure that the conditions and the quantity limitations set out in Appendix II are satisfied.

**A.3.3** *Empty Packaging*

**A.3.3.1** Empty packaging which has been used to carry radioactive materials, but which has been cleaned internally and is in

good condition and securely closed, is exempt from all the requirements of the Code (except Appendix II) provided that it is clearly marked 'Empty packaging having contained radioactive materials'. The consignor must ensure that any label or marking used previously to indicate the presence of radioactive material is removed or masked, and that conditions 1–3 and 6 of Appendix II are satisfied.

**A.3.4** *Exempt Instruments*

**A.3.4.1** Instruments or other manufactured apparatus incorporating as a component part radioactive material in a non-readily dispersible form or in the form of tritium gas (such as clocks with luminous dials, electronic tubes, or similar manufactured apparatus or equipment, but not radiography units or other items consisting essentially of sealed sources not incorporated in instruments) which are securely packed in strong packaging, are exempt from all the requirements of the Code. The consignor must ensure that conditions 1–3, 6 and 7 and the quantity limitations set out in Appendix II are satisfied.

**A.3.5** *Manufactured Articles containing Uranium*

**A.3.5.1** Manufactured articles other than fuel elements, in which the sole radioactive material is natural or depleted uranium, e.g. as used for packaging for transport of radioactive materials, are exempt from the general requirements of the Code provided that the outer surface of the uranium is enclosed in an inactive metallic sheath and the total activity per article does not exceed 3 curies. In addition, the consignor must ensure that conditions 2, 3 and 6 of Appendix II are satisfied.

**A.3.6** *Radioisotopes in Personal Medical Use*

**A.3.6.1** The requirements of this Code do not apply to any radioactive device which is being carried in or about the body of a person for the purpose of his medical treatment, or which has been so carried subject to the compliance with the Code of Practice for the Protection of Persons Against Ionising Radiations arising from Medical and Dental use.

**A.3.7** *Disposal of Certain Radioactive Waste*

**A.3.7.1** The provisions of the Code need not be observed in the case of radioactive waste which is being disposed of to a place used for refuse disposal in accordance with an authorisation granted under section 6 of the Radioactive Substances Act 1960 or an Order made by the Secretary of State for the Environment (under powers vested in the former Minister of Housing and Local Government) or the Secretary of State for Scotland or the

Secretary of State for Wales or the Ministry of Health and Social Services for Northern Ireland under section 6(5) of that Act, provided that the authorisation or order under which the disposal is effected does not require any special precautions to be taken in connection with the removal or disposal of that waste.

**A.3.8** *Partial Exemption for Professional Users*

**A.3.8.1** Certain members of the medical and other professions, such as consultants, use radioisotopes in their work and sometimes need to carry them in their private cars or in taxis. In special circumstances ambulances too may have to be used to transport radioisotopes used in hospitals. As a concession to these special needs, radioisotopes carried in these vehicles in accordance with the conditions set out in A.3.8.2.are exempt from B.1.7 and C.2.2 (as to consignor's certificates), C.4 (as to persons travelling in the vehicle), C.5 (as to Road Transport Workers Regulations), C.6 (as to notice in vehicle), C.7 (as to Labels on Vehicle) and C.9 (as to stowage).

**A.3.8.2** The conditions of partial exemption are that the radioisotope must be packed and labelled in the normal way as a White Label or Yellow Label Package, that not more than 10 packages (White Label, Yellow Label or mixed) must be carried and the sum of the Transport Indexes* specified on any Yellow Label Packages carried must not exceed 10, and that:

(a) in the case of a private car or taxi, none of the occupants of the vehicle must be under 18 years of age;

(b) in the case of an ambulance, the packages must be in the charge of a person acting under the instructions of a Radiological Safety Officer of a hospital.

Every safeguard against theft and against unnecessarily exposing anyone to radiation must be taken. Although not a legal requirement in those circumstances a notice should be exhibited in the vehicle similar to that required by C.6 and described in Appendix IX of this Code, so that it can be seen in the case of fire, etc., by fire-fighters and rescuers; and if the vehicle owner is travelling in the vehicle he should name some other person to be informed in case of an accident.

**A.3.8.3** No person who is not instructed in or completely aware of the precautions which ought to be adopted should take advantage of this concession.

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*For definition of 'Transport Index' see B.2.7.3.

†The Carriage by Road Regulations also exempt the carriage of certain radioactive material which is used or required for specified military defence purposes; such carriage is otherwise controlled.

PART B

# CONSIGNOR'S RESPONSIBILITIES

(As to the scope of the term 'consignor', see paragraph 6 of the Introduction.)

## B.1 General

### B.1.1 *General Safety Requirement*

**B.1.1.1** The consignor of radioactive materials, in addition to observing the general provision in Part A, especially the prohibitions in A.2, is under a duty generally to exercise reasonable care to ensure that the material causes no injury to the health of anyone.

### B.1.2 *Nature of Consignment*

**B.1.2.1** The consignor must not send any quantity of radioactive materials by road except as:

(a) an exempt package, see B.1.3; or
(b) a routine White Label or Yellow Label Package which fulfils the requirements of B.2;
(c) a 'Full Load' consignment of low specific activity materials which fulfils the requirements of B.3; or
(d) a 'Large Radioactive Source' which fulfils the requirements of B.4; or
(e) a Special Arrangement, see B.5

**B.1.2.2** For various purposes approvals or consents have to be obtained and in the case of exported consignments additional notifications may be necessary; a summary list of these will be found in Appendix VI. It is the consignor's responsibility to obtain these (or to see that they have been obtained in the case of e.g. Type B packaging already approved).

### B.1.3 *Exemptions*

**B.1.3.1** Certain consignments are exempt either generally or partially from the requirements of the Code, see A.3; but the consignor must ensure that all the conditions attached to the particular exemption are fulfilled.

### B.1.4 *Radioactive Explosives*

**B.1.4.1** The Consignor must not send radioactive explosives by road otherwise than as a Special Arrangement.

### B.1.5 *Radioactive Dangerous Goods*

**B.1.5.1** Where radioactive materials have other hazardous properties, e.g., substances which are liable to spontaneous combustion, or are highly inflammable, compressed gases, etc., effective measures must be taken to guard against these other hazards

including any statutory requirements applying to such dangerous articles in addition to the requirements of this Code.

**B.1.6** *Pyrophoric Radioactive Materials*

**B.1.6.1** The design of any package of pyrophoric radioactive materials must be approved by the Secretary of State for the Environment*, whose certificate may specify the materials and the quantities for which it can be used. If the design of the package originated outside Great Britain, the design must be approved by certificate of the competent authority of the country of origin of the design, which may similarly specify its use limitations.

**B.1.7** *Consignor's Certificate*

**B.1.7.1** The consignor must make out and sign a certificate for each consignment of radioactive materials and must give the certificate to the carrier, or if the consignor is himself carrying the goods, to the driver of the vehicle. The certificate should contain the following particulars:

(a) Name and address of the consignor and, if possible, telephone number at which he can be notified in case of accident;

(b) A statement identifying the package, group of packages when each is identical, or, in the case of a full load of low specific activity material, the consignment to which the certificate relates;

(c) A description of the radioactive materials beginning with the words 'Radioactive Material'; then the Group or Groups of the radionuclides in the package or consignment classified in accordance with Appendix I; the name of the radioactive material and a description of its physical and chemical form or whether the material is in special form;† and the activity in curies;

(d) Nature of package or consignment (see B.1.2.1); in the case of a White or Yellow Label Package, the category (e.g. I—White etc. see B.2.4.1); and in the case of a Yellow Label Package, the transport index (see B.2.7.3);

(e) The type of packaging, i.e. Type A or Type B or industrial (see B.2.2.6 and B.3.3);

(f) In the case of fissile materials:
—in quantities not exceeding the limits set out in Appendix V, Part 2, the quantity in grammes and the concentration or the degree of enrichment in uranium-235 where appropriate;

*It should be noted that the whole package, including contents, is subject to approval—see definition of 'package' in the Glossary.
†For definition of material in special form, see Appendix III.

—in quantities exceeding the limit set out in Appendix V, Part 2, the fissile class of the package (see Appendix V, Part 1);

(g) A statement in the following terms:
'This is to certify that the above named goods are properly described and are packed and marked in accordance with the applicable regulations of the Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1970, or of the International Regulations and are in a proper condition for transport'.

**B.1.7.2** A single certificate over one signature is sufficient in respect of a number of White Label and Yellow Label Packages travelling together in one vehicle or one carrier's vehicles to the same destination.

**B.1.7.3** In the case of a Special Arrangement, the certificate should identify the movement, specify that it is a Special Arrangement, certify that any requirements, prohibitions, or restrictions imposed by the Secretary of State in relation to the consignor are complied with and specify any instructions necessary to ensure compliance with the requirements, prohibitions and restrictions imposed by the Secretary of State in relation to the carriage of the consignment with which the carrier has to comply.

**B.1.8** *Certificates of Approval to be given to Carrier*

**B.1.8.1** The consignor, unless he is also the carrier, must give to the carrier a copy of the document of approval by the Secretary of State in cases to which B.1.6, B.2.2.4, B.2.2.5, B.4, B.5 and Appendix III apply. An extract from the certificate referred to in B.2.2.4 containing the identification mark of the Secretary of State for the Environment may be accepted in place of the full certificate of approval.

**B.1.8.2** In the case of Large Radioactive Sources (see B.4), the approval documents should include a copy of the Secretary of State's approval certificate of the package design together with a copy of the Secretary of State's approval certificate for the movement of the Large Source. Any supplementary operational requirements specified by the Secretary of State will be included in the movement approval certificates, together with any special stowage provisions, emergency arrangements in the event of an accident etc.

**B.1.8.3** In the case of Special Arrangements (see B.5), the approval documents will state in what respects the package does not comply with the regulations and indicate the appropriate actions to be taken during transport to make the transportation safe.

**B.1.8.4** Section 21(3) of the Nuclear Installations Act 1965 requires that for all nuclear matter other than excepted matter as

defined in section 26(1) of the Act a certificate of insurance be given to the carrier. The consignment note for the material should state whether such a certificate is required. When provided, the certificate must show the particulars prescribed in the Nuclear Installations (Insurance Certificate) Regulations, 1965 as amended by the Nuclear Installations (Insurance Certificate) (Amendment) Regulations 1969.

**B.1.8.5** Consignors should be aware that before a consignment for export can be accepted by a port prior notification together with copies of appropriate certificates may be required by the port authority. See Ministry of Transport Code of Practice for Conveyance through Ports of Radioactive Materials.

**B.1.9** *Inclusion of other articles in package*

**B.1.9.1** A package which contains radioactive material must not contain any other items except articles and documents which are necessary for the use of the radioactive materials and which can be included without producing any additional hazard due to reaction with the radioactive contents.

## B.2 Routine White Label and Yellow Label Packages

N.B. A routine White Label or Yellow Label Package is any White Label or Yellow Label Package which is not a Large Radioactive Source, see B.4.1, or Special Arrangement, see B.5.1.1.

**B.2.1** *General*

**B.2.1.1** The consignor of routine White Label or Yellow Label Packages must ensure that all the requirements of B.2 relating to either category, as appropriate, are strictly complied with.

**B.2.1.2** The requirements for routine White and Yellow Label Packages can be summarised as:

(a) packing in accordance with B.2.2 in Type A or Type B packaging (except where B.2.2.6 applies) is necessary;
(b) if fissile materials are included, the additional package requirements of B.2.2.5 and Appendix V relating to Fissile Class I or II must be met;
(c) the activity in curies of each package must be limited as in B.2.3;
(d) the package must fall into one of the categories set out in B.2.4 and the appropriate White or Yellow labels affixed (B.2.7);
(e) the requirements as to external contamination by loose material (B.2.5) markings and seals (B.2.6, B.2.8 and B.2.9) must be satisfied.

**B.2.2** *Packing*

**B.2.2.1** No external dimension of any package must be less than 10 cm (4 in.).

**B.2.2.2** The general packaging requirements set out in the IAEA Regulations* must be met for all White Label or Yellow Label Packages.

**B.2.2.3** Within the general framework of these requirements, two standards of packaging are recognised. Type A packaging is designed to provide adequate safeguards with respect to the maintenance of containment and radiation shielding in relation to the normal transport environment including minor mishaps such as dropping the package from the tailboard of a lorry during loading or unloading. Type B packaging is designed to provide similar safeguards in relation to severe accident conditions as well as the normal transport environment. The requirements for Type A and Type B packaging which must be met are set out in the IAEA Regulations. (A guide to these requirements are conveniently set out in BS 3895).

**B.2.2.4** The design of Type B packaging must be approved by the Secretary of State for the Environment, who will issue a certificate and allocate an identification number. It should be assumed that approval cannot be obtained within less than three months from the date of application. Application for approval should be submitted on the appropriate form obtainable from The Radiological Adviser, Department of the Environment, St. Christopher House, Southwark Street, London, S.E.1. If the design of the packaging originated outside Great Britain, the design must be approved by certificate of the competent authority of the country of the origin of the design, which may similarly specify its use limitations.

**B.2.2.5** Fissile materials, that is plutonium-239, plutonium-241, uranium-233, uranium-235, or any material containing any of these, if the quantity per package or form does not comply with the exempted quantities and/or forms laid down in Part 2 of Appendix V, are classified as defined in Appendix V as

Fissile Class I,
Fissile Class II, or
Fissile Class III.

Fissile material consigned in routine White Label and Yellow Label packages must be packed in accordance with the requirements of B.2.2.1 to B.2.2.4, and in addition must satisfy the criteria laid down in Section C-5 of the IAEA Regulations relating to Fissile Class I or II. (If the package design is Fissile Class III, then it must be treated as a specially approved consignment in

*See glossary.

accordance with B.5.2.). If the package design is not one published in Annex III of the IAEA Regulations, it must be approved by the competent authority of the country in which it was designed and, unless it complies with the physical model described in the IAEA Regulations for Fissile Class I, it must also be approved by the competent authority of each country concerned in the movement. For details of requirements for approval of package design see Appendix VI. For fissile materials in quantities within the limits specified in Part 2 of Appendix V, packagings may be Type A or Type B or they may even be strong industrial packagings should they fall within the terms of B.2.2.6 or B.3.

**B.2.2.6** The packaging requirements of B.2.2.3–B.2.2.4 do not apply to:

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

(b) unirradiated natural or depleted uranium or unirradiated natural thorium, in other than liquid or gaseous form, provided that the materials are packed in strong industrial packages which will prevent any loss of contents under normal conditions of transport; that the activity per package does not exceed the maximum activity permitted in Type A packaging (see B.2.3); and in the case of materials defined in (b) above, if in massive solid form, that they are packed so as to prevent movements of the material in the package such as to cause abrasion of the material, and if in other solid forms, that they are contained in an inert metal cover or sheath of other substantial material such that the surface of the material is not exposed.

(Note: These materials can also be carried as Full Load consignments, in which case the provisions of B.3 apply instead).

**B.2.3** *Maximum Contents of Package*

**B.2.3.1** The quantity of radioactive material in a routine White Label or Yellow Label Package, having regard to the group of material concerned (see list of radionuclides and rules for applying activity limits in Appendix I) and the type of packaging used, must not exceed the amounts shown in the following table:

**TABLE**

MAXIMUM ACTIVITY IN A PACKAGE

| Group of Material / Packaging | Group I | Group II | Group III | Group IV | Group V | Group VI | Group VII | Special Form* |
|---|---|---|---|---|---|---|---|---|
| TYPE A | 1 mCi | 50 mCi | 3 Ci | 20 Ci | | 1,000 Ci | | † 20 Ci |
| TYPE B | 20 Ci | | 200 Ci | 200 Ci | 5,000 Ci | 50,000 Ci | | † 5,000 Ci |

**B.2.4** *Radiation Limits*

**B.2.4.1** The category of a White Label or of a Yellow Label Package (as distinct from the standard of packaging defined in B.2.2.3) depends on the radiation dose rate emitted from the package except that Fissile Class II packages are always classified as Yellow Label packages even though the radiation may be within the limits prescribed for White Label packages. The international classification of packages into three categories which has been adopted in this country is:

(a) Category I—WHITE LABEL PACKAGE where the dose rate of radiation originating from the package does not exceed 0·5 millirem per hour at any point on the external surface of the package at any time during the journey and the package does not belong to Fissile Class II;

(b) Category II—YELLOW LABEL PACKAGE where the dose rate of radiation originating from the package exceeds the level in (a) above, or when the package belongs to Fissile Class II, and in either case the dose rate does not at any time during the journey exceed:

(i) 10 millirem per hour at any point on the external surface of the package; and

(ii) 0·5 millirem per hour at a distance of 1 metre from the centre of the package;

The Transport Index (see B.2.7.3) must not exceed 0·5 at any time during transport.

(c) Category III—YELLOW LABEL PACKAGE where the dose rate of radiation originating from the package exceeds the levels in (a) and (b) above, but does not at any time during the journey exceed:

(i) 200 millirem per hour at any point on the external surface of the package; and

(ii) 10 millirem per hour at a distance of 1 metre from the centre of the package.

The Transport Index (see B.2.7.3) must not exceed 10 at any time during transport. The maximum radiation dose rate in (ii) of 10 millirem per hour and the maximum Transport Index of 10 may be exceeded if a Category III—Yellow Label package is carried as a Full Load in accordance with the provisions of B.2.10.

**B.2.4.2** The two categories of Yellow Label Package, Category II and Category III, were introduced internationally to meet the needs of countries which do not use the Transport Index. In this

*For definition of material in Special Form see Appendix III.

†Where the material is in a capsule as defined in paragraph 1(b) of Appendix III these limits apply only if that capsule is *not* used as the containment vessel.

country, however, all Yellow Label Packages (whether Category II or Category III) are governed by the same rules and they are therefore referred to in the rest of this Code simply as Yellow Label Packages. But each Yellow Label Package should bear the appropriate labels (with either two or three red stripes—see B.2.7.1 and Appendix VIII) according to the category of the package, particular care being taken with a package being exported to any of the countries which do not use the Transport Index.

**B.2.4.3** It is the consignor's responsibility to ensure that the radiation dose rate emitted from a package at any time during the journey will not exceed the limits set out in B.2.4.1, according to the category of the package.

**B.2.5** *Contamination of Outer Surface of Package*

**B.2.5.1** Contamination of the outside surfaces of a White Label or Yellow Label Package by non-fixed radioactive material must be kept to a minimum and in any case must not exceed the surface countries which do not use the Transport Index.

**B 2.6** *Marking of Packaging*

**B.2.6.1** The consignor must ensure that for Type B packagings the radioactive warning sign (trefoil symbol) illustrated at Appendix VII (see also BS 3510:1968) is embossed, stamped or otherwise durably marked on or attached to the outermost receptacle which is resistant to fire and water. The size of the sign must be such that it can be readily and clearly seen on the container.

**B.2.6.2** The consignor must ensure that in the case of Type A packaging containing gamma-emitting radioactive material in excess of 3 curies, the outer surface of the metal vessel or, where the containment vessel is enclosed by a radiation shield of material with a melting point in excess of 800°C, the outer surface of the shield, is plainly marked by embossing, stamping or other means with the radioactive warning sign (trefoil symbol) illustrated at Appendix VII, and with the word 'RADIOACTIVE' in letters not less than 10 mm in height, in such a way that the symbol and letters are resistant to the effects of fire or water.

**B.2.7** *Labels on Packages*

**B.2.7.1** The consignor must affix to the outside of every White Label or Yellow Label Package according to the category of the package as defined in B.2.4.1, two labels, one on each of two opposite sides, of appropriate form and of the colour and size prescribed in the Regulations and reproduced here at Appendix VIII.

**B.2.7.2** Every label on a White Label or Yellow Label Package must specify, in the space provided, the principal radioactive content and the total activity in curies.

**B.2.7.3** Every label on a Yellow Label Package must specify additionally, in the space provided, the Transport Index of the package. The main purpose of the Transport Index is to enable the carrier in stowing packages to ensure, without having to measure radiation, that the dose rate in the driving cab is properly limited—see C.9.4. The Transport Index for a package is the number expressing the maximum radiation dose rate in millirem per hour at 1 metre (3 ft. 4 in.) from the centre of the package or, where any over-all external dimension of the package exceeds 3 metres, the number expressing the larger of the following:

(a) the maximum radiation dose rate at the surface at the end of the long axis of the package; and
(b) the maximum radiation dose rate at a distance of 1 metre perpendicular to the long axis of the package.

The Transport Index to be shown on a Fissile Class II package must be determined according to para. 10 of Appendix V. The number expressing the Transport Index should be rounded up to the first decimal place.

**B.2.7.4** The number of Yellow Label Packages allowed in any vehicle is limited so that the sum of the Transport Indexes is no greater than 50. It is the carrier's responsibility to restrict the loading to this figure and the consignor as such is not directly involved unless the consignment is a full load. Full Load consignments may, subject to certain conditions, exceed a Transport Index total of 50. (See B.2.10.)

**B.2.8** *Marking of Weight and Packaging Standard on Packages*

**B.2.8.1** A package weighing over 50 kilogrammes (1 cwt) gross must have the weight plainly and durably marked on the outside.

**B.2.8.2** Packaging of Type A design must be plainly and durably marked on the outside with the inscription 'Type A'.

**B.2.8.3** Any package or packaging, the design of which has been approved by the Secretary of State, must be plainly and durably marked on the outside with the Secretary of State's identification mark, and a serial number, and with 'Type B' in the case of a Type B packaging design. If approved by the authority of some other country of origin it should be marked accordingly.

**B.2.9** *Closing and Sealing Packages*

**B.2.9.1** The outside of every package must be sealed or carry some equivalent device as evidence that it has not been opened without authority, and any fastening device must be securely closed.

**B.2.10** *Full Load Consignments*

**B.2.10.1** Certain relaxations are made for the carriage of radioactive substances under Full Load conditions as defined in B.3.1.2. Yellow Label packages may have a dose rate at one metre in excess of 10 millirem per hour or a Transport Index in excess of 10, and the sum of Transport Indexes for all the packages in the vehicle may exceed 50, provided not more than the 'allowable number' of Fissile Class II packages are carried. The provisions of B.3.4 as to loading, stowage and certifying the dose rate in the vehicle must be observed, and the radiation dose rate at any accessible surface of the vehicle and at a distance of 2 metres from any external surface must be in accordance with para. B.3.6.

## B.3 Full Load Consignments of Low Specific Activity Materials

**B.3.1** *General*

**B.3.1.1** Low specific activity materials when transported under Full Load conditions are exempt from a number of provisions applicable to routine White Label and Yellow Label packages. For instance, the design of packaging is not so stringent, the activity limitation is not applicable, each individual package need not be labelled nor marked and it is not necessary to observe the stringent requirements on the contamination of the outer surface (see B.2.5).

**B.3.1.2** A 'Full Load' consignment is one for which the consignor must have the sole use of the carrying vehicle, though he may also carry in it (subject to the requirements otherwise specified in the Code) radioactive materials of different kinds in packages which may be different, or non-radioactive material in respect of which mixed loading with radioactive material is not prohibited. All terminal and intermediate loading must be carried out in accordance with the instructions of the consignor or the consignee.

**B.3.2** *Low Specific Activity Materials*

**B.3.2.1** Low specific activity materials which may be carried as a Full Load consignment are any of the following:

(a) uranium or thorium ores and physical or chemical concentrates of those ores;
(b) unirradiated natural or depleted uranium or unirradiated natural thorium;
(c) tritium as tritiated water provided that the concentration does not exceed 5 millicuries per millilitre;
(d) materials of uniformly distributed activity in which the estimated concentration in terms of microcuries per unit mass of the material does not exceed:
    (i) 0·1 microcurie per gramme of Group I material;
    (ii) 5 microcuries per gramme of Group II material; or

(iii) 300 microcuries per gramme of Group III or IV material;

(e) objects of non-radioactive material externally contaminated with radioactive material, provided that the radioactive material is in a non-readily dispersible form and the surface contamination does not exceed:
—in the case of alpha emitters of Group I,
0·1 microcurie per square centimetre; or
—in the case of other radionuclides,
1 microcurie per square centimetre,
when averaged over 1 square metre and provided also that the objects are suitably wrapped or enclosed.

**B.3.3** *Packaging Requirements for Low Specific Activity Materials*

**B.3.3.1** The materials must be packed in strong industrial packages which will prevent any loss of contents under normal conditions of transport, or loaded in vehicles designed to ensure that there will be no leakage of the materials under normal conditions of transport.

**B.3.3.2** In the case of materials included in B.3.2.1(b), if in massive solid form, they must be packed or stowed in a manner which will prevent movements of the materials within the package or vehicle such as to cause abrasion of the material; in other solid forms they must be contained in an inert metal cover or sheath of other substantial material so that the surface of the material is not exposed.

**B.3.3.3** Where materials covered by B.3.2.1(d) contain fissile materials (plutonium-239, plutonium-241, uranium-233, and uranium-235) the limits specified in paragraphs 1, 3 or 4 of Part 2 of Appendix V must not be exceeded per package, or per vehicle if the materials are loaded directly into a vehicle.

**B.3.4** *Loading, Unloading and Stowage*

**B.3.4.1** The consignor of a Full Load consignment is responsible for the loading and stowage of the vehicle and should instruct the carrier as necessary. No part of a Full Load consignment must be carried in the driving cab and all radioactive materials on the vehicle must be securely stowed.

**B.3.4.2** The consignor and consignee where appropriate must ensure that the conditions of loading or unloading for which he is responsible are such that drivers and others required to handle the consignment are not likely to receive doses of radiation exceeding permissible levels (see C.5).

**B.3.4.3** The radiation dose rate in the driving cab should be kept as low as possible by stowing all radioactive materials on the vehicle

as far away from the driving cab as possible, by the use of vehicles with bulkheads constructed or adapted to afford additional shielding, by stowing non-radioactive goods between the cab and the radioactive packages, or by a combination of these or other methods.

**B.3.4.4** The consignor, unless he is the carrier, must certify to the carrier whether or not the radiation dose rate anywhere on the inside surface of the driver's cab is likely at any time during the journey to exceed 2 millirem per hour. (If a dose rate of 2 millirem per hour is exceeded, the Road Transport Workers Regulations apply and the carrier must pay particular regard to C.5).

**B.3.5** *Maximum Content of Low Specific Activity Materials in a Vehicle*

**B.3.5.1** The consignor must ensure that the estimated total activity of low specific activity materials carried in any one vehicle does not exceed

—in the case of Group I material, 100 millicuries
—in the case of Group II material, 5 curies
—in the case of Group III or IV material, 250 curies.

If the load includes more than one group, the quantities should be limited so that the sum of the following does not exceed 1 (unity):

(a) the number of curies of Group I multiplied by 10
(b) the number of curies of Group II divided by 5
(c) the number of curies of Groups III and IV divided by 250.

**B.3.6** *Radiation Limits*

**B.3.6.1** The radiation dose rate must not exceed:

(a) 200 millirem per hour at any accessible surface of the vehicle, and
(b) 10 millirem per hour at a distance of 2 metres from any external surface of the vehicle,

at any time during transport.

## B.4 Large Radioactive Sources

**B.4.1** A Large Radioactive Source (referred to in the following paragraphs of B.4 as a 'Large Source') is material in a single package having an activity above the limits which are routinely carried in Type B packages i.e. where the radioactive content is in excess of the amounts indicated in the Table in B.2.3.

**B.4.2** Large Radioactive Sources must be carried in Type B packaging conforming to the relevant provisions of B.2.2 and B.2.4 to B.2.10.

**B.4.3** Quite often in the transportation of Large Sources, additional factors which have to be considered besides radiation, contamination or criticality, are the generation of heat and pressure. Precautions may have to be taken to dissipate heat and prevent a build-up of pressure, for example, it may be necessary to ensure that the package is not sheeted over or overstowed with other packages. The heat generated within the package must not be allowed to affect the efficiency of the package in any way, as it might for example by altering the physical state of the contents by melting the cladding of fuel elements, or melting the radiation shielding or causing corrosion of the materials of construction. At no time during transportation must the temperature of the accessible parts of the surface of the package exceed 50°C, except that this limit can be raised to 82°C if the package is transported in a vehicle as a Full Load. (Full details are set out in C-2.4 of the IAEA Regulations).

**B.4.4** The general position is as follows:

(a) There are two types of Large Source.

(b) Unilaterally approved Large Sources, referred to as Large Source I in Appendix VI, are transported in package designs which conform to very stringent design criteria, principally to avoid any loss of radioactive material in a severe accident. These criteria are set out in the IAEA Regulations (C-6.2.3.1(a)). If the package design satisfies these criteria no supplementary operational requirements such as those mentioned in B.4.5(a)(i) below will be imposed.

(c) Other Large Sources, which cannot meet the above mentioned criteria are treated as multilaterally approved Large Sources referred to as Large Source II in Appendix VI. Although these Large Source packages must be able to prevent loss or dispersal of the radioactive contents under normal transport conditions, it may be impossible to guarantee no loss of the coolant under severe accident conditions. However, the design must be such that the maximum leakage of activity is no greater than the quantities specified in C-6.2.3.2 of the IAEA Regulations and accordingly would be within safe limits.

**B.4.5** For Large Sources consigned within Great Britain or exported, the approval position is as follows (for consignments consigned from other countries, see C.2.4).

(a) *Large Source I*

(i) Unilaterally approved Large Sources conforming to the design criteria described above in B.4.4(b) must be

carried in Type B packaging, and the package design* approved by the Secretary of State for the Environment, and marked as in B.2.8.3 or as otherwise directed.

(ii) Each movement of the package will require the prior approval of the Secretary of State.

(iii) The consignor must make prior arrangements with each carrier involved in the movement of a Large Source, and a copy of the certificates of approval of the package design and movement must be supplied to him (see B.1.8.1).

(iv) All competent authorities of other countries, and the port authorities in this country concerned in the movement must receive prior notification.

(v) Before the movement begins, the consignor must retain the loaded package until its temperature has reached equilibrium, unless he demonstrates to the Secretary of State that when equilibrium is reached it will satisfy the surface temperature requirements of B.4.3.

(b) *Large Source II*

(i) Multilaterally approved Large Sources referred to as Large Source II in Appendix VI must be carried in Type B packaging. The design of the package must be approved by the Secretary of State and by all competent authorities in the countries affected by the movement of the package. The package must be marked as in B.2.8.3 or as otherwise directed. At this stage each competent authority may specify that certain supplementary operational requirements such as the need to take temperatures and pressures or to vent a flask, must be observed during transport.

(ii) Each movement of the Large Source will require the approval of the Secretary of State and of those competent authorities who specify supplementary operational requirements.

(iii) B.4.5(a)(iii) will apply, and the consignor must instruct the carrier as necessary of all operational requirements in which the latter is concerned.

(iv) B.4.5(a)(iv) will apply.

(v) B.4.5(a)(v) will apply.

**B.4.6** The additional requirements for packages containing Large Radioactive Sources and the additional design principles for large radioactive source packages as outlined in the IAEA Regulations

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*The whole package including contents is subject to approval—see definition of 'package' in the Glossary.

(see C-2.4) must also be met. (These requirements are also set out in B.S. 3895).

**B.4.7** Packages containing Large Radioactive Sources must also be subjected to certain additional requirements to be carried out under the consignor's responsibility before the first use of the packaging and before the delivery of the package to transport. These requirements include testing of new packages in regard to shielding and heat transfer characteristics, tests to confirm the presence of neutron poisons if used, testing for leakage before each movement, etc. (see C-7 of IAEA Regulations).

**B.4.8** Application for the Secretary of State's consent should be made on the appropriate form obtainable from the Radiological Adviser, Department of the Environment, St. Christopher House, Southwark Street, London, S.E.1. Application should be made at least one month, if practicable, before each movement or the first movement of a series, but standing approval for a continuing series may be given in appropriate cases. More than one month's notice may be needed where the source is to be exported, especially if B.4.4(b) is not satisfied.

**B.4.9** The consignor carries the primary responsibility for ensuring that any conditions which the Secretary of State may impose are complied with, and since some of them may relate to stowage, routeing, speed limits, planned halts, etc., he must instruct the carrier as necessary (see C.15).
(Note: For legal purposes, since movement requires the Secretary of State's approval, under the Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1970, a Large Source is deemed to be a 'specially approved consignment').

## B.5 Special Arrangements

**B.5.1** *General*

**B.5.1.1** A Special Arrangement is any consignment of radioactive materials intended for road carriage which does not satisfy all other relevant parts of this Code. It will include any Fissile Class III consignment (see B.5.2 and paragraph 11 of Part I of Appendix V), and any radioactive explosives (see para. B.1.4). The Secretary of State's consent will only be given after detailed scrutiny of all aspects of the proposed movement or series of movements. Application for consent should be made on the appropriate form obtainable from the Radiological Adviser, Department of the Environment, St. Christopher House, Southwark Street, London, S.E.1. Application forms should be submitted at least one month before the material is to be transported or the first movement of a series.

**B.5.1.2** Packages carried by Special Arrangement with a surface dose rate exceeding 200 millirem per hour will not be labelled with a White or Yellow label.

**B.5.2** *Fissile Class III*

**B.5.2.1** All fissile packages which do not meet all the specifications of Fissile Class I or Fissile Class II must be treated as Fissile Class III packages, which must be transported only by special arrangement.

**B.5.2.2** For Fissile Class III packages consigned within Great Britain, or exported, the approval position is as follows (for consignments consigned from other countries, see C.2.5):

(a) The package design must conform with the fissile criteria of C-5 of the IAEA Regulations and be approved by the Secretary of State and by all competent authorities in the countries affected by the movement of the package. At this stage each competent authority may specify that special precautions such as the prohibition of intermediate on-loading of other radioactive packages, must be observed during transport.

(b) Each movement of the Fissile Class III package will require the approval of the Secretary of State and of those competent authorities who specify supplementary operational requirements.

**B.5.2.3** The consignor must make prior arrangements with each carrier involved in a movement of a Fissile Class III package, and a copy of the certificates of approval of the package design and movement must be supplied to him (see B.1.8.1). He must also instruct the carrier as necessary of all special precautions in which the latter is concerned.

**B.5.2.4** All competent authorities of other countries and the port authorities in this country concerned in the movement must receive prior notification.

**B.5.3** *Other Special Arrangements*

**B.5.3.1** The possibility of consignment as a Special Arrangement is not intended as a means of circumventing the provisions of the Code in general. These provisions should normally be complied with whenever, and to the extent that, it is reasonably practicable to do so. A case will have to be made out for not complying with any of the provisions of the Code relating to Routine White Label or Yellow Label Packages or Full Load consignments of low specific activity materials or Large Radioactive Sources.

**B.5.3.2** Conditions will be attached to the Secretary of State's consent to a Special Arrangement which, among other things, will require compensating safety arrangements to be made in place of

those provisions of the Code with which it is impracticable to comply. Additionally, conditions as to route and timing of the journey, speed limits, provision of escorts, emergency arrangements, etc., may be attached in appropriate cases. Full details of the safety precautions to be taken must be given in the application for consent to a Special Arrangement.

**B.5.3.3** The consignor carries the primary responsibility for ensuring that any conditions which the Secretary of State may impose are complied with, and since some of them may relate to stowage, routeing, speed limits, planned halts, etc., he must instruct the carrier as necessary (see C.15).

(Note: Special Arrangements constitute 'specially approved consignments' for legal purposes under the Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1970.)

# PART C
# CARRIER'S RESPONSIBILITIES

(A carrier should also refer to the Introduction and to Part A.) 'Vehicle' includes an articulated vehicle, i.e. a tractor and semi-trailer combination, but a drawbar trailer should be treated as a separate vehicle. Any reference to a driving cab means a reference to the driving cab of the drawing vehicle.

N.B. See Glossary for 'IAEA Regulations' and Introduction and B.3.1.2 for 'Full Load consignments'.

**C.1** *General Safety Requirement*

**C.1.1** The carrier of radioactive material (that is, the operator of the vehicle in which the material is carried, whether on his own behalf or of someone else) in addition to observing the general provisions in Part A, especially the prohibitions in A.2, is under a duty generally to exercise reasonable care to ensure that the material causes no injury to the health of anyone.

**C.2** *Acceptance of Consignment*

**C.2.1** Any carrier may carry radioactive material but only if the material has been consigned as:

(a) an unlabelled exempt consignment (see C.3)
(b) a routine White Label or Yellow Label Package
(c) a Full Load consignment of low specific activity materials
(d) a Large Radioactive Source, or
(e) a Special Arrangement.

It is the consignor's responsibility to ensure that all the detailed packing and other requirements relating to any particular consignment, as set out in Part B, are complied with. In the case of (d) and (e) consent for movement of the consignment has to be obtained from the Secretary of State for the Environment but this is the responsibility of the consignor; in both cases the movement is for legal purposes known as a 'specially approved consignment' (in the case of certain imported Large Radioactive Sources, the Secretary of State's consent is replaced by the approval of the competent authority of the consigning country, see C.2.4). It should also be noted that a Large Radioactive Source will bear White or Yellow Labels.

**C.2.2** A carrier who is not also the consignor of the material must not carry the material (apart from the exemptions in C.3) unless he has received the signed consignor's certificate (see B.1.7) together with any approval documents or insurance certificate which the

consignor is required to provide (see B.1.8) or in the case of an imported consignment similar transport documents.* The category of consignment will be stated in the certificate or transport document which is the warranty upon which the carrier may assume that the material has been consigned in accordance with the detailed packing and other requirements set out in Part B. Where the certificate or transport document relates to White Label or Yellow Label Packages the carrier may only carry them if they bear White or Yellow Labels as appropriate. The labels are illustrated at Appendix VIII.

**C.2.3** The consignor's certificate and approval documents need not necessarily accompany the consignment to which they relate; but they, or copies of them, must be available at loading, unloading and at any transhipment point, preferably in advance. When the consignor is himself the carrier, he should give the certificate to the driver of the vehicle.

**C.2.4** For certain large radioactive sources consigned from a country outside Great Britain, the Secretary of State's approval for movement of the package is replaced by the approval of the competent authority of that country, and approval of the design of the packaging is the responsibility of the country in which the design originated. So far as the carrier is concerned, any Large Source can be transported like a routine White or Yellow Label Package unless the consignor (or his consignee or other agent) instructs that supplementary operational requirements have to be observed (see examples in B.4.5(b)(i)). The carrier should, as always, obtain the certificate referred to in C.2.2 containing the particulars referred to in B.1.7.1 (excluding items (e) and, if not applicable, (f)); the certificate at (g) need not refer to the Radioactive Substances (Carriage by Road) (Great Britain) Regulations 1970 but should refer specifically and clearly (e.g. by their full title) to the IAEA Regulations or state that the consignment is in conformity with ADR or RID (N.B. ADR is the European agreement on the carriage of dangerous goods by road; RID is the corresponding agreement for carriage by rail). If the consignor supplies additional approval documents which seem to impose supplementary operational requirements on the carrier of which he has not been informed, the position should be checked with the consignor or his agent.

Note: The technical position as regards imported large radioactive sources is as follows.

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*In the case of imported consignments the carrier will normally find that the transport document is in English with a certificate similar to that specified in B.1.7.1(g), but the labels may not be in English; however they will conform to the same general form, colour and layout. As regards Large Radioactive Sources see C.2.4.

(a) If the package design is approved by the competent authority of the country of origin of design in accordance with the criteria of paragraph C-6.2.3.1(a) of the IAEA Regulations and providing the competent authority of the country of origin of the movement has approved the movement in accordance with the IAEA Regulations or national regulations based upon them, then the carrier may transport the large source without a certificate from the Secretary of State.

(b) If the large source package design is not in accordance with the above criteria, the Secretary of State's approval of the design is necessary (in which case the documents mentioned in C.2.2 must include the design approval certificate from the Secretary of State). In addition, should the Secretary of State specify in this certificate that supplementary operational requirements must be carried out in Great Britain, the transport movement certificate must come from the Secretary of State, otherwise (i.e. if there are no supplementary operational requirements in Great Britain), the carrier may accept the transport movement certificate or document issued by the competent authority of the country of origin of the shipment.

**C.2.5** For Fissile Class III packages consigned from a country outside Great Britain, the design approval and the movement approval are the same as for Large Source II packages (see B.4.5[b]). The technical position is as in Note (b) above.

**C.3** *Exemptions*

**C.3.1** Packages covered by the exemptions set out in A.3.2–A.3.5 are not specially labelled and may be safely handled and carried without special precautions, although some may be declared on the consignment note as 'radioactive'. *Nothing in C.4–C.15 applies to such packages.*

**C.3.2** The exemptions in A.3.6–A.3.8 will usually concern only certain hospital patients, the refuse disposal services and professional users of instruments and apparatus containing radioisotopes.

**C.4** *Travelling in Vehicle*

**C.4.1** When radioactive materials are being carried in his vehicle, the carrier must not permit anyone to travel in it elsewhere than in the driving cab separated from the materials.

**C.4.2** The carrier must not permit anyone under 18 years of age to travel in his vehicle when it carries radioactive materials unless White label packages only are carried. Anyone under the age of 18 years must leave the cab if there is any risk at any time of the

radiation exceeding 2 millirem per hour. (This might happen if the vehicle had become contaminated, or a package damaged, for example).

**C.5** *Protection of Road Transport Workers—Special Regulations*

**C.5.1** The Radioactive Substances (Road Transport Workers) (Great Britain) Regulations 1970 lay down safeguards, similar to those applicable under the Factories Act to workers engaged in radiation work, to protect the health of road transport workers who are liable to be exposed to a radiation dose above the dose level, viz. 1·5 rem per annum to the whole body, recommended by the International Commission on Radiological Protection as a maximum for those not subjected to special health supervision and personnel monitoring.

**C.5.2** The Road Transport Workers Regulations apply only where:

(a) the Yellow Label Package(s) is/are carried nearer to the driving cab than the appropriate distance specified in the table at C.9.4; or
(b) the total of the Transport Indexes of all Yellow Label packages exceeds 50; or
(c) with the exception of unlabelled exempt packages any of the radioactive packages does not have a White or Yellow Label.

and in addition the radiation dose rate anywhere inside the driving cab on any journey exceeds 2 millirem per hour.

**C.5.3** A driver could be exposed to 2 millirem per hour continuously for 15 hours a week for up to 50 working weeks of the year and still not exceed the recommended maximum annual dose of 1·5 rem (calculated for road transport purposes as 375 millirem in any calendar quarter). To the extent that the actual dose rate in the driving cab is lower than 2 millirem per hour the 'exposed driving time' can, of course, be correspondingly longer without exceeding the maximum annual dose. But if, owing to frequently exceeding 15 hours per week 'exposed driving time' or any other reason, there is doubt, the carrier should check that the permissible dose is not exceeded.

**C.5.4** Carriers will normally find it convenient to stow Yellow Label Packages according to the minimum distances table in C.9.4. But if they do not, then they should seek to keep the radiation dose rate anywhere on the interior surface of the driving cab below 2 millirem per hour, both to limit as far as possible the radiation to which their drivers and others are exposed and to

avoid becoming subject to the Road Transport Workers Regulations; in any case where C.9.4 is disregarded, the carrier will have to provide the certificate called for by C.9.6. The measurement of dose rate is dealt with in paragraph 7 of Appendix I.

**C.5.5** In cases where the Road Transport Workers Regulations become applicable, the carrier must notify the Licensing Authority for Goods Vehicles in advance and certain other requirements follow; for details carriers should refer to the regulations.

**C.6** *Notice in Vehicle*

**C.6.1** A notice, as appropriate, in the form specified in the Carriage by Road Regulations and reproduced here in Appendix IX must be conspicuously displayed inside the driver's cab of any vehicle carrying radioactive material. As this is partly to warn the police etc. in case of an accident, care should be taken to remove the notice when no radioactive consignment is being carried, unless there is any contamination to the extent referred to in C.13.2.

**C.7** *Vehicle Label*

**C.7.1** A label in one of the two forms prescribed in the Carriage by Road Regulations and reproduced here as Alternative A or B in Appendix VIII must be securely attached to each side of any vehicle carrying radioactive material so that it is plainly visible to a person standing on that side of the vehicle. As this label is partly to warn the fire services, police, etc. in case of accident, care should be taken to remove the label when no radioactive consignment is being carried, or if exempt quantities are being carried, unless there is any contamination to the extent referred to in C.13.2. (Special Note: The vehicle label depicted at Alternative A of Appendix VIII is similar to the example given in the IAEA regulations which, among other things specifies minimum dimensions of 10 cm/10 cm. However, in order to conform to the existing United Kingdom labelling regulations for certain other dangerous goods and at the same time achieve an adequate practical size, the dimensions of this label when used on a vehicle should be at least 20 cm/20 cm.)

**C.8** *Maximum Number of Yellow Label Packages in Vehicle*

**C.8.1** The number of Yellow Label Packages, whether Category II (two red stripes) or Category III (three red stripes), or mixed, on a vehicle at any one time must not exceed that number which would bring the sum of the Transport Indexes specified on their labels to a total of more than 50. For this purpose a trailer may be regarded as a separate vehicle. Yellow Label Packages on which no Transport Index is shown (i.e. certain imported packages) should be treated as stated in C.9.5.

**C.8.2** The limit of 50 Transport Indexes for the vehicle may be exceeded only in the case of Full Load consignments (see C.10 below).

**C.9** *Stowage of Packages in Vehicle*

**C.9.1** Consignments of radioactive materials should be securely stowed and must not be carried in the driving cab.

**C.9.2** A carrier must take reasonable care to ensure that a White or Yellow Label package or a package carried as part of a Full Load consignment is secured against unlawful removal.

**C.9.3** White Label and Yellow Label Packages may safely be carried in the same vehicle as non-dangerous goods including foodstuffs (though it may be important in the carrier's own interest to ensure adequate screening or separation from undeveloped photographic film or plate, which is sensitive to radiation—see table in Appendix X); but radioactive materials should normally be stowed together and not intermingled with non-radioactive goods which should preferably be between the radioactive goods and the driving cab to afford additional shielding.

**C.9.4** Yellow Label Packages (which can include specially approved consignments) should be stowed no nearer to any part of the driving cab than the distance specified in the following table, as appropriate, having regard to the sum of the transport indexes shown on their labels. (The main purpose of the transport index is to enable any carrier, simply by use of the following table, to ensure that the radiation dose rate in the driving cab does not exceed that above which the Radioactive Substances (Road Transport Workers) (Great Britain) Regulations 1970 become applicable—see C.5).

**TABLE**

| Sum of Transport Indexes | Distance | Metres |
|---|---|---|
| Up to 2 | 3 ft. 6 ins. | 1·0 |
| Over 2, but not over 4 | 4 ft. 6 ins. | 1·5 |
| Over 4, but not over 8 | 6 ft. | 2·0 |
| Over 8, but not over 12 | 7 ft. 6 ins. | 2·5 |
| Over 12, but not over 20 | 10 ft. 6 ins. | 3·5 |
| Over 20, but not over 30 | 12 ft. 6 ins. | 4·0 |
| Over 30, but not over 40 | 14 ft. 6 ins. | 4·5 |
| Over 40, but not over 50 | 16 ft. 6 ins. | 5·0 |

**C.9.5** Two categories of Yellow Label Packages, Category II and Category III, which are differentiated in their labels by two and three red stripes respectively (see Appendix VIII) were introduced internationally to meet the needs of countries which do not use the Transport Index. If Yellow Label Packages are received from such countries without a Transport Index on the label, they should be treated as if each had the maximum Transport Index appropriate to its label, that is to say an index of 0·5 for Category II (two red stripes) and 10 for Category III (three red stripes).

**C.9.6** The carrier may disregard C.9.4 if he certifies whether or not the radiation dose rate on the inside surface of the driving cab will exceed 2 millirem per hour during the journey, and makes such certificate available to the driver and for inspection on demand. (The radiation dose rate in the driving cab may be kept under 2 millirem per hour in these circumstances by the use of vehicles with bulkheads specially adapted to afford additional shielding, but if 2 millirem per hour is exceeded the carrier, the driver and others on the vehicle become subject to the Radioactive Substances (Road Transport Workers) (Great Britain) Regulations 1970—see C.5).

**C.10** *Full Load Consignments*

**C.10.1** The consignor of a Full Load consignment must have the sole use of the carrying vehicle (see B.3.1.2).

**C.10.2** Full Load consignments must be loaded, stowed and unloaded strictly in accordance with the instructions of the consignor or the consignee (see B.3.4).

**C.10.3** The carrier, unless he is also the consignor must obtain from the consignor a signed certificate stating whether or not the radiation dose rate anywhere on the inside surface of the driving cab is likely to exceed 2 millirem per hour during the journey, such certificate to be available to the driver and for inspection on demand. (Particular regard should be paid in this connection to C.5).

**C.10.4** The consignor of a Full Load consignment may allow more than 50 Transport Indexes on the vehicle at any one time provided that the 'allowable number' of Fissile Class II packages is not exceeded (see B.2.10 and C.8.2).

**C.11** *Arrangements for Driver's Breaks*

**C.11.1** The carrier must ensure, where the driver may have to make a call or break his journey before unloading every package or consignment, that the driver is able to comply with D.3 and D.4.

**C.12** *Unloading Vehicle*

**C.12.1** The carrier should reasonably satisfy himself before the commencement of the journey, in consultation with the consignor or consignee if necessary, that the material will be accepted at the unloading points. This is particularly important where it is intended to off-load the material in a transit shed or depot. Advice on precautions to be taken is contained in the Code of Practice for the Storage of Radioactive Material in Transit. (The keeping of radioactive material in a transit shed or depot may need to be registered with the Secretary of State for the Environment (under powers vested in the former Minister of Housing and Local Government, the Secretary of State for Wales, the Secretary of State for Scotland or the Ministry of Health and Social Services for Northern Ireland. Unconditional exemption from registration has been given by the Radioactive Substances (Storage in Transit) Exemption Order 1962, the Radioactive Substances (Storage in Transit) Exemption (Scotland) Order 1962 and the Radioactive Substances (Storage in Transit) Exemption Order (Northern Ireland) 1962 for the keeping of packages which, in accordance with the provisions of this Code, do not require labels. Conditional exemption from registration has been given by those Orders for the keeping for up to two weeks of labelled packages, provided that not more than five of those packages are held on the premises at a time. Reference should be made to the Exemption Orders for the detailed conditions governing the exemption).

**C.13** *Contamination of Vehicle*

**C.13.1** Subject to the exemptions at C.13.3, vehicles and equipment used routinely for the carriage of radioactive materials must be periodically checked for radiation from fixed contamination* and for the presence of any non-fixed contamination* on accessible surfaces (i.e. not including the inside of any tank or other container which is sealed on every journey). The frequency of such checks should be related to the likelihood of contamination and the extent to which radioactive materials are carried.

**C.13.2** Subject to the exemptions at C.13.3, if at any time after the removal of non-fixed contamination* the radiation from fixed contamination* on any accessible surface of a vehicle or its equipment exceeds 0·5 millirem per hour, or the non-fixed contamination exceeds the levels prescribed in Appendix IV, the vehicle must be taken out of service within 48 hours of the completion of the journey during which the contamination occurred.

*See Glossary and Appendix IV for meaning of these terms.

The vehicle should be stored in some secure place until decontaminated (or until the activity naturally decays) below the levels in Appendix IV. Further goods should not be loaded on a contaminated vehicle meantime.

**C.13.3** Paragraphs C.13.1 and C.13.2 do not apply to a vehicle used exclusively for carrying Full Loads of low specific activity materials; but the vehicle should be inspected periodically for contamination on parts accessible to the general public, and it must not be used for loading other goods until checked and if necessary decontaminated as specified in C.13.2.

**C.14** *Accidents (including Lost or Damaged Packages etc.)*

**C.14.1** Accidents for this purpose include any occurrence in the course of carriage where

(a) radioactive material in a package or otherwise is lost or stolen or has escaped from the vehicle;
(b) a package or other container is opened or damaged, whether in a road accident or from some other cause (the damage not being purely superficial, such as a torn label); or
(c) the vehicle or its load is in danger, e.g. from fire.

**C.14.2** On learning of any such accident, the carrier must—

(a) at once notify the police and the consignor, unless he knows they have already been notified (the police will ensure that assistance to deal with the emergency is forthcoming by means of the National Arrangements for Incidents involving Radioactivity (NAIR) (See Glossary));
(b) arrange as quickly as possible for the examination of any persons who may have been contaminated by escaped radioactive material or exposed to large radiation doses, unless such arrangements have already been made;* and
(c) as soon as possible (except where the vehicle has been in danger from fire etc. and the danger has by then been removed or avoided and neither the vehicle nor the package or container carrying the material is damaged) notify the Radiological Adviser, Department of the Environment, St. Christopher House, Southwark Street, London, S.E.1. (01–928 7999, Ext. 3298).

**C.14.3** The carrier must instruct his driver on the action to be taken in case of accidents, including the driver's responsibilities set out in D.5. Hints on further action which drivers may take are given at the end of Part D.

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*If expert radiological advice is required urgently e.g. at the scene of a road accident, the police will be able to summon it. At other times a carrier should normally endeavour to obtain advice on radiological protection, if not from a consignor, from a source such as the Radiological Protection Service.

**C.14.4** Leaking packages or containers or those believed to be damaged must only be handled under expert supervision and must not be forwarded until repaired or re-conditioned. Any other goods contaminated should be dealt with under expert advice, as should any contaminated loading or unloading area. See also C.13 as to contaminated vehicles.

**C.15** *Large Radioactive Sources and Special Arrangements*

**C.15.1** The carrier must comply with any instruction given by the consignor in pursuance of any conditions imposed by the Secretary of State (or in the case of some imported consignments, the competent authority of the country of origin) and the carrier must instruct the driver as necessary.

# PART D
# DRIVER'S RESPONSIBILITIES

(Drivers should also read the Introduction and refer to Part A, especially A.2. They should note that there are packages some of which may be declared as radioactive in the consignment note which are not labelled and are exempt from the Code in general, see A.3.1–A.3.5.)

**D.1** *General Safety Requirements*

**D.1.1** The driver of a vehicle carrying radioactive materials is under a duty generally to exercise reasonable care to ensure that the material causes no injury to the health of anyone and that none of the material is lost, escapes, or is unlawfully removed from the vehicle or its package.

**D.1.2** The driver, besides strictly complying with the general prohibitions in A.2, must co-operate in their observance. For example, he should assist in seeing that packages are not roughly treated and are properly stowed; labels and cab notices are not defaced; and prohibited articles (dangerous goods) are not carried. (As regards stowage, see C.8 and C.9.)

**D.1.3** Where the driver is a 'classified worker' he must comply with any instruction given to him by the carrier as to the wearing of film badges or similar devices.

**D.2** *Travelling in Vehicle*

**D.2.1** The driver must not carry anyone in a vehicle carrying radioactive materials without the permission of the carrier, and then only in accordance with the carrier's instructions (see C.5).

**D.2.2** The driver should co-operate in seeing that the notice to be shown in the cab, and the vehicle labels to be displayed on each side of the vehicle while carrying radioactive materials, other than exempt quantities, are shown and displayed, and are removed when radioactive consignments have been delivered, and no further such consignments are being carried on the vehicle. They should however continue to be displayed if there is any considerable degree of radioactive contamination within the vehicle as to which the driver will be advised.

**D.3** *Leaving Vehicle Unattended*

**D.3.1** The driver must not leave unattended in any public place any vehicle containing a White Label or Yellow Label Package

or low specific activity material carried as a Full Load consignment unless the loaded compartment is locked or the packages are otherwise secure against unlawful removal.

**D.3.2** The driver must not without reasonable cause leave a vehicle carrying radioactive material completely unattended in a public place where it is out of his sight unless the dose rate at any accessible surface of the vehicle is no greater than 0·5 millirem per hour.

**D.4** *Parking*

**D.4.1** The driver of a vehicle carrying any radioactive material otherwise than in White Label packages must not park the vehicle in any place for more than one hour, unless when it is parked, there is a clear space of at least 6 feet all round the vehicle.

**D.5** *Accidents (including Lost or Damaged Packages, etc.)*

**D.5.1** The driver must as soon as reasonably practicable arrange for the police and the carrier to be notified if he finds or fears that in the course of carriage—

(a) any radioactive material has been lost or stolen or has escaped from the vehicle;

(b) any package containing radioactive material is open or damaged, whether in a road accident or from some other cause (the damage not being purely superficial, such as a torn label); or

(c) the vehicle or its load is in danger, e.g. from fire.

**D.5.2** In the case of fire or danger from fire, or in the event of a serious accident (e.g. overturning) requiring rescue tackle, the driver, if able, shall call the fire brigade immediately; he shall also, if able, inform the police and carrier. If expert radiological advice is required at the scene of an accident the police will be able to summon it under the NAIR Scheme—see Glossary. Advice on further action by drivers in the event of an accident is given in the Notes at the end of this section.

**D.6** *Large Radioactive Sources and Special Arrangements*

**D.6.1** The driver of a vehicle carrying a Large Radioactive Source or a Special Arrangement must carry out any instruction given by the carrier in accordance with any conditions imposed by the Secretary of State for the Environment (or in the case of some imported Large Source consignments the competent authority of the country of origin) in consenting to the consignment.

*Notes for Drivers in case of Accidents*

If a vehicle involved in a road accident is carrying radioactive material there need not be undue alarm on that account. All packaging for radioactive material is specially designed for the job.

Packages marked 'Type B' are designed to withstand the effects of a severe accident, e.g. impact at high speed followed by a fierce fire. Even those marked 'Type A' are considerably stronger than the average well designed commercial package. If however there is any reason to suspect from the violence of an accident or from superficial evidence or other grounds that a package may have been damaged or is leaking the following action is advised in addition to that required by D.5:

(a) try to keep the public away from the vehicle, subject to the overriding needs of saving life, until the police or other help arrives, but the presence even of a damaged or leaking package should not deter necessary rescue or fire-fighting work.

(b) keep at hand any consignment note, invoice or other document which will provide the police, fire brigade, or other help with information they may need about the nature of the radioactive material;

(c) do not attempt to remove the load from the vehicle if there is reason to suspect that any of the packages containing radioactive material has been damaged;

(d) if there appears to be any escape of radioactive material and especially if it is spilt onto the road, erect if possible a temporary barrier around the affected area;

(e) if any person is suspected of having been exposed to excessive radiation, e.g. from being for a short time in close proximity to a damaged package, it is unlikely that he has suffered any harm but arrangements should be made to obtain expert advice via the police as soon as possible;

(f) if any person has actually handled a damaged package containing radioactive material, or is known or thought to have got what may be radioactive material on any part of his body, he should be warned for the meantime not to eat, drink or smoke or otherwise put anything in his mouth. The affected part of the body should be wiped as clean as possible, care being taken not to spread the contamination to other parts of the body or to other people. Arrangements should be made through the police for his examination by an expert as soon as possible;

(g) if any radioactive material is thought to have settled on anyone's clothing, e.g. their shoes, the affected articles should be removed at the earliest practicable opportunity, taking care not to touch contaminated parts and should be placed where they cannot contaminate people or premises pending examination by a person with expert knowledge.

## APPENDIX I

**Classification of Radionuclides in Groups for Transport Purposes**

There are seven groups of radionuclides, beginning with the very high radiotoxic ones of Group I, the high toxic radionuclides of Group II, then the medium toxic radionuclides of Group III and IV. The remaining groups comprise a very limited number of low toxic noble gases and tritium and its compounds.

It should be noted that the classification of the materials listed below is not identical with that used for other purposes, e.g. in factories and laboratories, where working conditions and the risks to personnel are different.

Rules governing the calculation of activity and radiation for transport purposes are set out at the end of the following table. Radionuclides not listed in the table must be dealt with as specified in those rules.

| | Group | | Group |
|---|---|---|---|
| Actinium-227 | I | Caesium-135 | IV |
| Actinium-228 | I | Caesium-136 | IV |
| Americium-241 | I | Caesium-137 | III |
| Americium-243 | I | Calcium-45 | IV |
| Antimony-122 | IV | Calcium-47 | IV |
| Antimony-124 | III | Californium-249 | I |
| Antimony-125 | III | Californium-250 | I |
| Argon-37 (compressed or uncompressed*) | VI | Californium-252 | I |
| Argon-41 | II | Carbon-14 | IV |
| Argon-41 (uncompressed*) | V | Cerium-141 | IV |
| Arsenic-73 | IV | Cerium-143 | IV |
| Arsenic-74 | IV | Cerium-144 | III |
| Arsenic-76 | IV | Chlorine-36 | III |
| Arsenic-77 | IV | Chlorine-38 | IV |
| Astatine-211 | III | Chromium-51 | IV |
| | | Cobalt-56 | III |
| | | Cobalt-57 | IV |
| Barium-131 | IV | Cobalt-58m | IV |
| Barium-140 | III | Cobalt-58 | IV |
| Berkelium-249 | I | Cobalt-60 | III |
| Beryllium-7 | IV | Copper-64 | IV |
| Bismuth-206 | IV | Curium-242 | I |
| Bismuth-207 | III | Curium-243 | I |
| Bismuth-210 (Radium E) | II | Curium-244 | I |
| Bismuth-212 | III | Curium-245 | I |
| Bromine-82 | IV | Curium-246 | I |
| | | Dysprosium-154 | III |
| | | Dysprosium-165 | IV |
| Cadmium-109 | IV | Dysprosium-166 | IV |
| Cadmium-115m | III | | |
| Cadmium-115 | IV | | |
| Caesium-131 | IV | | |
| Caesium-134m | III | | |
| Caesium-134 | III | | |

* 'Uncompressed' means at a pressure not exceeding one atmosphere absolute at 0°C and mean sea-level.

| | Group |
|---|---|
| Erbium-169 | IV |
| Erbium-171 | IV |
| Europium-150 | III |
| Europium-152(A)(9·2 h) | IV |
| Europium-152(B) (12·7 yr) | III |
| Europium-154 | II |
| Europium-155 | IV |
| Fluorine-18 | IV |
| Gadolinium-153 | IV |
| Gadolinium-159 | IV |
| Gallium-67 | III |
| Gallium-72 | IV |
| Germanium-71 | IV |
| Gold-193 | III |
| Gold-194 | III |
| Gold-195 | III |
| Gold-196 | IV |
| Gold-198 | IV |
| Gold-199 | IV |
| Hafnium-181 | IV |
| Holmium-166 | IV |
| Hydrogen-3 see Tritium | |
| Indium-113m | IV |
| Indium-114m | III |
| Indium-115m | IV |
| Iodine-124 | III |
| Iodine-125 | III |
| Iodine-126 | III |
| Iodine-129 | III |
| Iodine-131 | III |
| Iodine-132 | IV |
| Iodine-133 | III |
| Iodine-134 | IV |
| Iodine-135 | IV |
| Iridium-190 | IV |
| Iridium-192 | III |
| Iridium-194 | IV |
| Iron-55 | IV |
| Iron-59 | IV |
| Krypton-85m | III |
| Krypton-85m (uncompressed*) | V |
| Krypton-85 | III |
| Krypton-85 (uncompressed*) | VI |
| Krypton-87 | II |
| Krypton-87 (uncompressed*) | V |
| Lanthanum-140 | IV |
| Lead-203 | IV |
| Lead-210 | II |
| Lead-212 | II |
| Low Specific Activity Material | See B.3 |
| Lutecium-172 | III |
| Lutecium-177 | IV |
| Mixed fission products | II |
| Magnesium-28 | III |
| Manganese-52 | IV |
| Manganese-54 | IV |
| Manganese-56 | IV |
| Mercury-197m | IV |
| Mercury-197 | IV |
| Mercury-203 | IV |
| Molybdenum-99 | IV |
| Neodymium-147 | IV |
| Neodymium-149 | IV |
| Neptunium-237 | I |
| Neptunium-239 | I |
| Nickel-56 | III |
| Nickel-59 | IV |
| Nickel-63 | IV |
| Nickel-65 | IV |
| Niobium-93m | IV |
| Niobium-95 | IV |
| Niobium-97 | IV |
| Osmium-185 | IV |
| Osmium-191m | IV |
| Osmium-191 | IV |
| Osmium-193 | IV |
| Palladium-103 | IV |
| Palladium-109 | IV |
| Phosphorus-32 | IV |
| Platinum-191 | IV |

* 'Uncompressed' means at a pressure not exceeding one atmosphere absolute at 0°C and mean sea-level.

| | Group |
|---|---|
| Platinum-193m | IV |
| Platinum-197m | IV |
| Platinum-197 | IV |
| Plutonium-238 | I |
| Plutonium-239 | I |
| Plutonium-240 | I |
| Plutonium-241 | I |
| Plutonium-242 | I |
| Polonium-210 | I |
| Potassium-42 | IV |
| Potassium-43 | III |
| Praseodymium-142 | IV |
| Praseodymium-143 | IV |
| Promethium-147 | IV |
| Promethium-149 | IV |
| Protactinium-230 | I |
| Protactinium-231 | I |
| Protactinium-233 | II |
| Radium-223 | II |
| Radium-224 | II |
| Radium-226 | I |
| Radium-228 | I |
| Radon-220 | IV |
| Radon-222 | II |
| Rhenium-183 | IV |
| Rhenium-186 | IV |
| Rhenium-187 | IV |
| Rhenium-188 | IV |
| Rhenium-natural | IV |
| Rhodium-103m | IV |
| Rhodium-105 | IV |
| Rubidium-86 | IV |
| Rubidium-87 | IV |
| Rubidium-natural | IV |
| Ruthenium-97 | IV |
| Ruthenium-103 | IV |
| Ruthenium-105 | IV |
| Ruthenium-106 | III |
| Samarium-145 | III |
| Samarium-147 | III |
| Samarium-151 | IV |
| Samarium-153 | IV |
| Scandium-46 | III |
| Scandium-47 | IV |
| Scandium-48 | IV |
| Selenium-75 | IV |
| Silicon-31 | IV |
| Silver-105 | IV |
| Silver-110m | III |
| Silver-111 | IV |
| Sodium-22 | III |
| Sodium-24 | IV |
| Strontium-85m | IV |
| Strontium-85 | IV |
| Strontium-89 | III |
| Strontium-90 | II |
| Strontium-91 | III |
| Strontium-92 | IV |
| Sulphur-35 | IV |
| Tantalum-182 | III |
| Technetium-96m | IV |
| Technetium-96 | IV |
| Technetium-97m | IV |
| Technetium-97 | IV |
| Technetium-99m | IV |
| Technetium-99 | IV |
| Tellurium-125m | IV |
| Tellurium-127m | IV |
| Tellurium-127 | IV |
| Tellurium-129m | III |
| Tellurium-129 | IV |
| Tellurium-131m | III |
| Tellurium-132 | IV |
| Terbium-160 | III |
| Thallium-200 | IV |
| Thallium-201 | IV |
| Thallium-202 | IV |
| Thallium-204 | III |
| Thorium-227 | II |
| Thorium-228 | I |
| Thorium-230 | I |
| Thorium-231 | I |
| Thorium-232 | III |
| Thorium-234 | II |
| Thorium-natural | III |
| Thulium-168 | III |
| Thulium-170 | III |
| Thulium-171 | IV |
| Tin-113 | IV |
| Tin-117m | III |
| Tin-121 | III |
| Tin-125 | IV |

* 'Uncompressed' means at a pressure not exceeding one atmosphere absolute at 0°C and mean sea-level.

| | Group |
|---|---|
| Tritium (in a form other than as specified in Group VII below) | IV |
| Tritium (as $T_2$ or HT in form of compressed or uncompressed* gas | VII |
| or as | |
| tritium-activated luminous paint or Tritium gas adsorbed on a solid carrier) | VII |
| Tungsten-181 | IV |
| Tungsten-185 | IV |
| Tungsten-187 | IV |
| Uranium-230 | II |
| Uranium-232 | I |
| Uranium-233 | II |
| Uranium-234 | II |
| Uranium-235 | III |
| Uranium-236 | II |
| Uranium-238 | III |
| Uranium-natural | III |
| Uranium-enriched | III |
| Uranium-depleted | III |
| Uranium-irradiated | II |
| Vanadium-48 | IV |
| Vanadium-49 | III |
| Xenon-125 (compressed or uncompressed*) | III |
| Xenon-131m | III |
| Xenon-131m (uncompressed*) | V |
| Xenon-133 | III |
| Xenon-133 (uncompressed*) | VI |
| Xenon-135 | II |
| Xenon-135 (uncompressed*) | V |
| Ytterbium-175 | IV |
| Yttrium-88 | III |
| Yttrium-90 | IV |
| Yttrium-91m | III |
| Yttrium-91 | III |
| Yttrium-92 | IV |
| Yttrium-93 | IV |
| Zinc-65 | IV |
| Zinc-69m | IV |
| Zinc-69 | IV |
| Zirconium-93 | IV |
| Zirconium-95 | III |
| Zirconium-97 | IV |

* 'Uncompressed' means at a pressure not exceeding one atmosphere absolute at 0°C and mean sea-level.

**Rules for the Application of Activity Limits**

**1** *Unlisted Radionuclides*

Any radionuclide not listed in the table above, but the identity of which is known, must be classified according to its atomic number and physical half-life as follows:

| Atomic Number | Physical Half-life | | |
|---|---|---|---|
| | 0–1,000 days | 1,001 days–$10^6$ years | Over $10^6$ years |
| 1–81 | Group III | Group II | Group III |
| 82 and above | Group I | Group I | Group III |

**2** *Unidentified Radionuclides*

Any radionuclide the identity of which is not known must be classified as Group I.

**3** *Mixed Fission Products*

Mixed fission products, as produced during the fission of fissile materials, must be classified as Group II; the activity of such a mixture shall be the total activity of all the radionuclides present.

**4** *Mixtures consisting of a Single Radioactive Decay Chain*

A mixture consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member of the chain, except that if a radionuclide has a half-life longer than that of that first member and an activity greater than that of any other member at any time during transport, the group and the activity of the mixture shall be the group and the maximum activity during transport of that nuclide.

In a mixture consisting of a single radioactive decay chain where one or more radionuclides are in proportions greater than those naturally occurring, because of artificial physical or chemical enrichment, the member or members of the chain which are in such greater proportions shall be treated as separate radionuclides; the rest of the chain shall be treated as in the immediately preceding paragraph.

**5** *Activity of Uranium and Natural Thorium*

The activity of uranium and natural thorium shall be as calculated by using the activity-mass relationship given in the following table:

| Radioactive material | curies/g | g/curies |
|---|---|---|
| Uranium (according to weight percentage of U-235 present) | | |
| 0·45 | $5{\cdot}0 \times 10^{-7}$ | $2{\cdot}0 \times 10^{6}$ |
| 0·72 (natural) | $7{\cdot}06 \times 10^{-7}$ | $1{\cdot}42 \times 10^{6}$ |
| 1·0 | $7{\cdot}6 \times 10^{-7}$ | $1{\cdot}3 \times 10^{6}$ |
| 1·5 | $1{\cdot}0 \times 10^{-6}$ | $1{\cdot}0 \times 10^{6}$ |
| 5·0 | $2{\cdot}7 \times 10^{-6}$ | $3{\cdot}7 \times 10^{5}$ |
| 10·0 | $4{\cdot}8 \times 10^{-6}$ | $2{\cdot}1 \times 10^{5}$ |
| 20·0 | $1{\cdot}0 \times 10^{-5}$ | $1{\cdot}0 \times 10^{5}$ |
| 35·0 | $2{\cdot}0 \times 10^{-5}$ | $5{\cdot}0 \times 10^{4}$ |
| 50·0 | $2{\cdot}5 \times 10^{-5}$ | $4{\cdot}0 \times 10^{4}$ |
| 90·0 | $5{\cdot}8 \times 10^{-5}$ | $1{\cdot}7 \times 10^{4}$ |
| 93·0 | $7{\cdot}0 \times 10^{-5}$ | $1{\cdot}4 \times 10^{4}$ |
| 95·0 | $9{\cdot}1 \times 10^{-5}$ | $1{\cdot}1 \times 10^{4}$ |
| Natural thorium | $1{\cdot}11 \times 10^{-7}$ | $9 \times 10^{6}$ |

**6** *Packages containing Mixed Groups*

Where a package contains several radionuclides of different group classification, the sum of the proportions which the activity of the material in each group bears to the applicable activity limit for that group must not exceed unity.

For the purpose of applying the above rule in the case where the identities of all radionuclides are known but the respective activities of all of them or some of them are not known, all the radionuclides whose respective activities are not known shall be deemed to belong to the more restrictive Groups among them; (their total activity must necessarily be known, either directly, or by subtracting the total activity of those radionuclides the respective activities of which are known from the total activity of the contents).

If the identity of all or some radionuclides is not known, those radionuclides must be deemed to belong to Group I as indicated in rule 2 above.

**7** *Measurement of Radiation Dose Rates*

Measurements to determine radiation dose rates should be made with an efficient radiation dosemeter or dose-rate meter of a type which is appropriate both to the type of radiation being measured and the circumstances in which the meter is used and the values so measured may be taken to the actual dose rates. Meters should be tested and re-calibrated at least once every 14 months and after any repair to a defect which could affect its accuracy. Advice on methods of measurement can be obtained through the Department of the Environment.

## APPENDIX II

# EXEMPTION CONDITIONS AND QUANTITY LIMITATIONS

(A.3.2–A.3.5)

**Conditions**

**1** The package must not contain more than a total of 15 grammes of plutonium-293, plutonium-241, uranium-233 or uranium-235 or any mixture of them.

**2** The package must not contain any pyrophoric or explosive material.

**3** The package must not be contaminated on any external surface by unfixed radioactive material to an extent exceeding the limits set out in Appendix IV.

**4** The packaging must be such that throughout the journey there can be no leakage of radioactive material under normal conditions of transport.

**5** The component of the packaging which is intended to prevent leakage of the radioactive material must bear the marking 'Radioactive' in such a manner that the marking will be visible before it can be opened.

**6** The radiation dose rate must not at any time during transport exceed 0·5 millirem per hour at any point on the surface of the package.

**7** The radiation dose rate at 10 centimetres (4 inches) from any point on the surface of any unpacked instrument or piece of apparatus must not exceed 10 millirem per hour.

| Transport Group | Maximum Activity | | |
|---|---|---|---|
| | Exempt Packages (A.3.2) | Exempt Instruments (A.3.4) | |
| | per package | per instrument | per package |
| I | 0·01 millicurie | 0·1 millicurie | 1 millicurie |
| II | 0·1 millicurie | 1 millicurie | 50 millicuries |
| III | 1 millicurie | 10 millicuries | 3 curies |
| IV | 1 millicurie* | 50 millicuries | 3 curies |
| V | 1 millicurie | 1 curie | 1 curie |
| VI | 1 millicurie | 1 curie | 1 curie |
| VII | 25 curies | 25 curies | 200 curies |
| Special Form as in para. 1 (a) of Appendix III | 1 millicurie | 50 millicuries | 20 curies |

* For tritiated water there is no limit for concentrations not greater than 0·5 millicurie per millilitre.

Note: It is advisable that the consignment note should include a declaration that the goods are radioactive but are in the exempt category.

**Quantity Limitations**

(See Appendix I for grouping of radionuclides and rules for applying activity limits).

## APPENDIX III

# RADIOACTIVE MATERIAL IN SPECIAL FORM

(B.2.3)

**1** Radioactive material is deemed to be in a special form if it meets the following requirements:

(a) the radioactive material is in massive solid form which:
  (i) has no overall dimension less than 0·5 mm or has at least one dimension of at least 5 mm; and
  (ii) does not melt, sublimate or ignite below 538°C; and
  (iii) does not break or shatter if subjected to the percussion-test specified in Annex IV, Part II of the IAEA Regulations; and
  (iv) does not, during one week's immersion in water at pH6–pH8 at 20°C with a maximum conductivity of 10 micromhos per centimetre, dissolve, or convert into reaction products to the extent of more than 50 microgrammes per gramme of the material; and
  (v) does not, during one week's exposure to air at 30°C, dissolve or convert into dispersible reaction products to the extent of more than 50 microgrammes per gramme of the material;

or

(b) the radioactive material is contained in a capsule which has similar properties to the above except that in (ii) 538°C should read 800°C and the design can be demonstrated to satisfy the tests given in Annex IV, Part II of the IAEA Regulations.

**2** Before radioactive material in a capsule or other receptacle satisfying 1(b) above can qualify as material in special form for transport purposes, the design of the capsule must be approved by the Secretary of State for the Environment.

## APPENDIX IV

# SURFACE LEVELS OF NON-FIXED RADIOACTIVE CONTAMINATION

**1** Non-fixed radioactive contamination on;

—the outside surface of an exempt package, exempt empty packaging, a package of exempt instruments or manufactured articles containing uranium (see A.3.2–A.3.5 and condition 3 of Appendix II);

—the outside surface of a White Label or Yellow Label Package (B.2.5);

—the accessible surfaces of vehicles and equipment (C.13),

must be kept as low as possible and in any case should not exceed the maximum permissible levels indicated in the following table:

| Contaminant | Maximum permissible level of radioactive surface contamination |
|---|---|
| Alpha emitters | $10^{-5}$ microcuries per sq. cm. (or 0·003 microcurie averaged over 300 sq. cm.) |
| Beta or Gamma emitters | $10^{-4}$ microcuries per sq. cm. (or 0·03 microcurie averaged over 300 sq. cm.) |

**2** Non-fixed radioactive contamination shall be treated as contamination that can be rubbed off on an absorbent material, and in assessing such contamination it should be assumed that one-tenth of the removable contamination has been transferred to the absorbent material from the area over which the material has been rubbed.

APPENDIX V

# FISSILE MATERIALS

(B.2.2.5)

## Part I—Additional Requirements for Packages containing Fissile Materials

*General Provisions*

**1** Packages containing fissile materials (other than as specified in Part 2 of this Appendix) must be classified as either:

(a) *Fissile Class I*—packages which are nuclearly safe in any number and in any arrangement under all foreseeable circumstances of transport; or

(b) *Fissile Class II*—packages which in limited number are nuclearly safe in any arrangement under all foreseeable circumstances of transport or

(c) *Fissile Class III*—packages which are nuclearly safe by reason of special arrangements.

**2** The consignor must ensure that fissile materials are so packed and consigned for transport that criticality cannot be reached under conditions encountered in transport, including accidents. For detailed criteria concerning fissile packages see IAEA Regulations (C-5) and for packaging design and tests see BS 3895:Part 2, 1968.

*Fissile Class I Packages: Approval Procedure*

**3** The consignor must not send by road any Fissile Class I package unless the design of the package used has been approved for the purpose by the Secretary of State for the Environment. (This does not apply to a package design approved and published by IAEA nor to a physical model Fissile Class I package designed and approved by another competent authority. For a table of approvals, including fissile packages, see Appendix VI).

**4** The application for approval must be supported by detailed information on the maximum quantity, physical state, and chemical and isotopic composition of the fissile materials to be carried in each package, together with the packaging specifications.

**5** The application must be accompanied by a statement, signed by a nuclear safety specialist, that the package satisfies the relevant requirements of this Appendix, and in particular the nuclear safety criteria referred to in paragraph 2 above.

*Fissile Class II Packages: Approval Procedure*

**6** The consignor must not send by road any Fissile Class II package unless:

(a) he holds a certificate issued by the Secretary of State which approves the package to be used and certifies the 'allowable number' of packages, as determined in accordance with IAEA regulations, to be allowed in any one consignment, or,
(b) the package design is one approved and published by IAEA.

**7** The application for approval and certification in case (a) must be supported by detailed information on:
(a) the maximum quantity, physical state, and chemical and isotopic composition of the fissile materials to be carried in each package;
(b) the packaging specifications; and
(c) the number of packages to be carried and the 'allowable number' for each Fissile Class II package.

**8** The application must be accompanied by a statement, signed by a nuclear safety specialist, that the package satisfies the relevant requirements of the IAEA Regulations, and in particular the nuclear safety criteria.

*Fissile Class II—Labelling*

**9** The purpose of the requirement in paragraph 10 is to help guard against criticality as well as radiation risks by taking advantage of the arrangement in C.8.1 for limiting the number of packages in any vehicle according to the sum of the Transport Indexes on Yellow Labels.

**10** Fissile Class II packages must carry Yellow Labels, either Category II-Yellow or Category III-Yellow, as reproduced at Appendix VIII. The number to be inserted on a label to indicate the Transport Index shall be
(a) the Transport Index calculated in the ordinary way as in B.2.7.3, or
(b) the number (rounded up to the next first decimal) obtained when 50 is divided by the 'allowable number',

whichever is the greater. If the Transport Index of any package exceeds 10, it shall be carried only as a 'Full Load' consignment. (See B.3.)

*Fissile Class III Packages*

**11** The consignor must not send by road Fissile Class III packages otherwise than as a Special Arrangement (see B.5).

**Part 2—Fissile Materials Exempted from the additional Requirements of Part 1**

**1** Packages containing individually not more than a total of

15 grammes of uranium-233 or uranium-235 or plutonium-239 or plutonium-241 or any mixture of them.

**2** Packages of irradiated or unirradiated natural or depleted uranium, in any quantity.

**3** Packages of homogeneous hydrogenous solutions or mixtures, in which the only fissile material present is:

(a) uranium-233 or uranium-235, and the hydrogen: uranium-233 hydrogen: uranium-235 atomic ratio is greater than 5200, corresponding to a uranium-233 or uranium-235 concentration in common aqueous solution of less than 5 grammes per litre; or

(b) plutonium, and the hydrogen: plutonium atomic ratio is greater than 7600 corresponding to a plutonium concentration in common aqueous solution of less than 3·5 grammes per litre,

and provided that the maximum quantities of fissile material per package do not exceed:

for uranium-235—800 grammes,
for uranium-233—500 grammes,
for plutonium —500 grammes.

If more than one fissile material is involved, the ratio of hydrogen atoms to fissile atoms shall be greater than 7600 and in addition the maximum quantity of fissile material per package shall not exceed 500 grammes.

**4** Packages in which the only fissile material present is enriched uranium of which the uranium-235 content does not exceed 1% of the total weight of the uranium. The uranium-235 shall be distributed homogeneously throughout the package, the contents of which shall not present a lattice arrangement within the package.

## APPENDIX VI

[See B.1.2.2 etc.]

**Approval of Capsule, Packaging and Package Designs, Approvals of Shipments and Prior Notifications**

A. *Requirements as to Approval of Capsule, Packaging and Package Designs*

| | Capsule, Packaging and Package | Competent Authority whose approval is required |
|---|---|---|
| 1. | Capsule | Country of Origin |
| 2. | Type A | (None) |
| 3. | Type B | Country of Origin |
| 4. | Type B approved by IAEA listed in Annex V of IAEA Regs. | (None) |
| 5. | Large Source—I—Unilateral | Country of Origin |
| 6. | Large Source—II—Multilateral | Country of Origin and all countries en route |
| 7. | Fissile Class I (a) (Scheme of calculation in IAEA Annex III) | Country of Origin and all countries en route |
| 8. | Fissile Class I (b) (Physical model in IAEA Annex III) | Country of Origin |
| 9. | Fissile Class I (c) (Design listed in IAEA Annex III) | (None) |
| 10. | Fissile Class II (a) (Design listed in IAEA Annex III) | (None) |
| 11. | Fissile Class II (b) (All other designs) | Country of Origin and all countries en route. |
| 12. | Fissile Class III | Country of Origin and all countries en route |
| 13. | Pyrophoric Materials package | Country of Origin |

N.B. In part A, 'Country of Origin' refers to the country where the design originated, whereas in Part B, 'Country of Origin' refers to the country from which the shipment originates.

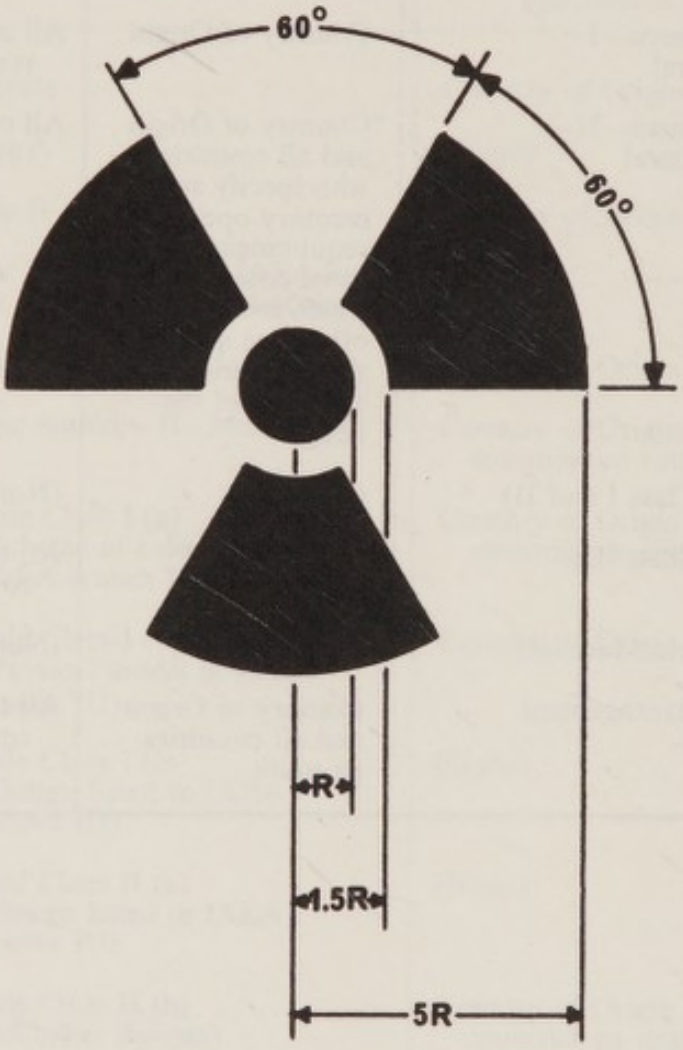
B. *Requirements as to Approval of Shipments and Prior Notifications*

| Packaging | Competent Authority whose approval is required | |
|---|---|---|
| | Each Shipment | Prior Notification of each shipment |
| 1. Type A | (None) | (None) |
| 2. Type B | (None) | (None) |
| 3. Large Source—I—Unilateral | Country of Origin | All countries en route |
| 4. Large Source—II—Multilateral | *Country of Origin and all countries who specify supplementary operational requirements except those countries which indicated otherwise at the time of their approval of the design. | All countries en route |
| 5. Fissile (Class I and II) | (None) | (None) |
| 6. Fissile (Class III) | As above at * | All countries en route |
| 7. Pyrophoric Materials | (None) | (None) |
| 8. Special Arrangement | Country of Origin and all countries en route | All countries en route |

# APPENDIX VII

**Radioactive Warning Sign**

(B.2.6)

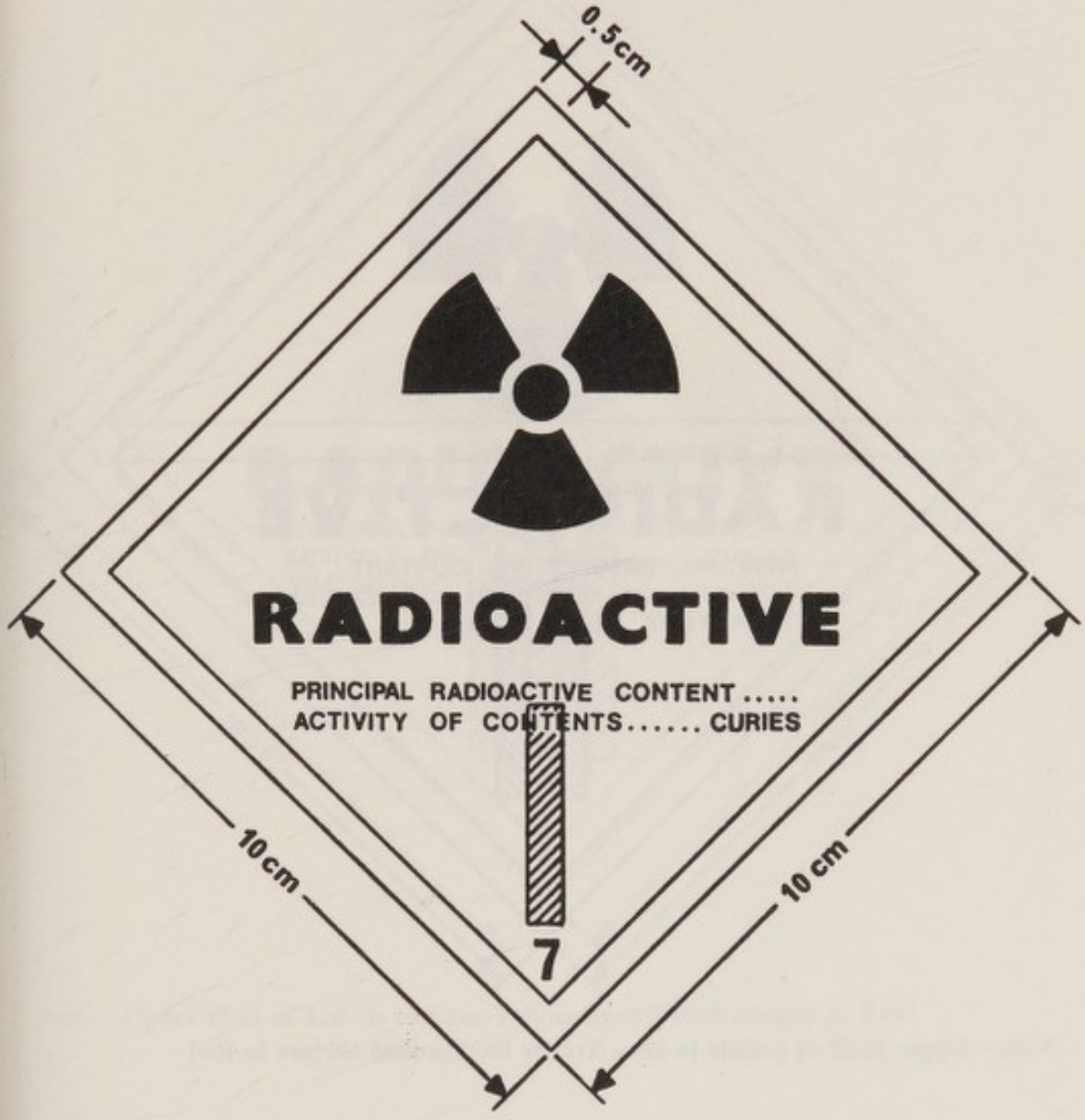


# APPENDIX VIII

## Forms of Label

(B.2.7)

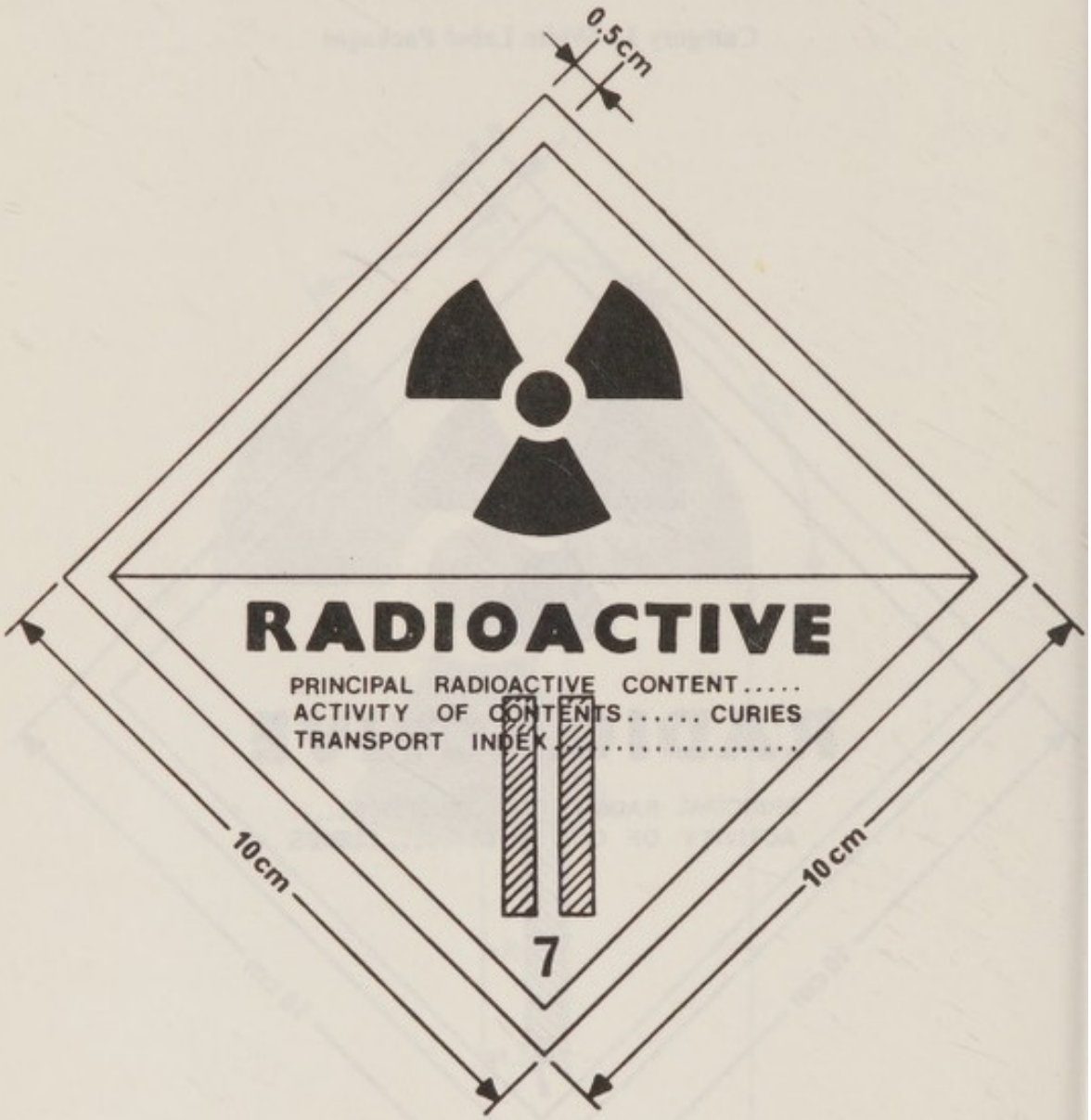
**Category I—White Label Packages**




**Note—Stripe in Red**

**Category II—Yellow Label Packages**

(B.2.7)




**Note—Upper Half of Labels to have Yellow Background Stripes in Red**

**Category III—Yellow Label Packages**

(B.2.7)


**Note—Upper Half of Labels to have Yellow Background Stripes in Red**

# APPENDIX VIII

## Vehicle Labels

## Alternative A

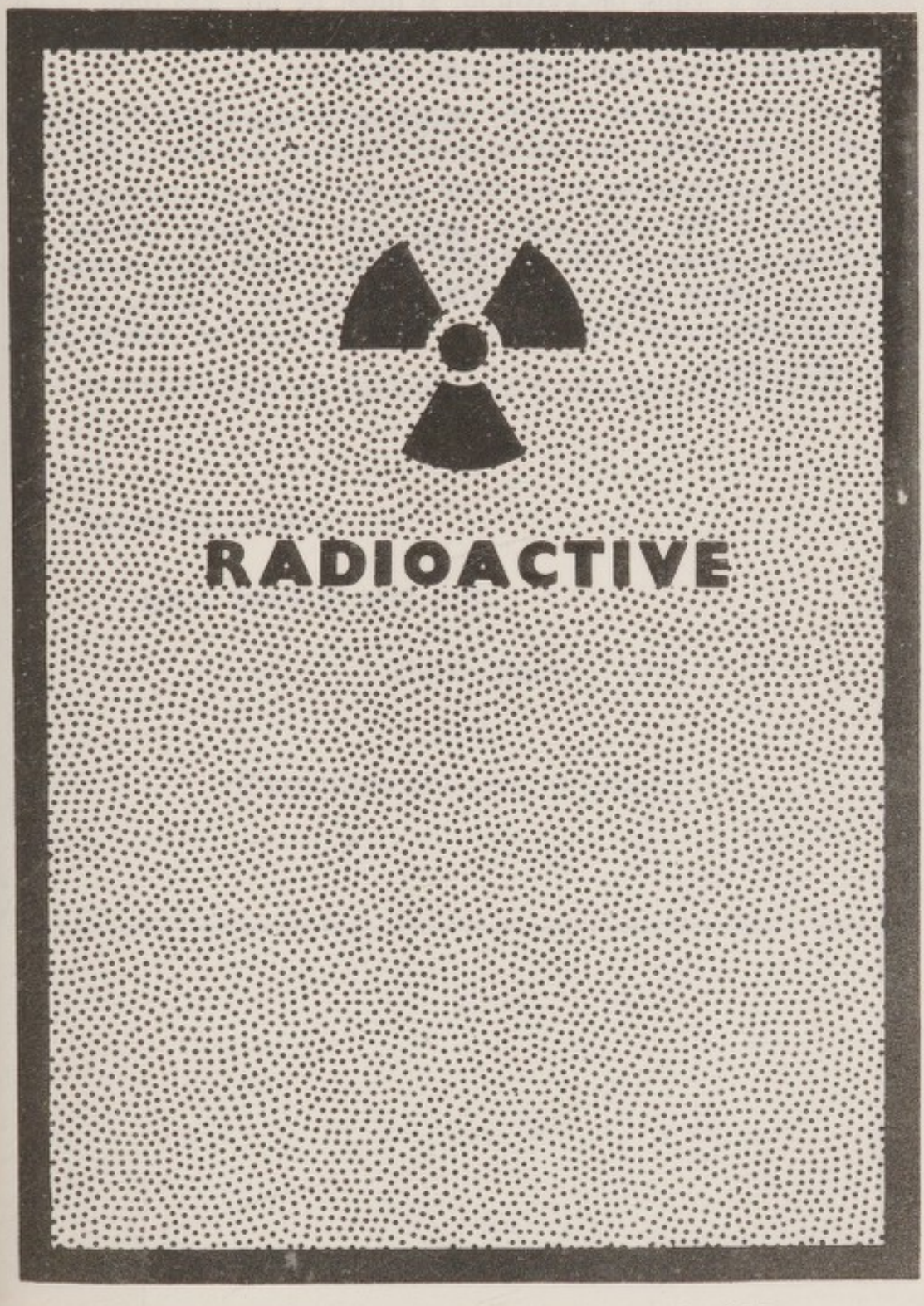
C.7


**Note—When dimensions larger than the minimum dimensions shown are used, the relative proportions must be maintained**

## APPENDIX VIII

**Vehicle Labels**
**Alternative B**
C.7

(Black Symbol and Inscription on Orange Background)




Dimensions of label to be not less than 148 × 210 mm.

## APPENDIX IX

# NOTICE IN VEHICLE

(C.6)

**1** The notice must have durable black lettering embossed or stamped on a white background. It must be not less than 12 cm. square and capital letters must be not less than 12 mm. high for the word 'Radioactive' and 5 mm high otherwise.

**2** The notice must be securely posted in the cab where it is plainly visible to the driver, but not so as to obstruct his view of the road.

**3** The notice must be in the form set out below as appropriate to the nature of the load, and it must state the name, address and telephone number of the operator of the vehicle (this means the owner or, where the vehicle is the subject of a hiring or hire-purchase agreement, the person in possession of the vehicle under that agreement).

## FORMS OF NOTICE

### For White and Yellow Label Packages

This vehicle is carrying

**RADIOACTIVE MATERIALS**

If undamaged the Packages are SAFE TO HANDLE

*In case of accident*

get in touch at once with

The Police

and

[Particulars of owner of vehicle]

**For Full Load Consignments of low specific activity material**

This vehicle is carrying

**RADIOACTIVE**
**MATERIAL**

*DO NOT HANDLE THE LOAD UNNECESSARILY*

In case of accident get in touch at once with

The Police

and

[Particulars of owner of vehicle]

# APPENDIX X

## Minimum safe distances for stowage of packages containing undeveloped radiographic or photographic plates or film away from Yellow Label Packages

(C.9.3)

| Sum of Transport Indexes | Minimum Distance in metres from packages of undeveloped Plates or Film according to length of journey in hours | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 h | 2 h | 4 h | 10 h | 24 h | 48 h | 120 h | 240 h |
| 0·2 | 0·3 | 0·3 | 0·3 | 0·5 | 1 | 1 | 2 | 3 |
| 0·5 | 0·3 | 0·3 | 0·5 | 1 | 1 | 2 | 3 | 4 |
| 1 | 0·3 | 0·3 | 1 | 1 | 2 | 3 | 4 | 5 |
| 2 | 0·5 | 1 | 1 | 2 | 3 | 3 | 5 | 7 |
| 4 | 1 | 1 | 2 | 2 | 3 | 5 | 7 | 10 |
| 10 | 1 | 2 | 2 | 4 | 5 | 7 | 11 | 16 |
| 20 | 2 | 2 | 3 | 5 | 7 | 10 | 16 | 22 |
| 30 | 2 | 3 | 4 | 6 | 9 | 12 | 19 | 27 |
| 40 | 2 | 3 | 4 | 7 | 10 | 14 | 22 | 31 |
| 50 | 3 | 4 | 5 | 7 | 11 | 16 | 25 | 35 |

(1 metre = 3 feet 4 inches approximately)



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