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Nuclear Safety & Radiation Control Rules – 1997
(Authenticated English Translation)

Bangladesh Atomic Energy Commission

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Nuclear Safety and Radiation Control Rules, 1997

CONTENTS

Chapter I
Preamble

Chapter II
Requirement of Licence and Exemption

Chapter III
Licence, Permit, Fee, Standard, etc.

Chapter IV
Safety, Technical and Management Requirement

Chapter V
Occupational Exposure

Chapter VI
Medical Exposure

Chapter VIII
Potential, Emergency and Chronic Exposures

Chapter IX
Operational Exposure Control

Chapter X
Transportation of Radioactive Material and Waste Management

Chapter XI
Bangladesh / IAEA / International and Bilateral Agreements

Chapter XII
Enforcement

Chapter XIII
Schedule

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SRO No. 205 – Law/97. – in exercise of the powers conferred by Section 16 of the Nuclear Safety and Radiation Control Act, 1993 (Act no. 21 of 1993), the Bangladesh Atomic Energy Commission hereby makes the following *Rules*, namely :–

Chapter I
Preamble

1. **Short Title, Extent, Commencement**

1.1. Title. – the *rules* may be called the, "*Nuclear Safety and Radiation Control Rules, 1997*"

1.2. Extent. – the *rules* shall extend to the whole of Bangladesh including the establishments of the *commission*.

1.3. Commencement. – the *rules* shall come into force immediately.

2. **Definition.** – in these *rules*, unless the context otherwise requires :

(1) "Absorbed Dose (D)" means the ratio of the mean energy imparted by the ionizing radiation to matter in a volume element **de** and the mass of the matter in that volume element **dm**, which can be expressed as :–

$$D = \frac{de}{dm}$$

Here, D is the absorbed dose; the SI unit of absorbed dose is joule per kilogram (JKg^{-1}) and its special name is gray (Gy);

(2) "Accident" means any unintended event, including operating errors, equipment failures or other mishaps, the consequences or potential consequences or which are not negligible from the point of view of protection or safety;

(3) "Accidental Exposure" means an unpredictable exposure that results in one or more persons receiving doses exceeding the Annual Effective or Equivalent Dose limit;

(4) "Act" means Nuclear Safety and Radiation Control Act, 1993, (Act No. 21 of 1993);

(5) "Action Level" means the level of dose rate or activity concentration above which remedial actions should be carried out under the situation of chronic exposure or emergency exposure;

(6) "Activity" means an amount of radionuclide in a particular energy state at a given time, which can be expressed as follows:-

$$A = \frac{dN}{dt}$$

Here, A is the activity, dN is the expectation value of the number of spontaneous nuclear transformations from that energy state in the time interval dt; the SI unit of activity is the reciprocal of second (s^{-1}) and its special name is becquerel (Bq);

(7) "Agricultural Countermeasure" means the actions taken to reduce the levels of contamination of food, agricultural or forestry products before they reach consumers;

(8) "Annual Limit on Intake (ALI)" means the intake by inhalation, ingestion or through the skin of a given radionuclide in a year by the Asian reference man which would result in a committed effective dose equal to the annual limit on effective dose;

(9) "Applicable Code" means the codes stated or specified in these rules;

(10) "Applicable Guide" means the guides stated or specified in these rules;

(11) "Applicable Standard" means the standards stated or specified in these rules;

(12) "Applicant" means an applicant applying to the commission under the provisions of these rules;

(13) "Approved" means, if not specifically mentioned otherwise, approved by the commission;

(14) "Approved Registered Medical Practitioner" means any medical practitioner who is approved and registered by the commission vide these rules;

(15) "Authorized Limit" means such limit as authorized by the commission for the purpose of radiation protection and safety;

(16) "Chronic Exposure" means an exposure that persists with time;

(17) "CIOMS" means Council for International Organizations of Medical Science, Geneva;

(18) "Commission" means Bangladesh Atomic Energy Commission constituted under the Bangladesh Atomic Energy Commission Order, 1973 (President's order No. XV of 1973);

(19) "Committed Effective Dose" means the quantity $E(\tau)$, which can be expressed as follows:-

$$E(\tau) = \sum_T w_T . H_T(\tau)$$

Here $H_T(\tau)$ is the committed equivalent dose to tissue T over the integration time t; when τ is not specified, it will be taken to be 50 years for adults and 70 years for intakes by children;

(20) "Committed Equivalent Dose" means the quantity $H(\tau)$, which can be expressed as follows : -

$$H_T(\tau) = \int_{t_0}^{t_0+\tau} H_T(t)dt$$

Here to is the time of intake, $H_T(\tau)$ is the equivalent dose rate at time t in an organ or tissue T and τ is the time elapsed after an intake of radioactive substances. When it is not specified it will be taken to be 50 years for adults and 70 years for intakes by children;

(21) "Consumer Product" means devices such as smoke detector, luminous dial, ion generating tube etc. which contains a small amount of radioactive substances and which are estimated by the commission to be of low risk;

(22) "Containment" means methods or physical structures that prevent the dispersion of radioactive substances;

(23) "Contamination" means harmful presence of radioactive substances in or on a material or the human body or other place;

(24) "Controlled Area" means any area in which specific protection measures and safety provisions are or could be required for :--

(a) controlling normal exposure or preventing the spread of contamination during normal working conditions; and
(b) preventing or limiting the extent of potential exposure;

(25) "Countermeasure" means an action aimed at alleviating the consequences of an accident;

(26) "Critical Group" means that group of members of the public whose radiation exposure is reasonably homogeneous and is typical of individuals receiving the highest effective dose or equivalent dose for a given radiation source and given exposure pathway;

(27) "Director" means Director of the Nuclear Safety and Radiation Control Division of the commission;

(28) "Division" means the Nuclear Safety and Radiation Control Division of the Commission;

(29) "Dose" means absorbed dose, organ dose, equivalent dose, effective dose, committed equivalent dose or committed effective dose;

(30) "Effective Dose" means the summation of the tissue equivalent doses each multiplied by the appropriate tissue weighting factor, which can be expressed as follows :--

$$E = \sum_T W_T . H_T$$

Here, H_T indicates the equivalent dose in tissue T and W_T indicates the tissue weighting factor for tissue T. The unit of effective dose is $J.kg^{-1}$ and its special name is sievert (Sv);

(31) "Emergency Exposure" means any exposure of an individual to radiation originating due to a sudden event requiring immediate remedial or protective measures;

(32) "Equivalent Dose" means the absorbed dose in an organ or tissue multiplied by the corresponding radiation weighting factor W_R, which can be expressed as follows :--

$$H_{T,R}=D_{T,R}.W_R$$

Here $D_{T,R}$ stands for the average absorbed dose in the organ or tissue T and W_R stands for the radiation weighting factor for radiation R. If the radiation field consists of radiations with different values of W_R, the equivalent dose can be expressed as follows :-

$$H_T = \sum_R w_R.D_{T,R}$$

The unit of equivalent dose is $J.kg^{-1}$ and its special name is sievert (Sv);

(33) "Ethical Review Committee" means a committee of independent persons to advise on the conditions of exposure and the dose constraints to be applied to the medical exposure of individuals exposed for biomedical research purpose when there is no direct benefit to the exposed individual;

(34) "Exposure" means exposure of people to external sources, internal sources or both. The exposure can be classified as either normal or potential exposure; either occupational, medical or public exposure; and, in intervention situations, either emergency or chronic exposure;

(35) "Exposure Pathways" means the routes by which radioactive substance or material can reach or irradiate a man;

(36) "Helsinki Declaration" means the Declaration adopted by the 18th World Medical Assembly, Helsinki, Finland, 1974;

(37) "IAEA" means the International Atomic Energy Agency;

(38) "Intake" means the process of entry of radionuclides into the body by inhalation, ingestion or through the skin;

(39) "Intervention Level" means the level of exposure which, if exceeded, requires intervention;

(40) "Investigation Level" means the value of equivalent dose, intake or contamination per unit area or volume above which an investigation should be conducted;

(41) "Ionizing Radiation" means such radiation as is capable of producing ions directly or indirectly in a matter while passing through it;

(42) "Irradiation Installation" means a structure and installation used for housing a particle accelerator, X-ray machine or a large radioactive source capable of producing high radiation fields ; the structure provides safety devices like interlocks preventing inadvertent entry into the high radiation zones;

(43) "Irradiating Apparatus" means any device which is capable of producing ionizing radiation;

(44) "Licence" means a licence issued under section 5 of the Act;

(45) "Licensee" means a person who is granted a licence by the commission vide these rules;

(46) "Limit" means the value of a quantity used in certain specified activities or circumstances which must not be exceeded;

(47) "May" means an option, neither a requirement nor a recommendation;

(48) "Medical Exposure" means the exposure of an individual due to medical or dental diagnosis or treatment involving radiation other than occupational exposure;

(49) "Member Designated" means the member of the Commission who has been delegated vide section –XV of the Act regulatory powers or responsibilities on behalf of the Commission;

(50) "Members of the Public" mean individuals in the population at large excluding occupationally and medically exposed;

(51) "Natural Exposure" means exposure from natural sources;

(52) "Natural Source" means naturally occurring sources of radiation including cosmic-rays and terrestrial radiation sources;

(53) "Nuclear Installation" means nuclear power plants, nuclear reactors including sub-critical or critical assemblies, research reactors, spent fuel storage and reprocessing facilities;

(54) "Nuclear Material" means

(a) plutonium-239, uranium-233, uranium enriched in the isotopes of uranium-235 or 233; or any material containing one or more of the foregoing; or
(b) uranium or thorium or any combination or them, in any physical or chemical form; or
(c) such natural ore which contains 0.05% or more by weight of uranium or thorium or any combination thereof; or
(d) any other material as may be deemed as such by the Commission;

(55) "Occupational Exposure" means all exposure of a worker to ionizing radiation during the course of his work excluding the exposure from practices or sources exempted by the regulatory standards;

(56) "Order" means, if not specifically stated otherwise, any general or special order, directive or instruction issued by the Commission;

(57) "Organ Dose" means dose in a particular tissue or organ of the human body which can be expressed as follows :–

$$D_T = \frac{1}{m_T} \int_{m_T} D dm$$

Here, m_T stands for the mass of the tissue or organ and D stands for the absorbed dose in the mass element dm;

(58) "Person" means

(a) any individual, government establishment, corporation, partnership, firm, association, trust, estate, public or private institution, group, department; and
(b) any legal successor, representative, agent or agency of the foregoing;

(59) "Personnel Monitoring" means radiation dose assessment of occupational workers;

(60) "Potential Exposure" means exposure due to accidental departures from the planned operations procedures or failure of equipment or environmental changes after the disposal of radioactive wastes;

(61) "Practice" means any human activity that introduces additional sources of exposure pathways or extends exposure to additional people or modifies the network of exposure pathways from existing sources, so as to increase the exposure or the likelihood of exposure of people or the number of people exposed;

(62) "Premises" means any land, building or structure whether fixed or movable or any part thereof;

(63) "Prescribed Substance" means any substance including any material prescribed by the commission which may be used for the production or use of atomic energy, or research, or into matters connected therewith;

(64) "Public Exposure" means exposure to members of the public from radiation sources ; it does not include occupational or medical exposure but it comprises all other exposure from those sources that are under control or may be controlled or reduced by intervention;

(65) "Qualified Expert" means an individual who, by virtue of certification by appropriate boards or societies, or professional licences or academic qualifications and experience, is duly recognized by the commission as having expertise in the relevant field of specialization, e.g., medical physics, radiation protection, occupational health, fire safety, quality assurance, any relevant engineering or safety speciality;

(66) "Radiation Control Officer" means a technically qualified person approved by the commission and designated by the licensee to supervise the application of the appropriate nuclear safety and radiation control rules, measures and procedures;

(67) "Radiation Source" means a substance or an apparatus producing or capable of producing ionizing radiation in a particular installation or place;

(68) "Radiation Worker" means any person who is employed full time, part time or temporarily in a radiation practice and who is occupationally exposed or likely to be exposed to radiation;

(69) "Radioactive Material" means a material in which radioactivity is present in excess of the authorized limit;

(70) "Radioactive waste" means such waste as is created by the nuclear or radiation activity and in which radioactivity is present in excess of the prescribed limit;

(71) "Radiological Examination" means the application of X-ray, gamma-ray or any other ionizing radiation in the diagnosis of human diseases;

(72) "Remedial action" means certain actions that need to be taken to reduce or control radiation doses that might otherwise be received in an intervention situation involving chronic exposure when a planned action level is exceeded;

(73) "Rules" means the Nuclear Safety and Radiation Control Rules;

(74) "Safety Analysis Report" means the safety analysis report prepared in pursuant to applicable standard, code and guide;

(75) "Shall" means a requirement;

(76) "Should" means a recommendation, not a requirement;

(77) "Sealed Source" means any radioactive material which has been permanently sealed in a capsule or fixed rigidly in it;

(78) "Source Material" means

(a) Uranium or Thorium or any combination of them, in any physical or chemical form, or
(b) Such natural ore which contains 0.05% or more by weight of Uranium or Thorium or any combination of them;

(79) "Supervised Area" means any area not designated as a controlled area but for which occupational exposure conditions are kept under review even though specific protective measures and safety provisions are not normally needed; and

(80) "US NRC 10 CFR" means 10 Code of Federal Regulations of the United States of America.

3. **Scope.-** the *rules* shall apply to all *practices, sources* and *nuclear materials* within *practices*, and *intervention* thereof.

3.1. Practice.—the *practices* to which the *rules* shall apply include –

(a) the production of *source* and the use of radiation or *radioactive material* for medical industrial, veterinary or agricultural purposes, or for education, training or research, including any *practice* related to that use which causes or can cause *exposure* to radiation or *radioactive material*;
(b) the generation of energy by nuclear power, including any practice in the nuclear fuel cycle which causes or can cause *exposure* to *radiation* or *radioactive material;*
(c) *practice* related to *natural source* involving *exposure* specified by the *commission* as requiring control; and
(d) *any* other *practice* specified by the *commission.*

3.2. Source and Nuclear Material. – the *source* and *nuclear material* within any *practice* to which the *rules* shall apply include –

(a) *radioactive material* and device that contain *radioactive material* or produce radiation e.g. X-ray machines, including *consumer product, sealed radioactive source, unsealed source*, radiation generator including portable radiography equipment, *nuclear material* and *prescribed substance*;
(b) installation and facility which contain *radioactive material* or device which produce *radiation*, including *irradiation installation*, mine and mill processing *radioactive* ores, installations processing *radioactive material, nuclear installation*, and *radioactive waste* management facility; and
(c) other *sources* specified by the *commission*.

provided that the *rules* shall apply to each individual *source* of *radiation* within an installation or a facility and to the complete installation or facility regarded as a *source* according to the requirements of the *commission*.

3.3. Exposure. – the *exposure* to which the *rules* shall apply include –

(a) any *occupational exposure, medical exposure, or public exposure* due to any relevant *practice* or *source* within the *practice*, including both normal *exposure* and *potential exposure* ;
(b) *Exposure* to *natural source* which normally be considered as a *chronic exposure* situation but is subjected to the rules of *intervention* as deemed necessary for control by the *commission*.

3.4. Intervention. – any action, intended to reduce or avert *exposure* or the likelihood of *exposure* to *sources* which is not part of a controlled *practice* or which is out of control as a consequence of an accident but such action will only be taken where it shall do more good than harm.

3.5. Exclusion. – the *rules* shall exclude any *exposure* whose magnitude or likelihood is essentially unamenable to control through the requirements of the *rules*.

4. Competent Authority and Administration

4.1. Competent Authority. – Bangladesh Atomic Energy Commission hereinafter referred to as the *commission*, is the Competent authority vide Act no. 21 of 1993 for implementation of the *rules*.

4.2. Delegation of Power. – the *commission* may delegate, vide Section 15 of the *Act*, any or all of its powers or responsibilities to any one of its members and hereinafter referred to as the *member designated*.

4.3. Administrative Arrangement. – in order to facilitate the implementation of different provisions of the *Act*, the *commission* –

(a) has set up a *division* under the name "*Nuclear Safety and Radiation Control Division*", which is headed by a *director* ; the *division* shall have its Headquarter in Dhaka and it may have a number of sections dealing with specific responsibilities ; and

(b) may set up one or more regional centers, laboratories, training centers, documentation and information centers as may deem necessary.

4.4. Exercise of Power. –

(a) the *member designated* will exercise all such powers or responsibilities under the *rules* as may be delegated vide rule 4.2;

(b) the *director* will assist the *member designated* in discharging the functions or responsibilities of the *commission* and the *member designated*; and

(c) notwithstanding the provisions of rule 4.4 (a) the *director* or any person may exercise such powers and responsibilities under the *rules* as may specifically be authorized by the *commission* and the *member designated*.

4.5. External Assistance. – the *commission*, vide section 6(2) of the *Act*, if necessary, may seek the assistance of any university of Bangladesh and of any foreign laboratory including those of the *IAEA*, or of any other national or foreign laboratory which is competent in the judgement of the *commission*, or may carry out joint research programmes on any subject with similar national or foreign institutions or laboratories.

4.6. Committee of Expert—the *commission*, may vide section 7 of the *Act*, if necessary, constitute from time to time, expert committee consisting of one or more person having specialized knowledge, to advise on specific problem pertaining to nuclear safety and radiation control matters.

5. **Interpretation**

5.1. Condition for acceptance. – except as specifically authorized by the *commission* in writing, no interpretation of the meaning of the *rules* in this part by any officer or employee of the *commission* other than a written interpretation by the *director* or a *person* duly authorized by the *commission* will be recognized to be binding upon the *commission*.

5.2. Laboratory Report. – any report or assessment sent to the *commission* on any matter or subject by a laboratory mentioned in rule 4.5 shall be deemed to be true and authentic unless proved otherwise in a court of law.

6 **Communication**

6.1. Mode. – all communication between the *commission* and a *person/licensee* shall be in writing.

6.2. Address. – the signed original of all correspondences, reports, applications, and any other written communication from a *licensee* or a *person* to the *commission* must be addressed to the *Director, Nuclear Safety and Radiation Control Division*, 4, Kazi Nazrul Islam Avenue, PO Box – 158, Ramna, Dhaka – 1000 or to the person authorized by the *commission*.

Chapter II
Requirement of Licence and Exemption

7. **Requirement of Licence.** – a *person* from the date of enforcement of the *rules* vide section 4 of the *Act*, shall require a *licence* from the *commission* to –

(a) adopt, introduce, conduct, discontinue or cease, mine, mill, process, design, manufacture, construct, assemble, acquire, import, export, sell, loan, hire, receive, site, locate, commission, possess, use, transfer, decommission, dissemble, transport, store or dispose a *practice* or a *source* except in accordance with the appropriate requirements of the *rules*, unless such *practice* and/or *source* is exempted from the scope of the rules including the requirements of enforcement ;

(b) bring or make entrance into Bangladesh of any vehicle operated by nuclear power or carrying *nuclear material*, or *radioactive material*, or *prescribed substance*, or *radioactive waste* ;

(c) process any food–stuff using radiation or similarly produce, distribute or market any food–stuff processed by *radiation* or to possess, procure, import or distribute any food–stuff or drink which contains *activity* exceeding the *authorized limit* , and

(d) own, make, install or operate, maintain, repair any equipment capable of producing radiation.

8. **Transitional Provision of Licence**

8.1. Existing Practice. – for the existing *practice*, falling under the scope of the *rules*, the concerned *person* –

(a) shall notify the *commission* about the *practice* being pursued within 90 (ninety) days from the date of enforcement ;

(b) shall take the *licence* in pursuant to rule 10.1, applicable for the *practice* within a period of 12 (twelve) months from the date of enforcement ; and

(c) shall report to the *commission*, notwithstanding any condition of a *licence* or holder of a permit issued earlier, or the *practice* followed in the past, within 90 (ninety) days from the date of enforcement and shall renew the *licence* in pursuance of the provisions of the *rules* within 12 (twelve) months from the date of notification.

8.2. Failure to Notify/Take Licence. – failure to notify within 90 (ninety) days or to take necessary *licence* within 12 (twelve) months vide rule 8.1(a) & 8.1(b) respectively shall automatically forbid continuation of the *practice* by the *person*.

8.3. Special circumstances. – notwithstanding the provisions of rules 8.1 and 8.2, the *commission* upon receipt of due notification and application within the requisite time may allow a person to continue the *practice* for a certain specific period under specific terms and conditions.

9. **Exemption.** – notwithstanding the provisions of rule 7, the *commission*, vide section 4.2 of the Act, may exempt any *person* from the applicability of rule 7, subject to the following conditions : –

(i) the *exemption criteria* provided in schedule – I is fulfilled by him; and

(ii) the *exemption levels* provided in schedule – II is fulfilled by him;

notwithstanding the provisions of rules 9(i) & (ii), the *commission* may change or modify from time to time the *exemption criteria* and *exemption levels* through notification.

Chapter III
Licence, Permit, Fee, Standard, etc.

10. **Licence**

10.1. General Requirement. – in order to obtain a *licence*, a person shall fulfil the following conditions : –

(a) justification. – the *practice* is justified on the basis that it produces sufficient benefit to the exposed individuals or to society to offset the radiation detriment it may cause;
(b) application. – shall apply to the *commission* in a prescribed form stated is schedules – IV.I to IV.VIII;
(c) fee. – shall pay the *commission* the requisite fee given in schedule – VI;
(d) safety & protection. – the proposed equipment, facility or *practice* is technically safe and provide adequate radiological protection;
(e) financial resource. – have adequate financial resource for the safety and protection throughout the life of the *practice*, equipment or facility;
(f) human resource. – have qualified and trained personnel adequate to discharge the licensed responsibilities for the entire life of the *practice*, equipment or facility; and
(g) compliance. – comply with all the requirements of the *rules* as applicable, and the specific *limits* and conditions mentioned in the *licence* until he is relieved of the responsibilities of the *licence* by the *commission*.

10.2. Classification of Licence. – a *licence* may fall under any of the following classes : –

(a) class A licence. – is a *licence* to manufacture, trade in, produce, process, purchase, own, possess, transfer, handle, sell, store *radioactive material*;
(b) class B licence. – is a *licence* to manufacture, trade in, produce, process, purchase, own possess, transfer, handle, sell, store nuclear material;
(c) class C licence. – is a *licence* to manufacture, trade in, produce, process, purchase, own, possess, transfer, handle, sell, store *irradiating apparatus;*
(d) class D licence. – is a *licence* to transport *radioactive material, nuclear material, prescribed substance*, and their waste;
(e) class E licence. – is a *licence* to export or import *radioactive material, nuclear material, prescribed substance* and their waste;
(f) class F licence. – is a *licence* to site, to start up or to operate *nuclear reactor*;
(g) class G licence. – is a licence to –

  (1) dispose of *radioactive material, nuclear material* and *prescribed substance* and their waste; and
  (2) decommission a milling installation, nuclear installation, irradiation installation, sealed source facility or waste treatment facility; and

(h) class H licence. – is a *licence* issued for any other *practice* or *source* which have not been covered under classes A to G *licences*.

10.3. Stage of Licence. – a *licence*, as per provisions made under the *rules*, may be issued at one or any combination of the following stages :-

(1) siting;
(2) temporary operation or start up; and
(3) full operation.

provided that issuance of *licence* at a particular stage shall not automatically entitle the *person* to obtain the *licence* for the subsequent stage(s).

10.4. Procedure for Obtaining Licence. – in order to perform *practice* mentioned in rule 3, a *person*, shall apply for a *licence* to the *commission* in the prescribed form applicable for the specific class and *practice*, furnishing all pertinent information required by the *applicable standard* and *guide*.

10.5. Issuance of Licence. – the *commission*, upon determination that an *applicant* for a *licence* fulfils the requirements of the *Act*, *rules* and *applicable standards*, will issue a *licence* in such form and containing such conditions and limitations including technical specification as it deems appropriate and necessary.

10.6. Duration of Licence. – the validity of the *licence*, unless otherwise specifically stated in the *licence*, shall be considered one year.

10.7. Renewal of Licence. – a *licensee* shall apply to the *commission* in the prescribed form and manner stated in schedules-IV.I–IV.VIII and on payment of due fee given in schedule – VI for the renewal of the *licence* at least 30 days prior to the expiry date of the *licence*.

10.8. Grant of More than One Licence to the same Person. – the *commission* may issue more than one *licence* to the same *person* for different purpose or for similar purposes at different locations.

10.9. Combined Licence. – the *commission* may combine in a single *licence* the *practices* of an *applicant* which would otherwise be licensed severally.

10.10. Amendment of Licence. – the *licensee* may apply to the *commission* in the prescribed form and manner stated in schedules – IV.I – IV.VIII and on payment of due fee given in schedule – VI for amendment of a *licence* issued to him and the commission may ask the *licensee* to furnish all such information and analyses deemed necessary by it in order to amend the *licence*.

10.11. Surrender of Licence. – a *licensee* will have the option to surrender the *licence* and shall comply the followings : –

(a) apply to the *commission* in a prescribed form and manner stated in schedule – XVII at least three months prior to the proposed date of surrender;
(b) fulfil all his responsibilities and discharge his obligations under the provisions of the *rules* and *applicable standards* and *guides*; and
(c) continue to discharge his licensed responsibilities until the date of acceptance of surrender of *licence* is communicated to him.

10.12. Registration of Licence.—the *commission* shall register each *licence* in the form given in schedule – III or as may be deemed fit.

10.13. Condition of Licence.—whether stated therein or not, the following conditions shall be applicable to every *licence* issued :–

(a) a Quality Assurance (QA) programme related to a safety assessment report exists;
(b) an emergency response plan and an emergency reporting system exist;
(c) the licence is subject to revocation, suspension, modification or amendment for causes as provided in the *Act* and *rules*; and
(d) other applicable *rules* and regulations are duly complied.

11. Import and Export Permit

11.1. Application. – any *licensee* prior to import or export *nuclear material, radioactive material or radiation source or apparatus* shall apply to the *commission* for a permit for custom's clearance in a prescribed form stated in schedule – XVIII and on payment of the fee given in schedule – VII.

11.2. Requirement. – the *commission* may direct the *applicant* to produce invoice or other documents which may indicate the origin, technical specifications and other details as may deem necessary.

11.3. Power of Commission. – the *commission* may defer the consideration of an application and may direct the *applicant* to perform such other acts which it deems necessary under the applicable safety standards.

12. Nuclear Reactor Operator's Licence

12.1. Requirement. – the *licensee* of a nuclear reactor shall obtain reactor operator's *licence* for each of its personnel designated to be involved in operation in a prescribed form and manner stated in schedule – V.

12.2. Applicable Code. – the nuclear reactor operator's *licence* shall be obtained and regulated in pursuant to USNRC 10 CFR 55 and other *applicable guides* as adopted by the *commission*.

12.3. Period. – the nuclear reactor operator's *licence* shall be issued for a period of 2(two) years along with other specific conditions as may be imposed by the *commission* and it shall be renewed after the date of expiry.

12.4. Restriction. – the *licensee* will have the right to enter into the operation phase of his licensed nuclear reactor only after the requisite number of nuclear reactor operators/senior nuclear reactor operators have obtained their nuclear reactor operator's *licences*.

13. Confidential Information

13.1. Confidentiality. – the confidential information furnished to the *commission* in pursuance of any order, directive or requirement or an application made in accordance with any provision

of the *Act* or of these rules will be considered as confidential by the *commission* and will be use for its intended purpose and such information will not be divulged except for purposes of prosecution, or when the *commission* itself considers it expedient in the greater interest of nuclear safety or radiation protection.

13.2. Condition for Confidentiality. – for the purposes of the *rules* confidential information includes any information protected by intellectual property rights, or industrial and commercial confidential information – identified by the *licensee* and accepted by the *commission* as protected or confidential.

14. Fee

14.1. Licence Fee. – the applicable fee for the issuance, renewal, amendment of a *licence* is given in schedule –VI.

14.2. Permit Fee. – the permit fee for the import or export of *nuclear material* or *radioactive material, radiation source*, or *apparatus* is given in schedule – VII.

14.3. Service Fee. – the applicable fee for any specialized service, e.g. standardization, calibration of equipment, testing of radioactivity of food stuff, dosimetry, special safety assessment, training of *radiation control officer* or nuclear reactor operator certification/*licence* to a person etc. is given in schedules – VIII.I to VIII.VIII.

15. Applicable Standard, Code and Guide

15.1. List of Standard. – in order to obtain a *licence*, each *person* and each *licensee* shall follow the *applicable standards, codes* and *guides* given in schedule – IX.

15.2. IAEA Standard. – in case where it has not been specifically mentioned in schedule – IX, the *commission*, generally, shall follow the *IAEA* standards and guides.

15.3. Other Standards. – where the *IAEA* standards and guides will be found in the judgement of the *commission* to be inadequate – standards, codes and guides published by any national regulatory authority or other internationally accepted bodies may be adopted as deemed appropriate by it.

16. Responsible Party

16.1. Party. – for the implementation of the *Act* and the *rules* the following parties shall be responsible : --

(a) Principal Parties. – the principal parties shall be the followings : --

(1) *commission*. – as the competent authority for enforcement of the *rules* and *intervention;*

(2) *applicant/licensee*. – as the principal responsible party for the compliance with the *rules* and *applicable standards, codes* and *guides* and for ensuring radiation protection and safety of the *source*;

(b) Subsidiary Parties. – except the principal parties, other subsidiary parties shall have responsibilities for compliance with the *rules* and *applicable standards* and *guides* and these parties shall include –

(1) suppliers;
(2) *radiation workers*;
(3) *radiation control officers*;
(4) *approved registered medical practitioners*;
(5) *qualified experts*;
(6) review committees; and
(7) any other party to whom a principal party has delegated specific responsibilities.

16.2. Responsibility of Subsidiary Party. – the subsidiary parties shall be responsible to the *applicant* or to the *licensee* ; the responsibility of a subsidiary party shall in no way relieve the *applicant* or *licensee* of his responsibilities and obligations under the *rules*.

Chapter IV
Safety, Technical and Management Requirement

17. Safety Requirement

17.1. General Requirement. –

(a) safety and fire protection provisions shall be incorporated in all plans, designs and layout of buildings, structures and premises and *applicable standards* and *codes* shall be followed for making such plans, designs and layouts; and

(b) in order to install, commission, operate, handle and store a *source* in such buildings, structures and premises – possible risk to health and safety of employees and properties shall have to be anticipated.

17.2. Security of Source. – a *person* or a *licensee* shall ensure that –

(a) the *source* shall be kept secured so as to prevent theft or damage;
(b) an unauthorized person shall not carry out any activity relating to the *source*;
(c) further ensure that –
(1) control of a *source* is not relinquished without compliance with all relevant requirements specified in the *licence* and without communication to the *commission* of the information regarding any decontrolled, lost, stolen or missing *source*;
(2) a *source* is not transferred unless the *person* possesses a valid authorization; and
(3) periodic inventories of movable *source* are conducted at appropriate intervals to confirm that they are in their assigned locations and are secured.

17.3. Safety Requirements at Different Stages of Licence. – a *person* or a *licensee* shall comply with the safety requirements, as applicable, at different stages of *licence* as given below.

(a) siting. –

(1) the following subjects shall have to be taken into consideration : –

(a) the factors which affect *exposure* or *potential exposure* of *radiation workers*, other employees and *members of the public* and for a *source* constituting a large inventory of *radioactive materials* and having the potential for large release into the environment, the site selection shall take into account relevant features (e.g. environmental features and local population) that might affect the radiation safety of the source, or be affected by the *source*, and the feasibility of carrying out emergency plans ;
(b) the design reliability, durability and easy manageability and operational suitability ;
(c) multilayer protection and defense in depth ; and
(d) the requirements of operational environment, human environment related procedural aspects and other human factors ;

(2) a safety analysis report prepared in pursuant to rule 17.3 (a) (1) shall have to be submitted to the *commission* ;

(b) temporary operation or start up – a report shall have to be submitted to the *commission* furnishing a set of operational procedures prepared on the basis of safety analysis report and the facts supporting that adequate manpower is available for the operation of *practice*;

(c) full operation. –

(1) the following subjects shall have to be taken into consideration : –

(a) adequate technical capability to support all aspects important for safety during the whole operational life time of the *source* ;
(b) establishment of a programme in order to ensure the determination of whether it is necessary to modify radiation safety related conditions of device and training requirement on the basis of operational experiences ; and

(c) *sources* be kept secured, so that they are only use by authorized persons for authorized purposes ; and

(2) a safety analysis report prepared in pursuant to rule 17.3(c)(1) shall have to be submitted to the *commission*.

18. Technical Requirement

18.1. Good Engineering Practice. – an *applicant* or a *licensee* shall ensure that the siting, location, design, construction, assembly, commissioning, operation, maintenance and decommissioning of source within *practice* shall be based on good engineering practices, which shall, as appropriate, –

(1) take into account *applicable standard, code* and *guide* and other appropriately documented instruments;

(2) be supported by reliable managerial and organizational features to ensure protection and safety throughout the life of the *source*;
(3) include sufficient safety margins for the design and construction of the *source*, and for operations involving the *sources*, such as ensuring reliable performance during normal operation, taking into account quality, redundancy and inspectability, with emphasis on preventing accident, mitigating their consequences and restricting any future *exposure*; and
(4) take into account the relevant developments of technical criteria, as well as the results of any relevant research on protection or safety and lessons from experience.

18.2. Other Technical Requirements. – an *applicant* or a *licensee*, among others, shall consider, as applicable, the following technical safety aspects in pursuant to *applicable standards*, *codes* and *guides* : –

(1) structural safety ;
(2) layout of roads and foot paths ;
(3) effluent control ;
(4) space requirements ;
(5) guarding of openings of elevated spaces ;
(6) ramps ;
(7) marking ;
(8) color codes for pipelines ;
(9) ventilation ;
(10) illuminations ;
(11) lightning protections ;
(12) building construction and maintenance ;
(13) portable ladders and cranes ;
(14) material storage ;
(15) fire protection ;
(16) machine guarding and operation ;
(17) electrical equipment ;
(18) hand tools and power tools ;
(19) pressure vessels and plants ;
(20) compressed gas cylinder ;
(21) handling of hazardous material ;
(22) personnel protective equipment ; and
(23) Health control.

19. Management Requirement

19.1. Quality Assurance Programme. – an *applicant* or a *licensee* shall establish an appropriate quality assurance (Q.A.) programme following *applicable standard*, *code* and *guide* in order to ensure the implementation of all nuclear safety and radiation protection requirement.

19.2. Safety Culture. – an *applicant* or a *licensee* shall ensure the establishment and maintenance of safety culture in order to encourage a questioning and learning attitude for nuclear safety and radiation protection and to discourage complacency, which shall –

(1) establish policies and procedures to identify the protection and safety of *members of the public* and workers as being of highest priority ;
(2) identify promptly the problems affecting protection and safety and correct in a manner commensurate with their importance ;
(3) identify the responsibilities clearly of each individual, including those at senior management levels for nuclear safety and radiation protection ;
(4) train and qualify each individual including those at senior management level suitably ;
(5) establish a clear lines of authority for decisions on nuclear safety and radiation protection ; and
(6) establish such organizational arrangements and lines of communications as it will result in an appropriate flow of information on protection and safety at the various levels in the organization of the *licensee*.

19.3. Human Factor. – an *applicant* or a *licensee* shall make provisions for reducing as far as practicable the contribution of human error to accidents and other incidents that could give rise to *exposure*, by ensuring that –

(1) each worker on whom protection and safety depend be appropriately trained and qualified to make him understand his responsibilities and perform his duties with appropriate judgement and according to defined procedures ;
(2) sound ergonomic principles be followed as appropriate in designing equipment and operating procedures, so as to facilitate the safe operation or use of equipment, to minimize the possibility of operating errors which may lead to accidents, and to reduce the possibility of misinterpreting indications if normal and abnormal conditions occur ;
(3) appropriate equipment, safety systems, and procedural requirements be provided and other necessary provisions be made –

(a) to reduce, as far as practicable, the possibility of human error which may lead to inadvertent or unintentional *exposure* of any *person* ;
(b) to provide means for detecting human errors and for correcting or compensating for them; and
(c) to facilitate *intervention* in the event of failure of safety systems or other protective measures.

19.4. Human Resource. – the *licensee* shall ensure that adequate human resources are available to discharge his licensed responsibilities.

19.5. Education and Training. – the *licensee* shall ensure that –

(a) adequate education, training, and requalification arrangement for the human resources involved in the licensed *practice* are available; and
(b) such education, training and requalification programmes are approved by the *commission*.

19.6. Qualified Expert. – an *applicant* or a *licensee* shall –

(a) select and appoint a *qualified expert* according to his need for providing advice on the observance or the standards; and
(b) keep the *commission* informed about the arrangements of the *qualified expert* identifying the scope of his functions.

19.7. Insurance. – an *applicant* or a *licensee* –

(a) when required by the *commission*, shall obtain an insurance policy for such an amount as to be fixed by the *commission* for each type of *licence* separately; and
(b) shall not cancel or suspend a policy obtained under rule 19.7 (a) without the prior permission of the *commission*.

Chapter V
Occupational Exposure

20. Occupational Exposure

20.1. General Information. – the *occupational exposure* shall be controlled as per the *IAEA* Safety Series no. 115 – 1996.

20.2. Responsibility. – the *licensee* shall be responsible for –

(a) the protection of worker from *occupational exposure* ; and
(b) the compliance with any other relevant requirements of the *applicable standards* and the *rules*.

20.3. Dose Limit. – the *licensee* shall ensure that the *occupational exposure* of a worker shall be so controlled that the following *dose limits* are not exceeded : -

(a) an *effective dose* of 20 mSv per year averaged over five consecutive years ;
(b) an *effective dose* of 50 mSv in any single year ;
(c) an *equivalent dose* to the lens of the eye of 150 mSv in a year ; and
(d) an *equivalent dose* to the extremities (hands or feet) or the skin of 500 mSv in a year.

20.4. Limit for Apprentice. – for apprentices of 16 to 18 years of age who are getting training for employment involving *exposure* to radiation and for students of age 16 to 18 who are required to use *sources* in the course of their studies, the *occupational exposure* shall be so controlled that the following *limits* are not exceeded :-

(a) an *effective dose* of 6 mSv in a year ;
(b) an *equivalent dose* to the lens of the eye of 50 mSv in a year ; and
(c) an *equivalent dose* to the extremities or the skin of 150 mSv in a year.

20.5. System of Dose Limitation. – in order to carry out any *practice* involving radiation, each *licensee* shall fulfil the following conditions : -

(a) the *practice* justified on the basis that it produces sufficient benefit to the exposed individual or to society to offset the radiation detriment it may cause ;
(b) restrictions on the *dose* that individual may be exposed to are applied in order to ensure that no *person* be subjected to an unacceptable risk attributable to radiation ; and
(c) in relation to any particular *source* within *practice*, the magnitude of individual *doses*, the number of people exposed and the likelihood of incurring *exposure* shall all be kept as low as reasonably achievable, economic and social factors being taken into account, and be within the restrictions on *doses* to individual that take account of multiple *sources*.

21. **Compliance with the Dose Limit.** – the *licensee* shall –

(a) comply with the *dose limits* stated in rules 20.3 and 20.4 ; and
(b) verify the compliance with the *dose limit* stated in rule 21.(a) according to the procedures stated in schedule – X.

22. Planned Special Exposure

22.1. Limit. – the equivalent *dose* or the *committed equivalent dose* incurred in the course of planned special *exposure* shall not exceed twice the relevant *annual dose limit* specified in rules 20.3 and 20.4 in any single event, and for the lifetime five times of this limit.

22.2. Authorization. – the *licensee* shall authorize, in writing, a planned special *exposure* only during special circumstances.

22.3. Information to Worker. – the *licensee* shall inform the workers of the estimated radiation *doses* and potential occupational hazards during the planned operation.

22.4. Restriction. – the *licensee* shall ensure that the planned special *exposures* are not authorized for *workers* who have previously received abnormal *exposure* resulting in *equivalent dose* in excess of two times the relevant *annual dose limit* and the workers who are women of reproductive capacity.

22.5. Information to Others. – the *licensee* shall inform the workers, the *approved medical practitioner* and the *commission* of the *dose equivalents* or the committed *dose equivalents* resulting from the planned special *exposure*.

22.6. Avoidance. – the *licensee* shall avoid planned special exposure *for* operations involving inhalation or ingestion risk of *radioactive material*.

22.7. Recording. – the *licensee* shall record the *equivalent dose* or the *committed equivalent dose* resulting from planned special *exposure* with those from normal *exposure* and any excess of the *limits* stated in rules 20.3 and 20.4 shall not in itself constitute a reason for removing the worker from his occupation.

CHAPTER VI
Medical Exposure

23. Medical Exposure

23.1. General Information. – *medical exposure*, in addition to those mentioned specifically in this chapter of the *rules*, should also comply with other applicable *IAEA*, WHO, CIOMS and USNRC 10 CFR 35 standards as appropriate.

23.2. Responsibility. – the *licensee* shall ensure that -

(a) no patient be administered a diagnostic or therapeutic *medical exposure* unless the *exposure* is prescribed by a medical practitioner ;
(b) the concerned medical practitioners be assigned the primary task and obligation of ensuring overall patient protection and safety while prescribing and administering *medical exposure* ;
(c) medical and paramedical personnel be available as required and health professionals or adequately trained manpower to conduct diagnosis or therapy as per the prescription of the medical practitioner are available ;
(d) for therapeutic uses of *radiation*, the calibration, dosimetry and quality assurance requirements in pursuant to the *applicable standards* be conducted by or under the supervision of a *qualified expert* in radiotherapy physics ; and
(e) the *exposure* of individuals incurred knowingly while voluntarily helping in the care, support or comfort of patients undergoing medical diagnosis or treatment shall be limited within 5 mSv during the whole treatment period and for the children visitor, such exposure shall be limited within 1 mSv.

23.3. Quality Assurance (Q.A.) of Imaging. – the *licensee* shall ensure that for diagnostic use of radiation, the imaging and quality assurance (Q.A.) requirements of the standards be fulfilled with the advice of a *qualified expert* in either radiology, or nuclear medicine, or medical physics, as appropriate.

23.4. Information Requirement. – the medical practitioner shall promptly inform the *licensee* of any deficiencies or needs regarding compliance with the standards with respect to radiation protection and safety of a patient and shall take such actions as may be appropriate to ensure radiation protection and safety of the patient.

23.5. Use of Guide. – the medical practitioner shall take into account the appropriate standards in justifying each type of diagnostic examination by radiography, fluoroscopy or nuclear medicine.

23.6. Restriction. – a *radiological examination* for occupational, legal or health insurance purposes undertaken without reference to clinical symptom is deemed to be not justified unless it is expected to provide useful information on the health of the individual examined or unless the specified type of examination is justified by those requesting it in consultation with relevant professional bodies.

23.7. Medical Research. – the *exposure* of human for medical research is deemed to be not justified and permissible unless it is –

(a) supported by the Helsinki Declaration stated in schedule – XII or CIOMS or WHO ;
(b) reviewed and approved by an *ethical review committee ; and*
(c) a prior intimation is made to the *commission.*

23.8. Theft Detection. – a *radiological examination* for theft detection purpose is deemed to be not justified ; should it nonetheless be conducted, it shall not be considered as *medical exposure* but shall be subjected to the requirements for *occupational* and *public exposure* of the standards.

23.9. Systematic Radiological examination. – a medical practitioner shall carry out radiological examination on any person only and only if there are clear clinical needs and important information of the person's health is expected to be obtained by such examination.

24. Operational Consideration

24.1. Responsibility of Licensee. – the *licensee* shall ensure that the medical practitioner while prescribing or conducting *radiological examination* shall comply with the following operational aspects ; -

(a) use of appropriate equipment ;
(b) *exposure* of a patient shall be kept to the minimum in pursuant to the *applicable standards* and in consideration to the acceptable quality of imaging ; and
(c) consideration of past relevant examination records in order to avoid unnecessary additional examinations.

24.2. Responsibility of Medical Staff. – the medical practitioner, the technologist or other imaging staff select the following parameter, as relevant, such that their combination produce the minimum patient *exposure* consistent with acceptable image quality and the clinical purpose of the examination, paying particular attention to the selection of pediatric radiology and interventional radiology ; -

(a) the area to be examined, the number and size of views per examination and the time per examination;
(b) the type of image receptor;
(c) the use of anti-scatter grids;
(d) proper collimation of the primary X-ray beam to minimize the volume of patient tissue being irradiated and to improve image quality;
(e) appropriate values of operational parameters;
(f) appropriate image storage techniques in dynamic imaging; and
(g) adequate image processing factors.

24.3. Condition for Portable and Mobile Equipment. – portable and mobile radiological equipment should be used only for examinations where it is impractical or not medically acceptable to transfer patients to a stationary radiological installation and only after proper attention has been given to the radiation protection measures required for use.

24.4. Restriction for Pregnant Woman. –a *radiological examination* causing *exposure* to abdomen or pelvis of a woman, pregnant or likely to be pregnant, shall be avoided unless there are strong clinical reasons for such examination.

24.5. Restriction for Woman. – any diagnostic examination of the abdomen or pelvis of a woman of reproductive capacity shall be planned in such a way so as to deliver minimum dose to embryo or fetus that might exist.

24.6. Shielding Requirement. – where feasible, shielding of radiosensitive organs, such as, gonads, lens of eye, breast and thyroid should be provided as appropriate.

25. Exposure from Radionuclide

25.1 Responsibility of Licensee. – the *licensee*, in nuclear medicine *practice* shall ensure that the medical practitioners, who prescribe or conduct diagnostic applications of redionuclide, *shall*-

(a) ensure that the *exposure* of a patient be the minimum required to achieve the intended diagnostic objective;
(b) consider the relevant information from previous examination in order to avoid unnecessary additional examination; and
(c) consider the relevant guidance levels for *medical exposures*.

25.2. Quality of Exposure. – the *licensee* shall ensure that the medical practitioners, the technologists or other imaging staffs, as appropriate, endeavor to achieve the minimum patient *exposure* consistent with acceptable image quality by -

(a) appropriate selection of the best available radiopharmaceutical and its *activity*, noting the special requirements for children and for patients with impaired organ function;
(b) use of applicable methods for blocking the uptake in organ not under study and for accelerated excretion when applicable; and
(c) appropriate image acquisition and processing.

25.3. Pregnant Woman. – the *licensee* shall ensure that administration of radionuclides for diagnostic or therapeutic procedures to a woman, pregnant or likely to be pregnant, be avoided unless there are strong clinical indications.

25.4. Mother. – the *licensee* shall ensure that for mothers in lactation, discontinuation of nursing be recommended until the radiopharmaceutical is no longer secreted in an amount estimated to give an unacceptable *effective dose* to the nursling.

25.5. Children. – the *licensee* shall ensure that administration of radionuclides to children for diagnostic procedures be carried out only if there is a strong clinical indication, and that the *activity* administered be reduced according to body weight, body surface area or other appropriate criteria.

26. **Therapeutic Exposure.** – the *license* shall ensure that –

(a) the *exposure* of normal tissue during radiotherapy be kept as low as reasonably achievable consistent with delivering the required *dose* to planned target volume, and organ shielding be used where feasible and appropriate;

(h) the radiotherapeutic procedures causing *exposure* of the abdomen or pelvis of a woman, pregnant or likely to be pregnant, be avoided unless there is strong clinical indication;
(c) the administration of radionuclides for therapeutic procedures to a woman, pregnant or likely to be pregnant, or in lactation, be avoided unless there is strong clinical indication;
(d) the therapeutic procedure for a pregnant woman be planned to deliver the minimum *dose* to the embryo or fetus; and
(e) the patient be informed of the possible risks.

27. **Calibration.** – the *licensee* shall ensure that –

(a) the calibration of a *source* used for *medical exposure* be traceable to secondary standards dosimetry laboratory;
(b) radiotherapy equipment be calibrated in terms of radiation quality or energy and either *adsorbed dose* or *absorbed dose* rate at a predefined distance under specified conditions;
(c) a *sealed radiation source* used for brachytherapy be calibrated in terms of activity, reference air karma rate in air or *absorbed dose rate* in a specified medium, at a specified distance, for a specified reference date;
(d) unsealed *source* for nuclear medicine procedures be calibrated in terms of activity of the radiopharmaceutical to be administered; and
(e) the calibration be carried out at the time of commissioning of a unit and after any maintenance procedure that may have an effect on the dosimetry and at intervals approved by the *rules*.

28. **Clinical Dosimetry.** – the *licensee* shall ensure that the following items be determined and documented : -

(a) in a *radiological examination*, representative values for a typical sized adult patient, entrance surface doses, dose-area products, *dose rates*, *exposure* times and organ *doses*;
(b) for each patient treated with external beam radiotherapy equipment, the maximum and minimum *adsorbed doses* to the planned target volume;
(c) in brachytherapy treatment performed with *sealed radiation source*, the *absorbed doses* at selected relevant points of each patient;
(d) in diagnostic or treatment with unsealed *source*, representative *absorbed doses* to a patient; and
(e) in all radiotherapeutic treatments, the *absorbed doses* to the relevant organs.

29. **Quality Assurance (Q.A.) for Medical Exposure.** – the *licensee* shall ensure the compliance with the Q.A. requirements as per *applicable standards*.

30. **Guidance Level.** – in the absence of wide-scale surveys, performance of diagnostic radiography and fluoroscopy equipment and of nuclear medicine equipment should be assessed on the basis of comparison with the guidance levels specified in schedule – XII and these levels should not be regarded as a guide for ensuring optimum performance in all cases, as they are appropriate only for typical adult patients, and therefore, in applying the values in *practice*, account should be taken of body size and age.

31. **Dose Constrained.** – in order to restrict the *exposure* of any member of the family of a patient who has undergone a therapeutic procedure with a *sealed* or unsealed *radiation*

source and *member of the public*, such as, a patient shall not be discharged from hospital before the *activity* of *prescribed substance* in the body falls below the level state in schedule – XII and written instructions to the patient concerning his contact with other *person* and relevant precautions for radiation protection shall be provided as necessary.

32. **Maximum Activity in Therapeutic Patient Discharged from Hospital.** – the *licensee* shall limit any *dose* to individuals to incurred knowingly as per the requirements of schedule – XII(C).

33. **Investigation of Accidental Medical Exposure.** – the *licensee* shall ensure the compliance with investigation requirements as per the *applicable standards* of an accidental *medical exposure*.

34. **Record of Medical Exposure.** - the *licensee* shall keep the following records of *medical exposure* for a period specified by the *rules* and shall make available, when required, :-

(a) for diagnostic radiology. – necessary information to allow retrospective *dose* assessment, including the number of *exposure* and the duration of fluoroscopic examinations;
(b) for nuclear medicine. – types of radio-pharmaceuticals administered and their *activities*;
(c) for radiation therapy. – a description of the planned target volume, the *dose* to the center of the planned target volume, the *dose* to the other relevant organs, the *dose* fractionation and the overall treatment time;
(d) the *exposure* of the volunteers in medical research; and
(e) the result of the calibration and periodic checks of the relevant physical and clinical parameters selected during treatments.

35. **Training and Experience Requirements.** – the *licensee*, should fulfill the training and experiences requirements of personnel as specified in schedule–IX, as appropriate, for the use of *radioactive material* in medical *practice*.

Chapter VII
Public Exposure

36. **General Information.** – the *licensee*, in addition to those requirements mentioned specifically in this chapter, shall comply, as appropriate, with the requirements stated in other chapters, of the *rules* and the *applicable standards*.

37. **Dose Limit for Public Exposure.** – the *licensee*, shall ensure that the *exposure* of *members of the public* attributable to the *practice* shall not exceed the following *limits* :–

(a) an *effective dose* of 1 mSv in a year;
(b) in special circumstances, an *effective dose* up to 5 mSv in a single year; provided that the average *dose* over the consecutive five years does not exceed 1 mSv per year;
(c) an *equivalent dose* to the lens of the eye of 15 mSv in a year; and
(d) an *equivalent dose* to the skin of 15 mSv in a year.

38. **Control of Visitor.** – the *licensee* shall –

(a) ensure that the visitors be accompanied in any *controlled area* by a *person* knowledgeable about radiation protection and safety measures for that area ;
(b) provide adequate information and instructions to the visitors before they enter into a *controlled area* so as to ensure appropriate protection of the visitors and other individuals who may be affected by their actions ; and
(c) ensure that adequate control over entry of visitors to a *supervised area* be maintained and that the appropriare signs are posted in such areas.

39. **Radioactive Contamination in Enclosed Space.** – the *licensee* shall ensure that –

(a) for the *source* for which he is responsible, measures are optimized in accordance with the requirements of the standards, as appropriate, for restricting *public exposure* to *contamination* in areas accessible to *members of the public*, and
(b) specific containment provisions be established for the construction and operation of a *source* that may cause spread of *contamination* in areas accessible to the *members of the public*.

40. **Radiation and Environmental Monitoring.** – the *licensee* shall, if applicable, -

(a) establish and carry out a radiation monitoring programme sufficient to ensure that the requirements of the standards regarding *public exposure* to a source of external radiation be satisfied and assess such *exposure*;
(b) establish and carry out an efficient environmental monitoring programme in order to ensure the following conditions : --
  (i) compliance with the standards for discharging *radioactive material* to the environment;
  (ii) compliance with the requirements established by the *rules* in guarantying discharging authority;
  (iii) capability of estimating the *exposure* to *critical group* and validating the conditions assumed in deriving the *authorized limit*;
(c) keep appropriate records of the results of the radiation and environmental monitoring programmes;
(d) report a summary of the monitoring results to the *commission* at approved intervals ;
(e) inform immediately the *commission* of any significant increase in environmental radiation or *contamination* that might be attributed to the radiation beam or *radioactive* discharge from the *source* under his responsibility;
(f) establish and maintain a capability to carry out emergency radiation and environmental monitoring, in case of unexpected increase in radiation fields and *radioactive contamination* due to accidental or other unusual incidents affecting the *source* under his responsibility;
(g) verify the adequacy of the assumptions made for the prior assessment of radiological consequences of the discharges; and
(h) forward a copy of the report mentioned in rules 40.(d) &40.(e) to the Department of Environment.

41. Radionuclide Contamination Level in Food Item, Beverage and Fodder

41.1. Restriction. – no *person* shall import, store, process for marketing, sell or offer to sell any food item, beverage or fodder for consumption of poultry, fish or cattle, agricultural input like fertilizer and pesticides in which the *radioactive contamination* is more than the levels specified in schedule – XIII.

41.2. Requirement for Application. – no *person* shall apply to the Chief Controller of Import and Export for any import of food item, beverage, fodder or agriculture input unless he produces along with his application a certificate from the relevant authority of the country of origin showing that the radionuclide levels in the item are not exceeding than those specified in schedule – XIII.

41.3. Radioactivity Testing of Imported Food item. – the *commission* shall examine the *radioactivity levels* of all imported foods on payment of the fees by the importer specified in schedule – VIII.I(a) and by drawing samples in a manner stated in schedule – VIII.I(b).

41.4. Re-export of Contaminated item. – notwithstanding the certificate provided by the relevant authority of the exporting country, if upon testing, the sample is found to contain radioactivity exceeding the levels stated in schedule – XIII, the exporter shall be obliged to export the entire consignment of the said stock to the exporting country forthwith at his own cost.

42. **Consumer Product.** – a *person* may supply *consumer product* capable of causing *exposure* to radiation to the *members of the public*, if –

(a) such *exposure* is excluded from the *applicable standards*;
(b) such products meet the exemption requirements specified in schedule – I or have been exempted by the *commission*; or
(c) such products are authorized by the *commission* for the use by the *members of the public*.

Chapter VIII
Potential, Emergency and Chronic Exposures

43. **Responsibility.** – the *licensee* shall ensure the safety of the *source* including the installation under his responsibility and shall comply with the *applicable standards*.

44. Safety Analysis. –

(1) the *licensee* shall, as applicable, include the following matters in the safety analysis of the *practice* : -

(a) the nature and magnitude of a *potential exposure* and the likelihood of its occurrence;
(b) the *limits* and technical specifications for operation of the *source*;
(c) the ways by which the structure, system, component and procedure related to radiation protection or safety may fail, singly or combinedly or otherwise lead to *potential exposure*, and the consequence of such failure;

(d) the ways by which the radiation protection or safety may be affected due to changes in the environment;
(e) the ways by which operating procedures related to radiation protection or safety may be erroneous, and the consequences of such errors;
(f) the influence of any proposed modification on radiation protection and safety measures;
(g) the factors which may accelerate a substantial release of any *radioactive material* and measures available to prevent or control such a release, and the maximum *activity* of any *radioactive material* which, in the event of a major failure of the *containment*, may be released to the atmosphere;
(h) the factors which may accelerate a smaller but continuous release of any *radioactive material* and the measures available to prevent or control such a release;
(i) the factors which may give rise to the unintended operation of any radiation beam and the measures available to prevent, identify and control such occurrences ; and
(j) the extent to which redundant and diverse safety features, being independent of each other in such a way that failure of one does not result in the failure of any other, are appropriate in order to restrict the probability and magnitude of *potential exposure*.

(2) the *licensee*, notwithstanding the safety measures implemented in rule 44.(1), shall perform reanalysis independently and review in pursuant to the relevant quality assurance (QA) programme to ensure that the followings, as applicable, technical guidance and their specifications are being fulfilled :–

(a) when a significant modification to a *source* or its associate plant or its operating or maintenance procedures are envisaged;
(b) when operating experience, other information about accidents, failures, errors or other events that lead to *potential exposure* indicates that the existing analysis are invalid; and
(c) when any significant change to a *practice*, or any relevant change in guides or standards, are envisaged or have been carried out.

45. **Documentation of Safety Analysis**. – the *licensee*, shall document the safety analysis review.

46. **Prevention of Accidents and Mitigation of Their Consequences**. – the *licensee*, shall ensure that –

(1) any accident, occurrence or incident that may reasonably be foreseen in connection with the *source* or *practice* shall be prevented as far as practicable;
(2) the consequences of any accident, occurrence or incident that may reasonably be foreseen in connection with the *source* or *practice* shall be contained;
(3) the *worker* shall be provided with the necessary information, training and equipment;
(4) adequate procedures shall be ensured for the control of a *source* and of any potential accident that could reasonably be foreseen;
(5) regular inspection and testing of safety significant systems, components and equipment that may cause to abnormal conditions or inadequate performance are carried out;

(6) appropriate maintenance, inspection and testing procedures shall be carried out in order to maintain the safety and protection requirements without causing undue *occupational exposure*;

(7) an automatic system, as appropriate, shall be provided for safely stopping or reducing radiation output from the *source* in the event that the operating limits are exceeded; and

(8) quick information indicating monitoring system shall be installed to detect and rectify unusual operational conditions which may influence the safety system seriously.

47. **Investigation and Follow-up.** – the *licensee* shall conduct formal investigations as specified by the *rules*, if –

(a) an operating parameter related to radiation protection or safety exceeds an *investigation level* or is beyond the stipulated range of operating conditions; and

(b) any equipment failure, accident, error, mishap or other unusual event or circumstance occurs which has the potential to exceed any relevant radiation *limit* or operating restriction.

48. **Accident Management Preparedness.** – the *licensee* shall be prepared to take necessary action for responding to possible accident and operational problem involving a *source*.

49. **Emergency Exposure Situation.** – the *commission* will prepare and carry out appropriate emergency plan to determine the respective responsibilities of the *commission*, District Administration, Environment Directorate, other intervening organizations and the *licensee* in an emergency situation.

50. **Chronic Exposure Situation.** – the *commission* will plan appropriate steps and advise the Government to allocate responsibilities for the management of interventions in *chronic exposure situations*, among the *commission*, Government and local intervening organizations and the *licensees*.

Chapter IX
Operational Exposure Control

51. **General Information.** – the *licensee* shall be obligated to comply with the requirements of this chapter and other chapters of the *rules*, as applicable to him.

52. **Operational Requirement.** – the *licensee*, himself, shall conduct the operation of the *source* and may delegate certain specific tasks to others but in all cases shall ensure that –

(a) all operations are conducted in a manner consistent with the requirement of *applicable standards* ;

(b) clear lines of responsibility and accountability of protection and safety of the *source* throughout their operational lifetime and protection and safety organization, as appropriate, are established ;

(c) for any *source* under his control that has the potential to give rise to *exposure* at levels greater than those specified by the *rules* requiring a specific safety analysis are assessed and such assessment are kept up to date ;

(d) the likely consequence of any *potential exposure*, its magnitude and probability of occurrence, and the number of *person* who may be affected by it are assessed ;

(e) operating procedures that are subject to periodic review and updating under an adequate quality assurance (Q.A.) programme are maintained ;
(f) procedures for reporting and learning from accidents, occurrence and incidents are established ;
(g) arrangements for the periodic review of the overall effectiveness of the protection and safety measures are established ; and
(h) adequate maintenance, testing, inspection and servicing be carried out as needed are ensured so that the *source* remain capable of meeting its design requirements for protection and safety throughout its lifetime.

53. **Source Accountability.** – the *licensee* shall maintain an accountability system that includes the following records :-

(a) the location and description of each *source*; and
(b) the *activity* and form of each *radioactive* substance.

54. **Radiation Control Officer (RCO).** – a *licensee* or an employer shall designate with the approval of the *commission*, either himself or a qualified person in his employment as *Radiation Control Officer* for each of his *irradiation installation*.

54.1. Duty of Radiation Control Officer. – duties of *radiation control officer* are to –

(a) handle and apply safely the *radioactive material, nuclear material* and *irradiating apparatus* ;
(b) formulate the necessary radiation protection working procedures in respect to the *practice* leading to radiation *exposure* ;
(c) establish a system of physical surveillance of *radiation exposure* and *contamination* through adequate procedures and *practice* ;
(d) organize the *radiation* monitoring programme for routine and special monitoring ;
(e) instruct the *radiation workers* on hazards of *radiation* and on safety measures and *practices* to minimize *exposure* and *contamination* ;
(f) take all necessary steps to ensure that the operational *limits* are not exceeded ;
(g) organize the safe transport, storage and disposal of all *radioactive materials* including waste containing *radioactive material* in such a way as it conforms to the conditions specified by the *commission* ;
(h) make arrangements for testing and calibrating all monitoring instruments ;
(i) ensure that records are up-to-date ;
(j) ensure that the quality assurance of radiation monitoring programme is maintained ;
(k) investigate and initiate prompt and suitable *remedial actions* in respect to any situation that may cause radiation hazards ;
(l) ensure that the reports on all hazardous situations along with details of any immediate *remedial actions* taken are made available to the *licensee* immediately;
(m) control access of people, other than those involved in the work, to any area where *practice* involving radiation are being conducted ; and
(n) in the event of spillage of any *radioactive material* resulting in personnel, surface or airborne *contamination* –

(1) take steps to arrange for the immediate decontamination of the affected person ;

(2) take necessary steps to prevent further spreading of *contamination* ;
(3) take an immediate decontamination measure in an affected area ; and
(4) inform the *commission* immediately of the details of the accident and *remedial actions* initiated, if any.

54.2. Qualification of RCO. – the authorized *radiation control officer* shall have –

(a) the educational qualification and training approved by the *commission* to conduct his duty ;
(b) to be certified by the *commission* ; and
(c) to be retrained, if necessary.

55. Classification of Working Area

55.1 General Information. – the *licensee* shall classify the working areas into the following classes:-
(i) *controlled area*; and
(ii) *supervised area*.

55.2 Requirement. – the *licensee* shall, in pursuant to the *applicable standards* and *guides*, establish the *controlled area* and the *supervised area*, and ensure that –

(a) the *supervised* and *controlled areas* are clearly demarcated and radiation warning signs bearing the radiation symbols prescribed in schedule – XVI are conspicuously posted in strategic places ;
(b) the notices shall be in Bangla and in English, if necessary ;
(c) operating instructions relevant to the *supervised* and the *controlled areas* are posted conspicuously in strategic places ;
(d) no *person* shall enter into a *controlled area* unless he has been assigned to the area or has been authorized to enter into the area ; and
(e) every *person* who has been given access to the *supervised* and the *controlled areas* shall comply with the prevailing instructions applicable for such areas.

56. Monitoring and Surveillance of Controlled and Supervised Areas

56.1. Monitoring Programme. – the *licensee* shall establish area monitoring programme in *supervised area* and *controlled area* as per *applicable standards*.

56.2. Requirement of Monitoring Programme. – the *licensee* shall include the following factors in the area monitoring programme : -

(a) the assessment of external radiation levels at all appropriate locations ;
(b) the assessment of levels of *radioactive* contamination at all appropriate locations ; and
(c) the assessment of radiation risks associated with the accident and emergency situations.

56.3. Period of Monitoring. – the *licensee* shall carry out area monitoring periodically and whenever there are changes in the processes or equipment which are likely to result in changes *exposure* situations.

56.4. Review of Monitoring Programme. – the *licensee* shall review the area monitoring programme periodically in the light of experience and also in the event of any major modifications carried out to the installation or *practice*.

57. **Monitoring and Surveillance of the Environment.** – the *licensee* shall ensure that the surveillance programme for the environment shall include the following :-

(a) compliance with the *authorized limits* ;
(b) assessment of *potential exposure* of *members of the public* from the *source* under consideration ;
(c) evaluation of trends of *exposure* levels in the environment ;
(d) monitoring of the *source*, environmental pathways and the *critical group* and the pre-operational studies ; and
(e) appropriate maintenance of the records of the measurements of external *exposure* and radioactive *contamination* and the estimates of *doses* received by the population.

58. Personnel Monitoring in Controlled Area

58.1. Requirement. – the *licensee* shall carry out *personnel monitoring* of all workers in a *controlled area*.

58.2. External Exposure. -- the *licensee* shall measure routinely the *doses* received by each *person* working in *controlled area* from *external exposure*.

58.3. Internal Exposure. – the *licensee* shall evaluate the *doses* received from internal *exposure* as per *applicable standard*.

58.4. Frequency of Assessment. – the *licensee* shall –

(a) pursue the frequency of assessment of internal and external *exposure* stated in rules 58.2 and 58.3 as fixed by the *commission* ; and
(b) conduct immediate assessment if it appears that a worker received sudden or accidental *exposure* or intakes *radioactive material* or *prescribed substance* as an outcome of an accident.

59. Exposure Record

59.1 Exposure Record of a Worker. – the *licensee*, in case of *exposure* record of a worker, shall–

(a) collect the *exposure* record of a worker while appointing him as a *radiation worker* and in such cases the former employer shall supply the *exposure* record of the worker upon requested by the *licensee* ; and
(b) record *doses* received by a worker during normal operation, planned special *exposure* and *accidental* and *emergency exposure* together but these shall be distinguishable.

59.2. Record-Keeping Procedure. – the *commission* may provide record-keeping procedures for keeping records of *exposure* of workers who work in *controlled areas* under different *licensees*.

60. **Personnel Monitoring Result.** – the *licensee* shall inform each worker, in writing, of the worker's personal monitoring result and the status of radiation *exposure* not later than 30 (thirty) days from the date the result is available.

61. **Retention of Personnel Monitoring Result.** – the *licensee* shall retain *personnel monitoring* result and shall take into account the following steps for its retention : -

(a) in the case *exposure* where the *annual dose limits* are exceeded, the *licensee* shall submit the *personnel monitoring* result to *approved registered medical practitioner* who shall interpret their implications to the health of the concerned worker ;
(b) when a worker occupationally receives an abnormal *exposure* exceeding twice the *annual dose limit* the *licensee* shall ensure that such worker undergoes a medical review by the *approved registered medical practitioner* ; and
(c) whenever an *accident* or emergency occurs, the *licensee* shall ensure that the results of *personnel monitoring* are submitted to the *approved registered medical practitioner* immediately.

62. **Abnormal Exposure**

62.1. Duty During Abnormal Exposure. – in case of an abnormal *exposure*, the *licensee* shall –

(a) investigation. – carry out an investigation as per *applicable standards* and *guides* to determine the circumstances in which the excess *exposure* occurred or is suspected to have occurred; and
(b) notification. – notify the *commission* of all *accidental* and *emergency exposures* within 24(twenty four) hours after such *accidental* and *emergency exposures*.

62.2. Report. – the *licensee* shall submit to the *commission* a written report on all *accidental* and *emergency exposures* within 30(thirty) days after such an exposure and such report shall contain, as appropriate, the followings : -

(a) detail information on time, date and place of occurrence ;
(b) the results of investigation ;
(c) a description of the material involved, including its kind and quantity, and its chemical and physical forms ;
(d) the result of the *dose* assessment of the individuals exposed or likely to have been exposed and a description of the circumstances under which the *exposure* might have been received ;
(e) the result of the preliminary environmental assessment ;
(f) a description of the actions which have been taken, or will be taken, to control any potential hazard arising from the occurrence ;
(g) a description of the procedures or measures which have been adopted or will be adopted to prevent the recurrence of such *exposure* ;
(h) any other information which the *licensee* deems necessary ; and
(i) the *licensee* shall forward a copy of the report to the Department of Environment .

63. **Prohibition on Employment of a Worker**. – the *licensee* shall not employ a *person* as *radiation worker* if the latter is found medically unfit to be a *radiation worker*.

64. **Condition of Service**

64.1. Restriction for a Person Age Below 16. – no *person* or *licensee* shall employ a worker of age less than 16 years in a place where the latter likely to have been exposed occupationally.

64.2. Restriction for a Person Age Between 16 - 18 years. – no *person* or *licensee* shall permit a person aged between 16 - 18 years in a *controlled area* except for the purpose of training only and in such case the work shall be done under appropriate supervision.

65. **Pre-Employment Medical Examination**

65.1. Requirement. – the *licensee* shall undergo pre-employment medical examination of every *person* who is to be employed in a *supervised* or *controlled area.*

65.2. Content. – a pre-employment medical examination mentioned in the rule 65.1 shall include an inquiry into the *person's* medical history including all known previous *exposures* to radiation resulting either from his previous employment or from previous medical examination or treatment or both, and shall also include any clinical or other investigations which may be necessary to determine his general state of health.

66. **General Health Surveillance.** – the *licensee* shall ensure that an *approved registered medical practitioner* is given access to the working premises and to any information which such *approved registered medical practitioner* may require in order to ascertain the state of health of the worker under surveillance.

67. **Periodic Review of Health**

67.1. Requirement. – the *licensee*, unless mentioned otherwise in the *licence*, shall ensure that health of a worker is reviewed in every two years to determine whether such worker remains fit to perform his duties.

67.2. Period of Surveillance. – the frequency of the periodic reviews of health provided by the *licensee* mentioned in rule 67.1 shall depend on type and extent of *exposure* to radiation and on the individual worker's state of health.

67.3. Time Limit. – the *licensee*, notwithstanding mentioned in the *rules*, shall make arrangement to review the state of health of a worker at least once in five years for a worker in a *supervised area*, once in two years for a worker in a *controlled area* and more frequently if the worker's *exposure* conditions and the state of health so require.

68. **Medical Examination at Termination of Employment or Retirement**

68.1 Requirement. – the *licensee* shall make arrangement for medical examination of every worker at the termination of employment or retirement and such medical examination shall be carried out by an *approved registered medical practitioner* who shall indicate, based on his examination of the worker, whether the medical surveillance of the worker is required to be continued after the termination of employment or retirement.

68.2 Period of Surveillance. – the *licensee* shall continue, as deem necessary, the surveillance of a worker after the termination of employment or retirement as per the result of the medical examination mentioned in rule 68.1 in order to safeguard the health of the concerned worker.

69. **Medical Supervision.** – the *licensee*, where occupationally related radiation induced diseases of a worker is suspected, shall provide medical supervision as appropriate.

70. **Authority of an Approved Registered Medical Practitioner.** – an *approved registered medical practitioner* shall have the following authorities : --
(a) to declare a worker temporarily unfit for his normal duties ;
(b) to advise the *licensee* to reinstate such a worker in his normal duties ; and
(c) to advise the *licensee* to transfer the worker to other duties.

71. **Payment of Medical Expense.** – the *licensee* shall provide all necessary expenses in relating to medical examination and treatment of worker.

72. **Special Medical Examination.** – the *licensee* shall provide special medical examination for the workers who have received *doses* exceeding the *limits* stated in the *rules*.

73. **Contingency Provision for Health Care of Worker.** – the *licensee*, in addition to periodic reviews of health and special medical examination stated in the *rules*, shall make contingency provisions to enable further examination or decontamination measures or urgent remedial treatment to be undertaken as considered necessary by an *approved registered medical practitioner*.

74. **Worker to be Informed of Conclusion of Medical Examination.** – where an *approved registered medical practitioner* carries out any medical examination on a worker, he shall inform the worker of the conclusions derived from such medical examination.

75. **Maintenance of Medical Record of Worker**

75.1. Requirement. – the *licensee* shall retain the medical record of each worker appropriately as per the requirement of the *rules*.

75.2. Content of Medical Record. – the medical record of a worker to be documented by the *licensee* shall include the followings : --
(a) general information of a worker exposed to radiation, and the type of radiation involved ;
(b) the results of pre-employment medical examination ;
(c) *doses* received during normal operation and planned special *exposure* ;
(d) potential *exposure* and during *accidental* and *emergency exposures* ;
(e) radiation *exposure* history for a worker who has worked in *controlled areas* under different *licensees* ; and
(f) the results of medical examinations at the termination of employment or retirement.

75.3. Confidentiality. – the medical record of a worker is confidential and every *person* who has access to it shall maintain the confidentiality of the record.

75.4. Period of Retention. – the *licensee* shall keep the medical record of a worker for a period of 30 (thirty) years after the termination of his employment or retirement or till attaining 70(seventy) years of age; after which the *licensee* shall transfer the record to the *commission*.

75.5. Transfer of Record. – the *licensee* shall transfer the medical records of his workers to the *commission* as per rule 75.4 or after exemption from his licensed responsibility.

75.6. Special Case. – notwithstanding rules 75.4 and 75.5, where a *licensee* ceases his operations and another *licensee* takes over the operation, the former *licensee* shall transfer all medical records of the workers to the new *licensee*.

75.7. Level of Recording. – the *licensee* shall establish recording levels, *investigation levels* and *intervention levels*, where appropriate, and such levels shall be subjected to the approval of the *commission*.

75.8. Recording Requirement. – the *licensee* shall record all values at or above the recording level.

76. **Operational Limit.** – the *licensee* shall establish operational *limits* which shall be subjected to the approval of the *commission*.

77. **Emergency Response Plan**

77.1. Requirement. – the *licensee* shall establish, in pursuant to *applicable standards*, an emergency response plan to deal with every foreseeable emergency.

77.2. Approval of Emergency Response Plan. – every emergency response plan mentioned in rule 77.1 shall be subjected to the approval of *commission*.

77.3. Contents of Emergency Response Plan. – an emergency response plan, as appropriate, shall include, among others, the followings : -

(a) an emergency organization ;
(b) an outline of the lines of communication with the appropriate authority and relevant public authorities ;
(c) a classification of emergencies ;
(d) measures to be taken during an emergency ;
(e) actions to be taken subsequent to the emergency ;
(f) the *intervention levels* for different emergency situations ; and
(g) a list and description of the equipment necessary for the use during an emergency; etc.

78. **Training**

78.1. Requirement. – the *licensee* shall ensure that every worker is –

(a) informed of the potential health risks involved in his job;
(b) instructed about the precautions to be taken; and
(c) given appropriate training on radiation protection relevant to his duties.

78.2. Retraining. – the *licensee* shall provide appropriate, if necessary, retraining and facilities for updating the skills and knowledge of the workers.

79. **Protective Measure, Device and Instrument.** – the *licensee* shall ensure that all protective measures, devices and instruments are in good working condition as per the requirement of the *rules*.

80. Control of release

80.1. Limit for Release. – the *commission* shall specify the *limit* for release as per the requirement of the *applicable standard*.

80.2. Conditions for Release Limit. – the *licensee*, while complying the release *limit*, shall take into consideration the following information :-

(a) the results of pre-operational environmental monitoring conducted for a period of not less than twelve months;
(b) the critical pathways;
(c) the *critical groups* of the population; and
(d) assessment of the radiation *exposure* to *members of the public* resulting from the release.

80.3. Effluent Monitoring. – the *licensee* shall determine the quantity of effluent and keep proper accounting of and *radioactive material, nuclear material* and prescribed substance discharged.

80.4. Complementary Monitoring. – the *licensee* shall complement effluent monitoring as per the manner directed by the *commission*.

81. **Protection of Licensed Material**. – the *licensee* shall take appropriate measures to protect all *radioactive materials, nuclear materials, prescribed substances, irradiating apparatus* and facilities to prevent theft or sabotage.

82. Notification of Theft and loss

82.1. Requirement. – the *licensee*, upon discovering any theft or loss of material mentioned in rule 81, shall –

(a) notify the *commission* of such theft or loss within 24 hours ; and
(b) submit a complete report of the theft or loss to the *commission* within 30 days.

82.2. Content of Report. – the report to be submitted by the *licensee* mentioned in 82.1(b) shall contain the followings : -

(a) a description of the licensed apparatus, substance or material used, including its kind, quantity and its chemical and physical forms, as appropriate ;
(b) a description of the circumstances under which the loss or theft occurred ;
(c) a statement of the whereabouts or probable whereabouts of the licensed apparatus, substance or material used ;
(d) the possible radiation *exposure* to individual, circumstances under which the *exposure* might have occurred, and the extent of potential hazard to *members of the public* ;

(e) the actions which have been taken, or will be taken, to recover the licensed apparatus, substance, or material ;
(f) the procedures or measures which have been or will be adopted to prevent a recurrence of the loss or theft of the licensed apparatus, substance or material ; and
(g) any other information which the *licensee* deems necessary.

83. Responsibility of a worker

83.1. General Information. – every worker –

(a) shall follow all instructions, rules and procedures issued by the *licensee* and refrain from careless and reckless practices or actions that might result unnecessary *exposure* to himself or to his fellow workers ;
(b) shall use, as instructed, all facilities, devices and protective equipment provided by the *licensee* to *limit* any possible *exposure* ;
(c) shall use approved *personnel monitoring* devices provided by the *licensee* for assessing *exposure* ;
(d) shall not interfere with, remove, alter or displace any safety device or other equipment furnished for his protection or the protection of others, or interfere with any method or process adopted for the control of *exposure* to radiation ; unless duly authorized and shall take all reasonable precautions to prevent damage to such equipment and to keep it in a good operating condition ;
(e) shall report immediately about all *accidental exposures* or intakes or any suspected *exposure* or intake of *radioactive material, nuclear material* or *prescribed substance* to his supervisor or the *radiation control officer* ;
(f) shall report immediately about any damage or malfunction of any safety equipment to his supervisor or the *radiation control officer* ; and
(g) shall report suspected pregnancy at the earliest knowledge, to the employer or to an *approved medical practitioner.*

83.2. Special Condition. – the notification of pregnancy shall not be considered a reason to exclude a female worker from work; however, the *licensee* shall adapt the working conditions of a female worker who has notified pregnancy with respect to *occupational exposure*, in order to ensure that the embryo or fetus be afforded the same broad level of protection as required by the *members of the public.*

84. **Co-operation between Employer and Licensee.** – the employer (where different from the *licensee)* and the *licensee* shall, for the sake of control, safety, the operation of radiological health surveillance and for the *dose* assessment programmes, –

(a) provide each other such necessary information of their past and current work as are relevant to ensure effective and comprehensive protection and safety;
(b) abstain from any willful action that may put themselves or others in a situation that may contravene the requirements stated by the *rules*; and
(c) adopt such information, instruction and training concerning protection and safety as will enable them to conduct their work in accordance with the requirements of the *applicable standards.*

85. **Report.** - the *licensee* shall supply the following information, as applicable, to the *commission* according to the latter's requirements : -

(a) area monitoring ;
(b) environmental monitoring ;
(c) effluent monitoring ;
(d) *accidental* and *emergency exposure*;
(e) operational procedures, instructions and manuals ;
(f) *personnel monitoring* ;
(g) training programmes ;
(h) physical protection measures ;
(i) a report by *approved registered medical practitioners* ;
(j) an emergency response plan ; and
(k) other reports and records which the *commission* deems necessary.

Chapter X
Transportation of Radioactive Material and Waste Management

86. Transportation of Radioactive Material

86.1. General Requirement. – the *licensee* shall comply with the requirements of the *IAEA* safety series No 6 as amended in 1990, and other *applicable standards* stated in schedule – IX for the safe transportation of *radioactive materials* and *radioactive wastes*.

86.2. Information to Commission.- the *licensee* shall provide the *commission* with the required information as specified in the *licence* before the transportation of any consignment of *radioactive material, nuclear material* or any *prescribed substance* and their waste at least 30 (thirty) days prior to the scheduled date of transportation of the same.

86.3. Other Applicable Rules. – the *licensee* and the vehicle shall comply with all other applicable transportation rules and regulations enforced by the Government from time to time.

87. **Radioactive Waste Management.** – the *licensee* –

(1) shall comply with the following requirements for *radioactive waste* management :–
  (a) the requirements of the applicable safety series published under the *IAEA* Radwass Programme ;
  (b) *activity* and volume of any *radioactive waste* that results from the *source* for which they are responsible be kept to the minimum practicable ;
  (c) the waste be collected, transported, stored and disposed of, in accordance with the requirements of the *applicable standards*; and
  (d) segregate, and treat separately if appropriate, different types of *radioactive waste* where warranted by differences in factor, such as radionuclide content, half-life, concentration, volume and physical and chemical properties, taking into account the available options for waste disposal ; and

(2) shall not dispose of licensed material without the approval of the *commission*.

Chapter XI
Bangladesh / IAEA / International and Bilateral Agreements

88. **Bangladesh – IAEA Agreement.** – each *person* shall comply with the requirements, as applicable, of the following agreements and conventions signed between the government and the *IAEA* : –

(a) Non Proliferation Treaty – 1979, (Convention on Physical Protection of Nuclear Materials) and the Subsidiary Safeguards Arrangements signed under this instrument for a particular facility ;
(b) the Convention on Early Notification of a Nuclear Accident – 1986 ;
(c) the Convention on Assistance in the Case of Nuclear Accident or Radiological emergency – 1986 ;
(d) the Convention on Nuclear Safety – 1996 ; and
(e) any other Convention or treaty which may be signed between the government and the *IAEA*.

89. **Bangladesh – USA Agreement.** – each *person*, as applicable, shall comply with the requirements of Bangladesh – USA agreement on Peaceful Uses of Atomic Energy – 1980.

90. **Other Agreements.** – each *person* shall comply with the requirements, as applicable, of any other bilateral and international agreement that may be signed between the government and a state or an international agency.

Chapter XII
Enforcement

91. Inspection

91.1. Objective. – the *commission* shall, in order to verify compliance with the *rules* and licensed conditions or any actions under the scope of the *rules*, conduct inspections by a *person* duly authorized by it.

91.2. Type and Frequency of Inspection. - the inspection may either be announced or unannounced, the frequency of inspection will be decided by the *commission* depending on the nature of the *practice* and its performances.

91.3. Appointment of Inspector. – the *commission* vide section 8 of the *Act* may appoint –

(a) one or more inspector(s) for enforcing different provisions of the *rules* and licensed conditions ; and
(b) one or more inspector(s) may be designated for a particular facility, a geographical or an administrative area or for a specific purpose to be specified by the *commission*.

91.4. Duty of the Inspector. – an inspector shall –

(a) carry with him a valid identity card showing such designation and a document of his accrediting to a facility located within a geographical or an administrative area, issued by the *commission* and if necessary, he shall show the identity card to a *person* authorized by the facility and also be obliged to produce, on demand, the identity card to the representative of the law enforcing agencies ; and

(b) send a report immediately to the *commission*, if during an inspection, he comes to the conclusion that any condition of any *licence* is being violated or will be violated, and shall mention in the said report if any harm is caused to the personnel exposed to radiation, the public health or property or environment or if there is any apprehension of such harm due to violation of the conditions as aforesaid.

91.5. Power of Inspector. – an inspector –

(a) may, in order to verify that the rules and conditions of the *licence* are being properly complied with, enter into any place, house, premise or vehicle and may conduct inspection and investigation ;
(b) may, in order to verify that the nuclear safety conditions, *limits* and *doses or* ionizing radiation are being complied with, collect related documents, equipment or materials or their samples for analysis and may demand necessary information form the *person(s)* concerned ; and
(c) may direct the *licensee* to take necessary measures in order to ensure the safety of the public health, property and environment as per the provisions of the *rules*.

91.6. Assistance to Inspector. – a *licensee* or any other *person* acting on his behalf shall permit inspection without any hindrance by the authorized inspector of the *commission*, of his records, information, premises, areas, activities of licensed materials in possession or use, any matters related to *licence* or *licensee* issued at different stages and shall extend assistance to collect samples as may be necessary to implement the *rules*.

91.7. Power to Demand Certain Record. – the *commission*, in order to verify or assess, may demand all relevant records which may have been maintained by any person prior to the enforcement of the *rules*.

91.8. Violation. – failure to comply with the requirements of the *rules* shall be considered as a violation and such failures shall include the followings : -

(a) failure or delay in providing the required assistance to an inspector ;
(b) willful or attempted breach or conspiracy to breach any of the applicable requirements of the standards ;
(c) failure to comply with the applicable *dose* and *operational limits* and conditions of the *licence* ;
(d) failure to report within the specified time frame required by the *rules* ;
(e) willful concealment of the pertinent information ; and
(f) reporting of false information.

91.9. Cancellation of Licence. – based on the report of an inspector or on receiving information or otherwise if the *commission* is of the opinion that a *person* has violated any of the requirements mentioned in rule 7, or it apprehends that the operation of a facility or device may cause harm to the workers, or the *members of public* or to the environment, the *commission* may, vide section 9 of the *Act* –

(a) direct as deemed appropriate, the concerned *person* to comply with the conditions properly and take appropriate *remedial actions* ;

(b) direct as deemed appropriate, the concerned *person* to stop the activities of the *licence* subject to taking necessary remedial measures to ensure safety of health, property and environment ;
(c) cancel the *licence* after giving an opportunity of showing cause to the accused *licensee*; and
(d) refer the matter to the court of law vide sections 13 of the *Act*.

92. **Appeal.** – if a *person* is aggrieved due to the cancellation of his *licence*, he may appeal to the government within 30 (thirty) days of receipt of the order of cancellation of *licence* and the decision of the government in response to the appeal shall be final.

93. **Intervention.** – in order to avert public *dose* from the consequence of an *accident* or in *chronic exposure* situations the *commission* may intervene and take appropriate action and while taking such action the following principles shall be followed : -

(a) the proposed intervention shall do more good than harm ;
(b) the form, scale and duration of the intervention shall be optimized so that the net benefit is maximized and the intervention should be flexible and modified according to the specific circumstances of the intervention situation ; and
(c) in a nuclear or radiation emergency, *applicable standards* will be followed as far as practicable.

94. Emergency Rectification Measure

94.1. Requirement. – if it appears to the *commission* on the basis of any information received or result of any investigation that the radiation *dose* level in any place is dangerous to the people, animal, property or environment of that place, it shall inform the Department of Environment (DoE) of the matter and, if necessary, through notification, issue the following instructions : -

(a) for removal of *person*, animals or properties from that place; and
(b) for destruction of the animals or properties contaminated with radioactivity, within the period specified in such notification.

94.2. Power to Act. – the Deputy Commissioner or any other authority empowered by the government may take steps to implement the instructions of such notification and, if necessary, may apply reasonable force as and when any *person* fails or neglects to comply with the instructions of the *commission* within the time mentioned in the notification under rule 94.1.

94.3. Restriction of Entry. – no *person* shall enter into the place specified in rule 94.1 without the permission of the Deputy Commissioner, unless the *commission* orders otherwise and in case a *person* enters into the place or tries to enter into it, he shall be ousted from the place, by the order of the Deputy Commissioner, if necessary, by applying force.

94.4. Immunity from Legal Claim. – if a *person* is affected as a consequence of the actions taken under the *rules*, he cannot claim any compensation for it from the *commission*, Deputy Commission or official, or employee of the Government or the commission.

95. **Offence and Penalty.** – any *person* who violates or contravenes any of the provisions of the *rules* or any of the terms and conditions of *licence* issued hereunder shall be punishable as provided under sections 11 and 12 of the *Act*.

96. Disposal Order by the Court

96.1. Disposal of Confiscated Material. – if a person is convicted by the court of an offence under the *Act* which was committed in respect of *radioactive material, nuclear substance, irradiation apparatus*, and the court passes an order for such *radioactive material, nuclear substance, radiation apparatus*, contaminated food item, beverage, fodder or agricultural input to be handed over to the *commission* for safe disposal and the *commission* shall dispose of the same as prescribed in the *rules*.

96.2. Re-export of Confiscated Material. – notwithstanding the order passed by the court as mentioned in rule 96.1 the *commission*, if it finds that disposal of such contaminated items are not permissible from the point of view of nuclear safety or radiation protection or are likely to cause damage to the public, animal life, plant life or the environment, it may file a petition with the Court, or a higher court, for passing an order on a defaulter forcing him to send the contaminated food item, beverage, fodder or agricultural input back to the country of origin.

96.3. Acceptance for Trial. – no court shall entertain any offence under the *rules* for trial unless a written complaint is submitted to it by the inspector(s) vide section 13 of the *Act*.

97. **Compensation.** – the *commission* has the power to fix and award compensation to a *person* affected by an incident or *accident* related to radiation.

98. **Indemnity.** – no suit, prosecution or other legal proceeding shall be filed against the government or the *commission* or any of its member, inspectors, Deputy Commissioner, or any *person* authorized under this *Act* for anything done or intended to be done in good faith under the *Act* and the *rules*.

99. **Authenticity.** – both the Bengali and English texts of the *rules* shall be treated as authentic provided that in the event of conflict between the Bengali and English text, the Bengali text in general, except for the words originated from English (for which English meaning shall prevail), shall prevail.

CHAPTER-XIII – SCHEDULE

SCHEDULE -I

Exemption Criteria

(I.1) *Practices* and *sources* within *practices* may be *exempted* from the requirements of the Standards, including those for *notification, registration or licensing*, if the *Regulatory Authority* is satisfied that the *sources* meet the *exemption* criteria or the *exemption* levels specified in this schedule or other *exemption* levels specified by the *Regulatory Authority* on the basis of these *exemption* criteria. *Exemption* should not be granted to permit practices that would otherwise not be justified.

(I.2) The general principles for *exemption*[1] are that :

(a) the *radiation risks* to individuals caused by the *exempted practice* or *source* be sufficiently low as to be of no regulatory concern;

(b) the collective radiological impact of the *exempted practice* or *source* be sufficiently low as not to warrant *regulatory* control under the prevailing circumstances; and

(c) the *exempted practices* and *sources* be inherently safe, with no appreciable likelihood of scenarios that could lead to a failure to meet the criteria in (a) and (b).

(I.3) A *practice* or a *source* within a practice may be *exempted* without further consideration provided that the following criteria are met in all feasible situations:

(a) the *effective dose* expected to be incurred by any *member of the public* due to the *exempted practice* or *source* is of the order of 10 uSv or less in a year; and

(b) either the *collective effective dose* committed by one year of performance of the *practice* is no more than about 1man.Sv or an assessment for the optimization of *protection* shows that *exemption* is the optimum option.

Exempted Sources and Exemption Levels

(I.4) Under the criteria in paragraphs (I.1)-(I.3), the following *sources* within *practices* are automatically *exempted* without further consideration from the requirements of the Standards, including those for *notification, registration or licensing* :

(a) *radioactive substances* for which either the total activity of a given nuclide present on the premises at any time or the *activity* concentration used in the *practice* does not exceed the *exemption* levels given in Schedule-II; and

1 See, International Atomic Energy Agency: Principles for the Exemption of Radiation Sources and Practices from Regulatory Control , Safety Series No. 89, IAEA, Vienna (1988).

(b) *radiation generators* of a type *approved* by the *Regulatory Authority* and any electronic tube, such as, a cathode ray tubes for the display of visual images, provided that :

(i) they do not cause in normal operating conditions an *ambient dose equivalent* rate or a directional *dose equivalent* rate, as appropriate, exceeding $1 uSv.h^{-1}$ at a distance of 0.1 m from any accessible surface of the apparatus; or

(ii) the maximum energy of the *radiation* produced is no greater than 5 keV.

(I.5) Conditional *exemptions* may be granted subject to conditions specified by the *Regulatory Authority*, such as conditions relating to the physical or chemical form and to the use or disposal of the radioactive materials. In particular, such an *exemption* may be granted for an apparatus containing radioactive substances not otherwise *exempted* under (I.4)(a) provided that:

(a) it is of a type approved by the *Regulatory Authority*;

(b) the radioactive substances are in the form of *sealed sources* that effectively prevent any contact with radioactive substances or their leakage except that this should not prevent *exemption* of small quantities of *unsealed sources* such as those used for radioimmunoassay;

(c) in normal operating conditions it does not cause an ambient dose equivalent rate or a directional dose equivalent rate, as appropriate, exceeding $1 uSv.h^{-1}$ at a distance of 0.1 m from any accessible surface of the apparatus; and

(d) necessary conditions for disposal have been specified by the *Regulatory Authority*.

(1.6) Radioactive substances from an *authorized practice* or *source* whose release to the environment has been *authorized*, are *exempted* from any new requirements of *notification*, *registration* or *licensing* unless otherwise specified by the *Regulatory Authority*.

Schedule - II

EXEMPTION LEVELS: EXEMPT ACTIVITY CONCENTRATIONS AND EXEMPT ACTIVITIES OF RADIONUCLIDES (ROUNDED) *(see footnote 2.)*

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
H-3	1×10^{6}	1×10^{9}	Fe-52	1×10^{1}	1×10^{6}
Be-7	1×10^{3}	1×10^{7}	Fe-55	1×10^{4}	1×10^{6}
C-14	1×10^{4}	1×10^{7}	Fe-59	1×10^{1}	1×10^{6}
O-15	1×10^{2}	1×10^{9}	Co-55	1×10^{1}	1×10^{6}
F-18	1×10^{1}	1×10^{6}	Co-56	1×10^{1}	1×10^{5}
Na-22	1×10^{1}	1×10^{6}	Co-57	1×10^{2}	1×10^{6}
Na-24	1×10^{1}	1×10^{5}	Co-58	1×10^{1}	1×10^{6}
Si-31	1×10^{3}	1×10^{6}	Co-58m	1×10^{4}	1×10^{7}
P-32	1×10^{3}	1×10^{5}	Co-60	1×10^{1}	1×10^{5}
P-33	1×10^{5}	1×10^{8}	Co-60m	1×10^{3}	1×10^{6}
S-35	1×10^{5}	1×10^{8}	Co-61	1×10^{2}	1×10^{6}
Cl-36	1×10^{4}	1×10^{6}	Co-62m	1×10^{1}	1×10^{5}
Cl-38	1×10^{1}	1×10^{5}	Ni-59	1×10^{4}	1×10^{8}
Ar-37	1×10^{6}	1×10^{8}	Ni-63	1×10^{5}	1×10^{8}
Ar-41	1×10^{7}	1×10^{9}	Ni-65	1×10^{1}	1×10^{6}
K-40	1×10^{2}	1×10^{6}	Cu-64	1×10^{2}	1×10^{6}
K-42	1×10^{2}	1×10^{6}	Zn-65	1×10^{1}	1×10^{6}
K-43	1×10^{1}	1×10^{6}	Zn-69	1×10^{4}	1×10^{6}
Ca-45	1×10^{4}	1×10^{7}	Zn-69m	1×10^{2}	1×10^{6}
Ca-47	1×10^{1}	1×10^{6}	Ga-72	1×10^{1}	1×10^{5}
Sc-46	1×10^{1}	1×10^{6}	Ge-71	1×10^{4}	1×10^{8}
Sc-47	1×10^{2}	1×10^{6}	As-73	1×10^{3}	1×10^{7}
Sc-48	1×10^{1}	1×10^{5}	As-74	1×10^{1}	1×10^{6}
V-48	1×10^{1}	1×10^{5}	As-76	1×10^{2}	1×10^{5}
Cr-51	1×10^{3}	1×10^{7}	As-77	1×10^{3}	1×10^{6}
Mn-51	1×10^{1}	1×10^{5}	Se-75	1×10^{2}	1×10^{5}
Mn-52	1×10^{1}	1×10^{5}	Br-82	1×10^{1}	1×10^{6}
Mn-52m	1×10^{1}	1×10^{5}	Kr-74	1×10^{2}	1×10^{9}
Mn-53	1×10^{4}	1×10^{9}	Kr-76	1×10^{2}	1×10^{9}
Mn-54	1×10^{1}	1×10^{6}	Kr-77	1×10^{2}	1×10^{9}
Mn-56	1×10^{1}	1×10^{5}	Kr-79	1×10^{3}	1×10^{5}

(cont.)

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Kr-81	1×10^4	1×10^7	Te-97	1×10^3	1×10^8
Kr-83m	1×10^5	1×10^{12}	Te-97m	1×10^3	1×10^7
Kr-85	1×10^5	1×10^4	Te-99	1×10^4	1×10^7
Kr-85m	1×10^3	1×10^{10}	Te-99m	1×10^2	1×10^7
Kr-87	1×10^2	1×10^9	Ru-97	1×10^2	1×10^7
Kr-88	1×10^2	1×10^9	Ru-103	1×10^3	1×10^6
Rb-86	1×10^2	1×10^5	Ru-105	1×10^3	1×10^6
Sr-85	1×10^2	1×10^6	Ru-106*	1×10^2	1×10^5
Sr-85m	1×10^2	1×10^7	Rh-103m	1×10^4	1×10^8
Sr-87m	1×10^2	1×10^6	Rh-105	1×10^2	1×10^7
Sr-89	1×10^3	1×10^6	Pd-103	1×10^3	1×10^8
Sr-90*	1×10^2	1×10^4	Pd-109	1×10^3	1×10^6
Sr-91	1×10^3	1×10^5	Ag-105	1×10^3	1×10^6
Sr-92	1×10^3	1×10^5	Ag-110m	1×10^1	1×10^6
Y-90	1×10^3	1×10^5	Ag-111	1×10^3	1×10^6
Y-91	1×10^3	1×10^6	Cd-109	1×10^4	1×10^6
Y-91m	1×10^2	1×10^6	Cd-115	1×10^3	1×10^6
Y-92	1×10^3	1×10^5	Cd-115m	1×10^3	1×10^6
Y-93	1×10^3	1×10^5	In-111	1×10^3	1×10^6
Zr-93*	1×10^3	1×10^7	In-113m	1×10^2	1×10^6
Zr-95	1×10^3	1×10^6	In-114m	1×10^2	1×10^6
Zr-97*	1×10^3	1×10^5	In-115m	1×10^2	1×10^6
Nb-93m	1×10^4	1×10^7	Sn-113	1×10^3	1×10^7
Nb-94	1×10^1	1×10^6	Sn-125	1×10^3	1×10^5
Nb-95	1×10^1	1×10^6	Sb-122	1×10^2	1×10^4
Nb-97	1×10^1	1×10^6	Sb-124	1×10^1	1×10^6
Nb-98	1×10^1	1×10^5	Sb-125	1×10^2	1×10^6
Mo-90	1×10^1	1×10^6	Te-123m	1×10^2	1×10^7
Mo-93	1×10^3	1×10^8	Te-125m	1×10^2	1×10^7
Mo-99	1×10^2	1×10^6	Te-127	1×10^3	1×10^6
Mo-101	1×10^1	1×10^6	Te-127m	1×10^3	1×10^7
Tc-96	1×10^1	1×10^6	Te-129	1×10^2	1×10^6
Tc-96m	1×10^3	1×10^7	Te-129m	1×10^3	1×10^6

(cont.)

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Te-131	1×10^{2}	1×10^{5}	Ce-143	1×10^{2}	1×10^{6}
Te-131m	1×10^{1}	1×10^{6}	Ce-144*	1×10^{2}	1×10^{5}
Te-132	1×10^{2}	1×10^{7}	Pr-142	1×10^{2}	1×10^{5}
Te-133	1×10^{1}	1×10^{5}	Pr-143	1×10^{4}	1×10^{6}
Te-133m	1×10^{1}	1×10^{5}	Nd-147	1×10^{2}	1×10^{6}
Te-134	1×10^{1}	1×10^{6}	Nd-149	1×10^{2}	1×10^{6}
I-123	1×10^{2}	1×10^{7}	Pm-147	1×10^{4}	1×10^{7}
I-125	1×10^{2}	1×10^{6}	Pm-149	1×10^{3}	1×10^{6}
I-126	1×10^{2}	1×10^{6}	Sm-151	1×10^{4}	1×10^{8}
I-129	1×10^{2}	1×10^{5}	Sm-153	1×10^{2}	1×10^{6}
I-130	1×10^{1}	1×10^{6}	Eu-152	1×10^{1}	1×10^{6}
I-131	1×10^{2}	1×10^{6}	Eu-152m	1×10^{2}	1×10^{6}
I-132	1×10^{1}	1×10^{5}	Eu-154	1×10^{1}	1×10^{6}
I-133	1×10^{1}	1×10^{6}	Eu-155	1×10^{2}	1×10^{7}
I-134	1×10^{1}	1×10^{5}	Gd-153	1×10^{2}	1×10^{7}
I-135	1×10^{1}	1×10^{6}	Gd-159	1×10^{3}	1×10^{6}
Xe-131m	1×10^{4}	1×10^{4}	Tb-160	1×10^{1}	1×10^{6}
Xe-133	1×10^{3}	1×10^{4}	Dy-165	1×10^{3}	1×10^{6}
Xe-135	1×10^{3}	1×10^{10}	Dy-166	1×10^{3}	1×10^{6}
Cs-129	1×10^{2}	1×10^{5}	Ho-166	1×10^{3}	1×10^{5}
Cs-131	1×10^{3}	1×10^{6}	Er-169	1×10^{4}	1×10^{7}
Cs-132	1×10^{1}	1×10^{5}	Er-171	1×10^{2}	1×10^{6}
Cs-134m	1×10^{3}	1×10^{5}	Tm-170	1×10^{3}	1×10^{6}
Cs-134	1×10^{1}	1×10^{4}	Tm-171	1×10^{4}	1×10^{8}
Cs-135	1×10^{4}	1×10^{7}	Yb-175	1×10^{3}	1×10^{7}
Cs-136	1×10^{1}	1×10^{5}	Lu-177	1×10^{3}	1×10^{7}
Cs-137*	1×10^{1}	1×10^{4}	Hf-181	1×10^{1}	1×10^{6}
Cs-138	1×10^{1}	1×10^{4}	Ta-182	1×10^{1}	1×10^{4}
Ba-131	1×10^{2}	1×10^{6}	W-181	1×10^{3}	1×10^{7}
Ba-140*	1×10^{1}	1×10^{5}	W-185	1×10^{4}	1×10^{7}
La-140	1×10^{1}	1×10^{5}	W-187	1×10^{2}	1×10^{6}
Ce-139	1×10^{2}	1×10^{6}	Re-186	1×10^{1}	1×10^{6}
Ce-141	1×10^{2}	1×10^{7}	Re-188	1×10^{2}	1×10^{5}

(cont.)

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Os-185	1×10^{1}	1×10^{6}	Rn-222*	1×10^{1}	1×10^{8}
Os-191	1×10^{2}	1×10^{7}	Ra-223*	1×10^{2}	1×10^{3}
Os-191m	1×10^{3}	1×10^{7}	Ra-224*	1×10^{3}	1×10^{5}
Os-193	1×10^{2}	1×10^{6}	Ra-225	1×10^{2}	1×10^{5}
Ir-190	1×10^{1}	1×10^{6}	Ra-226*	1×10^{4}	1×10^{4}
Ir-192	1×10^{1}	1×10^{4}	Ra-227	1×10^{2}	1×10^{5}
Ir-194	1×10^{2}	1×10^{5}	Ra-228*	1×10^{4}	1×10^{5}
Pt-191	1×10^{2}	1×10^{6}	Ac-228	1×10^{4}	1×10^{6}
Pt-193m	1×10^{3}	1×10^{7}	Th-226*	1×10^{4}	1×10^{7}
Pt-197	1×10^{3}	1×10^{6}	Th-227	1×10^{4}	1×10^{4}
Pt-197m	1×10^{2}	1×10^{6}	Th-228*	1×10^{6}	1×10^{4}
Au-198	1×10^{2}	1×10^{6}	Th-229*	1×10^{6}	1×10^{3}
Au-199	1×10^{2}	1×10^{6}	Th-230	1×10^{6}	1×10^{4}
Hg-197	1×10^{2}	1×10^{7}	Th-231	1×10^{3}	1×10^{7}
Hg-197m	1×10^{2}	1×10^{6}	Th-nat	1×10^{6}	1×10^{3}
Hg-203	1×10^{2}	1×10^{5}	(incl. Th-232)		
Tl-200	1×10^{1}	1×10^{6}	Th-234*	1×10^{3}	1×10^{3}
Tl-201	1×10^{2}	1×10^{6}	Pa-230	1×10^{1}	1×10^{6}
Tl-202	1×10^{2}	1×10^{6}	Pa-231	1×10^{0}	1×10^{3}
Tl-204	1×10^{4}	1×10^{4}	Pa-233	1×10^{2}	1×10^{7}
Pb-203	1×10^{2}	1×10^{6}	U-230*	1×10^{1}	1×10^{5}
Pb-210*	1×10^{1}	1×10^{4}	U-231	1×10^{2}	1×10^{7}
Pb-212*	1×10^{1}	1×10^{5}	U-232*	1×10^{0}	1×10^{3}
Bi-206	1×10^{1}	1×10^{5}	U-233	1×10^{1}	1×10^{4}
Bi-207	1×10^{1}	1×10^{6}	U-234	1×10^{1}	1×10^{4}
Bi-210	1×10^{3}	1×10^{6}	U-235*	1×10^{1}	1×10^{4}
Bi-212*	1×10^{1}	1×10^{5}	U-236	1×10^{1}	1×10^{4}
Po-203	1×10^{1}	1×10^{6}	U-237	1×10^{2}	1×10^{6}
Po-205	1×10^{1}	1×10^{6}	U-238*	1×10^{1}	1×10^{4}
Po-207	1×10^{1}	1×10^{6}	U-nat	1×10^{0}	1×10^{3}
Po-210	1×10^{1}	1×10^{4}	U-239	1×10^{2}	1×10^{6}
At-211	1×10^{3}	1×10^{7}	U-240	1×10^{3}	1×10^{7}
Rn-220*	1×10^{4}	1×10^{7}	U-240*	1×10^{1}	1×10^{6}

(cont.)

Nuclide	Activity concentration (Bq/g)	Activity (Bq)	Nuclide	Activity concentration (Bq/g)	Activity (Bq)
Np-237[a]	1×10^{0}	1×10^{3}	Cm-244	1×10^{4}	1×10^{7}
Np-239	1×10^{4}	1×10^{7}	Cm-245	1×10^{0}	1×10^{3}
Np-240	1×10^{1}	1×10^{6}	Cm-246	1×10^{0}	1×10^{3}
Pu-234	1×10^{2}	1×10^{7}	Cm-247	1×10^{0}	1×10^{4}
Pu-235	1×10^{2}	1×10^{7}	Cm-248	1×10^{0}	1×10^{3}
Pu-236	1×10^{1}	1×10^{4}	Bk-249	1×10^{3}	1×10^{6}
Pu-237	1×10^{2}	1×10^{7}	Cf-246	1×10^{3}	1×10^{6}
Pu-238	1×10^{0}	1×10^{4}	Cf-248	1×10^{1}	1×10^{4}
Pu-239	1×10^{0}	1×10^{4}	Cf-249	1×10^{0}	1×10^{3}
Pu-240	1×10^{0}	1×10^{3}	Cf-250	1×10^{1}	1×10^{4}
Pu-241	1×10^{2}	1×10^{5}	Cf-251	1×10^{0}	1×10^{3}
Pu-242	1×10^{0}	1×10^{4}	Cf-252	1×10^{1}	1×10^{4}
Pu-243	1×10^{3}	1×10^{7}	Cf-253	1×10^{2}	1×10^{5}
Pu-244	1×10^{0}	1×10^{4}	Cf-254	1×10^{0}	1×10^{3}
Am-241	1×10^{0}	1×10^{4}	Es-253	1×10^{2}	1×10^{5}
Am-242	1×10^{3}	1×10^{6}	Es-254	1×10^{1}	1×10^{4}
Am-242m[a]	1×10^{0}	1×10^{4}	Es-254m	1×10^{2}	1×10^{5}
Am-243[a]	1×10^{0}	1×10^{3}	Fm-254	1×10^{4}	1×10^{7}
Cm-242	1×10^{2}	1×10^{5}	Fm-255	1×10^{3}	1×10^{6}
Cm-243	1×10^{0}	1×10^{4}			

[a] Parent nuclides and their progeny included in secular equilibrium are listed in the following:

Sr-90	Y-90
Zr-93	Nb-93m
Zr-97	Nb-97
Ru-106	Rh-106
Cs-137	Ba-137m
Ce-134	La-134
Ce-144	Pr-144
Ba-140	La-140
Bi-212	Tl-208 (0.36), Po-212 (0.64)
Pb-210	Bi-210, Po-210
Pb-212	Bi-212, Tl-208 (0.36), Po-212 (0.64)
Rn-220	Po-216
Rn-222	Po-218, Pb-214, Bi-214, Po-214

Ra-223	Rn-219, Po-215, Pb-211, Bi-211, Tl-207
Ra-224	Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Ra-226	Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
Ra-228	Ac-228
Th-226	Ra-222, Rn-218, Po-214
Th-228	Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-229	Ra-225, Ac-225, Fr-221, At-217, Bi-213, Po-213, Pb-209
Th-nat	Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
Th-234	Pa-234m
U-230	Th-226, Ra-222, Rn-218, Po-214
U-232	Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208 (0.36), Po-212 (0.64)
U-235	Th-231
U-238	Th-234, Pa-234m
U-nat	Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210
U-240	Np-240m
Np-237	Pa-233
Am-242m	Am-242
Am-243	Np-239

[2] The exemption levels set forth in of Schedule[] are subject to the following considerations: (a) They have been derived using a conservative model based on (i) the criteria of para. (1-3) and (ii) a series of limiting (bounding) use and disposal scenarios. The values of activity concentration and total activity represent the lowest values calculated in any scenario for a moderate quantity of material. (See COMMISSION OF THE EUROPEAN COMMUNITIES, Principles and Methods for Establishing Concentrations and Quantities (Exemption Values) below Which Reporting is Not Required in the European Directive, Radiation Protection 65, Doc. XI-028/93, CEC, Brussels (1993). (b) The application of exemption to natural radionuclides, where these are not excluded, is limited to the incorporation of naturally occurring radionuclides into consumer products or their use as a radioactive source (e.g. Ra-226, Po-210) or for their elemental properties (e.g. thorium, uranium). (c) In the case of more than one radionuclide, the appropriate sum of the ratios of the activity or activity concentration of each radionuclide and the corresponding exempt activity or activity concentration shall be taken into account. (d) Unless the exposure is excluded, exemption for bulk amounts of materials with activity concentrations lower than the guidance exemption levels of may nevertheless require further consideration by the Regulatory Authority.

Schedule – III
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Licence Registration Form

Ref. No. – NSRC – LR 1/97 Form No. – LR 1/97

Part – I Description of Licence

1. Class of Licence : .....
2. Purpose of Licence : .....
3. Licence No. : .....
4. Registration No. : .....
5. Date of Application : .....
5. Issuing Date : .....
7. Date of Effect : .....
8. Period of Validity : .....
9. Date of Expiry : .....
10. Date of Renewal : .....

Part – II Description of Licensee

1. Name (in block letter) : .....
2. Mailing Address : .....
3. Address of Premises : .....
4. Telephone : .....
5. Fax/Telex : .....

Part – III Authorized Person

1. Name (in block letter) : .....
2. Sex : .....
3. Date of Birth : .....
4. Identity / Passport No. : .....
5. Mailing Address : .....
6. Authorized Person : .....

Part – IV Licensed Facility/Premise

1. Full Address : .....
2. Telephone : .....
3. Fax/Telex : .....

Part – V Radiation Control Officer

1. Name : .....
2. Sex : .....
3. Date of Birth : .....
4. Qualifications : .....
5. RCO Approval No. and Date : .....
6. Validity Period : .....
7. Expiry Date : .....
8. Renewal Date : .....

Part – VI Description of Licensed Material/Apparatus/Installation

.....

.....

Part – VII Special Remarks (if any)

.....

.....

Form Verified by : .....

Signature : .....
Date : .....
Official Stamp : .....

Registered by : .....
(person authorized by the Commission)

Signature : .....
Date : .....
Official Stamp : .....

Schedule – IV.I
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. – NSRC – L 1/97 Form No. – L1/97

APLICATION FORM
for Radioactive Material Licence
Class "A" Licence

Part – 1

1. This is an Application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

2. Purpose of the Practice (tick (√) where appropriate) :

☐ Use ☐ Manufacture ☐ Trade
☐ Produce ☐ Process ☐ Purchase
☐ Own ☐ Handle ☐ Store
☐ Others (specify)

3. Stage of Licence (tick (√) where appropriate) :

☐ Siting ☐ Temporary operation ☐ Full operation

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address where the Radioactive Material will be Used or Stored :

6. Particulars of the Authorized Person to be contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(f) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (c) Date of birth :
(d) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II (Proforma for Technical Annexure)

N.B. While preparing this part : (1) the applicant is advised to consult the applicable standards, codes and guides and if required, seek help from the Nuclear Safety and Radiation Control Division of the Commission ; and (2) for the amendment and renewal of the licence, only update the information with the analysis where required and for the rest just refer to the respective section of the original licence application .

Submit on typed page, measuring 8.5" x 11" (A4 size), all particulars to the items described below with additional papers where needed.

1. Describe the Purpose and Justification for which the Radioactive Material will be Used:

2. Information on Site, Site Layout, Building Plan and Design of Radiation Related Room and Structure :

3. Describe the Operation and Maintenance Programme to be Adopted :

4. Describe the Quality Assurance(QA) Programme to be Adopted :

5. Provide the Construction, Testing and Commissioning Schedule, as applicable :

6. Describe the Line of Administrative Control of the Radioactive Material with a Copy of Organogram :

7. Particulars of Person Who will Supervise the Use of Radioactive Material :

Name A	Designation B	Date of Birth C	Identity D

8. Qualified Expert (where applicable) :

(a) Name :
(b) Field of expertise :
(c) Academic and professional qualification :
(d) Experiences :
(e) Full address :
(f) Telephone no. :
(g) Commission's approval no. :

9. Particulars of Worker Who will Work with Radioactive Material :

Sl No.	Name A	Date of Birth B	Identity C

10. Description and Intended Use of the Radioactive Material to be Used :

Element and mass number A	Chemical and/or physical form B	Name of the manufacturer and model no. (if available) C	Activity and date		Intended use F
			Sealed source (per source) D	Unsealed source E	

11. Additional Information on Radioactive Material Listed in Item 10:

12. Storage of Source (if appropriate) :

Type of container and/or device for storage A	Supplier(if applicable) B	Model number (if applicable) C

13. Radiation Detection or Measuring Instrument Currently Possessed by the Applicant (if any) :

Type of instrument A	Supplier B	Model Number C	Number Available D	Radiation Detectable E	Range F

14. Calibration of Instrument listed in Item 13 :
(tick (√) where appropriate and attach the relevant certification)

☐ By applicant ☐ Others (state the name and address of the calibrating agency)

Attach a resume describing the method and frequency of calibration, date of last calibration and standards used for instrument calibration.

15. Personnel Monitoring :

Type (tick(√) where appropriate) A	Supplier B	Evaluating Agency C	Frequency of Evaluation D
☐ Film badge ☐ Thermoluminescence Dosimeter(TLD) ☐ Others(specify)			

16. Storage and Handling Facility for Radioactive Material (tick(√) where appropriate) :

☐ Laboratory facility, plant facility, including those equipped with fume hood, etc.
☐ Storage facility, container, special shielding (fixed or temporary), etc.
☐ Remote handling tool or equipment, etc.
☐ Personal protective appliance, etc.

Applicant is required to attach sketch and description of the relevant items.

17. Storage/Disposal of Waste (if appropriate) :

Specify the nature of radioactive waste. Specify the types and activities of the radionuclides. Describe in details the proposed methods for storage/disposal of radioactive waste. If the application is for sealed sources, state whether the sealed sources will be returned to the suppliers upon termination of use.

18. Specify and Describe the Radiation Control Programme to be Adopted :

19. Specify and Describe the Fire Protection Programme to be Adopted :

20. Specify and Describe the Emergency Response Programme to be Adopted :

21. Specify and Describe the Education and Training Programme for Supervisor, Radiation Control Officer, Operator and Radiation Worker to be Adopted :

22. Qualification and Experience of Supervisor, Radiation Control Officer and Operator:

(a) State the Qualification of Supervisor, Radiation Control Officer and Operator. List relevant courses attended and attach certified copy of certificate obtained.

Name A	Designation B	Qualification/Course attended C

(b) State the Experience of Supervisor, Radiation Control Officer and Operator and attach the appropriate resume, if available.

Name A	Designation B	Organization C	Duration D	Year E

23. Safety Related Equipment and Facility :

Facility and equipment A	Supplier B	Model Number C	Function D	Quantity E

24. Declaration by the Licensee/Authorized Person :

I .....
(full name)

do hereby declare –

(a) that this application is made on my own behalf/on behalf of .....

(b) that the particulars given in this form, including all supplements attached hereto, are true and correct.

.....
Signature

Name (in block letters) : .....
Designation : .....
Official Stamp : .....
Date : .....

For use of the Commission

Completed application form received on :	Comments	Approved by :
Fee received on :		Date :

Schedule – IV.II
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. – NSRC L 2/97 Form No. – L2/97

APLICATION FORM
for Nuclear Material Licence
Class "B" Licence

Part – I

1. This is an Application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

2. Purpose of the Practice (tick (√) where appropriate) :

☐ Use ☐ Manufacture ☐ Trade
☐ Produce ☐ Process ☐ Purchase
☐ Own ☐ Handle ☐ Store
☐ Others (specify)

3. Stage of Licence (tick (√) where appropriate) :

☐ Siting ☐ Temporary operation ☐ Full operation

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address where the Nuclear Material will be Used or Stored :

6. Particulars of the Authorized Person to be contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(f) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (c) Date of birth :
(d) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II (Proforma for Technical Annexure)

N.B. While preparing this part : (1) the applicant is advised to consult the applicable standards, codes and guides and if required, seek help from the Nuclear Safety and Radiation Control Division of the Commission ; and (2) for the amendment and renewal of the licence, only update the information with the analysis where required and for the rest just refer to the respective section of the original licence application .

Submit on typed page, measuring 8.5" x 11" (A4 size), all particulars to the items described below with additional papers where needed.

1. Describe the Purpose and Justification for which the Nuclear Material will be Used:

2. Information on Site, Site Layout, Building Plan and Design of Radiation Related Room and Structure :

3. Describe the Operation and Maintenance Programme to be Adopted :

4. Describe the Quality Assurance(QA) Programme to be Adopted :

5. Provide the Construction, Testing and Commissioning Schedule, as applicable :

6. Describe the Line of Administrative Control of the Nuclear Material with a Copy of Organogram :

7. Particulars of Person Who will Supervise the Use of Nuclear Material :

Name A	Designation B	Date of Birth C	Identity D

8. Qualified Expert (where applicable) :

(a) Name :
(b) Field of expertise :
(c) Academic and professional qualification :
(d) Experiences :
(e) Full address :
(f) Telephone no. :
(g) Commission's approval no. :

9. Particulars of Worker Who will Work with Nuclear Material :

Sl No.	Name A	Date of Birth B	Identity C

10. Description and Intended Use of the Nuclear Material to be Used :

Element and mass number A	Chemical and/or physical form B	Name of the manufacturer and model no. (if available) C	Activity and date		Intended use F
			Sealed source (per source) D	Unsealed source E	

11. Additional Information on Nuclear Material Listed in Item 10:

12. Storage of Nuclear Material and Source (if appropriate) :

Type of container and/or device for storage A	Supplier(if applicable) B	Model number (if applicable) C

13. Radiation Detection or Measuring Instrument Currently Possessed by the Applicant (if any) :

Type of Instrument A	Supplier B	Model Number C	Number Available D	Radiation Detectable E	Range F

14. Calibration of Instrument listed in Item 13 :
(tick (√) where appropriate and attach the relevant certification)

☐ By applicant ☐ Others (state the name and address of the calibrating agency)

Attach a resume describing the method and frequency of calibration, date of last calibration and standards used for instrument calibration.

15. Personnel Monitoring :

Type (tick(√) where appropriate) A	Supplier B	Evaluating Agency C	Frequency of Evaluation D
☐ Film badge ☐ Thermoluminescence Dosimeter(TLD) ☐ Others(specify)			

16. Storage and Handling Facility for Nuclear Material (tick(√) where appropriate) :

☐ Laboratory facility, plant facility, including those equipped with fume hood, etc.
☐ Storage facility, container, special shielding (fixed or temporary), etc.
☐ Remote handling tool or equipment, etc.
☐ Personal protective appliance, etc.

Applicant is required to attach sketch and description of the relevant items.

17. Storage/Disposal of Waste (if appropriate) :

Specify the nature of nuclear waste. Specify the types and activities of the radionuclides. Describe in details the proposed methods for storage/disposal of radioactive waste.

18. Specify and Describe the Radiation Control Programme to be Adopted :

19. Specify and Describe the Fire Protection Programme to be Adopted :

20. Specify and Describe the Emergency Response Programme to be Adopted :

21. Specify and Describe the Education and Training Programme for Supervisor, Radiation Control Officer, Operator and Radiation Worker to be Adopted :

22. Qualification and Experience of Supervisor, Radiation Control Officer and Operator:

(a) State the Qualification of Supervisor, Radiation Control Officer and Operator. List relevant courses attended and attach certified copy of certificate obtained.

Name A	Designation B	Qualification/Course attended C

(b) State the Experience of Supervisor, Radiation Control Officer and Operator and attach the appropriate resume, if available.

Name A	Designation B	Organization C	Duration D	Year E

23. Safety Related Equipment and Facility :

Facility and equipment A	Supplier B	Model Number C	Function D	Quantity E

24. Declaration by the Licensee/Authorized Person :

I .....
(full name)

do hereby declare –

(a) that this application is made on my own behalf/on behalf of .....

(b) that the particulars given in this form, including all supplements attached hereto, are true and correct.

.....
Signature

Name (in block letters) : .....
Designation : .....
Official Stamp : .....
Date : .....

For use of the Commission

Completed application form received on :	Comments	Approved by :
Fee received on :		Date :

Schedule – IV.III
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. NSRC L - 3/97 Form No. -L 3/97

APLICATION FORM
for Irradiating Apparatus Licence
Class "C" Licence

Part – I

1. This is an Application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

2. Purpose of the Practice (tick (√) where appropriate) :

☐ Use ☐ Manufacture ☐ Trade
☐ Produce ☐ Process ☐ Purchase
☐ Own ☐ Handle ☐ Store
☐ Others (specify)

3. Stage of Licence (tick (√) where appropriate) :

☐ Siting ☐ Temporary operation ☐ Full operation

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address where the Irradiating Apparatus will be Used or Stored :

6. Particulars of the Authorized Person to be contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(f) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (c) Date of birth :
(d) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II (Proforma for Technical Annexure)

N.B. While preparing this part : (1) the applicant is advised to consult the applicable standards, codes and guides and if required, seek help from the Nuclear Safety and Radiation Control Division of the Commission ; and (2) for the amendment and renewal of the licence, only update the information with the analysis where required and for the rest just refer to the respective section of the original licence application .

Submit on typed page, measuring 8.5" x 11" (A4 size), all particulars to the items described below with additional papers where needed.

1. Describe the Purpose and Justification for which the Irradiating Apparatus will be Used:

2. Information on Site, Site Layout, Building Plan and Design of Radiation Related Room and Structure :

3. Describe the Operation and Maintenance Programme to be Adopted :

4. Describe the Quality Assurance(QA) Programme to be Adopted :

5. Provide the Construction, Testing and Commissioning Schedule, as applicable :

6. Describe the Line of Administrative Control of the Irradiating Apparatus with a copy of Organogram :

7. Particulars of Person who will Supervise the Use of Irradiating Apparatus :

Name A	Designation B	Date of Birth C	Identity D

8. Qualified Expert (where applicable) :

(a) Name :
(b) Field of expertise :
(c) Academic and professional qualification :
(d) Experiences :
(e) Full address :
(f) Telephone No. :
(g) Commission's approval No. :

9. Particulars of Radiation Worker:

Sl No.	Name A	Date of Birth B	Identity C

10. Description and Intended Use of the Irradiating Apparatus to be Licensed :

Type and model A	Maximum voltage Kilovolt B	Maximum current mili ampere C	Maximum power level Kilowatt D	Serial number of control panel E	Serial number of tube head F	Supplier G	Intended use(use relavant code given) H

Codes for column H

1. Dental	2. Medical Diagnosis	3. Medical Therapy
4. Chiropractice	5. Veterinary	6. Industrial Radiography
7. X-Ray Analysis	8. X-Ray Gauge	9. Research with human
10. Research	11. Others (specify)	

11. Additional Information on Irradiating Apparatus Listed in Item 10:

12. Radiation Detection or Measuring Instrument Currently Possessed by the Applicant (if any) :

Type of instrument A	Supplier B	Model Number C	Number Available D	Radiation Detectable E	Range F

13. Calibration of Instrument listed in Item 13 :
(tick (√) where appropriate and attach the relevant certification)

☐ By applicant ☐ Others (state the name and address of the calibrating agency)

Attach a resume describing the method and frequency of calibration, date of last calibration and standards used for instrument calibration.

14. Personnel Monitoring :

Type (tick(√) where appropriate) A	Supplier B	Evaluating Agency C	Frequency of Evaluation D
☐ Film badge ☐ Thermoluminescence Dosimeter(TLD) ☐ Others(specify)			

15. Description of Facility and Equipment to be Installed :

Detailed layout plan submitted shall contain at least the following information :

(a) Room : location and dimension ;
(b) Wall, ceiling and floor : material uses and thickness ;
(c) Windows, doors and other opening : position, size and material used ;
(d) Equipment : specification of irradiating apparatus, its position in the room and the position of the operating console ; and
(e) Surrounding : use of spaces adjoining to the room including those above and below.

16. Specify and Describe the Radiation Control Programme to be Adopted :

17. Specify and Describe the Fire Protection Programme to be Adopted :

18. Specify and Describe the Emergency Response Programme to be Adopted :

19. Specify and Describe the Education and Training Programme for Supervisor, Radiation Control Officer, Operator and Radiation Worker to be Adopted :

20. Qualification and Experience of Supervisor, Radiation Control Officer and Operator:

(a) State the Qualification of Supervisor, Radiation Control Officer and Operator. List relevant courses attended and attach certified copy of certificate obtained.

Name A	Designation B	Qualification/Course attended C

(b) State the Experience of Supervisor, Radiation Control Officer and Operator and attach the appropriate resume, if available.

Name A	Designation B	Organization C	Duration D	Year E

21. Safety Related Equipment and Facility :

Facility and equipment A	Supplier B	Model Number C	Function D	Quantity E

22. Declaration by the Licensee/Authorized Person :

I .....
(full name)

do hereby declare –

(a) that this application is made on my own behalf/on behalf of .....

(b) that the particulars given in this form, including all supplements attached hereto, are true and correct.

.....
Signature

Name (in block letters) : .....
Designation : .....
Official Stamp : .....
Date : .....

For use of the Commission

Completed application form received on :	Comments	Approved by :
Fee received on :		Date :

Schedule – IV.IV
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. – NSRC L 4/97 Form No. – L 4/97

APLICATION FORM
for Transportation Licence
Class "D" Licence

Part – I

1. This is an application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

2. Transportation of (tick (√) where appropriate) :

☐ Radioactive material ☐ Nuclear material
☐ Radioactive waste ☐ Nuclear waste
☐ Others (specify)

3. Transportation Mode (tick (√) where appropriate) :

☐ Sea ☐ Air
☐ Rail ☐ Others(specify)

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address of the Premise of the Service Company/Agency :

6. Particulars of the Authorized Person to be Contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(f) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (d) Date of birth :
(c) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II (Proforma for Technical Annexure)

N.B. While preparing this part : (1) the applicant is advised to consult the applicable standards, codes and guides and if required, seek help from the Nuclear Safety and Radiation Control Division of the Commission ; and (2) for the amendment and renewal of the licence, only update the information with the analysis where required and for the rest just refer to the respective section of the original licence application .

Submit on typed page, measuring 8.5" x 11" (A4 size), all particulars to the items described below with additional papers where needed.

1. Describe the Purpose and Justification of the Practice :

2. Description of Package :

(a) Description of packaging
(1) Type of package
(2) Package identification number
(3) Model number

(4) Main material of packaging, weight, dimensions and its fabrication and also its design in detail
(5) Gross weight

(b) Description of content
(1) Name of radioactive material or radioactive waste and its maximum activity (if applicable)
(2) Name of nuclear material or nuclear waste and its maximum quantity (if applicable)
(3) Chemical and physical form
(4) Maximum weight

3. Regulatory Authority's Approval Certificate :
The applicant shall submit the approval test certificates issued by the commission or, where the tests are conducted in any country outside Bangladesh, by the Regulatory Authority of that country and endorsed by the commission.

4. Describe the Quality Assurance (QA) Programme to be Adopted:

5. Describe the Line of Administrative Control of the Radioactive Material with a Copy of Organogram :

6. Qualified Expert (where applicable) :

(a) Name :
(b) Field of expertise :
(c) Academic and professional qualification :
(d) Experiences :
(e) Full address :
(f) Telephone No. :
(g) Commission's approval No. :

7. Radiation Detection or Measuring Instrument Currently Possessed by the Applicant (if any) :

Type of instrument A	Supplier B	Model Number C	Number Available D	Radiation Detectable E	Range F

8. Calibration of Instrument listed in Item 13 :
(tick (√) where appropriate and attach the relevant certification)

☐ By applicant ☐ Others (state the name and address of the calibrating agency)

Attach a resume describing the method and frequency of calibration, date of last calibration and standards used for instrument calibration.

9. Personnel Monitoring :

Type (tick(√) where appropriate) A	Supplier B	Evaluating Agency C	Frequency of Evaluation D
☐ Film badge ☐ Thermoluminescence Dosimeter(TLD) ☐ Others(specify)			

10. Specify and Describe the Radiation Control Programme to be Adopted :

11. Specify and Describe the Fire Protection Programme to be Adopted :

12. Specify and Describe the Emergency Response Programme to be Adopted :

13. Specify and Describe the Education and Training Programme for Supervisor, Radiation Control Officer, Operator and Radiation Worker to be Adopted :

14. Qualification and Experience of Supervisor, Radiation Control Officer and Operator:

(a) State the Qualification of Supervisor, Radiation Control Officer and Operator. List relevant courses attended and attach certified copy of certificate obtained.

Name A	Designation B	Qualification/Course attended C

(b) State the Experience of Supervisor, Radiation Control Officer and Operator and attach the appropriate resume, if available.

Name A	Designation B	Organization C	Duration D	Year E

15. Safety Related Equipment and Facility :

Facility and equipment A	Supplier B	Model Number C	Function D	Quantity E

16. Declaration by the Licensee/Authorized Person :

I .....
(full name)

do hereby declare –

(a) that this application is made on my own behalf/on behalf of .....

(b) that the particulars given in this form, including all supplements attached hereto, are true and correct.

.....
Signature

Name (in block letters) : .....
Designation : .....
Official Stamp : .....
Date : .....

For use of the Commission

Completed application form received on :	Comments	Approved by :
Fee received on :		Date :

Schedule – IV.V
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. – NSRC L 5/97 Form No. – L 5/97

APLICATION FORM
for Import and Export Licence
Class "E" Licence

Part – I

1. This is an Application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

2. Purpose of the Practice (tick (√) where appropriate) :

☐ Import ☐ Export
☐ Both ☐ Others (specify)

3. Item of Import/Export (tick (√) where appropriate) :

☐ Radioactive material ☐ Nuclear material
☐ Irradiating apparatus ☐ Others (specify)

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address of the Premise of the Applicant/Licensee :

6. Particulars of the Authorized Person to be Contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(f) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (c) Date of birth :
(d) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II (Proforma for Technical Annexure)

N.B. While preparing this part : (1) the applicant is advised to consult the applicable standards, codes and guides and if required, seek help from the Nuclear Safety and Radiation Control Division of the Commission ; and (2) for the amendment and renewal of the licence, only update the information with the analysis where required and for the rest just refer to the respective section of the original licence application .

Submit on typed page, measuring 8.5" x 11" (A4 size), all particulars to the items described below with additional papers where needed.

1. Describe the Purpose and Justification of the Practice :

2. Information Required for Import or Export Licence :

General information required for the import or export of radioactive material, nuclear material, prescribed substance, or irradiating apparatus.

(a) Name of the country imported from/exported to :

(b) Name and address of supplier :

3. (a) Additional Information Required for Import or Export of Radioactive Material, where appropriate :

Element and mass number A	Chemical and/or physical form B	Name of the manufacturer and model no. (if available) C	Activity and date		Intended use F
			Sealed source (per source) D	Unsealed source E	

(b) Specify the mode of transportation
(c) Type of package
(d) State the number of freighted container to be used(if any)

4. Additional Information Required for Import or Export of Nuclear Material, where appropriate :

(a) Chemical or physical form of nuclear material and for enriched uranium, the weight percentage of enrichment and Pu – 239 content.
(b) Quantity in grams or kilograms of –
  (1) the nuclear material imported or exported
  (2) the uranium or plutonium content
  (3) the content of Pu – 239 in enriched uranium.
(c) Specify the mode of transportation and type of package to be used.
(d) Financial security which covers the liability for nuclear damage (attach relevant document)

5. Additional Information required for the import or Export of Irradiating Apparatus, where appropriate :

5.1

Type and model A	Maximum voltage Kilovolt B	Maximum current miliampere C	Maximum power level Kilowatt D	Serial number of control panel E	Serial number of tube head F	Supplier G

5.2 Technical specification of manufacture :

6. Additional Information Required for Import or Export of Prescribed Substance :

7. Particulars of Licensee :

(1) Licence no. :
(2) Date of issuing licence :
(3) Date of expiry :
(4) Class of licence :

8. Declaration by the Licensee/Authorized Person :

I .....
(full name)

do hereby declare –

(a) that this application is made on my own behalf/on behalf of .....

(b) that the particulars given in this form, including all supplements attached hereto, are true and correct.

.....
Signature

Name (in block letters) : .....
Designation : .....
Official Stamp : .....
Date : .....

For use of the Commission

Completed application form received on :	Comments	Approved by :
Fee received on :		Date :

Schedule – IV.VI
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. – NSRC L 6/97 Form No. – L 6/97

APLICATION FORM
for Nuclear Installation Licence
Class "F" Licence

Part – I

1. This is an Application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

2. Purpose of the Practice (tick (√) where appropriate) :

☐ Research and Development ☐ Production of Isotope
☐ Generation of Electricity ☐ Others (specify)

3. Stage of Licence (tick (√) where appropriate) :

☐ Siting ☐ Temporary operation
☐ Full operation

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address where the Nuclear Installation will be Sited :

6. Particulars of the Authorized Person to be Contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(f) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (c) Date of birth :
(d) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant
or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II

This part of the application form will be formulated by the commission when the need arises in view of the IAEA and USNRC codes and guides (as applicable and adopted).

Schedule – IV.VII
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. – NSRC – L 7/97 Form No. – L7/97

APLICATION FORM
for Waste Storage/Disposal Licence
Class "G" Licence

Part – I

1. (a) This is an Application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

(b) Period needed :

2. Purpose of the Practice (tick (√) where appropriate) :

☐ Storage prior to disposal ☐ Disposal
☐ Others (specify)

3. Type of waste (tick (√) where appropriate) :

☐ Radioactive waste ☐ Nuclear waste
☐ Others (specify)

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address of the Premise where the Waste will be Stored/Disposed :

6. Particulars of the Authorized Person to be Contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(f) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (c) Date of birth :
(d) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant
or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II (Proforma for Technical Annexure)

N.B. While preparing this part : (1) the applicant is advised to consult the applicable standards, codes and guides and if required, seek help from the Nuclear Safety and Radiation Control Division of the Commission ; and (2) for the amendment and renewal of the licence, only update the information with the analysis where required and for the rest just refer to the respective section of the original licence application .

Submit on typed page, measuring 8.5" x 11" (A4 size), all particulars to the items described below with additional papers where needed.

1. Describe the Purpose and Justification of the Practice :

2. Provide the Information on Site, Site Layout, Building Plan and Design of Radiation Related Room and Structure :

3. Describe the Operation and Maintenance Programme to be Adopted :

4. Describe the Quality Assurance (QA) Programme to be Adopted :

5. Provide the Construction, Testing and Commissioning Schedule, as applicable ;

6. Describe the Line of Administrative Control of the Radioactive Material with a Copy of Organogram :

7. Method of Disposal :

☐ Transfer to licensed disposal facility ☐ At licensee's own disposal facility
☐ Others (specify)

8. Description of Methods in item 7, as applicable :

(a) Transfer to disposal facility
(i) Name of facility
(ii) Address of facility
(iii) Transport mode
(iv) Facility licence number
(v) Method and period of agreement between the applicant and facility company for the purpose of the waste material disposed
(b) At licensee's own disposal facility : attach relevant documents of site and facility for approval .
(c) Others. : Explain in detail.

9. Description of Waste :

Type of waste A	Physical/Chemical form B	Activity C

10. Particulars of Person Who will be Responsible for the Storage and Disposal of the Wastes :

Name A	Designation B	Date of Birth C	Identity D

11. Qualified Expert (where applicable) :
(a) Name :
(b) Field of expertise :
(c) Academic and professional qualification :
(d) Experiences :
(e) Full address :
(f) Telephone No. :
(g) Commission's approval No. :

12. Particulars of Worker Handling the Wastes :

Sl No.	Name A	Date of Birth B	Identity C

13. Radiation Detection or Measuring Instrument Currently Possessed by the Applicant (if any) :

Type of instrument A	Supplier B	Model Number C	Number Available D	Radiation Detectable E	Range F

14. Calibration of Instrument listed in Item 13 :
(tick (√) where appropriate and attach the relevant certification)

☐ By applicant ☐ Others (state the name and address of the calibrating agency)

Attach a resume describing the method and frequency of calibration, date of last calibration and standards used for instrument calibration.

15. Personnel Monitoring :

Type (tick(√) where appropriate) A	Supplier B	Evaluating Agency C	Frequency of Evaluation D
☐n badge ☐ermoluminescence Dosimeter(TLD) ☐hers(specify)			

16. Storage and Handling Facility for Radioactive Material (tick(√) where appropriate) :

☐ Laboratory facility, plant facility, including those equipped with fume hood, etc.
☐ Storage facility, container, special shielding (fixed or temporary), etc.
☐ Remote handling tool or equipment, etc.
☐ Personal protective appliance, etc.

Applicant is required to attach sketch and description of the relevant items.

17. Specify and Describe the Radiation Control Programme to be Adopted :

18. Specify and Describe the Fire Protection Programme to be Adopted :

19. Specify and Describe the Emergency Response Programme to be Adopted :

20. Specify and Describe the Education and Training Programme for Supervisor, Radiation Control Officer, Operator and Radiation Worker to be Adopted :

21. Qualification and Experience of Supervisor, Radiation Control Officer and Operator:

(a) State the Qualification of Supervisor, Radiation Control Officer and Operator. List relevant courses attended and attach certified copy of certificate obtained.

Name A	Designation B	Qualification/Course attended C

(b) State the Experience of Supervisor, Radiation Control Officer and Operator and attach the appropriate resume, if available.

Name A	Designation B	Organization C	Duration D	Year E

22. Safety Related Equipment and Facility :

Facility and equipment A	Supplier B	Model Number C	Function D	Quantity E

23. Declaration by the Licensee/Authorized Person :

I .....
(full name)

do hereby declare –

(c) that this application is made on my own behalf/on behalf of .....

(d) that the particulars given in this form, including all supplements attached hereto, are true and correct.

.....
Signature

Name (in block letters) : .....
Designation : .....
Official Stamp : .....
Date : .....

For use of the Commission

Completed application form received on :	Comments	Approved by :
Fee received on :		Date :

Schedule – IV.VIII
Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O. Box No. – 158, Ramna, Dhaka – 1000.

Ref. No. – NSRC/L 8/97 Form No. – L 8/97

APLICATION FORM
for Other Practice Licence
Class "H" Licence

Part – I

1. This is an Application for (tick (√) where appropriate) :

☐ New licence ☐ Amendment of licence ☐ Renewal of licence

2. Purpose of the Practice (tick (√) where appropriate) :

☐ Use ☐ Manufacture ☐ Trade
☐ Produce ☐ Process ☐ Purchase
☐ Own ☐ Handle ☐ Store
☐ Others (specify)

3. Stage of Licence (tick (√) where appropriate) :

☐ Siting ☐ Temporary operation ☐ Full operation

4. Particulars of the Applicant/Licensee :

(a) Name :
(b) Mailing address :
(c) Address of premise :
(d) Telephone No. : (e) Fax/Telex :

5. Full Address where the Nuclear Installation will be Sited :

6. Particulars of the Authorized Person to be contacted about this Application :

(a) Full name :
(b) Date of birth :
(c) Mailing address :
(d) Telephone no. : (e) Fax/Telex :
(e) Signature and date :

7. Radiation Control Officer :

(a) Name :
(b) Sex : (c) Date of birth :
(d) Qualification :
(e) R.C.O. approval no. and date :
(f) Validity period : (g) Expiry date :
(h) Renewal date :

8. Amount of the Fee Paid : ..... Draft/Pay Order No.: ..... Date : .....

CERTIFICATION
(Must be completed by the applicant/licensee)

I do hereby declare that, the statement and proposals which have been furnished in this application form shall be binding upon me and that I and any person who certifies on behalf of me and whose name is stated in item number 4 of this part certify that this document has been prepared in pursuant to the applicable standards, codes and guides stated under these rules and that all information provided in this application form are true and correct.

Signature of the applicant
or his Legal Nominee

Printed Name and Designation

Place :

Date :

Part II

This part of the application form will be formulated by the commission in pursuant to the nature and involvement of the practice.

Schedule –V

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

Procedure for Obtaining Reactor Operator/Senior Reactor Operator Licence:

The following conditions/procedures shall apply for issuing a Reactor Operator (RO)/ Senior Reactor Operator (SRO) licence:

i) An application with the requisite qualification and on satisfactory completion of the required training shall apply to the Commission through the licensee in prescribed Application Form (Annex-I) along with the Certificate of Medical History and Medical Examination (Annex-II);
ii) The minimum qualification required for a RO/SRO licence is B.Sc. degree in Engineering or M.Sc. in Physics;
iii) The training requirements is given in 10 CFR 55 and USNRC NUREG-0094 Rev.=1 of WASH 1094;
iv) The procedures and conditions of the licence shall be in accordance with the requirements of 10 CFR 55;
v) The licensee shall provide police and NSI vetting of the applicants;
vi) The written examination and oral test to be conducted by the Commission shall be in pursuant to requirements of 10 CFR 55 and USNRC NUREG-0094, Rev.-I of WASH 1094; and
vii) The Commission on satisfactory review of the application, medical history and medical history and medical examination, result of the written re-examination and oral test and the police & NSI vetting will issue the licence on such terms and conditions as necessitated by the regulations.

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

Ref. No. NSRCD-4(13)/88 Form Approval No. L-1/88.

APPLICATION FOR
Reactor Operator (RO) / Senior Reactor Operator's (SRO) Licence

1. Full Name (in Block letters):
2. Father's Name:
3. Present Address:
4. Permanent Address:
5. Date of Birth (Year/Month/Day):
6. Place of Birth:
7. Nationality by Birth
8. Present Nationality
9. Sex:
10. Marital Status (Single/Married/Divorced /Widow(er)/Separated)

Attach in this space a recent photograph. On the back of photograph write your name and address and the year the picture was taken.

11. Education: (Studies above primary education in chronological order)

Year Attended		Degrees & Academic Distinctions	Year of Award	Main Course of Study	Name of Institution
From	To				

12. Employment Record: Starting with your present, past, list in reverse order every employment you have had. Use a separate Block for each post. If you need more space attach additional pages of the same size.

From	To	Exact title of your post	DESCRIPTION OF YOUR DUTIES
Name & address of present employer			
Name and title of present supervisor:			
Type of business			
From	To	Exact title of your post	
Name & address of employer:			
Type of business:			

13. Whether any RO/SRO licence issued previously? If so, give serial no., place and date of issue and the date of expiration (attach an attested copy).

14. Any other relevant information the applicant wishes to furnish.

15. I certify that the foregoing information supplied by me is true to the best of my knowledge, and authorize the Commission to use any of the information in this certificate in the exercise of its authority over the licensing of operators.

(Date) (Facility) (Signature of applicant)

16. Name and address of the reactor facility, for which the licence is sought and state the facility licence No.

17. Evidence/proof that the applicant has learned to operate the controls of the facility in competent and safe manner and the need for the RO/SRO licence. List the examination Passed and attach relevant documents.

18.If a complete waiver for the examinations/tests by the Commission is desired, please submit adequate justifications for it.

19. A report of a current medical examination by a licensed medical practitioner, in the form prescribed by the NSRCD (No. MT-1/88) shall be attached.

20. Written request by the authorized representative of the reactor facility.

(Date) (Place) (Signature and seal of the authorized representative)

INSTRUCTIONS:
1) The application shall be submitted in TRIPLICATE.
2) Applicant must complete all items in pages 1 and 2 and the authorized representatives of the reactor facility shall fill in pages 3 and 4;
3) For any further information/clarifications, please contact Nuclear Safety and Radiation Control Division, Bangladesh Atomic Energy Commission.

MEDICAL EXAMINATION

A. Doctor : It is essential that each of the items on this page be completed. Sign the certificate and mail to the Director, Nuclear Safety and Radiation Control Division, Bangladesh Atomic Energy Commission, P. O Box 158, Ramna, Dhaka.

B. Physician's summary and elaboration of the medical history in front of report. Use additional sheet if more space is needed.

Physical examination. Give details of abnormal findings under item 20 below

1. Date of examination	2. Height		3. Weight
4. Blood pressure	5. Pulse		
6. Distant visual acuity uncorrected	right	left	method used
7. Distant visual acuity corrected	right	left	(data required if corrected lenses are normally worn)
8. Near visual acuity uncorrected	right	left	method used
9. Near visual acuity corrected	right	left	(data required if corrected lenses are normally worn)
10. Colour vision			method used
11. Gross visual fields			
12. Hearing	right	left	method used
13. Eyes, general	14. Pupils		
15. Opthalmoscopic			
16. Ears general	17. Drums		
18. Heart	19. Vascular system		

20. Details and evaluation of any item 1 through 19 above, report abnormal and summary evaluation of overall condition.

21. Did the foregoing examination reveal any mental or physical disability which might cause impaired judgement or ..... co-ordination. ☐ Yes ☐ No

I understand that any of the information in this examination may be used by the commission/ Director, Nuclear Safety and Radiation Control Division, in the exercise of its authority over the licensing of operators.

(Date)

1. Signature of examining Physician
2. Typed or printed name of examining Physician
3. Address

DOCTOR : IT IS REQUIRED THAT EVERY ITEM ON THIS PAGE BE COMPLETED EXCEPT THOSE MARKED WITH WHEN NOT APPLICABLE

Instructions : 1. Applicant must complete all item on pages 1 & 2 typewritten or print in ink. Physician must complete all items on pages 3&4.

2. For any further information/clarifications, please contact Nuclear Safety and Radiation Control Division, Bangladesh Atomic Energy Commission.

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

Ref. No. NSRC-4(13)/87 Form Approval NO. MT-1/88

CERTIFICATE OF MEDICAL HISTORY
Reactor Operator's or Senior Reactor Operator's Licence

1. Last Name First Name Middle Name 2. Date of Birth		
3. Home Address 4. Sex		
Have you ever had or do you have now any of the following? Give details of any condition answered in the affirmative under item 37.		
	Yes	No
5. Rheumatic fever		
6. Frequent or severe headache		
7. Dizziness or fainting spells		
8. Eye trouble		
9. Diabetes		
10. Tuberculosis		
11. Chronic shortness of breath		
12. Pain or pressure in chest or "heart attack"		
13. High blood pressure		
14. Low blood pressure		
15. Peptic ulcer		
16. Bone, joint or other deformity		
17. Painful or "trick" shoulder		
18. Painful or "trick" elbow		
19. Paralysis		
20. Epilepsy or fits		
21. Depression or excessive worry		
22. Loss or memory or amnesia		
23. Nervous condition which could impair judgement or reliability		
24. Drug narcotic habit or excessive drinking		
25. Do you normally wear eyeglasses?		
26. Has your work ever been limited or restricted for medical reasons?		
27. Have you ever been denied or rated up for life insurance for medical reasons?		
28. Have you ever been under observation or received care or treatment for any mental or nervous condition as a patient in a hospital, sanatorium, clinic or other facility or from a physician, clinical psychologist, etc.?		
29. Have you ever been rejected for or discharged from employment or military service for physical, mental or from a physician, clinical psychologist, etc.?		

30. Have you ever been received, is there pending, have you applied for, or do you intend to apply for pension or compensation for existing disability?		
31. Have you ever seriously considered committing suicide?		
32. Have you ever been convicted of any violation of law, regulations or ordinance? Do not include anything that happened before your 16th birthday. Do not include violations for which a fine of Tk. 1000/- or less was imposed.		
33. Have you ever had any major illness or injury other than those already noted?		
34. How many jobs have you had in the last 3 years?		
35. What is the length of time in your present employment?		
36. Give a brief statement of your present health in your own words.		
37. Details of any items 5 through 33 answered in the affirmative. In addition if your medical history includes any matter relating to physical, mental or nervous condition, please describe the condition and set forth your explanation of why this matter would not affect your ability to function as a facility operator. Use additional sheet if more space is needed.		
38. I certify that the foregoing information supplied by me is true to the best of my knowledge, and authorize the Commission. To use any of the information in this certificate in the exercise of its authority over the licensing of operators. (Date) (Facility) (Signature of applicant)		

Schedule – VI

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

LICENCE, RENEWAL AND AMENDMEND FEES

VI.1. LICENCE AND RENEWAL FEES

The licence and annual renewal fees for different nuclear/radiation facilities/activities shall be charged as follows:

No.	Facility/Practice	Licence Fee		Renewal Fee (Taka)
		Stage (Taka)	Total (Taka)	
01.	Full-fledged medical centres which have-			
	a) Radiotherapy devices such as Linear Accelerator, Betatron, Cobalt-60, Cesium-137, Deep X-ray therapy, Teletherapy, etc.		2,50,000.00	50,000.00
	1) siting licence	1,00,000.00		
	2) temporary operating licence	50,000.00		
	3) full operating licence	1,00,000.00		
	b) diagnostic devices such as Gamma Camera, Linear Scanner, RIA equipment etc.		1,50,000.00	20,000.00
	1) siting licence	75,000.00		
	2) temporary operating licence	25,000.00		
	3) full operating licence	50,000.00		
02.	Radiotherapy Centre or Nuclear Medicine Centre or Nuclear Cardiology Centre. (Single facility)		75,000.00	10,000.00
	1) siting licence	35,000.00		
	2) temporary operating licence	15,000.00		
	3) full operating licence	25,000.00		
03.	Radio-Immunno Assay, devices used in research, education and testing activities etc. (per unit) – full operation		10,000.00	2,000.00
04.	X-ray machine used for diagnosis in clinics, hospitals, nursing homes etc. (per unit) – full operation		10,000.00	2,000.00
05.	Organisation using radiation source for industrial radiography, mining etc. activities.		30,000.00	10,000.00
06.	Nuclear Reactor		7 Crore	30,00,000.00
	1) siting licence	3 Crore		
	2) startup licence	2 Crore		
	3) full operating licence	2 Crore		

No.	Facility/Practice	Licence Fee		Renewal Fee (Taka)
		Stage (Taka)	Total (Taka)	
07.	Nuclear Research Reactor 1) siting licence 2) startup licence 3) full operating licence	 10,00,000.00 7,50,000.00 7,50,000.00	25,00,000.00	1,50,000.00
08.	Nuclear fuel enrichment and fabrication facilities: 1) siting licence 2) startup licence 3) full operating licence	 0.75 Crore 1.25 Crore 0.75 Crore	2.75 Crore	15,00,000.00
09.	Mining & Milling facilities: (single unit) 1) temporary operating licence 2) full operating licence	 7,50,000.00 7,50,000.00	15,00,000.00	3,00,000.00
10.	Uranium Conversion facility Licence – full operation		30,00,000.00	7,00,000.00
11.	Radioactive Waste Facility a) Waste repository licence b) Waste storage facility licence (ordinary)		 0.80 Crore 0.20 Crore	 8,00,000.00 2,00,000.00
12.	Entry into Bangladesh and stay of Nuclear powered vehicle a) Entry Fee b) Stay per day		 1,00,000.00 10,000.00	
13.	Irradiating Facility a) Commercial irradiating facility per unit upto 50,000 Ci. 1) siting licence 2) startup licence 3) full operating licence b) For sources above 50,000 Ci, additional 50% of the rates at 13(a) Schedule VI.1 per unit source. c) Non - commercial irradiating facility per unit (<50,000 Ci), the following rates for each 10,000 Ci or fraction thereof: 1) siting licence 2) startup licence 3) full operating licence	 40,000.00 40,000.00 40,000.00 4,000.00 4,000.00 4,000.00	1,20,000.00 12,000.00	30,000.00 2,000.00
14.	Licence for transport of radioactive materials, nuclear materials or any prescribed substances or their wastes.		10,000.00	2,000.00
15.	Licence for import and export of radioactive materials, nuclear materials or any prescribed substances or their wastes.		10,000.00	

No.	Facility/Practice	Licence Fee		Renewal Fee (Taka)
		Stage (Taka)	Total (Taka)	
16.	a) Licence for disposal of radioactive materials, nuclear materials, prescribed substances or their wastes.	To be decided by the BAEC on case by case basis.		
	b) Licence for storage of radioactive materials, nuclear materials, prescribed substances or their wastes.	To be decided by the BAEC on case by case basis.		
	c) Licence for decommissioning a milling installation, nuclear installation, waste treatment facility, irradiating apparatus or sealed source apparatus.	To be decided by the BAEC on case by case basis.		
17.	Licence for Radiation Processed Food-Stuff	To be decided by the BAEC on case by case basis.		
18.	Licence for other types	To be decided by the BAEC on case by case basis.		

VI.2: LICENCE AMENDMENT FEE

The above rates may be reviewed by the BAEC from time to time. Licence amendment fee for each of the above mentioned 18 (eighteen) categories of radiation/nuclear facilities shall be fixed 50% of the licence fee.

Schedule – VII

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

PERMIT FEE:

The permit fee to be paid by a licensed importer/exporter of radioactive materials, sources, apparatus, etc. to the commission prior to customs' clearance shall be charged at the following rate : --

(1)	Commercial	-	2% of the C& F value
(2)	Non – commercial	-	0.5% of the C & F value

Schedule VIII

Bangladesh Atomic Energy Commission
Nuclear Safety and Radiation Control Division
P.O.Box. No. 158, Ramna, Dhaka.

8.1. RADIOACTIVITY TESTING FEES OF THE FOOD SAMPLES

*(a) Radioactivity testing fees of food samples of all imported milk and dairy products shall be charged at the following rates on the basis of C & F value of imported food –

Sl. No.	C&F value of the imported items	Fixed fee
01.	Up to Tk. 10,00,000/=	0.5% of the C&F value but not less than Tk. 500/=
02.	From Tk. 10,00,001/= to Tk. 1,00,00,000/=	Tk. 5,000/= and 0.25% of the C&F value for the amount exceeding Tk. 10,00,000/=
03.	From Tk. 1,00,00,001/= to Tk. 2,50,00,000/=	Tk. 27,500/= and 0.15% of the C&F value for the amount exceeding Tk. 1,00,00,000/=
04.	From Tk. 2,50,00,000/= to Tk. 5,00,00,000/=	Tk. 50,000/= and 0.10% of the C&F value for the amount exceeding Tk. 2,50,00,000/=
05.	From Tk. 5,00,00,000/= to Tk. 10,00,00,000/=	Tk. 75,000/= and 0.05% of the C&F value for the amount exceeding Tk. 5,00,00,000/=
06.	More than Tk. 10,00,00,000/=	Tk. 1,00,000/= and 0.01% of the C&F value for the amount exceeding Tk. 10,00,00,000/=

*(aa) Radioactivity testing fees of the food samples of other food items except the food items mentioned in clause 8.1(a) shall be charged at 50% of the fees mentioned in that clause:

provided that such fees shall not be less than Tk. 500/=

*(b) Sample collection procedure –

The following procedures shall be followed to collect food samples in order to examine the radioactivity level of imported food:-

(1) in the case of food item mentioned in clause 8.1(a) is imported in a container, at least one sample shall be collected from each container and in the case of the item, imported in gunny bags placed in hatch or deck of a ship, one sample shall be collected from every 100 bags; and

(2) in the case of food items mentioned in clause 8.1(aa), -

(a) if the item is imported in a container, at least one sample for every five containers or its part;

(b) if the item is imported in gunny bags, at least one sample for every ten thousands gunny bags or its part; and

(c) if the item is imported in open condition in hatch or shell under the deck of a ship at least one sample from each hatch or shell,

shall be collected.

* Amended and notified in Bangladesh Gazette on the 25th of May, 1998.

(c) Special Case –

1) if samples are needed to be re-examined, in that case, Tk. 1,000/– shall be charged for each sample.

2) no radioactivity testing fee is required for the imported food used for relief and rehabilitation work. In such case, prior permission from the Commission or certification form ministry of Relief & Rehabilitation/NGO Bureau or at least Deputy/Divisional Commissioner/Head shall be needed.

(d) Exported Item –

in the case of radioactivity testing of exported item, the fee shall be 50% of applicable fee of the imported food or be collected at reduced rate specified by the Commission.

8.2. CALIBRATION FEE

Sl. No.	Facility/Practice	Fee per unit per time	Travelling allowance rule
1.	X – Ray Machine		
	(a) Diagnostic (stationary)	Tk. 3,000.00	As per govt. rule
	(b) Diagnostic (portable)	Tk. 2,500.00	-do-
	(c) Radiography (NDT)	Tk. 2,500.00	-do-
	(d) Fluoroscopy/Simulator	Tk. 3,500.00	-do-
2.	Therapeutic Machine		
	(a) Deep Therapy	Tk. 4,000.00	-do-
	(b) Teletherapy(Cs-137,Co-60,etc.)	Tk. 4,000.00	-do-
	(c) Linear Accelerator/Betatron	Tk. 5,000.00	-do-
	(d) Brachytherapy	Tk. 4,000.00	-do-
3.	Radioisotope for Industrial use (Ir–192, Cs–137, Co–60, etc.)	Tk. 3,000.00	-do-
4.	Radioisotope for Research/ Development in Scientific Activity (Agriculture, Research Organisation, etc.)	Tk. 2,500.00	-do-
5.	Nuclear Medicine Centre/ Mining/Milling/Nuclear Installation	To be decided by BAEC on case by case basis.	

8,3. STANDARDIZATION FEE

Sl. No.	Facility/Practice	Fee per unit per time	Travelling allowance rule
1.	X – Ray Machine		
	(a) Diagnostic (stationary)	Tk. 3,000.00	As per govt. rule
	(b) Diagnostic (portable)	Tk. 2,500.00	-do-
	(c) Radiography (NDT)	Tk. 2,500.00	-do-
	(d) Fluoroscopy/Simulator	Tk. 3,500.00	-do-
2.	Therapeutic Machine		
	(a) Deep Therapy	Tk. 4,000.00	-do-
	(b) Teletherapy(Cs-137,Co-60,etc.)	Tk. 4,000.00	-do-
	(c) Linear Accelerator/Betatron	Tk. 5,000.00	-do-
	(d) Brachytherapy	Tk. 4,000.00	-do-
3.	Radioisotope for Industrial use (Ir-192, Cs-137, Co-60, etc.)	Tk. 3,000.00	-do-
4.	Radioisotope for Research/ Development in Scientific Activity (Agriculture, Research Organisation, etc.).	Tk. 2,500.00	-do-
5.	Nuclear Medicine Centre/Mining /Milling/Nuclear Installation	To be decided by BAEC on case by case basis.	

8.4. DOSIMETRY FEE

Sl. No.	Name of Badge	New Badge(per piece)	Processing/Reading per time per piece
1.	Film	Tk. 150.00	Tk. 75.00
2.	TLD	Tk. 800.00	Tk. 100.00

8.5. STANDARDIZATION OF DOSE MEASURING INSTRUMENT AT SSDL

Sl. No.	Name of the Equipment	Fee per unit per time
1.	Survey meter (Beta, Gamma, Neutron, etc.)	Tk. 1,000.00
2.	Exposure meter	Tk. 1,500.00
3.	Other Dose Measuring Devices	To be decided by BAEC on case by case basis.

8.6. DA OF THE EXPERT FOR TECHNICAL SERVICES OUTSIDE BAEC

Sl. No.	Designation	Allowance Per Day
1.	Chief Scientific Officer/Equivalent	Tk. 250.00
2.	Principal Scientific Officer/Equivalent	Tk. 200.00
3.	Senior Scientific Officer/Equivalent	Tk. 175.00
4.	Senior Experimental Officer/Senior Technical Officer /Chief Technician	Tk. 160.00
5.	Scientific Officer/Equivalent	Tk. 150.00
6.	Experimental Officer/Technical Officer /Principal Technician	Tk. 120.00
7.	Junior Experimental Officer/Junior Engineer/Senior Scientific Assistant/Senior Technician/Equivalent	Tk. 110.00
8.	Research Assistant/Sub-Assistant Engineer/Scientific Assistant-I/Equivalent	Tk. 100.00
9.	Scientific Assistant-II/Technician – II/Equivalent	Tk. 75.00
10.	Laboratory Attendant/Technician Helper/Equivalent	Tk. 60.00

N.B.: For remote places such as Teknaf, Mongla, Kutubdia, Tetulia, etc., the respective institution shall pay 10% in addition to the above mentioned rate.

8.7. OTHER SERVICE FEES

Fee shall be charged for the following services based on the consideration of actual cost involved for the particular service determined by the Commission:

(1) Special Safety Analysis – shall be determined on the basis of the type of analysis, its depths, required man-hour, use of special equipment and technique, inspection or observation requirement, management requirement etc.

(2) Training of Radiation Control Officer - shall be determined on the basis of the number, duration and quality of lectures, number, duration and quality of practical classes, related instruments and other facilities to be used and other institutional and management requirements to be determined on the basis of type and involvement of the practice.

(3) Training of Occupational Worker - shall be determined on the basis of number, duration and quality of lectures, number, duration and quality of practical classes, related instruments and other facilities to be used and other institutional and management requirements to be determined on the basis of type and involvement of the practice.

(4) Special inspection - shall be determined on the basis of status of the inspecting persons, their number and instruments and devices required for the special demand of the licensee or for the evaluation of licence application.

(5) Other cases – shall be fixed by the commission based on the actual cost.

Schedule –IX

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

APPLICABLE STANDARD, CODE AND GUIDE[1]

Sl No.	Facilities/Practices	Applicable Standards, Code and Guide
1.	Radiation Exposure Control :	
	(i) Occupational Exposure	IAEA Safety Series Nos. 115(1996), 34 &101 ICRU Report 51 (1993)
	(ii) Medical Exposure	IAEA Safety Series No. 115(1996) Helsinki Declaration(1974) and Amendments USNRC 10 CFR 35 (as applicable) WHO TRS No. 795(1990)
	(iii) Public Exposure	IAEA Safety Series Nos. 115(1996), 72 & 81.5
	(iv) Potential Exposure	IAEA Safety Series Nos. 115(1996), 72 & 104
	(v) Emergency Exposure	IAEA Safety Series Nos. 115(1996), 91 & 102
	(vi) Chronic Exposure Situations	IAEA Safety Series Nos. 115(1996) & 81
2.	Emergency Response Plan	IAEA Safety Series Nos. 55, 73, 88, 91, 94 & 97
3.	Medical Practices :	
	(i) X – Ray	IAEA Safety Series No. 115(1996) AERB Code No. SC/MED-2, December, 1986
	(ii) Radiation Imaging	IAEA Safety Series No. 115(1996) AERB Code No. SC/MED-5, November, 1989 WHO TRS No. 757(1987) &795(1990) WHO QA - 1982
	(iii) Nuclear Medicine	IAEA Safety Series Nos. 115(1996), 88 & 102 AERB Code No. SC/MED-4, November, 1988 USNRC 10 CFR 35 WHO QA – 1982.
	(iv) Tele Gamma Therapy	IAEA Safety Series No. 115(1996) AERB Code No. SC/MED-1, November, 1988 USNRC 10 CFR 35 WHO QA – 1988.
	(v) Brachytherapy	IAEA Safety Series No. 115(1996) AERB Code No. SC/MED-3, March, 1986 USNRC 10 CFR 35
	(vi) Accelerator	IAEA Safety Series Nos. 115(1996) & 107 IAEA TRS Nos. 188 & 283
4.	Research, Development & Training	IAEA Safety Series No. 102
5.	Transportation of Radioactive Material	IAEA Safety Series Nos. 6 (1990), 7, 37, 80 & 87

[1] List is not comprehensive.

Sl No.	Facilities/Practices	Applicable Standards, Code and Guide
6.	Personnel Monitoring	IAEA Safety Series No. 14
7.	Radioactive Waste Management	IAEA Safety Series Nos. 53, 63, 79, 111 SF. 111-S1, 111 – G1.1, 111-G3.1 and Other IAEA RADWASS Publications
8.	Intervention Criteria in a Nuclear or Radiation Emergency	IAEA Safety Series No. 109 (1994)
9.	Quality Assurance	IAEA QA Documents
10.	Nuclear Safeguards	IAEA Publications under INFCIRC
11.	Research Reactor : (i) Operation (ii) Design (iii) Safety Assessment (iv) Utilization & Modification (v) Commissioning (vi) Decommissioning	 IAEA Safety Series Nos. 35 & 35 – S1 IAEA Safety Series Nos. 35 & 35 – S2 IAEA Safety Series Nos. 35 & 35 – G1 IAEA Safety Series Nos. 35 & 35 – G2 IAEA Safety Series Nos. 35 & 35 – G4 IAEA Safety Series No. 74
12.	Nuclear Reactor	IAEA Safety Series Nos. 115 (1996), 52, 69 & 73, and other IAEA publications published under INSAG and NUSS Programme and USNRC 10 CFR 50, 55 & 100 (as applicable)
13.	Operator's Licence for Nuclear Reactor	USNRC 10 CFR 55, USNRC NUREG-0094, Rev. 1 of WASH 1094
14.	Industrial Radiography	USNRC 10 CFR 34 (as applicable), Working Safety in Gamma Radiography – NUREG/BR-0024, AERB Guide Nos. SG/IN-1, SG/IN-2 & SG/IN-3.
15.	Site Preparations and Structural Works	Bangladesh National Building Code (1993) and other applicable National & International Standards.
16.	Electrical Works	NEC Code, USNIST Standards or Equivalent Standards
17.	Mechanical Works	ASME, ASTM & equivalent Standards
18.	Fire Protection	IAEA Safety Series No. 50-SG-D2 (REV-1) and other National & International Standards
19.	Uranium Mining and Milling	IAEA Safety Series Nos. 82, 85, 90 & 95
20.	Release of Radioactive Effluents into Environment	IAEA Safety Series No. 77
21.	Exemption Criteria	IAEA Safety Series No. 89
22.	Safety Culture	IAEA Safety Series Nos. INSAG-4
23.	Radiation Processing of Food Stuff	Joint FAO/WHO Food Standards Programme, Codex Alimentarius Commission, Codex Alimentarius, 1991
24.	Intervention	IAEA Safety Series No. 109

Schedule - X

VERIFICATION OF COMPLIANCE WITH DOSE LIMITS

1. The dose limits specified in [illegible] apply to the sum of the relevant doses from external exposure in the specified period and the relevant committed doses from intakes in the same period; the period for calculating the committed dose shall normally be 50 years for intakes by adults and to age 70 years for intakes by children.

2. For the purpose of demonstrating compliance with dose limits, the sum of the personal dose equivalent from external exposure to penetrating radiation in the specified period and the committed equivalent dose or committed effective dose, as appropriate, from intakes of radioactive substances in the same period shall be used.

3. Compliance with the foregoing requirements for application of the dose limits on effective dose shall be determined by either of the following methods

(a) by comparing the total effective dose with the relevant dose limit, where the total effective dose E_T is calculated according to the following formula:

$$E_T = H_p(d) + \sum_j e(g)_{j,ing} I_{j,ing} + \sum_j e(g)_{j,inh} I_{j,inh}$$

where $H_p(d)$ is the personal dose equivalent from exposure to penetrating radiation[3] during the year; $e(g)_{j,ing}$ and $e(g)_{j,inh}$ are the committed effective dose per unit intake by ingestion and inhalation for radionuclide j by the group of age g; and $I_{j,ing}$ and $I_{j,inh}$ are the intakes via ingestion or inhalation of radionuclide j during the same period; or

(b) by satisfying the following condition:

$$\frac{H_p(d)}{DL} + \sum_j \frac{I_{j,ing}}{I_{j,ing,L}} + \sum_j \frac{I_{j,inh}}{I_{j,inh,L}} \leq 1$$

where DL is the relevant dose limit on effective dose, and $I_{j,ing,L}$ and $I_{j,inh,L}$ are the annual limits on intake (ALI) via ingestion or via inhalation of radionuclide j (i.e. the intakes by the relevant route of radionuclide j that lead to the relevant limit on effective dose); or

(c) by any other approved method.

[3] The use of the ICRU operational quantity personal dose equivalent, $H_p(d)$, for this purpose is appropriate for all radiations except neutrons in the energy range 1 eV to 30 keV. In situations in which neutrons in this energy range contribute a major fraction of the effective dose, additional information may be necessary to determine the relationship between the value of the personal dose equivalent and the corresponding effective dose.

4. Except for radon progeny and thoron progeny, values of the committed effective dose per unit intake for ingestion $e(g)_{j,ing}$ and for inhalation $e(g)_{j,inh}$ are given for occupational exposure in Table -- III and for public exposure in Tables -VI and II-VII. Values of $I_{j,L}$ may be obtained from the relevant values of the committed effective dose per unit intake by means of the following relationship:

$$I_{j,L} = \frac{DL}{e_j}$$

where DL is the relevant annual dose limit on effective dose and e_j is the relevant value of dose per unit intake for radionuclide j given in Tables -III, VI or VII as appropriate.

5. For occupational exposure to radionuclides, Table -III gives ingestion and inhalation dose coefficients: that is, the committed effective dose per unit intake via ingestion corresponding to different gut transfer factors f_1 (i.e. the proportion of the intake transferred to body fluids in the gut) for various chemical forms; and the committed effective dose per unit intake via inhalation for the default lung absorption types (fast, moderate and slow) given in the new model for the respiratory tract (see ICRP Publication No. 66 (1994))[4] , with appropriate f_1 values for the component of the intake cleared from the lung to the gastrointestinal tract. These inhalation and ingestion dose coefficients for occupational exposure are consistent with those given in ICRP Publication No. 68 (1994)[4] . Table -IV gives the f_1 values and Table -V gives the lung absorption types for various chemical forms of the elements, on the basis that inhalation classes given as days, weeks and years in ICRP Publication No. 30, Parts 1-4, have been designated as absorption types F, M and S (fast, moderate and slow), respectively, as in ICRP Publication No. 68 (1994)[4] . Under certain assumptions $I_{j,L}$ can be used as an ALI for occupational exposure.

6. For public exposure to radionuclides, Table -VI gives ingestion dose coefficients corresponding to different gut transfer factors f_1 for intakes of radionuclides by members of the public. The f_1 values used in the calculations, which are also given in the table, are taken from ICRP Publications Nos 56 (1989), 67 (1993), 69 (1995) and 71 (1996)[4] wherever possible, or otherwise from ICRP Publication No. 30 (Parts 1-4)[4] . Increased f_1 values have been applied to three-month-old infants. Table -VII gives inhalation dose coefficients for members of the public for different lung absorption types (F, M and S). The relevant ICRP Publications for the source of information on lung absorption types and biokinetic models for systemic

activity used for these calculations are given in Table -VIII. For the 31 elements for which information on lung absorption is given in ICRP Publication No. 71 (1996)[4], dose coefficients are given for the three absorption types, together with a recommended default value for use if, and only if, no specific information is available on the chemical form of the radionuclide. For all these 31 elements, specific age dependent biokinetic models for systemic activity have been developed by the ICRP and information is given in Publications Nos 56, 67, 69 and 71[4]. The radionuclides of these elements are considered to be of principal significance for purposes of environmental radiation protection. For radionuclides of the remaining 60 elements, the biokinetic models used are those given in ICRP Publication No. 30 (Parts 1–4)[7] for workers. The dose calculations for the radionuclides of these additional elements allow for age dependent changes in body mass, geometry and excretion rates, but not for the biokinetics of systemic activity. The results should therefore be used with caution for members of the public. Higher f_1 values have been applied to three-month-old infants. The dose coefficients for the various radionuclides of these additional 60 elements have been calculated on the basis that lung classes given as D, W and Y in ICRP Publication No. 30 have been designated as absorption types F, M and S respectively. Information is given in the relevant ICRP publications on the chemical forms appropriate to the different inhalation classes/types. In general, if no information is available on these parameters, the most restrictive value should be used for comparison with dose limits. These dose coefficients are consistent with those given in ICRP Publication No. 72 (1996)[4]

7. Table -IX gives dose coefficients for gases and vapours for infants, children and adults. The values for adults are appropriate for both workers and members of the public. These dose coefficients are consistent with those given in ICRP Publication Nos 71 (1996) and 72 (1996)[4]. Table -X gives effective dose rates for exposure of adults to inert gases. The values are applicable to both workers and adult members of the public.

8. For exposure to radon progeny, using a conversion coefficient of 1.4 mSv per $mJ \cdot h \cdot m^{-3}$, the dose limits in para. II-5 may be interpreted as follows: 20 mSv corresponds to 14 $mJ \cdot h \cdot m^{-3}$ (4 working level months (WLMs)) and 50 mSv corresponds to 35 $mJ \cdot h \cdot m^{-3}$ (10 WLM). For exposure to radon progeny and thoron progeny, $I_{j,inh}$ and $I_{j,inh,L}$ in the formulas given in para. 3 may be expressed in terms of potential alpha energy intake, using the relevant limits specified in Tables -I and II (the values are from ICRP Publication No. 65 (1993)[4]); alternatively, $I_{j,inh}$ and $I_{j,inh,L}$ may be replaced by potential alpha energy exposure (often expressed in WLMs), using the relevant limits specified in Tables -I and II.

9. The committed equivalent dose in an organ or tissue due to the intake by a given route of any radionuclide may be determined:

(a) by multiplying the estimated intake of the radionuclide via such a route by the appropiate value of the committed equivalent dose per unit intake corresponding to such an organ or tissue; or

(b) by any other approved method.

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* INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Limits for Intakes of Radionuclides by Workers, ICRP Publication No. 30, Part 1, *Ann. ICRP* 2 3/4, Pergamon Press, Oxford (1979); ICRP, Limits for Intakes of Radionuclides by Workers, ICRP Publication No. 30, Part 2, *Ann. ICRP* 4 3/4, Pergamon Press, Oxford (1980); ICRP, Limits for Intakes of Radionuclides by Workers, ICRP Publication No. 30, Part 3 (including addendum to Parts 1 and 2), *Ann. ICRP* 6 2/3, Pergamon Press, Oxford (1981); ICRP, Limits for Intakes of Radionuclides by Workers: An Addendum, ICRP Publication No. 30, Part 4, *Ann. ICRP* 19 4, Pergamon Press, Oxford (1988);; ICRP, Age-Dependent Doses to Members of the Public from Intake of Radionuclides: Part 1, ICRP Publication No. 56, *Ann. ICRP* 20 2, Pergamon Press, Oxford (1989); ICRP, Age-Dependent Doses to Members of the Public from Intake of Radionuclides: Part 2, Ingestion Dose Coefficients, ICRP Publication No. 67, *Ann. ICRP* 23 3/4, Elsevier Science, Oxford (1993); ICRP, Human Respiratory Tract Model for Radiological Protection, ICRP Publication No. 66, *Ann. ICRP* 24 1-3, Elsevier Science, Oxford (1994); ICRP, Dose Coefficients for Intakes of Radionuclides by Workers, ICRP Publication No. 68, *Ann. ICRP* 24 4, Elsevier Science, Oxford (1994); ICRP, Age-Dependent Doses to Members of the Public from Intake of Radionuclides: Part 3, Ingestion Dose Coefficients, ICRP Publication No. 69, *Ann. ICRP* 25 1, Elsevier Science, Oxford (1995); ICRP, Age-Dependent Doses to Members of the Public from Intake of Radionuclides, Part 4, Inhalation Dose Coefficients, ICRP Publication No. 71, *Ann. ICRP* 26, Elsevier Science, Oxford (1996); ICRP, Age-Dependent Doses to Members of the Public from Intake of Radionuclides, Part 5, Compilation of Ingestion and Inhalation Dose Coefficients, ICRP Publication No. 72, *Ann. ICRP* 26, Elsevier Science, Oxford (1996); ICRP, Protection against Radon-222 at Home and at Work, ICRP Publication No. 65, *Ann. ICRP* 23 2, Pergamon Press, Oxford (1993).

TABLE I LIMITS ON INTAKE AND EXPOSURE FOR RADON PROGENY AND THORON PROGENY

Quantity	Unit	Value for radon progeny[a]	Value for thoron progeny[b]
Annual average over 5 years			
Potential α-energy intake	J	0.017	0.051
Potential α-energy exposure	$J \cdot h \cdot m^{-3}$ [d]	0.014	0.042
	WLM[c,d]	4.0	12
Maximum in a single year			
Potential α-energy intake	J	0.042	0.127
Potential α-energy exposure	$J \cdot h \cdot m^{-3}$ [d]	0.035	0.105
	WLM	10.0	30

Note: Values are from ICRP Publication No. 65 (see footnote 5).

[a] Radon progeny: short lived decay products of ^{222}Rn: ^{218}Po (RaA), ^{214}Bi (RaC), ^{214}Pb (RaB) and ^{214}Po (RaC').

[b] Thoron progeny: short lived decay products of ^{220}Rn: ^{216}Po (ThA), ^{212}Pb (ThB), ^{212}Bi (ThC), ^{212}Po (ThC') and ^{208}Tl (ThC").

[c] Working level month (WLM): A unit of exposure to radon progeny or thoron progeny. One working level month is 3.54 $mJ \cdot h \cdot m^{-3}$ or 170 $WL \cdot h$, where one working level (WL) is any combination of radon or thoron progeny in one litre of air that will result in the ultimate emission of 1.3×10^5 MeV of alpha energy. In SI units, the WL is equivalent to 2.1×10^{-5} $J \cdot m^{-3}$.

[d] Conversion coefficients are given in Table II

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5 The International Commission on Radiological Protection has recommended that the action levels for occupational exposure to radon can fall in the range 500–1500 $Bq \cdot m^{-3}$. (See INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Protection against Radon-222 at Home and at Work, Publication No. 65, *Ann. ICRP* 23 2, Pergamon Press, Oxford (1993).)

TABLE II . CONVERSION COEFFICIENTS FOR UNITS IN TABLE I FOR RADON AND RADON PROGENY

Quantity	Unit	Value
Radon progeny conversion	(mJ·h·m^{-3}) per WLM	3.54
Radon progeny/radon exposure conversions (equilibrium factor 0.4)	(mJ·h·m^{-3}) per (Bq·h·m^{-3})	2.22×10^{-6}
	WLM per (Bq·h·m^{-3})	6.28×10^{-7}
Annual exposure to radon progeny per unit radon concentration[a]:		
at home	(mJ·h·m^{-3}) per (Bq·m^{-3})	1.56×10^{-2}
at work	(mJ·h·m^{-3}) per (Bq·m^{-3})	4.45×10^{-3}
at home	WLM per (Bq·m^{-3})	4.40×10^{-3}
at work	WLM per (Bq·m^{-3})	1.26×10^{-3}
Dose conversion convention, effective dose per unit exposure to radon progeny:		
at home	mSv per (mJ·h·m^{-3})	1.1
at work	mSv per (mJ·h·m^{-3})	1.4
Dose conversion convention, effective dose per unit exposure to radon progeny:		
at home	mSv per WLM	4
at work	mSv per WLM	5
Radon progeny/radon concentration conversion		
with equilibrium factor F = 0.4	WL per (Bq·m^{-3})	1.07×10^{-4}
in general	WL per (Bq·m^{-3})	2.67×10^{-4}

Note: Values are from ICRP Publication No. 65 (see footnote 5).

[a] Assuming 7000 hours per year indoors or 2000 hours per year at work and an equilibrium factor of 0.4.

TABLE - III: Refer to IAEA SS-115 (1996)
(Page number 100 - 156)

TABLE - III: Refer to IAEA SS-115 (1996)
(Page number 100 - 156)

TABLE -IV. COMPOUNDS AND VALUES OF GUT TRANSFER FACTOR f_1 USED TO CALCULATE COMMITTED EFFECTIVE DOSE PER UNIT INTAKE VIA INGESTION FOR WORKERS

Element	Gut transfer factor f_1	Compounds
Hydrogen	1.000	Tritiated water (ingested)
	1.000	Organically bound tritium
Beryllium	0.005	All compounds
Carbon	1.000	Labelled organic compounds
Fluorine	1.000	All compounds
Sodium	1.000	All compounds
Magnesium	0.500	All compounds
Aluminium	0.010	All compounds
Silicon	0.010	All compounds
Phosphorus	0.800	All compounds
Sulphur	0.800	Inorganic compounds
	0.100	Elemental sulphur
	1.000	Organic sulphur
Chlorine	1.000	All compounds
Potassium	1.000	All compounds
Calcium	0.300	All compounds
Scandium	1.0×10^{-4}	All compounds
Titanium	0.010	All compounds
Vanadium	0.010	All compounds
Chromium	0.100	Hexavalent compounds
	0.010	Trivalent compounds
Manganese	0.100	All compounds
Iron	0.100	All compounds
Cobalt	0.100	All unspecified compounds
	0.050	Oxides, hydroxides and inorganic compounds
Nickel	0.050	All compounds
Copper	0.500	All compounds
Zinc	0.500	All compounds
Gallium	0.001	All compounds

TABLE -IV. (cont.)

Element	Gut transfer factor f_1	Compounds
Germanium	1.000	All compounds
Arsenic	0.500	All compounds
Selenium	0.800	All unspecified compounds
	0.050	Elemental selenium and selenides
Bromine	1.000	All compounds
Rubidium	1.000	All compounds
Strontium	0.300	All unspecified compounds
	0.010	Strontium titanate ($SrTiO_3$)
Yttrium	1.0×10^{-4}	All compounds
Zirconium	0.002	All compounds
Niobium	0.010	All compounds
Molybdenum	0.800	All unspecified compounds
	0.050	Molybdenum sulphide
Technetium	0.800	All compounds
Ruthenium	0.050	All compounds
Rhodium	0.050	All compounds
Palladium	0.005	All compounds
Silver	0.050	All compounds
Cadmium	0.050	All inorganic compounds
Indium	0.020	All compounds
Tin	0.020	All compounds
Antimony	0.100	All compounds
Tellurium	0.300	All compounds
Iodine	1.000	All compounds
Caesium	1.000	All compounds
Barium	0.100	All compounds
Lanthanum	5.0×10^{-4}	All compounds
Cerium	5.0×10^{-4}	All compounds
Praseodymium	5.0×10^{-4}	All compounds
Neodymium	5.0×10^{-4}	All compounds

TABLE -IV. (cont.)

Element	Gut transfer factor f_1	Compounds
Promethium	5.0×10^{-4}	All compounds
Samarium	5.0×10^{-4}	All compounds
Europium	5.0×10^{-4}	All compounds
Gadolinium	5.0×10^{-4}	All compounds
Terbium	5.0×10^{-4}	All compounds
Dyspresium	5.0×10^{-4}	All compounds
Holmium	5.0×10^{-4}	All compounds
Erbium	5.0×10^{-4}	All compounds
Tlulium	5.0×10^{-4}	All compounds
Ytterbium	5.0×10^{-4}	All compounds
Lutetium	5.0×10^{-4}	All compounds
Hafnium	0.002	All compounds
Tantalum	0.001	All compounds
Tungsten	0.300	All unspecified compounds
	0.010	Tungstic acid
Rhenium	0.800	All compounds
Osmium	0.010	All compounds
Iridium	0.010	All compounds
Platinum	0.010	All compounds
Gold	0.100	All compounds
Mercury	0.020	All inorganic compounds
Mercury	1.000	Methyl mercury
	0.400	All unspecified organic compounds
Thallium	1.000	All compounds
Lead	0.200	All compounds
Bismuth	0.050	All compounds
Polonium	0.100	All compounds
Astatine	1.000	All compounds
Francium	1.000	All compounds
Radium	0.200	All compounds

TABLE -IV. (cont.)

Element	Gut transfer factor f_1	Compounds
Actinium	5.0×10^{-4}	All compounds
Thorium	5.0×10^{-4}	All unspecified compounds
	2.0×10^{-4}	Oxides and hydroxides
Protactinium	5.0×10^{-4}	All compounds
Uranium	0.020	All unspecified compounds
	0.002	Most tetravalent compounds, e.g., UO_2, U_3O_8, UF_4
Neptunium	5.0×10^{-4}	All compounds
Plutonium	5.0×10^{-4}	All unspecified compounds
	1.0×10^{-4}	Nitrates
	1.0×10^{-5}	Insoluble oxides
Americium	5.0×10^{-4}	All compounds
Curium	5.0×10^{-4}	All compounds
Berkelium	5.0×10^{-4}	All compounds
Californium	5.0×10^{-4}	All compounds
Einsteinium	5.0×10^{-4}	All compounds
Fermium	5.0×10^{-4}	All compounds
Mendelevium	5.0×10^{-4}	All compounds

TABLE –V. COMPOUNDS, LUNG ABSORPTION TYPES AND VALUES OF GUT TRANSFER FACTOR f_1 USED TO CALCULATE COMMITTED EFFECTIVE DOSE PER UNIT INTAKE VIA INHALATION FOR WORKERS

Element	Absorption type(s)	Gut transfer factor f_1	Compounds
Beryllium	M	0.005	All unspecified compounds
	S	0.005	Oxides, halides and nitrates
Fluorine	F	1.000	Determined by combining cation
	M	1.000	Determined by combining cation
	S	1.000	Determined by combining cation
Sodium	F	1.000	All compounds
Magnesium	F	0.500	All unspecified compounds
	M	0.500	Oxides, hydroxides, carbides, halides and nitrates
Aluminium	F	0.010	All unspecified compounds
	M	0.010	Oxides, hydroxides, carbides, halides, nitrates and metallic aluminium
Silicon	F	0.010	All unspecified compounds
	M	0.010	Oxides, hydroxides, carbides and nitrides
	S	0.010	Aluminosilicate glass aerosol
Phosphorus	F	0.800	All unspecified compounds
	M	0.800	Some phosphates: determined by combining cation
Sulphur	F	0.800	Sulphides and sulphates: determined by combining cation
	M	0.800	Elemental sulphur. Sulphides and sulphates: determined by combining cation
Chlorine	F	1.000	Determined by combining cation
	M	1.000	Determined by combining cation
Potassium	F	1.000	All compounds
Calcium	M	0.300	All compounds
Scandium	S	1.0×10^{-4}	All compounds
Titanium	F	0.010	All unspecified compounds
	M	0.010	Oxides, hydroxides, carbides, halides and nitrates
	S	0.010	Strontium titanate ($SrTiO_3$)
Vanadium	F	0.010	All unspecified compounds
	M	0.010	Oxides, hydroxides, carbides and halides
Chromium	F	0.100	All unspecified compounds
	M	0.100	Halides and nitrates
	S	0.100	Oxides and hydroxides

Note: Types F, M and S denote fast, moderate and slow absorption from the lung, respectively.

TABLE –V. (cont.)

Element	Absorption types	Gut transfer factor f_1	Compounds
Manganese	F	0.100	All unspecified compounds
	M	0.100	Oxides, hydroxides, halides and nitrates
Iron	F	0.100	All unspecified compounds
	M	0.100	Oxides, hydroxides and halides
Cobalt	M	0.100	All unspecified compounds
	S	0.050	Oxides, hydroxides, halides and nitrates
Nickel	F	0.050	All unspecified compounds
	M	0.050	Oxides, hydroxides and carbides
Copper	F	0.500	All unspecified inorganic compounds
	M	0.500	Sulphides, halides and nitrates
	S	0.500	Oxides and hydroxides
Zinc	S	0.500	All compounds
Gallium	F	0.001	All unspecified compounds
	M	0.001	Oxides, hydroxides, carbides, halides and nitrates
Germanium	F	1.000	All unspecified compounds
	M	1.000	Oxides, sulphides and halides
Arsenic	M	0.500	All compounds
Selenium	F	0.800	All unspecified inorganic compounds
	M	0.800	Elemental selenium, oxides, hydroxides and carbides
Bromine	F	1.000	Determined by combining cation
	M	1.000	Determined by combining cation
Rubidium	F	1.000	All compounds
Strontium	F	0.300	All unspecified compounds
	S	0.010	Strontium titanate ($SrTiO_3$)
Yttrium	M	1.0×10^{-4}	All unspecified compounds
	S	1.0×10^{-4}	Oxides and hydroxides
Zirconium	F	0.002	All unspecified compounds
	M	0.002	Oxides, hydroxides, halides and nitrates
	S	0.002	Zirconium carbide
Niobium	M	0.010	All unspecified compounds
	S	0.010	Oxides and hydroxides
Molybdenum	F	0.800	All unspecified compounds
	S	0.050	Molybdenum sulphide, oxides and hydroxides
Technetium	F	0.800	All unspecified compounds
	M	0.800	Oxides, hydroxides, halides and nitrates

TABLE -V (cont.)

Element	Absorption types)	Gut transfer factor f_1	Compounds
Ruthenium	F	0.050	All unspecified compounds
	M	0.050	Halides
	S	0.050	Oxides and hydroxides
Rhodium	F	0.050	All unspecified compounds
	M	0.050	Halides
	S	0.050	Oxides and hydroxides
Palladium	F	0.005	All unspecified compounds
	M	0.005	Nitrates and halides
	S	0.005	Oxides and hydroxides
Silver	F	0.050	All unspecified compounds and metallic silver
	M	0.050	Nitrates and sulphides
	S	0.050	Oxides, hydroxides and carbides
Cadmium	F	0.050	All unspecified compounds
	M	0.050	Sulphides, halides and nitrates
	S	0.050	Oxides and hydroxides
Indium	F	0.020	All unspecified compounds
	M	0.020	Oxides, hydroxides, halides and nitrates
Tin	F	0.020	All unspecified compounds
	M	0.020	Stannic phosphate, sulphides, oxides, hydroxides, halides and nitrates
Antimony	F	0.100	All unspecified compounds
	M	0.010	Oxides, hydroxides, halides, sulphides, sulphates and nitrates
Tellurium	F	0.300	All unspecified compounds
	M	0.300	Oxides, hydroxides and nitrates
Iodine	F	1.000	All compounds
Caesium	F	1.000	All compounds
Barium	F	0.100	All compounds
Lanthanum	F	5.0×10^{-4}	All unspecified compounds
	M	5.0×10^{-4}	Oxides and hydroxides
Cerium	M	5.0×10^{-4}	All unspecified compounds
	S	5.0×10^{-4}	Oxides, hydroxides and fluorides
Praseodymium	M	5.0×10^{-4}	All unspecified compounds
	S	5.0×10^{-4}	Oxides, hydroxides, carbides and fluorides
Neodymium	M	5.0×10^{-4}	All unspecified compounds
	S	5.0×10^{-4}	Oxides, hydroxides, carbides and fluorides

TABLE –V. (cont.)

Element	Absorption type(s)	Gut transfer factor f_1	Compounds
Promethium	M	5.0×10^{-4}	All unspecified compounds
	S	5.0×10^{-4}	Oxides, hydroxides, carbides and fluorides
Samarium	M	5.0×10^{-4}	All compounds
Europium	M	5.0×10^{-4}	All compounds
Gadolinium	F	5.0×10^{-4}	All unspecified compounds
	M	5.0×10^{-4}	Oxides, hydroxides and fluorides
Terbium	M	5.0×10^{-4}	All compounds
Dysprosium	M	5.0×10^{-4}	All compounds
Holmium	M	5.0×10^{-4}	All unspecified compounds
Erbium	M	5.0×10^{-4}	All compounds
Thulium	M	5.0×10^{-4}	All compounds
Ytterbium	M	5.0×10^{-4}	All unspecified compounds
	S	5.0×10^{-4}	Oxides, hydroxides and fluorides
Lutetium	M	5.0×10^{-4}	All unspecified compounds
	S	5.0×10^{-4}	Oxides, hydroxides and fluorides
Hafnium	F	0.002	All unspecified compounds
	M	0.002	Oxides, hydroxides, halides, carbides and nitrates
Tantalum	M	0.001	All unspecified compounds
	S	0.001	Elemental tantalum, oxides, hydroxides, halides, carbides, nitrates and nitrides
Tungsten	F	0.300	All compounds
Rhenium	F	0.800	All unspecified compounds
	M	0.800	Oxides, hydroxides, halides and nitrates
Osmium	F	0.010	All unspecified compounds
	M	0.010	Halides and nitrates
	S	0.010	Oxides and hydroxides
Iridium	F	0.010	All unspecified compounds
	M	0.010	Metallic iridium, halides and nitrates
	S	0.010	Oxides and hydroxides
Platinum	F	0.010	All compounds
Gold	F	0.100	All unspecified compounds
	M	0.100	Halides and nitrates
	S	0.100	Oxides and hydroxides
Mercury	F	0.020	Sulphates
	M	0.020	Oxides, hydroxides, halides, nitrates and sulphides

TABLE -V. (cont.)

Element	Absorption type(s)	Gut transfer factor f_1	Compounds
Mercury	F	0.400	All organic compounds
Thallium	F	1.000	All compounds
Lead	F	0.200	All compounds
Bismuth	F	0.050	Bismuth nitrate
	M	0.050	All unspecified compounds
Polonium	F	0.100	All unspecified compounds
	M	0.100	Oxides, hydroxides and nitrates
Astatine	F	1.000	Determined by combining cation
	M	1.000	Determined by combining cation
Francium	F	1.000	All compounds
Radium	M	0.200	All compounds
Actinium	F	5.0×10^{-4}	All unspecified compounds
	M	5.0×10^{-4}	Halides and nitrates
	S	5.0×10^{-4}	Oxides and hydroxides
Thorium	M	5.0×10^{-4}	All unspecified compounds
	S	2.0×10^{-4}	Oxides and hydroxides
Protactinium	M	5.0×10^{-4}	All unspecified compounds
	S	5.0×10^{-4}	Oxides and hydroxides
Uranium	F	0.020	Most hexavalent compounds, e.g., UF_6, UO_2F_2 and $UO_2(NO_3)_2$
	M	0.020	Less soluble compounds, e.g., UO_3, UF_4, UCl_4 and most other hexavalent compounds
	S	0.002	Highly insoluble compounds, e.g., UO_2 and U_3O_8
Neptunium	M	5.0×10^{-4}	All compounds
Plutonium	M	5.0×10^{-4}	All unspecified compounds
	S	1.0×10^{-5}	Insoluble oxides
Americium	M	5.0×10^{-4}	All compounds
Curium	M	5.0×10^{-4}	All compounds
Berkelium	M	5.0×10^{-4}	All compounds
Californium	M	5.0×10^{-4}	All compounds
Einsteinium	M	5.0×10^{-4}	All compounds
Fermium	M	5.0×10^{-4}	All compounds
Mendelevium	M	5.0×10^{-4}	All compounds

TABLE - VI: Refer to IAEA SS-115 (1996)
(Page number 166 - 201)

TABLE - VII: Refer to IAEA SS-115 (1996)
(Page number 202 - 269)

TABLE –VIII. LUNG ABSORPTION TYPES USED TO CALCULATE COMMITTED EFFECTIVE DOSE PER UNIT INTAKE VIA INHALATION FOR EXPOSURE TO PARTICULATE AEROSOLS OR TO GASES AND VAPOURS FOR MEMBERS OF THE PUBLIC

Element	Absorption type(s)[a]	ICRP Publication No. for details of biokinetic model and absorption type(s)
Hydrogen	F, M[b], S, G	Publications 56, 67 and 71
Beryllium	M, S	Publication 30, Part 3
Carbon	F, M[b], S, G	Publications 56, 67 and 71
Fluorine	F, M, S	Publication 30, Part 2
Sodium	F	Publication 30, Part 2
Magnesium	F, M	Publication 30, Part 3
Aluminium	F, M	Publication 30, Part 3
Silicon	F, M, S	Publication 30, Part 3
Phosphorus	F, M	Publication 30, Part 1
Sulphur	F, M[b], S, G	Publications 67 and 71
Chlorine	F, M	Publication 30, Part 2
Potassium	F	Publication 30, Part 2
Calcium	F, M, S	Publication 71
Scandium	S	Publication 30, Part 3
Titanium	F, M, S	Publication 30, Part 3
Vanadium	F, M	Publication 30, Part 3
Chromium	F, M, S	Publication 30, Part 2
Manganese	F, M	Publication 30, Part 1
Iron	F, M[b], S	Publications 69 and 71
Cobalt	F, M[b], S	Publications 67 and 71
Nickel	F, M[b], S, G	Publications 67 and 71
Copper	F, M, S	Publication 30, Part 2
Zinc	F, M[b], S	Publications 67 and 71
Gallium	F, M	Publication 30, Part 3

[a] For particulates: F: fast; M: moderate; S: slow; G: gases and vapours.

[b] Recommended default absorption type for particulate aerosol when no specific information is available (see ICRP Publication No. 71 (1996) (see footnote 4)).

TABLE -VIII. (cont.)

Element	Absorption type(s)[a]	ICRP Publication No. for details of kinetic model and absorption type(s)
Germanium	F, M	Publication 30, Part 3
Arsenic	M	Publication 30, Part 3
Selenium	F[b], M, S	Publications 69 and 71
Bromine	F, M	Publication 30, Part 2
Rubidium	F	Publication 30, Part 2
Strontium	F, M[b], S	Publications 67 and 71
Yttrium	M, S	Publication 30, Part 2
Zirconium	F, M[b], S	Publications 56, 67 and 71
Niobium	F, M[b], S	Publications 56, 67 and 71
Molybdenum	F, M[b], S	Publications 67 and 71
Technetium	F, M[b], S	Publications 67 and 71
Ruthenium	F, M[b], S, G	Publications 56, 67 and 71
Rhodium	F, M, S	Publication 30, Part 2
Palladium	F, M, S	Publication 30, Part 3
Silver	F, M[b], S	Publications 67 and 71
Cadmium	F, M, S	Publication 30, Part 2
Indium	F, M	Publication 30, Part 2
Tin	F, M	Publication 30, Part 3
Antimony	F, M[b], S	Publications 69 and 71
Tellurium	F, M[b], S, G	Publications 67 and 71
Iodine	F[b], M, S, G	Publications 56, 67 and 71
Caesium	F[b], M, S	Publications 56, 67 and 71
Barium	F, M[b], S	Publications 67 and 71
Lanthanum	F, M	Publication 30, Part 3
Cerium	F, M[b], S	Publications 56, 67 and 71
Praseodymium	M, S	Publication 30, Part 3
Neodymium	M, S	Publication 30, Part 3
Promethium	M, S	Publication 30, Part 3
Samarium	M	Publication 30, Part 3

TABLE -VIII. (cont.)

Element	Absorption type(s)[a]	ICRP Publication No. for details of biokinetic model and absorption type(s)
Europium	M	Publication 30, Part 3
Gadolinium	F, M	Publication 30, Part 3
Terbium	M	Publication 30, Part 3
Dysprosium	M	Publication 30, Part 3
Holmium	M	Publication 30, Part 3
Erbium	M	Publication 30, Part 3
Thulium	M	Publication 30, Part 3
Ytterbium	M, S	Publication 30, Part 3
Lutetium	M, S	Publication 30, Part 3
Hafnium	F, M	Publication 30, Part 3
Tantalum	M, S	Publication 30, Part 3
Tungsten	F	Publication 30, Part 3
Rhenium	F, M	Publication 30, Part 2
Osmium	F, M, S	Publication 30, Part 2
Iridium	F, M, S	Publication 30, Part 2
Platinum	F	Publication 30, Part 3
Gold	F, M, S	Publication 30, Part 2
Mercury	F, M, G	Publication 30, Part 2
Thallium	F	Publication 30, Part 3
Lead	F, M[b], S, G	Publications 67 and 71
Bismuth	F, M	Publication 30, Part 2
Polonium	F, M[b], S, G	Publications 67 and 71
Astatine	F, M	Publication 30, Part 3
Francium	F	Publication 30, Part 3
Radium	F, M[b], S	Publications 67 and 71
Actinium	F, M, S	Publication 30, Part 3
Thorium	F, M, S[b]	Publications 69 and 71
Protactinium	M, S	Publication 30, Part 3
Uranium	F, M[b], S	Publications 69 and 71

TABLE –VIII. (cont.)

Element	Absorption type(s)*	ICRP Publication No. for details of biokinetic model and absorption type(s)
Neptunium	F, M[b], S	Publications 67 and 71
Plutonium	F, M[b], S	Publications 67 and 71
Americium	F, M[b], S	Publications 67 and 71
Curium	F, M[b], S	Publication 71
Berkelium	M	Publication 30, Part 4
Californium	M	Publication 30, Part 4
Einsteinium	M	Publication 30, Part 4
Fermium	M	Publication 30, Part 4
Mendelevium	M	Publication 30, Part 4

TABLE –IX. INHALATION: COMMITTED EFFECTIVE DOSE PER UNIT INTAKE e(g) ($Sv \cdot Bq^{-1}$) FOR SOLUBLE OR REACTIVE GASES AND VAPOURS

Nuclide	Physical half-life	Absorption[a]	% deposit	Age g ≤ 1 a		f_1 for g > 1 a	Age 1-2 a	Age 2-7 a	Age 7-12 a	Age 12-17 a	Age > 17 a
				f_1	e(g)		e(g)	e(g)	e(g)	e(g)	e(g)[b]
Tritiated water	12.3 a	V	100	1.000	6.4×10^{-11}	1.000	4.8×10^{-11}	3.1×10^{-11}	2.3×10^{-11}	1.8×10^{-11}	1.8×10^{-11}
Elemental hydrogen	12.3 a	V	0.01	1.000	6.4×10^{-15}	1.000	4.8×10^{-15}	3.1×10^{-15}	2.3×10^{-15}	1.8×10^{-15}	1.8×10^{-15}
Tritiated methane	12.3 a	V	1	1.000	6.4×10^{-13}	1.000	4.8×10^{-13}	3.1×10^{-13}	2.3×10^{-13}	1.8×10^{-13}	1.8×10^{-13}
Organically bound tritium	12.3 a	V	100	1.000	1.1×10^{-10}	1.000	1.1×10^{-10}	7.0×10^{-11}	5.5×10^{-11}	4.1×10^{-11}	4.1×10^{-11}
Carbon-11 vapour	0.340 h	V	100	1.000	2.8×10^{-11}	1.000	1.8×10^{-11}	9.7×10^{-12}	6.1×10^{-12}	3.8×10^{-12}	3.2×10^{-12}
Carbon-11 dioxide	0.340 h	V	100	1.000	1.8×10^{-11}	1.000	1.2×10^{-11}	6.5×10^{-12}	4.1×10^{-12}	2.5×10^{-12}	2.2×10^{-12}
Carbon-11 monoxide	0.340 h	V	40	1.000	1.0×10^{-11}	1.000	6.7×10^{-12}	3.5×10^{-12}	2.2×10^{-12}	1.4×10^{-12}	1.2×10^{-12}
Carbon-14 vapour	5.73×10^3 a	V	100	1.000	1.3×10^{-9}	1.000	1.6×10^{-9}	9.7×10^{-10}	7.9×10^{-10}	5.7×10^{-10}	5.8×10^{-10}
Carbon-14 dioxide	5.73×10^3 a	V	100	1.000	1.9×10^{-11}	1.000	1.9×10^{-11}	1.1×10^{-11}	8.9×10^{-12}	6.3×10^{-12}	6.2×10^{-12}
Carbon-14 monoxide	5.73×10^3 a	V	40	1.000	9.1×10^{-12}	1.000	5.7×10^{-12}	2.8×10^{-12}	1.7×10^{-12}	9.9×10^{-13}	8.0×10^{-13}
Carbon disulphide-35	87.4 d	F	100	1.000	6.9×10^{-9}	0.800	4.8×10^{-9}	2.4×10^{-9}	1.4×10^{-9}	8.6×10^{-10}	7.0×10^{-10}
Sulphur-35 dioxide	87.4 d	F	85	1.000	9.4×10^{-10}	0.800	6.6×10^{-10}	3.4×10^{-10}	2.1×10^{-10}	1.3×10^{-10}	1.1×10^{-10}
Nickel-56 carbonyl	6.10 d	c	100	1.000	6.8×10^{-9}	1.000	5.2×10^{-9}	3.2×10^{-9}	2.1×10^{-9}	1.4×10^{-9}	1.2×10^{-9}
Nickel-57 carbonyl	1.50 d	c	100	1.000	3.1×10^{-9}	1.000	2.3×10^{-9}	1.4×10^{-9}	9.2×10^{-10}	6.5×10^{-10}	5.6×10^{-10}
Nickel-59 carbonyl	7.50×10^4 a	c	100	1.000	4.0×10^{-9}	1.000	3.3×10^{-9}	2.0×10^{-9}	1.3×10^{-9}	9.1×10^{-10}	8.3×10^{-10}
Nickel-63 carbonyl	96.0 a	c	100	1.000	9.5×10^{-9}	1.000	8.0×10^{-9}	4.8×10^{-9}	3.0×10^{-9}	2.2×10^{-9}	2.0×10^{-9}

[a] F: fast, V: material is taken to be completely and instantaneously transferred to body fluids.

[b] Applicable to both workers and adult members of the public.

[c] Deposition 30% : 10% : 20% : 40% (extrathoracic : bronchial : bronchiolar : alveolar-interstitial), 0.1 day retention half-time (see ICRP Publication No. 68 (1994) (see footnote 4 p).

TABLE - IX . (cont.)

Nickel-65 carbonyl	2.52 h	c	100	1.000	2.0×10^{-9}	1.000	1.4×10^{-9}	8.1×10^{-10}	5.6×10^{-10}	4.0×10^{-10}	3.6×10^{-10}
Nickel-66 carbonyl	2.27 d	c	100	1.000	1.0×10^{-8}	1.000	7.1×10^{-9}	4.0×10^{-9}	2.7×10^{-9}	1.8×10^{-9}	1.6×10^{-9}
Ruthenium-94 tetroxide	0.863 h	F	100	0.100	5.5×10^{-10}	0.050	3.5×10^{-10}	1.8×10^{-10}	1.1×10^{-10}	7.0×10^{-11}	5.6×10^{-11}
Ruthenium-97 tetroxide	2.90 d	F	100	0.100	8.7×10^{-10}	0.050	6.2×10^{-10}	3.4×10^{-10}	2.2×10^{-10}	1.4×10^{-10}	1.2×10^{-10}
Ruthenium-103 tetroxide	39.3 d	F	100	0.100	9.0×10^{-9}	0.050	6.2×10^{-9}	3.3×10^{-9}	2.1×10^{-9}	1.3×10^{-9}	1.1×10^{-9}
Ruthenium-105 tetroxide	4.44 h	F	100	0.100	1.6×10^{-9}	0.050	1.0×10^{-9}	5.3×10^{-10}	3.2×10^{-10}	2.2×10^{-10}	1.8×10^{-10}
Ruthenium-106 tetroxide	1.01 a	F	100	0.100	1.6×10^{-7}	0.050	1.1×10^{-7}	6.1×10^{-8}	3.7×10^{-8}	2.2×10^{-8}	1.8×10^{-8}
Tellurium-116 vapour	2.49 h	F	100	0.600	5.9×10^{-10}	0.300	4.4×10^{-10}	2.5×10^{-10}	1.6×10^{-10}	1.1×10^{-10}	8.7×10^{-11}
Tellurium-121 vapour	17.0 d	F	100	0.600	3.0×10^{-9}	0.300	2.4×10^{-9}	1.4×10^{-9}	9.6×10^{-10}	6.7×10^{-10}	5.1×10^{-10}
Tellurium-121m vapour	154 d	F	100	0.600	3.5×10^{-8}	0.300	2.7×10^{-8}	1.6×10^{-8}	9.8×10^{-9}	6.6×10^{-9}	5.5×10^{-9}
Tellurium-123 vapour	1.00×10^{13} a	F	100	0.600	2.8×10^{-8}	0.300	2.5×10^{-8}	1.9×10^{-8}	1.5×10^{-8}	1.3×10^{-8}	1.2×10^{-8}
Tellurium-123m vapour	120 d	F	100	0.600	2.5×10^{-8}	0.300	1.8×10^{-8}	1.0×10^{-8}	5.7×10^{-9}	3.5×10^{-9}	2.9×10^{-9}
Tellurium-125m vapour	58.0 d	F	100	0.600	1.5×10^{-8}	0.300	1.1×10^{-8}	5.9×10^{-9}	3.2×10^{-9}	1.9×10^{-9}	1.5×10^{-9}
Tellurium-127 vapour	9.35 h	F	100	0.600	6.1×10^{-10}	0.300	4.4×10^{-10}	2.3×10^{-10}	1.4×10^{-10}	9.2×10^{-11}	7.7×10^{-11}
Tellurium-127m vapour	109 d	F	100	0.600	5.3×10^{-8}	0.300	3.7×10^{-8}	1.9×10^{-8}	1.0×10^{-8}	6.1×10^{-9}	4.6×10^{-9}
Tellurium-129 vapour	1.16 h	F	100	0.600	2.5×10^{-10}	0.300	1.7×10^{-10}	9.4×10^{-11}	6.2×10^{-11}	4.3×10^{-11}	3.7×10^{-11}
Tellurium-129m vapour	33.6 d	F	100	0.600	4.8×10^{-8}	0.300	3.2×10^{-8}	1.6×10^{-8}	8.5×10^{-9}	5.1×10^{-9}	3.7×10^{-9}
Tellurium-131 vapour	0.417 h	F	100	0.600	5.1×10^{-10}	0.300	4.5×10^{-10}	2.6×10^{-10}	1.4×10^{-10}	9.5×10^{-11}	6.8×10^{-11}
Tellurium-131m vapour	1.25 d	F	100	0.600	2.1×10^{-8}	0.300	1.9×10^{-8}	1.1×10^{-8}	5.6×10^{-9}	3.7×10^{-9}	2.4×10^{-9}
Tellurium-132 vapour	3.26 d	F	100	0.600	5.4×10^{-8}	0.300	4.5×10^{-8}	2.4×10^{-8}	1.2×10^{-8}	7.6×10^{-9}	5.1×10^{-9}
Tellurium-133 vapour	0.207 h	F	100	0.600	5.5×10^{-10}	0.300	4.7×10^{-10}	2.5×10^{-10}	1.2×10^{-10}	8.1×10^{-11}	5.6×10^{-11}
Tellurium-133m vapour	0.923 h	F	100	0.600	2.3×10^{-9}	0.300	2.0×10^{-9}	1.1×10^{-9}	5.0×10^{-10}	3.3×10^{-10}	2.2×10^{-10}
Tellurium-134 vapour	0.696 h	F	100	0.600	6.8×10^{-10}	0.300	5.5×10^{-10}	3.0×10^{-10}	1.6×10^{-10}	1.1×10^{-10}	8.4×10^{-11}
Elemental iodine-120	1.35 h	V	100	1.000	3.0×10^{-9}	1.000	2.4×10^{-9}	1.3×10^{-9}	6.4×10^{-10}	4.3×10^{-10}	3.0×10^{-10}
Elemental iodine-120m	0.883 h	V	100	1.000	1.5×10^{-9}	1.000	1.2×10^{-9}	6.4×10^{-10}	3.4×10^{-10}	2.3×10^{-10}	1.8×10^{-10}

TABLE –IX. (cont.)

Nuclide	Physical half-life	Absorption[a]	% deposit	Age g ≤ 1 a		f_1 for g > 1 a	Age 1–2 a	Age 2–7 a	Age 7–12 a	Age 12–17 a	Age > 17 a
				f_g	e(g)		e(g)	e(g)	e(g)	e(g)	e(g)[b]
Elemental iodine-121	2.12 h	V	100	1.000	5.7×10^{-10}	1.000	5.1×10^{-10}	3.0×10^{-10}	1.7×10^{-10}	1.2×10^{-10}	8.6×10^{-11}
Elemental iodine-123	13.2 h	V	100	1.000	2.1×10^{-9}	1.000	1.8×10^{-9}	1.0×10^{-9}	4.7×10^{-10}	3.2×10^{-10}	2.1×10^{-10}
Elemental iodine-124	4.18 d	V	100	1.000	1.1×10^{-7}	1.000	1.0×10^{-7}	5.8×10^{-8}	2.8×10^{-8}	1.8×10^{-8}	1.2×10^{-8}
Elemental iodine-125	60.1 d	V	100	1.000	4.7×10^{-8}	1.000	5.2×10^{-8}	3.7×10^{-8}	2.8×10^{-8}	2.0×10^{-8}	1.4×10^{-8}
Elemental iodine-126	13.0 d	V	100	1.000	1.9×10^{-7}	1.000	1.9×10^{-7}	1.1×10^{-7}	6.2×10^{-8}	4.1×10^{-8}	2.6×10^{-8}
Elemental iodine-128	0.416 h	V	100	1.000	4.2×10^{-10}	1.000	2.8×10^{-10}	1.6×10^{-10}	1.0×10^{-10}	7.5×10^{-11}	6.5×10^{-11}
Elemental iodine-129	1.57×10^{7} a	V	100	1.000	1.7×10^{-7}	1.000	2.0×10^{-7}	1.6×10^{-7}	1.7×10^{-7}	1.3×10^{-7}	9.6×10^{-8}
Elemental iodine-130	12.4 h	V	100	1.000	1.9×10^{-8}	1.000	1.7×10^{-8}	9.2×10^{-9}	4.3×10^{-9}	2.8×10^{-9}	1.9×10^{-9}
Elemental iodine-131	8.04 d	V	100	1.000	1.7×10^{-7}	1.000	1.6×10^{-7}	9.4×10^{-8}	4.8×10^{-8}	3.1×10^{-8}	2.0×10^{-8}
Elemental iodine-132	2.30 h	V	100	1.000	2.8×10^{-9}	1.000	2.3×10^{-9}	1.3×10^{-9}	6.4×10^{-10}	4.3×10^{-10}	3.1×10^{-10}
Elemental iodine-132m	1.39 h	V	100	1.000	2.4×10^{-9}	1.000	2.1×10^{-9}	1.1×10^{-9}	5.6×10^{-10}	3.8×10^{-10}	2.7×10^{-10}
Elemental iodine-133	20.8 h	V	100	1.000	4.5×10^{-8}	1.000	4.1×10^{-8}	2.1×10^{-8}	9.7×10^{-9}	6.3×10^{-9}	4.0×10^{-9}
Elemental iodine-134	0.876 h	V	100	1.000	8.7×10^{-10}	1.000	6.9×10^{-10}	3.9×10^{-10}	2.2×10^{-10}	1.5×10^{-10}	1.5×10^{-10}
Elemental iodine-135	6.61 h	V	100	1.000	9.7×10^{-9}	1.000	8.5×10^{-9}	4.5×10^{-9}	2.1×10^{-9}	1.4×10^{-9}	9.2×10^{-10}
Methyl iodide-120	1.35 h	V	70	1.000	2.3×10^{-9}	1.000	1.9×10^{-9}	1.0×10^{-9}	4.8×10^{-10}	3.1×10^{-10}	2.0×10^{-10}
Methyl iodide-120m	0.883 h	V	70	1.000	1.0×10^{-9}	1.000	8.7×10^{-10}	4.6×10^{-10}	2.2×10^{-10}	1.5×10^{-10}	1.0×10^{-10}
Methyl iodide-121	2.12 h	V	70	1.000	4.2×10^{-10}	1.000	3.8×10^{-10}	2.2×10^{-10}	1.2×10^{-10}	8.3×10^{-11}	5.6×10^{-11}
Methyl iodide-123	13.2 h	V	70	1.000	1.6×10^{-9}	1.000	1.4×10^{-9}	7.7×10^{-10}	3.6×10^{-10}	2.4×10^{-10}	1.5×10^{-10}
Methyl iodide-124	4.18 d	V	70	1.000	8.5×10^{-8}	1.000	8.0×10^{-8}	4.5×10^{-8}	2.2×10^{-8}	1.4×10^{-8}	9.2×10^{-9}
Methyl iodide-125	60.1 d	V	70	1.000	3.7×10^{-8}	1.000	4.0×10^{-8}	2.9×10^{-8}	2.2×10^{-8}	1.6×10^{-8}	1.1×10^{-8}

TABLE - IX . (cont.)

Methyl iodide-126	13.0 d	V	70	1.000	1.5×10^{-7}	1.000	1.5×10^{-7}	9.0×10^{-8}	4.8×10^{-8}	3.2×10^{-8}	2.0×10^{-8}
Methyl iodide-128	0.416 h	V	70	1.000	1.5×10^{-10}	1.000	1.2×10^{-10}	6.3×10^{-11}	3.0×10^{-11}	1.9×10^{-11}	1.3×10^{-11}
Methyl iodide-129	1.57×10^{7} a	V	70	1.000	1.3×10^{-7}	1.000	1.5×10^{-7}	1.2×10^{-7}	1.3×10^{-7}	9.9×10^{-8}	7.4×10^{-8}
Methyl iodide-130	12.4 h	V	70	1.000	1.5×10^{-8}	1.000	1.3×10^{-8}	7.2×10^{-9}	3.3×10^{-9}	2.2×10^{-9}	1.4×10^{-9}
Methyl iodide-131	8.04 d	V	70	1.000	1.3×10^{-7}	1.000	1.3×10^{-7}	7.4×10^{-8}	3.7×10^{-8}	2.4×10^{-8}	1.5×10^{-8}
Methyl iodide-132	2.30 h	V	70	1.000	2.0×10^{-9}	1.000	1.8×10^{-9}	9.5×10^{-10}	4.4×10^{-10}	2.9×10^{-10}	1.9×10^{-10}
Methyl iodide-132m	1.39 h	V	70	1.000	1.8×10^{-9}	1.000	1.6×10^{-9}	8.3×10^{-10}	3.9×10^{-10}	2.5×10^{-10}	1.6×10^{-10}
Methyl iodide-133	20.8 h	V	70	1.000	3.5×10^{-8}	1.000	3.2×10^{-8}	1.7×10^{-8}	7.6×10^{-9}	4.9×10^{-9}	3.1×10^{-9}
Methyl iodide-134	0.876 h	V	70	1.000	5.1×10^{-10}	1.000	4.3×10^{-10}	2.3×10^{-10}	1.1×10^{-10}	7.4×10^{-11}	5.0×10^{-11}
Methyl iodide-135	6.61 h	V	70	1.000	7.5×10^{-9}	1.000	6.7×10^{-9}	3.5×10^{-9}	1.6×10^{-9}	1.1×10^{-9}	6.8×10^{-10}
Mercury-193 vapour	3.50 h	d	70	1.000	4.2×10^{-9}	1.000	3.4×10^{-9}	2.2×10^{-9}	1.6×10^{-9}	1.2×10^{-9}	1.1×10^{-9}
Mercury-193m vapour	11.1 h	d	70	1.000	1.2×10^{-8}	1.000	9.4×10^{-9}	6.1×10^{-9}	4.5×10^{-9}	3.4×10^{-9}	3.1×10^{-9}
Mercury-194 vapour	2.60×10^{2} a	d	70	1.000	9.4×10^{-8}	1.000	8.3×10^{-8}	6.2×10^{-8}	5.0×10^{-8}	4.3×10^{-8}	4.0×10^{-8}
Mercury-195 vapour	9.90 h	d	70	1.000	5.3×10^{-9}	1.000	4.3×10^{-9}	2.8×10^{-9}	2.1×10^{-9}	1.6×10^{-9}	1.4×10^{-9}
Mercury-195m vapour	1.73 d	d	70	1.000	3.0×10^{-8}	1.000	2.5×10^{-8}	1.6×10^{-8}	1.2×10^{-8}	8.8×10^{-9}	8.2×10^{-9}
Mercury-197 vapour	2.67 d	d	70	1.000	1.6×10^{-8}	1.000	1.3×10^{-8}	8.4×10^{-9}	6.3×10^{-9}	4.7×10^{-9}	4.4×10^{-9}
Mercury-197m vapour	23.8 h	d	70	1.000	2.1×10^{-8}	1.000	1.7×10^{-8}	1.1×10^{-8}	8.2×10^{-9}	6.2×10^{-9}	5.8×10^{-9}
Mercury-199m vapour	0.710 h	d	70	1.000	6.5×10^{-10}	1.000	5.3×10^{-10}	3.4×10^{-10}	2.5×10^{-10}	1.9×10^{-10}	1.8×10^{-10}
Mercury-203 vapour	46.6 d	d	70	1.000	3.0×10^{-8}	1.000	2.3×10^{-8}	1.5×10^{-8}	1.0×10^{-8}	7.7×10^{-9}	7.0×10^{-9}

[d] Deposition 10% : 20% : 40% (bronchial : bronchiolar : alveolar-interstitial), 1.7 day retention time (see ICRP Publication No. 68 (1994) (see footnote 4)).

TABLE –X. EFFECTIVE DOSE RATE FOR EXPOSURE TO INERT GASES FOR ADULTS*

Nuclide	Physical half-life	Effective dose rate per unit integrated air concentration ($Sv \cdot d^{-1}/Bq \cdot m^{-3}$)*
Argon		
Ar-37	35.0 d	4.1×10^{-15}
Ar-39	269 a	1.1×10^{-11}
Ar-41	1.83 h	5.3×10^{-9}
Krypton		
Kr-74	11.5 m	4.5×10^{-9}
Kr-76	14.8 h	1.6×10^{-9}
Kr-77	74.7 m	3.9×10^{-9}
Kr-79	1.46 d	9.7×10^{-10}
Kr-81	2.10×10^{5} a	2.1×10^{-11}
Kr-83m	1.83 h	2.1×10^{-13}
Kr-85	10.7 a	2.2×10^{-11}
Kr-85m	4.48 h	5.9×10^{-10}
Kr-87	1.27 h	3.4×10^{-9}
Kr-88	2.84 h	8.4×10^{-9}
Xenon		
Xe-120	40.0 m	1.5×10^{-9}
Xe-121	40.1 m	7.5×10^{-9}
Xe-122	20.1 h	1.9×10^{-10}
Xe-123	2.08 h	2.4×10^{-9}
Xe-125	17.0 h	9.3×10^{-10}
Xe-127	36.4 d	9.7×10^{-10}
Xe-129m	8.0 d	8.1×10^{-11}
Xe-131m	11.9 d	3.2×10^{-11}
Xe-133m	2.19 d	1.1×10^{-10}
Xe-133	5.24 d	1.2×10^{-10}
Xe-135m	15.3 m	1.6×10^{-9}
Xe-135	9.10 h	9.6×10^{-10}
Xe-138	14.2 m	4.7×10^{-9}

* Applicable to both workers and adult members of the public.

Schedule - XI

PROVISIONS OF HELSINKI DECLARATION APPLICABLE TO MEDICAL RESEARCH INVOLVING THE USE OF IONIZING RADIATION

Section I

Basic Principles

(1) Biomedical research involving human subjects shall conform to generally accepted scientific principles and shall be based on adequately performed laboratory and animal experimentation and on a thorough knowledge of the scientific literature.

(2) The design and performance of each experimental procedure involving human subjects shall be clearly formulated in an experimental protocol which shall be transmitted to a specially appointed independent committee for consideration, comment and guidance.

(3) Biomedical research involving human subjects shall be conducted only by scientifically qualified persons and under the supervision of a clinically competent medical person. The responsibility for the human subject shall always rest with a medically qualified person and never rest on the subject of the research, even though the subject has given his consent.

(4) Biomedical research involving human subjects shall not legitimately be carried out unless the importance of the objective is in proportion to the inherent risk to the subject.

(5) Every biomedical research project involving human subjects shall be preceded by careful assessment of predictable risks in comparison with foreseeable benefits to the subject or to others. Concern for the interests of the subject shall always prevail over the interest of science and society.

(6) The right of the research subject to safeguard his integrity shall always be respected. Every precaution shall be taken to respect the privacy of the subject and to minimize the impact of the study on the subject's physical and mental integrity and on the personality of the subject.

(7) Doctors shall abstain from engaging in research projects involving human subjects unless they are satisfied that the hazards involved are believed to be predictable. Doctors shall cease any investigation if the hazards are found to outweigh the potential benefits.

(8) In publication of the results of his research, the doctor shall preserve the accuracy of the results. Reports of experimentation not in accordance with the principles laid down in this Declaration shall not be accepted for publication.

(9) In any research on human beings, each potential subject shall be adequately informed of the aims, methods, anticipated benefits and potential hazards of the study and the discomfort it may entail. He shall be informed that he is at liberty to abstain from participation in the study and that he is free to withdraw his consent to participation at any time. The doctor shall then obtain the subject's freely given informed consent in writing.

(10) When obtaining informed consent for the research project the doctor shall be particularly cautious if the subject is in a dependent relationship to him or may consent under duress. In that case the informed consent shall be obtained by a doctor who is not engaged in the investigation and who is completely independent of this official relationship.

(11) In case of legal incompetence, informed consent shall be obtained from the legal guardian in accordance with the law. Where physical or mental incapacity makes it impossible to obtain informed consent, or when the subject is a minor, permission from the responsible relative replaces that of the subject in accordance with the law.

(12) The research protocol shall always contain a statement of the ethical considerations involved and shall indicate that the principles enunciated in the present Declaration are complied with.

SECTION II

Principles of Medical Research Combined With Professional Care

(13) In the treatment of the sick person, the doctor shall be free to use a new diagnostic and therapeutic measure, if in his judgement it offers hope of saving life, re-establishing health or alleviating suffering.

(14) The potential benefits, hazards and discomfort of a new method shall be weighed against the advantages of the best current diagnostic and therapeutic methods.

(15) In any medical study, every patient—including those of a control group, if any—shall be assured of the best proven diagnostic and therapeutic method.

(16) The refusal of the patient to participate in a study shall never interfere with the doctor-patient relationship.

(17) If the doctor considers it essential not to obtain informed consent, the specific reasons for this proposal shall be stated in the experimental protocol for transmission to the independent committee.

(18) The doctor can combine medical research with professional care, the objective being the acquisition of new medical knowledge, only to the extent that medical research is justified by its potential diagnostic or therapeutic value for the patient.

Schedule XII

GUIDANCE LEVELS OF DOSE, DOSE RATE AND ACTIVITY FOR MEDICAL EXPOSURE

GUIDANCE LEVELS FOR DIAGNOSTIC RADIOLOGICAL PROCEDURES

TABLE -I. GUIDANCE LEVELS OF DOSE FOR DIAGNOSTIC RADIOGRAPHY FOR A TYPICAL ADULT PATIENT

Examination		Entrance surface dose per radiograph* (mGy)
Lumbar spine	AP	10
	LAT	30
	LSJ	40
Abdomen, intravenous urography and cholecystography	AP	10
Pelvis	AP	10
Hip joint	AP	10
Chest	PA	0.4
	LAT	1.5
Thoracic spine	AP	7
	LAT	20
Dental	Periapical	7
Skull	AP	5
	PA	5
	LAT	3

Notes: PA: posterior-anterior projection; LAT: lateral projection; LSJ: lumbo-sacral-joint projection; AP: anterior-posterior projection.

In air with backscatter. These values are for conventional film-screen combination in the relative speed of 200. For high speed film-screen combinations (400-600), the values should be reduced by a factor of 2 to 3.

TABLE -II. DOSE GUIDANCE LEVELS FOR COMPUTED TOMOGRAPHY FOR A TYPICAL ADULT PATIENT

Examination.	Multiple scan average dose[a] (mGy)
Head	50
Lumbar spine	35
Abdomen	25

[a] Derived from measurements on the axis of rotation in water equivalent phantoms, 15 cm in length and 16 cm (head) and 30 cm (lumbar spine and abdomen) in diameter.

TABLE III DOSE GUIDANCE LEVELS FOR MAMMOGRAPHY FOR A TYPICAL ADULT PATIENT

Average glandular dose per cranio-caudal projection[a]
1 mGy (without grid)
3 mGy (with grid)

[a] Determined in a 4.5 cm compressed breast consisting of 50% glandular and 50% adipose tissue, for film-screen systems and dedicated Mo-target Mo-filter mammography units.

TABLE -IV. DOSE RATE GUIDANCE LEVELS FOR FLUOROSCOPY FOR A TYPICAL ADULT PATIENT

Mode of operation	Entrance surface dose rate[a] (mGy/min)
Normal	25
High level[b]	100

[a] In air with backscatter.

[b] For fluoroscopes that have an optional 'high level' operational mode, such as those frequently used in interventional radiology.

GIUDANCE LEVELS FOR MEDICAL EXPOSURE

GIUDANCE LEVEL FOR DIAGNOSTIC PROCEDURES IN NUCLEAR MEDICINE

TABLE . V. GUIDANCE LEVELS OF ACTIVITY FOR PROCEDURES IN NUCLEAR MEDICINE FOR A TYPICAL ADULT PATIENT

Test	Radio-nuclide	Chemical form[a]	Maximum usual activity per test[b] (MBq)
Bone			
Bone imaging	$^{99}Tc^m$	Phosphonate and Phosphate compounds	600
Bone imaging by single photon emission computerized tomography (SPECT)	$^{99}Tc^m$	Phosponate and Phosphate compounds	800
Bone marrow imaging	$^{99}Tc^m$	Labelled colloid	400
Brain			
Brain imaging (static)	$^{99}Tc^m$	TcO_4^-	500
	$^{99}Tc^m$	Diethylenetriaminepenta-acetic acid (DTPA), gluconate and glucoheptonate	500
Brain imaging (SPECT)	$^{99}Tc^m$	TcO_4^-	800
	$^{99}Tc^m$	DTPA, gluconate and glucoheptonate	800
	$^{99}Tc^m$	Exametazime	500
Cerebral blood flow	^{133}Xe	In isotonic sodium chloride solution	400
	$^{99}Tc^m$	Hexamethyl propylene amino oxime (HM-PAO)	500
Cisternography	^{111}In	DTPA	40
Lacrimal			
Lacrimal drainage	$^{99}Tc^m$	TcO_4^-	4
	$^{99}Tc^m$	Labelled colloid	4
Thyroid			
Thyroid imaging	$^{99}Tc^m$	TcO_4^-	200
	^{123}I	I^-	20
Thyroid metastases (after ablation)	^{131}I	I^-	400
Parathyroid imaging	^{201}Tl	Tl^+, chloride	80

TABLE -V. (cont.)

Test	Radio-nuclide	Chemical form[a]	Maximum usual activity per test[b] (MBq)
Lung			
Lung ventilation imaging	$^{81}Kr^{m}$	Gas	6000
	$^{99}Tc^{m}$	DTPA-aerosol	80
Lung ventilation study	^{133}Xe	Gas	400
	^{127}Xe	Gas	200
Lung perfusion imaging	$^{81}Kr^{m}$	Aqueous solution	6000
	$^{99}Tc^{m}$	Human albumin (macroaggregates or microspheres)	100
Lung perfusion imaging (with venography)	$^{99}Tc^{m}$	Human albumin (macroaggregates or microspheres)	160
Lung perfusion studies	^{133}Xe	Isotonic solution	200
	^{127}Xe	Isotonic chloride solution	200
Lung imaging (SPECT)	^{99}Tc	Macroaggregated albumin (MAA)	200
Liver and spleen			
Liver and spleen imaging	$^{99}Tc^{m}$	Labelled colloid	80
Functional biliary system imaging	$^{99}Tc^{m}$	Iminodiacetates and equivalent agents	150
Spleen imaging	$^{99}Tc^{m}$	Labelled denaturated red blood cells	100
Liver imaging (SPECT)	$^{99}Tc^{m}$	Labelled colloid	200
Cardiovascular			
First pass blood flow studies	$^{99}Tc^{m}$	TcO_4^-	800
	$^{99}Tc^{m}$	DTPA	800
	$^{99}Tc^{m}$	Macroaggregated globulin 3	400
Blood pool imaging	$^{99}Tc^{m}$	Human albumin complex	40
Cardiac and vascular imaging/probe studies	$^{99}Tc^{m}$	Human albumin complex	800
Mycardial imaging/probe studies	$^{99}Tc^{m}$	Labelled normal red blood cells	800

GUIDANCE LEVELS FOR MEDICAL EXPOSURE

TABLE -V. (cont.)

Test	Radio-nuclide	Chemical form[a]	Maximum usual activity per test[b] (MBq)
Myocardial imaging	$^{99}Tc^m$	Phosphonate and phosphate compounds	600
Myocardial imaging (SPECT)	$^{99}Tc^m$	Isonitriles	300
	^{201}Tl	Tl^+ chloride	100
	$^{99}Tc^m$	Phosphonate and phosphate compounds	800
	$^{99}Tc^m$	Isonitriles	600
Stomach, gastrointestinal tract			
Stomach/salivary gland imaging	$^{99}Tc^m$	TcO_4^-	40
Meckel's diverticulum imaging	$^{99}Tc^m$	TcO_4^-	400
Gastrointestinal bleeding	$^{99}Tc^m$	Labelled colloid	400
	$^{99}Tc^m$	Labelled normal red blood cells	400
Oesophageal transit and reflux	$^{99}Tc^m$	Labelled colloid	40
	$^{99}Tc^m$	Non-absorbable compounds	40
Gastric emptying	$^{99}Tc^m$	Non-absorbable compounds	12
	^{111}In	Non-absorbable compounds	12
	$^{113}In^m$	Non-absorbable compounds	12
Kidney, urinary system and adrenals			
Renal imaging	$^{99}Tc^m$	Dimercaptosuccinic acid	160
Renal imaging/renography	$^{99}Tc^m$	DTPA, gluconate and glucoheptonate	350
	$^{99}Tc^m$	Macroaggregated globulin 3	100
	^{123}I	O-iodohippurate	20
Adrenal imaging	^{75}Se	Selenocholesterol	8

TABLE -V. (cont.)

Test	Radio-nuclide	Chemical form[a]	Maximum usual activity per test[b] (MBq)
Miscellaneous			
Tumour or abscess imaging	^{67}Ga	Citrate	300
	^{201}Tl	Chloride	100
Tumour imaging	$^{99}Tc^{m}$	Dimercaptosuccinic acid	400
Neuroectodermal tumour imaging	^{123}I	Meta-iodo-benzyl guanidine	400
	^{131}I	Meta-iodo-benzyl guanidine	20
Lymph node imaging	$^{99}Tc^{m}$	Labelled colloid	80
Abscess imaging	$^{99}Tc^{m}$	Exametazime labelled white cells	400
	^{111}In	Labelled white cells	20
Thrombus imaging	^{111}In	Labelled platelets	20

[a] In some countries some of the compounds are considered obsolete.
[b] In some countries the typical values are lower than those indicated in the table.

GUIDANCE LEVEL OF ACTIVITY FOR DISCHARGE FROM HOSPITAL

TABLE -VI. GUIDANCE LEVEL FOR MAXIMUM ACTIVITY FOR PATIENTS IN THERAPY ON DISCHARGE FROM HOSPITAL

Radionuclide	Activity (MBq)
Iodine-131	1100[a]

[a] In some countries a level of 400 MBq is used as an example of good practice.

Schedule - XIII

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

RADIONUCLIDE CONTAMINATION LEVELS IN FOOD ITEMS, FODDER AND AGRICULTURAL INPUTS.

Radionuclide	Target Organ	Limits of radionuclide concentration level (Bq/Kg)	
		Milk powder & Dairy Products *	Other Food Materials **
Cesium-137	whole body (infant/adult)	95	50
Cesium-134	whole body (adult)	-	-
Strontium-90	bone surface (infant)	-	-
Iodine-131	thyroid (infant)	-	-
Plutonium-239	bone surface (infant)	-	-

* Milk Powder and Dairy Products (Milk Powder, Condensed or Concentrated Milk, Cheese, Ghee, Butter, Cerelac, Ovaltine, Maltova, Horlicks, Farlac and other Milk Products, etc.)

** Other Food Materials (Rice, Wheat, Rape Seed, Fish, Meat, Pulses, Onion, Garlic, Spices, Vegetables, All Edible Oils, Drinks and Drinking water and other Food Materials)

The radioactivities of all the imported items of food materials are considered in the form they arrive in the port without any further dilution, concentration or processing.

Schedule - XIV

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

DOSE LEVELS AT WHICH INTERVENTION IS EXPECTED TO BE UNDERTAKEN UNDER ANY CIRCUMSTANCES

Acute Exposures:

Organ or tissue	Projected absorbed dose to the organ or tissue in less than 2 days (Gy)
Whole body (bone marrow)	1
Lung	6
Skin	3
Thyroid	5
Lens of the eye	2
Gonads	1

The possibility of *deterministic effects* for *doses* greater than about 0.1 Gy (delivered over less than 2 days) to the foetus should be taken into account in considering the justification and optimisation of actual *intervention levels* for immediate protective action.

Chronic Exposure:

Organ or tissue	Equivalent dose rate($Sv\ y^{-1}$)
Gonads	0.2
Lens of the eye	0.1
Bone marrow	0.4

Schedule - XV

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

GUIDELINES FOR ACTION LEVELS IN CHRONIC EXPOSURE SITUATIONS

1) Although the concept of *action levels* for *chronic exposure* situations is of more general application. So far an international consensus on numerical values only exists in respect of radon. Guidelines are therefore only given for *chronic exposure* to *radon*.

Radon in dwellings

2) Optimized *action levels* relating to *chronic exposure* involving *radon* in dwellings should, in most situations, fall within a yearly average concentration of 200 to 600 $Bq.m^{-3}$ of ^{222}Rn in air.

Radon in workplaces

3) The *action level* for *remedial action* relating to *chronic exposure* situations involving *radon* in workplaces is a yearly average concentration of 1000 Bq of ^{222}Rn per cubic meter of air[1].

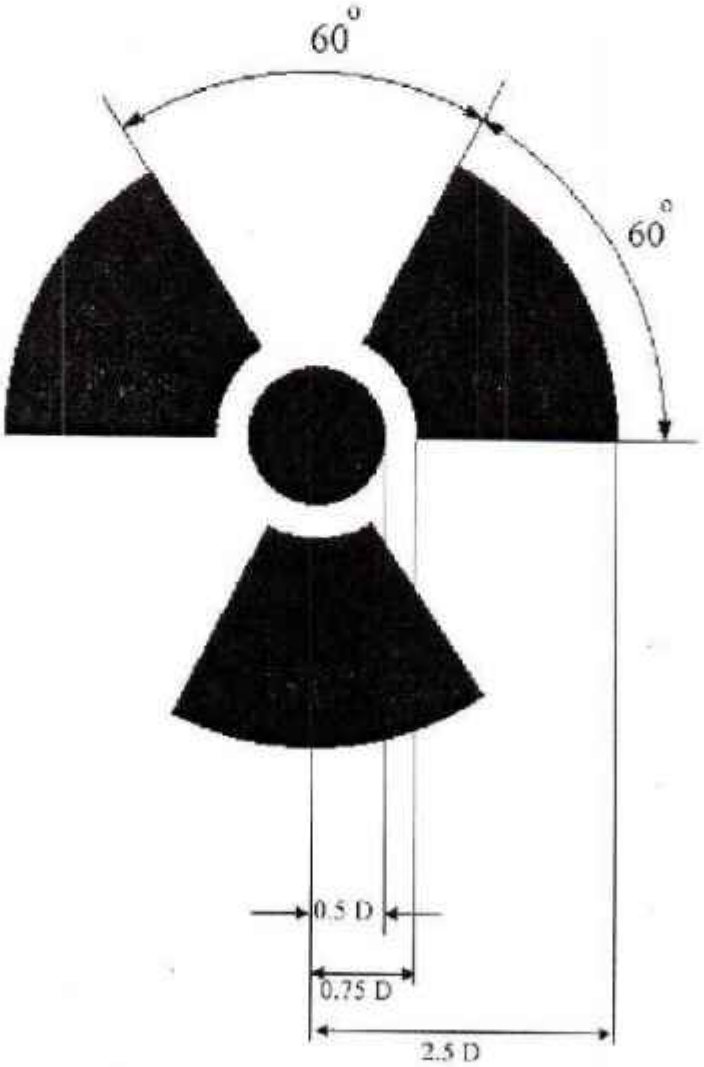
[1] The International Commission on Radiological Protection has recommended that the *action levels* for occupational exposure to radon can fall in the range 500-1500 $Bq.m^{-3}$. (See International Commission on Radiation Protection; ICRP Publication No. 65; Protection against Radon-222 at Home and at Work; Annals of the ICRP, Vol. 23; No. 2, Pergamon Press (1993

Schedule - XVI

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

Radiation Symbol

The basic symbol consists of a three blade design shown below which is to be displayed in areas where exposure to radiation is likely to occur and all containers containing radioactive materials. D stands for the diameter of the central circle. The caution colours are black for the design and yellow for the back ground.



Schedule – XVII

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

Reference: NSRC S/T – 1/97 Form no. S/T – 1/97

APPLICATION FORM
for Licence Surrender/Transfer

1. This is an Application for (tick (√) where appropriate) :

   ☐ Surrender ☐ Transfer ☐ Others (specify)

2. Description of Licence:

   (a) Class : (b) Number :
   (c) Date issue : (d) Date of expiry :

3. Description of Present Status of the up-to-date Licensed Radioactive/Nuclear Source/Equipment:

4. Radioactive Waste Management :

   ☐ Self ☐ Return to supplier
   ☐ Liability handed to the commission ☐ Others (specify)

5. Date of Intended Surrender/Transfer :

6. Declaration of the Licensee/Authorised Person :

   I .....
   (full name)
   hereby declare that,

   (a) this application is made on my behalf/on behalf of .....; and

   (b) the particulars furnished in this form, including all supplements attached hereto are true and correct.

Date Signature

Name :
Designation :

Official Stamp :

Schedule – XVIII

BANGLADESH ATOMIC ENERGY COMMISSION
Nuclear Safety and Radiation Control Division
Post Box No. 158, Ramna, Dhaka.

Reference : NSRC I/E – 1/97 Form no. I/E – 1/97

APPLICATION FORM
for Permit of Import/Export

1. Description of Application/Licensee:

   (a) Name:
   (b) Mailing address:
   (c) Tele no.: (d) Fax/Telex:

2. Full Address of Organization of Applicant/Licensee:

3. Description of Licence:

   (a) Class: (b) Number:
   (c) Date of issue: (d) Date of expiry:

4. This is an Application for (tick(√) where appropriate):

   ☐ Import ☐ Export

5. Purpose of Import/Export (tick (√) where appropriate):

   ☐ Use ☐ Trade ☐ Others (specify)

6. Description of the Materials to be Imported/Exported (tick (√) where appropriate):

   ☐ Radioactive material ☐ Nuclear material
   ☐ Radiation equipment ☐ Others (specify)

7. Information Required for Import/Export:

   (a) Name of importer/exporter country :
   (b) Name and address of supplier :
   (c) Approximate date of first consignment :
   (d) Approximate date of last consignment:
   (e) Name of the port of loading :
   (f) Name of the port of unloading :

8. (a) Additional Information for Import/Export of Radioactive Material, where applicable, :

Element and mass number A	Chemical and/or physical form B	Name of the manufacturer and model no.(if available) C	Activity and date	
			Sealed source (per source) D	Unsealed source E

(b) Mention the Name of Transport :

1) Specify the mode of transportation
2) Type of package
3) State the number of freighted container to be used(if any)

9. Additional Information Required for Import or Export of Nuclear Material, where appropriate. :

(a) Chemical or physical form of nuclear material and for enriched uranium, the weight percentage of enrichment and Pu – 239 content.
(b) Quantity in grams or kilograms of –
   (1) the nuclear material imported or exported
   (2) the uranium or plutonium content
   (3) the content of Pu – 239 in enriched uranium.
(c) Specify the mode of transportation and type of package to be used.
(d) Financial security which covers the liability for nuclear damage (attach relevant document)

10. Additional Information Required for the Import or Export of Irradiating Apparatus, where appropriate, :

(1) Description of Equipment

Type and model A	Maximum voltage Kilovolt B	Maximum current mili ampere C	Maximum power level Kilowatt D	Serial number of control panel E	Serial number of tube head F	Supplier G

(2) Technical specification of manufacturer (enclose document):

11. Permit Fee Issued (Taka): ..... Draft/Pay Order no.: ..... Date: .....

12. Declaration of the Licensee/Authorised Person :

I .....
(full name)
hereby declare that,

(a) this application is made on my behalf/on behalf of .....; and

(b) the particulars furnished in this form, including all supplements attached hereto are true and correct.

Date

Signature

Name :
Designation :

Official Stamp :

Dr. M.A. Wazed Miah
Member, Physical Science
For, Bangladesh Atomic Energy Commission

Nuclear Safety and Radiation Control Act, 1993

Act No. XXI of 1993

An act to provide for ensuring nuclear safety and radiation control.

Whereas it is expedient to provide for ensuring nuclear safety and radiation control ;

It is hereby enacted as follows ;–

1. Short title and commencement – This act may be called the Nuclear Safety and Radiation Control Act , 1993.

2. Definitions –In this Act, unless there is anything repugnant in the subject or context, -

(a) "Authorized Radioactivity Limit" means the maximum permissible limit of radioactivity prescribed in section 3, clause (h) ;

(b) "Ionizing Radiation" means such radiation as is capable of producing ions directly or indirectly in a matter while passing through it ;

(c) "Source Material" means

(i) Uranium or Thorium or any combination of them, in any physical or chemical form, or

(ii) Such natural ore which contains 0.05% or more by weight of uranium or thorium or any combination of thereof ;

(d) "Commission" means Bangladesh Atomic Energy Commission constituted under the Bangladesh Atomic Energy Commission order, 1973 (President's Order No. XV of 1973).

(e) "Radioactive Material" means a material in which radioactivity is present in excess of the authorized limit.

(f) "Radioactive Waste " means such waste as is created by the Nuclear or Radiation activity and in which radioactivity is present in excess of the prescribed limit.

(g) "Nuclear Radiation " means such ionizing radiation as is produced by the activities involving radiation and radiation producing machines.

(h) " Radioactivity " means the decay of an unstable nucleus through disintegration or emission of nuclear particles.

(i) "Prescribed " means prescribed by rules made under this act.

(j) "Inspector" means an Inspector appointed under section 8, sub-section (1).

(k) "Radiation" means such radiation which, while dispersing or propagating through matter or space, produces electromagnetic induction or effects.

(l) "Person" means any Government institution, statutory body, commercial enterprise or a person or an association.

(m) "Licence" means a licence issued under section 5.

3. Powers of the Commission :- The Commission shall have the powers to –

(a) make necessary rules or formulate policies, or issue orders or instructions for the management of nuclear safety, radiation control and radioactive waste and may take appropriate steps to implement the same ;

(b) formulate policies and carry on research programmes and implement them to save life, health, property and to conserve environment from the risks of nuclear radiation ;

(c) formulate policies for such other radiations, besides the nuclear radiation, as are harmful to life, health, property and environment and may implement the same ;

(d) regulate exploration, production, import, export, transfer, transportation, ownership, possession, processing, reprocessing, use and sale of radioactive minerals and co-ordinate those activities ;

(e) control the production and use of nuclear materials or nuclear energy, and regulate the safety of necessary materials and equipment related to the production and uses of the same ;

(f) regulate the use and management of the radioactive wastes ;

(g) regulate the production, storage, import, export, use, transfer, transportation and trade of radioactive materials or radiation producing equipment ;

(h) prescribe the maximum permissible limits of radioactivity in air and anything usable as food or drink or otherwise by men and animals ;

(i) publish information for the public on matters relating to nuclear safety and radiation control ;

(j) advise nuclear power and related projects, educational and research institutions, industry and commerce or any other establishment on matters of nuclear safety and radiation control ;

(k) provide for training of the persons dealing with or handling radioactive materials or radiation producing equipment on the matters relating to radiation ;

4. Restrictions on certain activities – (1) No person, without holding a licence issued under this Act shall, after the date prescribed by the Commission by notification in the official gazette –

(a) procure, produce, own, import, export, transport, possess, process, reprocess, use, trade, transfer, displace, store, abandon or destroy any radioactive materials, nuclear materials, and equipment capable of producing ionizing radiation and carry on research on them ;

(b) bring or make entrance into Bangladesh of any vehicle operated by nuclear power or carrying radioactive materials or radiation producing equipment or radioactive wastes ;

(c) process any food-stuff using nuclear radiation and produce, distribute or market any food-stuff processed by nuclear radiation ;

(d) possess, procure, import or distribute any food-stuff or drinks which contains radioactivity exceeding the authorized limit ;

(e) own, make, install, possess or operate any equipment capable of producing nuclear or ionizing radiation .

(2) Not withstanding anything contained in sub-section (1) the Commission may exempt any person from the applicability of this section, subject to certain conditions as may be imposed by it.

5. Procedure for Issuing Licence :— (1) An application for a licence mentioned in section 4 , may be made to the Commission on payment of such fee and in such manner and form as may be prescribed, and the Commission may,after considering the application, issue a licence for a prescribed period and subject to such condition as may be imposed by i from time to time.

(2) The Commission may require from the applicant any information necessary for the consideration of the application submitted to it under sub - section (1).

(3) In a licence to be issued under this section, insurance and other economic measures for payment of compensation or meeting liabilities arising out of nuclear or radioactive effects, including other conditions to be fulfilled by the licensee, may be specified.

6. Laboratory – (1) The Commission may, in order to apply the powers and carry on the functions assigned to it under this Act, set up –

(a) a central Laboratory and, if necessary, establish one or more regional laboratories ; and

(b) one or more training centers, scientific documentation and information exchange centers and establish libraries on subjects relating to nuclear safety and radiation control.

(2) The Commission, in order to perform the functions and apply the powers specified under sub -section (1) may, seek assistance of any university of Bangladesh and of any foreign laboratory including those of the International Atomic Energy Agency (IAEA) or of such other national or foreign laboratory as are considered reliable by the Commission for the purpose, or may carry on joint research programs on any subject with similar national or foreign institutions or laboratories.

(3) Any report or study sent to it on any matter or subject by such laboratories as aforesaid shall be deemed to be true and authentic unless proved otherwise in a court of law.

7. Committee of Experts — The Commission may, constitute from time to time, expert committees consisting of one or more persons having specialized knowledge, to advise on any specific problem pertaining to nuclear safety and radiation control matters.

8. Appointment of Inspector — (1) The Commission may appoint one or more inspectors for the purpose of this Act.

(2) An inspector shall discharge his functions under the control and overall supervision of the Commission

(3) An inspector may,—

(a) in order to verify that the rules made under the Act and the conditions of the licence are being properly complied with, enter into any place, house, premises or vehicles and conduct inspection and investigation ;

(b) in order to verify that the nuclear safety conditions, limits of radioactivity and doses of ionizing radiation are being complied with, collect related documents, equipment or materials or their samples for analysis and demand necessary information from the persons concerned ;

(c) direct the licensee to take necessary measures in order to ensure the safety of the public, health, property and environment in accordance with the provisions of this Act .

(4) The Inspector shall, as soon as he finds that any condition of the license is violated, send a report to the Commission, and mention therein the harm caused or likely to be caused to personnel exposed to radiation, to public health or safety of property or environment as a result of such violation.

9. Cancellation of Licence, etc. –

(1) The Commission may, in a prescribed manner, cancel any licence issued under this Act.

(2) The Commission, on received of a report under section 8, sub-section (4) that any condition of the licence has been violated or is being violated, may –

(a) direct, as deemed appropriate in its consideration, the concerned person to comply properly with the conditions of the licence ;
(b) direct to stop the activities under the licence, subject to taking necessary steps required to ensure safety of health or property or environment ; or
(c) cancel the licence.

(3) Any person, aggrieved due to the cancellation of the licence under this section, may appeal to the Government within 30 days of received of the order of cancellation of the licence.

(4) The decision of the Government, in the appeal made under sub-section (3), shall be final and no suit shall be instituted against it in any court of law.

10. Emergency Rectification Measures — (1) If it appears to the commission on the basis of any information received or result of any investigation that the radiation dose level in any place is dangerous to the people, animals, property or environment of that place, it shall inform the Directorate of Environment of the matter and, if necessary, through gazette notification, issue instructions for removal of persons,animals or properties from that place or destruction of animals or properties,contaminated with radioactivity, within the period specified in such notification.

(2) If any person fails or neglects to comply with the instructions of the Commission within the time specified in the notification under sub-section (1), the Deputy Commissioner or any other authority empowered by the Government on this behalf, may take steps to implement the instructions of such notification and, if necessary, may apply reasonable force for the purpose.

(3) No person shall enter the place specified in sub-section (1) without the permission of the Deputy Commissioner, unless the Commission orders, otherwise and if any person enters or tries to enter the place without the permission of the Deputy Commissioner, shall be removed from the place, by the order of the Deputy Commissioner, if necessary, by applying force.

(4) No person affected by the actions taken under this section, can claim any compensation for it from the Commission, Deputy Commissioner or officials or employees of the Government or the Commission.

11. Penalty — Any person who violates or fails to comply with this Act or any rule made under it or any condition of the licence, shall be punished with imprisonment for a term of not less than three years but not exceeding seven years, and shall also be liable to fine and if the court considers expedient, may order in favour of seizure by the Commission of the materials, food stuffs, drinks, equipment, vehicles or any property concerning which the said violation or failure has occurred.

12. Offence Committed by a Company.— If the person who violates this Act or any rule made under this Act, is a company, each Director, Manager, Secretary or any other official or agent of that company shall be liable for the said violation, unless he can prove that such violation had occurred, beyond his knowledge or that he had tried his best to prevent it.

Explanation :— Under this section —

(a) "Company" means any statutory organization, commercial enterprise, association or establishment and

(b) a "Director" in case of a commercial enterprise, means a partner or a Member-Director.

13. Cognizance of Offences — No court shall take cognizance of any offence committed under this Act or rules made under it unless a written complaint is submitted to it by an Inspector.

14. Indemnity — No suit, prosecution or other legal proceeding shall be against the Government, the Commission or any of its member, Inspectors, Deputy Commissioner or any person authorized under this Act for anything done or intended to be done in good faith under this Act.

15. Delegation of Power — The Commission may delegate any or all of its powers or responsibilities under the Act to any of its members.

16. Power to make rules — (1) The Commission may, by notification in the official Gazette, make rules for carrying out the purposes of this Act.

(2) The Commission may, in particular and without prejudice to the generality of sub-section (1) provide formulate for all or any of the following matters namely, —

(a) procedures for issuance of licence, rectification, renewal, suspension and cancellation and the conditions to be complied with by the licensee.
(b) protection of public health and environment from nuclear and ionizing radiations and radioactive contamination.
(c) physical and financial security and insurance for any person who in discharging his responsibilities may come in contact with nuclear materials, radioactive materials or equipment capable of producing ionizing radiation.
(d) fixation of safety standards and implementation thereof for the activities related to nuclear and ionizing radiations.
(e) precautionary measures for storage, packaging, transportation, use of nuclear materials, radioactive materials or equipment capable of producing ionizing radiations.
(f) fixation of compensation and payment thereof to any person affected by an accident relating to nuclear or ionizing radiation.

sd/-
(Abul Hashem)
Secretary

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