NORTHERN TERRITORY OF AUSTRALIA

MINES SAFETY CONTROL (RADIATION PROTECTION) REGULATIONS

TABLE OF PROVISIONS

Regulation

NORTHERN TERRITORY OF AUSTRALIA

Regulations 1981, No. 30*

Regulations under the Mines Safety Control Act

I, ERIC EUGENE JOHNSTON, the Administrator of the Northern Territory of Australia, acting with the advice of the Executive Council, hereby make the following Regulations under the Mines Safety Control Act.

Dated this 25th day of September, 1981.

N. M. DONDAS

E. E. JOHNSTON
Administrator

By His Honour's Command

Minister for Transport and Works acting for and on behalf of the Minister for Mines and Energy

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MINES SAFETY CONTROL (RADIATION PROTECTION) REGULATIONS

1. CITATION

These Regulations may be cited as the Mines Safety Control (Radiation Protection) Regulations.

2. INTERPRETATION

(1) In these Regulations, unless the contrary intention appears -

"Code" means the Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores (1980), referred to as the Radiation Protection (Mining and Milling) Code (1980), made under section 9(1) of the Environment Protection (Nuclear Codes) Act 1978 of the Commonwealth, as it is set out in Schedule I and as amended from time to time;

"Chief Medical Officer" means the Chief Medical Officer appointed under the Public Health Act;

"employee" includes a designated employee.

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* Notified in the Northern Territory Government Gazette on 28 SEP 1981, 1981.

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(2) Words and expressions that are used in these Regulations have the meanings that they have in the Mines Safety Control Act.

(3) The expression -

"appropriate authority" used -

(a) in regulation 4(2), in a paragraph of that regulation specified in Column 1 of Schedule II, in relation to the relevant requirement in that paragraph, means, subject to sub-regulation (5), the person or persons specified in Column 2 of that Schedule opposite that paragraph so specified; or

(b) in the Code, in a provision of the Code specified in Column 1 of Schedule III, in relation to the relevant requirement in that provision, means the person or persons specified in Column 2 of that Schedule opposite that provision so specified.

(4) Subject to sub-regulation (2), words and expressions that are used in these Regulations have the meanings that they have in the Code.

(5) The Director of Mines shall not exercise his powers under regulation 4(2)(d), (e), (g), (h), (k)(ii), (m), (n), (q), (z) and (za) without prior consultation with the Chief Medical Officer.

3. APPLICATION

These Regulations apply to each mine in the Territory.

4. DUTIES OF OWNER AND MANAGER

(1) The owner and the manager of a mine shall be responsible to ensure that the provisions of the Code are applied in respect of the mine.

(2) Where the operations of a mine include the mining or milling of radioactive ores, and the provisions of the Code apply in respect of that mining or milling, the owner and the manager of the mine shall ensure that -

(a) the exposure of employees and members of the public to radiation resulting from the operations of the mine or mill does not exceed those levels specified in clauses 7, 10 and 14 of the Code, and that the exposure of persons is reduced to the lowest practicable level;

(b) such notifications are made to the appropriate authority as are required by the provisions of the Code or by the direction of the appropriate authority;

(c) the appropriate authority is notified in writing, prior to the operation of the mine or mill and thereafter at intervals not exceeding 12 months, of -

(i) the individual processes in the mine or mill that may involve exposure of employees and members of the public to radiation; and

(ii) the equipment and procedures which shall be used and the steps which shall be taken to limit the exposure referred to in sub-paragraph (i), in accordance with the levels specified in clauses 7, 10 and 14 of the Code, and to reduce the exposure of persons to the lowest practicable level;

(d) approval from the appropriate authority is obtained before commencing those operations that may result in exposure of employees or members of the public to radiation;

(e) after obtaining the approval referred to in paragraph (d), a further approval is obtained from the appropriate authority before making a variation to operations, procedures or equipment in the mine or mill that may result in changes in exposure of employees or members of the public to radiation;

(f) each employee, before commencing work, is properly instructed in the radiation aspects of his work and in the precautions necessary to limit his exposure to radiation and to avoid radiation accidents and injuries;

(g) re-instruction of employees, for the purposes referred to in paragraph (f), occurs at intervals acceptable to the appropriate authority;

(h) the instructions referred to in paragraph (f), and the re-instructions referred to in paragraph (g), are submitted to the appropriate authority for approval;

(j) supervision is provided to ensure that each employee performs his work in accordance with the provisions of the Code;

(k) facilities, plant and equipment for the radiation protection of employees and of members of the public are -

(i) provided, made available and maintained in proper working order; and

(ii) inspected at intervals approved by the appropriate authority;

(m) the results of the maintenance carried out, and the results of each inspection, referred to in paragraph (k), shall be recorded as required by the appropriate authority;

(n) the adequacy and effectiveness of the working procedures instituted to limit exposure of employees and members of the public to radiation are assessed at intervals approved by the appropriate authority and the results of those assessments recorded;

(p) where a defect is discovered in the mine, mill, plant, equipment or working procedure, the defect is promptly investigated to determine whether or not it is likely to cause a radiation hazard;

(q) a defect referred to in paragraph (p) and likely to lead to a radiation hazard is promptly remedied, or the hazard is brought promptly under control, to the satisfaction of the appropriate authority and, for those purposes, persons whose presence in the affected controlled area or supervised area is not essential shall be evacuated from the area and shall not be re-admitted until the defect is remedied or the radiation hazard is otherwise brought under control;

(r) the boundaries of controlled areas and supervised areas are delineated and the delineation of those boundaries notified to the appropriate authority;

(s) access to and occupancy of controlled areas and supervised areas is controlled;

(t) controlled areas and supervised areas are clearly and permanently identified and their location and boundaries brought to the attention of employees of the mine or mill;

(u) in every controlled area legible notices specifying the procedures necessary to comply with the provisions of this Code are posted and maintained in positions approved by the appropriate authority, such notices to be in such language as to ensure comprehension by all employees in the mine or mill;

(w) locations, not being controlled areas, are designated for eating, drinking and smoking, such locations to meet the requirements specified in paragraph (b) of Schedule 8 of the Code;

(y) areas used for recreational and residential purposes are outside of controlled and supervised areas;

(z) change rooms, showers and associated facilities are provided as approved by the appropriate authority;

(za) a monitoring program, approved by the appropriate authority, is established and carried out for the purposes of enabling the basic radiation protection standards of clause 7 of the Code to be met and the concentrations of contaminants referred to in Schedules 5, 6 and 7 of the Code, the radioactive contamination on surfaces referred to in Schedule 8 of

the Code, and the absorbed dose rates in air referred to in Schedule 9 of the Code, to be assessed;

(zb) where the derived limits specified in Schedules 5, 6, 7, 8 and 9 of the Code are exceeded, corrective measures, as required by the appropriate authority, are taken;

(zc) inspectors are afforded the right of access and reasonable opportunity to examine equipment, working procedures and records required to be held under the Code by the owner or manager;

(zd) the results of all measurements and examinations of equipment and procedures, and assessments performed, in accordance with the requirements of the Code, are -

(i) promptly recorded in a register and retained until such time as determined by the appropriate authority;

(ii) brought to the attention of the manager where required to do so by the provisions of the Code;

(iii) made available to an employee upon the employee's request where they pertain to that employee's working conditions; and

(iv) supplied to the appropriate authority on request by the appropriate authority;

(ze) a radiation safety officer is appointed for the mine or mill, to be responsible to the manager for radiation protection in the mine or mill;

(zf) a ventilation officer is appointed for the mine or mill where required by the appropriate authority, such a person, if any, to be responsible to the manager for ventilation in the mine or mill;

(zg) support staff are appointed, and monitoring equipment and facilities are made available, to ensure compliance with the provisions of the Code;

(zh) for each designated employee -

(i) measurements and assessments to determine the quarterly, annual and cumulative dose equivalents, committed dose equivalents, radon daughter exposures and thoron daughter exposures are made;

(ii) the results of the measurements and assessments referred to in sub-paragraph (i) to be retained in a form acceptable to the appropriate authority; and

(iii) the results referred to in sub-paragraph (ii) to be provided to the designated employee upon the request of that designated employee;

(zj) the appropriate authority is provided with the name of a newly appointed designated employee, together with the available information on the known previous employment of the designated employee involving exposure to radiation;

(zk) the appropriate authority is informed of an employee who has ceased to be a designated employee or of a person whose employment has been terminated;

(zm) health surveillance of each designated employee is carried out and arrangements made, for the maintenance of medical records of each designated employee;

(zn) a designated employee is transferred to duties which will result in a lowering of dose equivalent or radon daughter exposure or thoron daughter exposure where a medical practitioner so recommends in accordance with clause 19(5) of the Code;

(zp) a pregnant designated employee about whom notification under clause 6(11) of the Code has been received is not employed in a controlled area;

(zq) an employee, if transferred in accordance with clause 19(5) of the Code, does not resume his regular work until declared medically fit for that work by a medical practitioner;

(zr) where a designated employee leaves the employment of one operator and takes up employment with another operator, the second-mentioned operator obtains from the appropriate authority a copy of the radiation records, as required by the Code, of that employee;

(zs) individual employee records of exposure to radiation and other relevant radiation and medical information are provided as required to the appropriate authority upon request by the appropriate authority.

5. DUTIES OF EMPLOYEES

(1) An employee shall inform the manager of all previous employment involving exposure to radiation.

(2) An employee shall obey all notices displayed in accordance with the Code and obey all instructions relating to radiation protection of himself and others.

(3) An employee shall not engage in any careless or reckless practice or action likely to result in a radiation hazard for himself or others.

(4) An employee shall report forthwith to his supervisor any defect of which the employee is aware and which that employee believes is likely to cause a radiation hazard or contribute to one arising.

(5) An employee who exercises supervision in accordance with regulation 4(2)(j) shall promptly assess each defect reported to him, and if he believes it likely to cause a radiation hazard or contribute to one arising, shall report the defect forthwith to the manager.

(6) An employee shall use, in the manner required by the manager, all radiation protective equipment furnished for the employee's use.

(7) An employee shall use, in the manner required by the manager, devices or equipment furnished to the employee to assess that employee's dose equivalent, radon daughter exposure or thoron daughter exposure.

(8) An employee shall not, except for the purposes of inspection, maintenance, repair, modification or replacement, interfere with, remove, alter, displace or render ineffective any radiation protective equipment provided to protect employees or other persons, or interfere with any method, process or working procedure adopted to minimise exposure to radiation.

(9) An employee shall not, within any controlled or supervised area, eat, drink or smoke, except in locations specified for such purposes by the manager.

(10) An employee shall not undertake to receive a dose equivalent, radon daughter exposure or thoron daughter exposure in excess of the limits given for planned special exposures in Schedule 10 of the Code except voluntarily to rescue a person, to prevent the exposure of a large number of persons to a radiation hazard or to protect an essential installation.

(11) A designated employee who becomes pregnant shall, as soon as practicable after a medical examination, notify the manager so that the requirements of regulation 4(2)(zp) are met.

(12) A designated employee shall undergo all medical examinations for health surveillance, in accordance with the provisions of the Code, as arranged by the manager.

(13) An employee shall ensure that the manager is informed of the results of each medical examination undertaken, in accordance with clauses 19 and 20 of the Code, by the employee.

6. OFFENCES AND PENALTIES

(1) A person who contravenes, or fails to comply with, a provision of these Regulations is guilty of an offence.

(2) A person who is guilty of an offence against these Regulations is punishable upon conviction by a fine not exceeding $500.

SCHEDULE I

Regulation 2(1)

CONTENTS

PART I — Preliminary

Title

1. This Code of Practice on Radiation Protection in the Mining and Milling of Radioactive Ores (1980) may be referred to as the Radiation Protection (Mining and Milling) Code (1980).

Interpretation

2. (1) In this Code unless the contrary intentions appear —
   (a) a reference to a Clause is a reference to the relevant Clause of this Code;
   (b) a reference to a Schedule or part thereof is a reference to the relevant Schedule or part thereof of this Code.

   (2) Each of the terms set out in this Clause has in this Code the meaning given in this Clause.

"Absorbed dose" (D) is the quotient of ΔE by Δm, where ΔE is the energy imparted by ionising radiation to the matter in a volume element and Δm is the mass of the matter in that element.

The unit of absorbed dose is one joule per kilogram and has the special name gray (symbol Gy). This unit replaces the non-SI unit, the rad, where 1 gray = 100 rad.

"Accidental exposure" means an involuntary exposure resulting from sources of radiation which are not under control.

"Activity" (A) of a quantity of a radionuclide is the quotient of ΔN by Δt where ΔN is the number of nuclear transformations which occur in this quantity in time Δt.

The unit of activity is one disintegration per second and has the special name becquerel (symbol Bq). This unit replaces the non-SI unit, the curie (Ci) where 1 becquerel = 2.703×10^{-11} curie.

"Appropriate authority" means an authority having responsibility for enforcing the provisions of any legislation implementing any part or the whole of this Code.

"Committed dose equivalent" means the dose equivalent to the body, organ or tissue integrated over a fifty year period from a specified intake of radioactive material.

"Concentrate" means the end-product of the processes of milling of radioactive ore.

"Contaminant" means the radionuclide which is a component of specified contamination.

"Contamination" means material in unsealed gaseous, liquid or particulate form in air, water or other substances or on surfaces.

"Controlled area" means an area or region where radiation levels may exceed three-tenths of any of the derived limits given in Schedules 5, 7(a) and 9(a).

"Daughter products" means radionuclides which are formed as a result of radioactive decay of a specified radionuclide.

"Designated employee" means any person who works in a supervised or controlled area of a mine or mill.

"Dose equivalent" (DE) is the product of absorbed dose (D), quality factor (Q), and absorbed dose distribution factor (DF).

The unit of dose equivalent has the special name sievert (symbol Sv), which is

numerically equal to the absorbed dose in gray multiplied by the appropriate factors. This unit replaces the non-SI unit, the rem where 1 sievert = 100rem.

"Emergency exposure" means voluntary exposure to radiation in emergency situations.

"Exposure" means the circumstance of being exposed to radiation. When used as part of a complete term the definition of that term applies — see radon daughter exposure, thoron daughter exposure, external exposure, internal exposure, planned special exposure, accidental exposure, emergency exposure.

"External exposure" means exposure to radiation from sources of radiation external to the body.

"Inspector" means a person appointed as an inspector by the appropriate authority.

"Internal exposure" means exposure to radiation from radioactive material taken into the body.

"Manager" means the person responsible for the administration and direction of the mine and/or mill.

"Mill" means a facility used for concentrating and processing radioactive ores, its associated administrative support within the controlled or supervised areas, and facilities for management of contaminated waste and effluent.

"Mine" means a facility engaged in the extraction, including excavation, in situ leaching, removal and storage, of radioactive ores,its associated administrative support within the controlled or supervised areas and facilities for management of contaminated waste and effluent.

"Operator" means any person, government or other entity that conducts or carries on operations for the mining and/or milling of radioactive ores.

"Planned special exposure" means exposure to radiation from a procedure which does not occur during normal operations and for which special planning is required.

"Radiation" means ionising radiation, that is, electromagnetic or corpuscular radiation capable of producing ions directly or indirectly in passage through matter.

"Radiation hazard" means radiation levels in excess of the basic radiation protection standards (Clause 7) or derived limits (Clause 9) of this Code.

"Radiation protective equipment" means equipment intended for the protection of a person or persons against radiation or contamination. It may be intended to ensure individual protection or to provide protection throughout an area.

"Radioactive material" means material which spontaneously emits radiation.

"Radioactive ore" means an ore or mineral containing uranium or thorium or their radioactive daughter products.

"Radionuclide" means a species of radioactive atom having specified numbers of neutrons and protons in its nucleus.

"Radon" means the radioactive gas radon-222.

"Radon daughters" means the short-lived radioactive products of decay of radon, namely polonium-218 (radium A), lead-214 (radium B), bismuth-214 (radium C) and polonium-214 (radium C').

"Radon daughter concentration" means the quotient of ΔE by ΔV, where ΔE is the sum of energies of the alpha particles emitted by the complete decay of the radon daughters in the volume element ΔV.

"Radon daughter exposure" means the sum, for all exposures of a person to inhaled radon daughters within a stated period of time, of all products formed by multiplying the radon daughter concentration in the inhaled air and the time for which that concentration was inhaled.

"Supervised area" means an area or region not designated as a controlled area where radiation levels may exceed any of the derived limits given in Schedules 6, 7(b) and 9 (b).

"Thorium" means the mixture of thorium-232 and thorium-228 in the proportions in which they occur naturally.

"Thoron" means the radioactive gas radon-220.

"Thoron daughters" means the short-lived radioactive products of decay of thoron, namely, polonium-216 (thorium A), lead-212 (thorium B), bismuth-212 (thorium C), polonium-212 (thorium C^{1}) and thallium-208 (thorium C^{11}).

"Thoron daughter concentration" means the quotient of ΔE by ΔV, where ΔE is the sum of energies of the alpha particles emitted by the complete decay of the thoron daughters in the volume element ΔV.

"Thoron daughter exposure" means the sum, for all exposures of a person to inhaled thoron daughters within a stated period of time, of all products formed by multiplying the thoron daughter concentration in the inhaled air and the time for which that concentration was inhaled.

"Uranium" means the mixture of uranium-238, uranium-235 and uranium-234 in the proportions in which they occur naturally.

"Working Level" means the concentration unit defined as any combination of radon daughters or thoron daughters in one litre of air such that the sum of energies of the alpha particles emitted by the complete decay of the daughters is 1.3×10^5 MeV.

The abbreviation for 'Working Level' is 'WL'.

1 WL = 1.3×10^5 MeV/litre

(Note: 1 "eV" or "electron volt" = 1.6×10^{-19} joules.)

"Working Level Month" means the unit of exposure to radon daughters or thoron daughters. The abbreviation for 'Working Level Month' is 'WLM'.

1 WLM = 8.0×10^{10} MeV second/litre

(1 WLM is approximately equivalent to an exposure to 1 WL for a working month of 170 hours).

Application

3. The purpose of this Code is the prevention or limitation of radiation risk to persons in all stages of mining or milling operations, from exploratory excavations to decommissioning and subsequent rehabilitation of the site. The Code applies to:

(1) a mine from which are extracted radioactive ores containing greater than or equal to 0.02 per cent by weight of uranium or greater than or equal to 0.05 per cent by weight of thorium;

(2) a mill for the production of ore concentrates or intermediate products that contain at any stage of milling greater than 0.05 per cent by weight of uranium or greater than 0.05 per cent by weight of thorium;

(3) such other operations as designated by the appropriate authority.

Approvals

4. Approvals are required from the appropriate authority for:

(1) exploratory excavations;

(2) development of a mine or construction of a mill;

(3) any operation of a mine or mill that may result in exposure to radiation of employees or of members of the public, or any variations to existing

operations, procedures or equipment in a mine or mill which may result in changes in exposure to radiation of employees or members of the public;

(4) decommissioning of a mine, mill or other associated facilities and subsequent rehabilitation.

PART II — Duties and Responsibilities

Operator and manager

5. (1) The operator and manager of the mine or mill shall be responsible to ensure that the provisions of this Code are applied in the mine or mill.

(2) Where a contractor is employed, his responsibility shall be to the manager or to the operator.

(3) The operator and manager shall ensure that:

(a) the exposure of employees and of members of the public to radiation resulting from the operations of the mine or mill does not exceed those levels specified in Clauses 7, 10 and 14, and that the exposure of persons is reduced to the lowest practical level;

(b) such notifications are made to the appropriate authority as are required by the provisions of this Code or by the direction of the appropriate authority;

(c) the appropriate authority is notified in writing, prior to operation of the mine or mill, and thereafter at intervals not exceeding twelve months, of:

(i) the individual processes in the mine or mill that may involve exposure to radiation of employees and of members of the public,

(ii) the equipment and procedures that will be used and the steps to be taken to limit such exposure in accordance with the levels specified in Clauses 7, 10 and 14 and to reduce the exposure of persons to the lowest practical level;

(d) approval from the appropriate authority is obtained before commencing those operations that may result in exposure to radiation of employees or of members of the public. Thereafter approval from the appropriate authority shall be obtained before making any variations to operations, procedures, or equipment in the mine or mill that may result in changes in exposure to radiation of employees or of members of the public;

(e) (i) all employees, before commencing work, are properly instructed in the radiation aspects of their work and in the precautions necessary to limit their exposure to radiation and to avoid radiation accidents and injuries,

(ii) re-instruction of employees is undertaken at intervals acceptable to the appropriate authority,

(iii) the instructions are submitted to the appropriate authority for approval;

(f) supervision is provided to ensure that employees perform their work in accordance with the provisions of this Code;

(g) facilities, plant and equipment for the radiation protection of employees and of members of the public are:

(i) provided, made available and maintained in proper working order,

(ii) inspected at intervals approved by the appropriate authority.

The results of the maintenance carried out and the results of each inspection shall be recorded as required by the appropriate authority;

(h) the adequacy and effectiveness of the working procedures instituted to limit exposure to radiation of persons are assessed at intervals approved by the appropriate authority and the results of these assessments recorded;

(i) whenever a defect is discovered in the mine, mill, plant, equipment or working procedure, it is promptly investigated to determine whether or not it is likely to cause a radiation hazard;

(j) any defect referred to in Clause 5(3)(i) and likely to lead to a radiation hazard is promptly remedied or the hazard is brought promptly under control, to the satisfaction of the appropriate authority. Persons whose presence in the affected controlled area or supervised area is not essential shall be evacuated from the area and shall not be re-admitted until the defect is remedied or the radiation hazard is otherwise brought under control;

(k) boundaries of controlled areas and supervised areas are delineated and notified to the appropriate authority;

(l) access to and occupancy of controlled areas and supervised areas is controlled;

(m) controlled areas and supervised areas are clearly and permanently identified and brought to the attention of employees of the mine or mill;

(n) in every controlled area legible notices specifying the procedures necessary to comply with the provisions of this Code are posted and maintained in positions approved by the appropriate authority. The notices shall be such as to ensure comprehension by all employees in the mine or mill;

(o) locations, not being controlled areas, are designated for eating, drinking and smoking. These shall meet the requirements of Schedule 8(b). Areas used for recreational and residential purposes shall be outside of controlled and supervised areas;

(p) change rooms, showers and associated facilities are provided as approved by the appropriate authority;

(q) a monitoring program approved by the appropriate authority is established and carried out. The monitoring program shall be designed to enable the basic radiation protection standards of Clause 7 to be met and the concentrations of contaminants referred to in Schedules 5, 6 and 7, the radioactive contamination on surfaces referred to in Schedule 8, and the absorbed dose rates in air referred to in Schedule 9, to be assessed;

(r) corrective measures as required by the appropriate authority are taken when the derived limits specified in Schedules 5, 6, 7, 8 and 9 are exceeded;

(s) inspectors are afforded the right of access and reasonable opportunity to examine equipment, working procedures and records required to be held by the operator/manager under this Code;

(t) the results of all measurements, results of examinations of equipment and procedures, and assessments performed in accordance with the requirements of this Code are:

(i) promptly recorded in a register and retained until such time as determined by the appropriate authority.

(ii) brought to the attention of the manager where required by the provisions of this Code or the appropriate authority,
(iii) made available to an employee upon his request where they pertain to that employee's working conditions, and
(iv) supplied to the appropriate authority on request;

(u) a radiation safety officer is appointed for the mine or mill. The person appointed shall be responsible to the manager for radiation protection in the mine or mill;

(v) a ventilation officer is appointed for the mine or mill when required by the appropriate authority. The person appointed shall be responsible to the manager for ventilation in the mine or mill;

(w) support staff is appointed and monitoring equipment and facilities are made available to ensure compliance with the provisions of this Code;

(x) for each designated employee:
(i) measurements and assessments to determine the quarterly, annual and cumulative dose equivalents, committed dose equivalents, radon daughter exposures and thoron daughter exposures are made,
(ii) the results are recorded and retained in a form acceptable to the appropriate authority,
(iii) these measurements and assessments are provided to the designated employee upon his request;

(y) the appropriate authority is provided with the names of new designated employees, together with available information on known previous employment of these employees involving exposure to radiation. The appropriate authority shall be informed of employees who have ceased to be designated employees or whose employment has terminated;

(z) health surveillance of all designated employees is carried out and arrangements made for maintenance of their medical records;

(aa) a designated employee is transferred to duties which will result in a lower dose equivalent or radon daughter exposure or thoron daughter exposure if the medical practitioner so recommends in accordance with Clause 19(5);

(bb) a pregnant designated employee about whom notification under Clause 6(11) has been received is not employed in a controlled area;

(cc) an employee, if transferred in accordance with Clause 19(5), does not resume his regular work until declared medically fit for that work by the medical practitioner;

(dd) when a designated employee leaves the employment of one operator and takes up employment with another operator, the second mentioned operator obtains from the appropriate authority a copy of the radiation records of that employee provided for in this Code;

(ee) individual employee records of exposure to radiation and other relevant radiation and medical information are provided as required to the appropriate authority.

Employee

6. (1) An employee shall inform the manager of all previous employment involving exposure to radiation.

(2) An employee shall obey all notices displayed in accordance with the Code and obey all instructions relating to radiation protection of himself and others.

(3) An employee shall not engage in any careless or reckless practice or action likely to result in a radiation hazard for himself or others.

(4) An employee shall report forthwith to his supervisor any defect of which he is aware and which he believes is likely to cause a radiation hazard or contribute to one arising.

(5) An employee who exercises supervision in accordance with Clause 5(3)(f) shall promptly assess each defect reported to him, and if he believes it likely to cause a radiation hazard or contribute to one arising, shall report the defect forthwith to the manager.

(6) An employee shall use in the manner required by the manager all radiation protective equipment furnished for his use.

(7) An employee shall use in the manner required by the manager, devices or equipment furnished to him to assess his dose equivalent, radon daughter exposure or thoron daughter exposure.

(8) Except for the purposes of inspection, maintenance, repair, modification or replacement, an employee shall not interfere with, remove, alter, displace or render ineffective any radiation protective equipment provided to protect employees or other persons or interfere with any method, process or working procedure adopted to minimise exposure to radiation.

(9) Within any controlled or supervised area, an employee shall not eat, drink or smoke except in locations specified for such purposes by the manager.

(10) An employee shall not undertake to receive a dose equivalent, radon daughter exposure or thoron daughter exposure in excess of the limits given for planned special exposures in Schedule 10 except voluntarily to rescue a person, to prevent the exposure of a large number of persons to a radiation hazard or to protect an essential installation.

(11) A designated employee who becomes pregnant shall, as soon as practicable after a medical examination, notify the manager so that the requirements of Clause 5(3)(bb) are met.

(12) A designated employee shall undergo all medical examinations as arranged by the manager for health surveillance in accordance with the provisions of this Code.

(13) An employee shall ensure that the manager is informed of the results of medical examinations undertaken in accordance with Clauses 19 and 20.

PART III – Radiation Standards and Limits

Basic radiation protection standards

7. For the purposes of this Code, the basic radiation protection standards shall be as follows:

(1) the dose equivalent limits for radiation received by a designated employee as a consequence of employment are given in Schedule 1;

(2) the dose equivalent limits for an employee other than a designated employee and for members of the public exposed as a consequence of the operation of a mine or mill are given in Schedule 2;

(3) the radon daughter exposure and thoron daughter exposure limits for a designated employee in the course of employment are given in Schedule 3;

(4) the radon daughter exposure and the thoron daughter exposure limits for an employee other than a designated employee and for members of the public exposed as a consequence of the operation of a mine or mill are given in Schedule 4.

Exclusions from the requirements for meeting these standards are given in Clause 8.

Doses excluded from basic radiation protection standards

8. For the purposes of this Code, the following shall not be taken into account in assessing compliance with the basic radiation standards given in Clause 7:

(1) doses due to natural radiation other than those arising from the mining and milling of radioactive ores;

(2) doses received as a result of radiological examinations, radiotherapy or nuclear medicine investigations;

(3) doses to lung tissues caused by exposure to alpha-particle radiation from inhaled radon daughters or thoron daughters;

(4) dose equivalents, radon daughter exposures and thoron daughter exposures from planned special exposures;

(5) dose equivalents, radon daughter exposures and thoron daughter exposures from emergency exposures and from accidental exposures.

Derived limits

9. For designated employees, the derived limits are based on exposure to radiation over a 40 hour working week. For other employees and for members of the public, where such derived limits are given, the derived limits are based on exposure to radiation over a 168 hour week. For the purposes of this Code, the derived limits for the concentrations of radioactive materials in air and water and on surfaces and for absorbed dose rates in air shall be as follows:

(1) the derived limits of concentrations of radioactive materials, other than radon daughters and thoron daughters, in air inhaled and in water for personal use by a designated employee in the course of employment are given in Schedule 5. The derived limits applicable at other times are the same as for members of the public (see Clause 9(2));

(2) the derived limits of concentrations of radioactive materials, other than radon daughters and thoron daughters, in air inhaled and in water for personal use by an employee other than a designated employee and by

members of the public who may be exposed continually as a consequence of the operation of a mine or mill are given in Schedule 6;

(3) the derived limits of radon daughter concentration and of thoron daughter concentration for a designated employee in the course of employment are given in Schedule 7(a). The derived limits applicable at other times are the same as for members of the public (see Clause 9(4));

(4) the derived limits of radon daughter concentration and of thoron daughter concentration for an employee other than a designated employee and for members of the public who may be exposed continually as a consequence of the operation of a mine or mill are given in Schedule 7(b);

(5) the derived limits of radioactive contamination on surfaces are given in Schedule 8;

(6) the derived limit for absorbed dose rate in air at positions occupied by a designated employee in the course of employment is given in Schedule 9(a);

(7) the derived limit for absorbed dose rate in air at positions occupied by an employee other than a designated employee and by members of the public is given in Schedule 9(b).

Limits for planned special exposures

10. (1) Planned special exposures of an employee in excess of any limits specified in Schedules 1 and 3 may be permitted subject to the conditions of Clauses 11, 12 and 13.

(2) The maximum dose equivalents or radon daughter exposure or thoron daughter exposure shall be -

(a) in a single planned special exposure, those levels specified in Schedule 10(a);

(b) in a number of planned special exposures in the lifetime of an employee, those levels specified in Schedule 10(b).

Procedures for planned special exposures

11. For any planned special exposure:

(1) a radiation and contamination assessment shall be made in each area where the planned special exposure is to be undertaken;

(2) the following assessments shall be made for each employee involved in the planned special exposure:

(a) the anticipated and actual dose equivalents from external exposure during the planned special exposure,

(b) the anticipated and actual dose equivalents from internal exposure from the intake of radioactive materials (other than radon daughters and thoron daughters),

(c) the anticipated and actual committed dose equivalents that will be delivered to the body organs or tissues receiving the greatest dose equivalents as a result of the intakes referred to in Clause 11(2)(b), and

(d) the anticipated and actual radon daughter exposures and thoron daughter exposures;

(3) the appropriate authority shall be informed in advance of any intention to undertake a planned special exposure and of the anticipated dose equivalents, committed dose equivalents and radon daughter exposures and thoron daughter exposures as determined in Clause 11(2); and

(4) the appropriate authority shall be informed after the planned special exposure of the assessed dose equivalents, committed dose equivalents and radon daughter exposures and thoron daughter exposures assessed in accordance with Clause 11(2).

Exclusions from planned special exposures

12. An employee shall not be subjected to a planned special exposure

(a) if any of the anticipated dose equivalents or anticipated radon daughter exposures or thoron daughter exposures exceed the limits given in Schedule 10;

(b) if the employee is a woman of reproductive capacity.

Exclusions from usual occupation

13. Any dose equivalent, radon daughter exposure or thoron daughter exposure in excess of the limits specified in Schedules 1 and 3 of this Code, received by an employee as a result of planned special exposures, shall not constitute a reason for excluding that employee from his usual occupation.

Emergency exposures

14. Subject to Clause 15, a person may undertake to receive voluntarily in emergency operations during or immediately after an accident, a dose equivalent or radon daughter exposure or thoron daughter exposure in excess of the appropriate limit for planned special exposures specified in Schedule 10(a). A limit is not specified for such an exposure, which is permissible only if it is to be received in rescuing a person, in preventing the exposure of a large number of persons to a radiation hazard or in saving an essential installation.

Procedures for emergency and accidental exposures

15. When an emergency exposure is undertaken voluntarily or an accidental exposure is received involuntarily the manager shall

(1) inform persons likely to be called on in an emergency of the risks involved in accepting higher levels of exposure to radiation;

(2) inform the appropriate authority within 48 hours of each situation involving emergency or accidental exposures.

16. (1) After an emergency exposure or accidental exposure the manager shall ensure that appropriate radiation surveys are made for each person exposed and the following assessments shall be made for each such person:

(a) the dose equivalents received from external exposure during the emergency exposure or accidental exposure;

(b) the dose equivalents received from internal exposure from the intake of radioactive materials (other than radon daughters and thoron daughters);

(c) the committed dose equivalents, as specified in Clause 11(2)(c); and

(d) the radon daughter exposure and thoron daughter exposure.

(2) After an emergency exposure or accidental exposure, the manager shall report to the appropriate authority the results of any assessments when the dose equivalents or radon daughter exposure or thoron daughter exposure for any person exceed the values in Schedule 11.

(3) The manager shall ensure that the requirements of Clause 19(4) are met.

Measurements and assessments of dose equivalents, radon daughter exposures and thoron daughter exposures

17. (1) Monitoring techniques, sampling procedures, monitoring frequency and statistical tests to be used and assessments of dose equivalents, radon daughter exposures and thoron daughter exposures of employees and of members of the public shall be carried out in a manner approved by the appropriate authority.

(2) The results of all measurements, investigations and assessments shall be recorded together with all the criteria and assumptions used in arriving at these results. Individual employee records shall identify separately dose equivalents, committed dose equivalents, radon daughter exposures and thoron daughter exposures arising from normal employment, from planned special exposures and from emergency or accidental exposures.

PART IV — Radioactive Wastes

Management of radioactive wastes

18. Contaminated waste and effluent from mines and mills shall be managed so as to ensure that the exposures to radiation of employees and of members of the public are as low as practical and at all times are below the respective radiation limits prescribed in Schedules 1, 2, 3 and 4, and in accordance with any code of practice or other requirements for management of wastes promulgated by appropriate authorities.

PART V — Health Surveillance

Medical examinations

19. (1) Except as specified in Clause 20, each designated employee shall undergo a medical examination as required by the appropriate authority within a period of four weeks of the date of commencement of employment.

(2) Additional medical examinations shall be carried out on all employees as required by the appropriate authority.

(3) Following any examination referred to in Clauses 19 and 20, the medical practitioner shall inform an employee, in writing, of the employee's fitness for employment.

(4) Medical examinations shall be carried out on employees who, in an emergency or as a result of an accident, are exposed to radiation in excess of limits prescribed by the appropriate authority.

(5) The medical practitioner shall inform the manager when there is a need to act to reduce the exposure to radiation of an employee following the examination carried out in accordance with Clause 19(4).

(6) Each designated employee who has been employed for a period not less than six months shall undergo a medical examination on termination of employment unless he has had an examination under Clause 19(2) within the preceding eight weeks.

Acceptance of medical examinations

20. A manager who engages an employee who has been medically examined in accordance with Clause 19(6) in the eight weeks prior to employment, may accept the report of the medical examination on termination of employment in lieu of the pre-employment examination required in Clause 19(1).

Cost of medical examinations

21. The operator shall meet the expenses of the medical examinations required by Clause 19.

The Schedules

Schedule 1
Dose equivalent limits for a designated employee exposed as a consequence of employment

Organ or tissue	*Annual dose equivalent limit in sieverts (dose in rem in brackets)*		*Quarterly dose equivalent limit in sieverts (dose in rem in brackets)*	
Whole body, gonads, red bone marrow	0.05	(5)	0.03	(3)
Skin, bone, thyroid	0.30	(30)	0.15	(15)
Hands and forearms, feet and ankles	0.75	(75)	0.40	(40)
Abdomen of a woman of reproductive capacity			0.013	(1.3)
Any other single organ	0.15	(15)	0.08	(8)

Schedule 2
Annual dose equivalent limits for an employee other than a designated employee and for members of the public

Organ or tissue	*Annual dose equivalent limit in sieverts (dose in rem in brackets)*	
Whole body, gonads, red bone marrow	0.005	(0.5)
Skin, bone, thyroid*	0.030	(3)
Hands and forearms, feet and ankles	0.075	(7.5)
Any other single organ	0.015	(1.5)

* 0.015 Sv (1.5 rem) to the thyroids of children up to 16 years of age.

Schedule 3

Limits for radon daughter exposure and thoron daughter exposure for a designated employee in the course of employment

	Annual	*Quarterly*
Radon	4 WLM	2 WLM
Thoron	40 WLM	20 WLM

Schedule 4

Annual limits for radon daughter exposure and thoron daughter exposure for an employee other than a designated employee and for members of the public

Radon	0.4 WLM
Thoron	4 WLM

Schedule 5

Derived limits of concentrations for a designated employee exposed in the course of employment (based on 40 hours/week exposure)

	Derived limits of concentration in units of becquerel/metre³ (limits in curies/metre³ in brackets)			
(a) Contaminant	*In air*		*In water*	
	Bq/m³		*Bq/m³*	
Uranium (soluble)*	3.7	(10^{-10})	1.5×10^{6}	(4×10^{-5})
Uranium (insoluble)*	3.7	(10^{-10})	3.7×10^{7}	(10^{-3})
Thorium (soluble)*	2.2	(6×10^{-11})	2.2×10^{6}	(6×10^{-5})
Thorium (insoluble)*	2.2	(6×10^{-11})	2.2×10^{7}	(6×10^{-4})
Thorium—230 (soluble)	7.4×10^{-2}	(2×10^{-12})	1.9×10^{6}	(5×10^{-5})
Thorium—230 (insoluble)	3.7×10^{-1}	(10^{-11})	3.3×10^{7}	(9×10^{-4})
Radium—228 (soluble)	2.6	(7×10^{-11})	3.0×10^{4}	(8×10^{-7})
Radium—228 (insoluble)	1.5	(4×10^{-11})	2.6×10^{7}	(7×10^{-4})
Radium—226 (soluble)	1.1	(3×10^{-11})	1.5×10^{4}	(4×10^{-7})
Radium—226 (insoluble)	1.9	(5×10^{-11})	3.3×10^{7}	(9×10^{-4})
Radium—224 (soluble)	1.9×10^{2}	(5×10^{-9})	2.6×10^{6}	(7×10^{-5})
Radium—224 (insoluble)	2.6×10	(7×10^{-10})	7.4×10^{6}	(2×10^{-4})
Radon—220 alone**	2.2×10^{5}	(6×10^{-6})	3.7×10^{7}	(10^{-3})
Radon— 222 alone**	1.1×10^{5}	(3×10^{-6})	1.9×10^{7}	(5×10^{-4})
Lead—210 (soluble)	3.7	(10^{-10})	1.5×10^{5}	(4×10^{-6})
Lead—210 (insoluble)	7.4	(2×10^{-10})	1.9×10^{8}	(5×10^{-3})

*Expressed in mass units in Part (b)
**With no daughter products present

(b) Contaminant	*In air*	*In water*
	ug/m³	*mg/1*
Uranium (soluble)	210	60
Uranium (insoluble)	180	1500
Thorium (soluble)	280	280
Thorium (insoluble)	280	2800

The inhalation of soluble uranium should not exceed 2.5 mg in one day.
The ingestion of soluble uranium should not exceed 150 mg over two days.

Schedule 6

Derived limits of concentrations for an employee other than a designated employee and for members of the public (based on 168 hours/week exposure)

	Derived limits of concentration in units of becquerel/metre^3 (limits in curies/metre^3 in brackets)			
(a) Contaminant	*In air*		*In water*	
	Bq/m^3		Bq/m^3	
Uranium (soluble)*	1.9×10^{-1}	(5×10^{-12})	3.7×10^{4}	(10^{-6})
Uranium (insoluble)*	1.5×10^{-1}	(4×10^{-12})	1.5×10^{6}	(4×10^{-5})
Thorium (soluble)*	7.4×10^{-2}	(2×10^{-12})	7.4×10^{4}	(2×10^{-6})
Thorium (insoluble)*	7.4×10^{-2}	(2×10^{-12})	7.4×10^{5}	(2×10^{-5})
Thorium—230 (soluble)	3.0×10^{-3}	(8×10^{-14})	7.4×10^{4}	(2×10^{-6})
Thorium—230 (insoluble)	1.1×10^{-2}	(3×10^{-13})	1.1×10^{6}	(3×10^{-5})
Radium—228 (soluble)	7.4×10^{-2}	(2×10^{-12})	1.1×10^{3}	(3×10^{-8})
Radium—228 (insoluble)	3.7×10^{-2}	(10^{-12})	1.1×10^{6}	(3×10^{-5})
Radium—226 (soluble)	3.7×10^{-2}	(10^{-12})	3.7×10^{2}	(10^{-8})
Radium—226 (insoluble)	7.4×10^{-2}	(2×10^{-12})	1.1×10^{6}	(3×10^{-5})
Radium—224 (soluble)	7.4	(2×10^{-10})	7.4×10^{4})	(2×10^{-6})
Radium—224 (insoluble)	7.4×10^{-1}	(2×10^{-11})	1.9×10^{5}	(5×10^{-6})
Radon—220 alone**	7.4×10^{3}	(2×10^{-7})	1.1×10^{6}	(3×10^{-5})
Radon—222 alone**	3.7×10^{3}	(10^{-7})	7.4×10^{5}	(2×10^{-5})
Lead—210 (soluble)	1.5×10^{-1}	(4×10^{-12})	3.7×10^{3}	(10^{-7})
Lead—210 (insoluble)	3.0×10^{-1}	(8×10^{-12})	7.4×10^{6}	(2×10^{-4})

*Expressed in mass units in Part (b)
**With no daughter products present

(b) Contaminant	*In air*	*In water*
	ug/m^3	*mg/1*
Uranium (soluble)	7	2
Uranium (insoluble)	6	60
Thorium (soluble)	9	9
Thorium (insoluble)	9	90

Schedule 7

Derived limits of radon daughter concentration and of thoron daughter concentration

(a)	For a designated employee in the course of employment (based on 40 hours/week exposure)	
	(i) Radon daughters	0.33 WL
	(ii) Thoron daughters	3.3 WL
(b)	For an employee other than a designated employee and for members of the public (based on 168 hours/week exposure)	
	(i) Radon daughters	0.01 WL
	(ii) Thoron daughters	0.1 WL

Schedule 8

Derived limits of surface contamination by alpha-emitting radionuclides

	Type of Surface	*Derived limit in units of becquerel/metre^2 (limit in curies/metre^2 given in brackets)*	
(a)	Accessible surfaces of controlled and supervised areas in mines and mills, other than meal rooms, offices, recreation rooms, change rooms and wash rooms	3.7×10^5	(10^{-5})
(b)	Accessible surfaces in meal rooms, offices, recreation rooms, change rooms and wash rooms	3.7×10^4	(10^{-6})
(c)	Skin	3.7×10^3	(10^{-7})
(d)	Clothing	3.7×10^5	(10^{-5})

Schedule 9

Derived limits for absorbed dose rate in air at occupied positions

(a)	For a designated employee in the course of employment (based on 40 hours/week exposure)	2.5×10^{-5} Gy/hour (2.5×10^{-3} rad/hour)
(b)	For an employee other than a designated employee and for members of the public (based on 168 hours/week exposure)	6.0×10^{-7} Gy/hour (6.0×10^{-5} rad/hour)

Schedule 10
Planned special exposures

(a) *A single planned special exposure*

(i) Dose equivalent limits for an employee

Organ or tissue	*Dose equivalent limits in sieverts (dose in rem in brackets)*	
Whole body, gonads, red bone marrow	0.10	(10)
Skin, bone, thyroid	0.60	(60)
Hands and forearms, feet and ankles	1.50	(150)
Any other single organ	0.30	(30)

(ii) Limits for radon daughter exposure or thoron daughter exposure for an employee

Radon — 8 WLM
Thoron — 80 WLM

(b) *A number of planned special exposures in the lifetime of an employee*

(i) Total dose equivalent limit for an employee

Organ or tissue	*Total dose equivalent limits in sieverts (dose in rem in brackets)*	
Whole body, gonads, red bone marrow	0.25	(25)
Skin, bone, thyroid	1.50	(150)
Hands and forearms, feet and ankles	3.75	(375)
Any other single organ	0.75	(75)

(ii) Total limit for radon daughter exposure or thoron daughter exposure for an employee

Radon — 20 WLM
Thoron — 200 WLM

Schedule 11

Minimum dose equivalent limits and limits of radon daughter exposure and thoron daughter exposure for reporting in the event of emergency and accidental exposures

Minimum dose equivalent limits for reporting in the event of emergency or accidental exposures

(a) Organ or tissue	*Dose equivalent limit in sieverts (dose in rem in brackets)*	
Whole body, gonads, red bone marrow	0.03	(3)
Skin, bone, thyroid	0.15	(15)
Hands and forearms, feet and ankles	0.40	(40)
Abdomen of a woman of reproductive capacity	0.013	(1.3)
Any other single organ	0.08	(8)

Minimum limits for radon daughter exposure and thoron daughter exposure for reporting in the event of emergency and accidental exposures

(b)	Radon	2 WLM
	Thoron	20 WLM

SCHEDULE II

Regulation 2(3)(a)

MEANING OF "APPROPRIATE AUTHORITY" IN REGULATION 4(2)

Column 1	Column 2
Paragraph	Meaning
(b)	Director of Mines and Chief Medical Officer
(c)	Director of Mines and Chief Medical Officer
(d)	Director of Mines
(e)	Director of Mines
(g)	Director of Mines
(h)	Director of Mines
(k)(ii)	Director of Mines
(m)	Director of Mines
(n)	Director of Mines
(q)	Director of Mines
(r)	Director of Mines and Chief Medical Officer
(u)	Director of Mines
(z)	Director of Mines
(za)	Director of Mines
(zb)	Director of Mines
(zd)(i)	Chief Medical Officer
(zd)(iv)	Director of Mines and Chief Medical Officer
(zf)	Director of Mines
(zh)(ii)	Chief Medical Officer
(zj)	Director of Mines and Chief Medical Officer
(zk)	Director of Mines and Chief Medical Officer
(zr)	Chief Medical Officer
(zs)	Chief Medical Officer

SCHEDULE III

Regulation 2(3)(b)

MEANING OF "APPROPRIATE AUTHORITY" IN THE CODE

Column 1	Column 2
Provision	Meaning
2(2) (definition of "Inspector")	Director of Mines and Chief Medical Officer
3(3)	Director of Mines
4	Director of Mines
11(3) and (4)	Chief Medical Officer
15(2)	Director of Mines and Chief Medical Officer
16(2)	Director of Mines and Chief Medical Officer
17(1)	Chief Medical Officer
18	Director of Mines
19(1), (2) and (4)	Chief Medical Officer