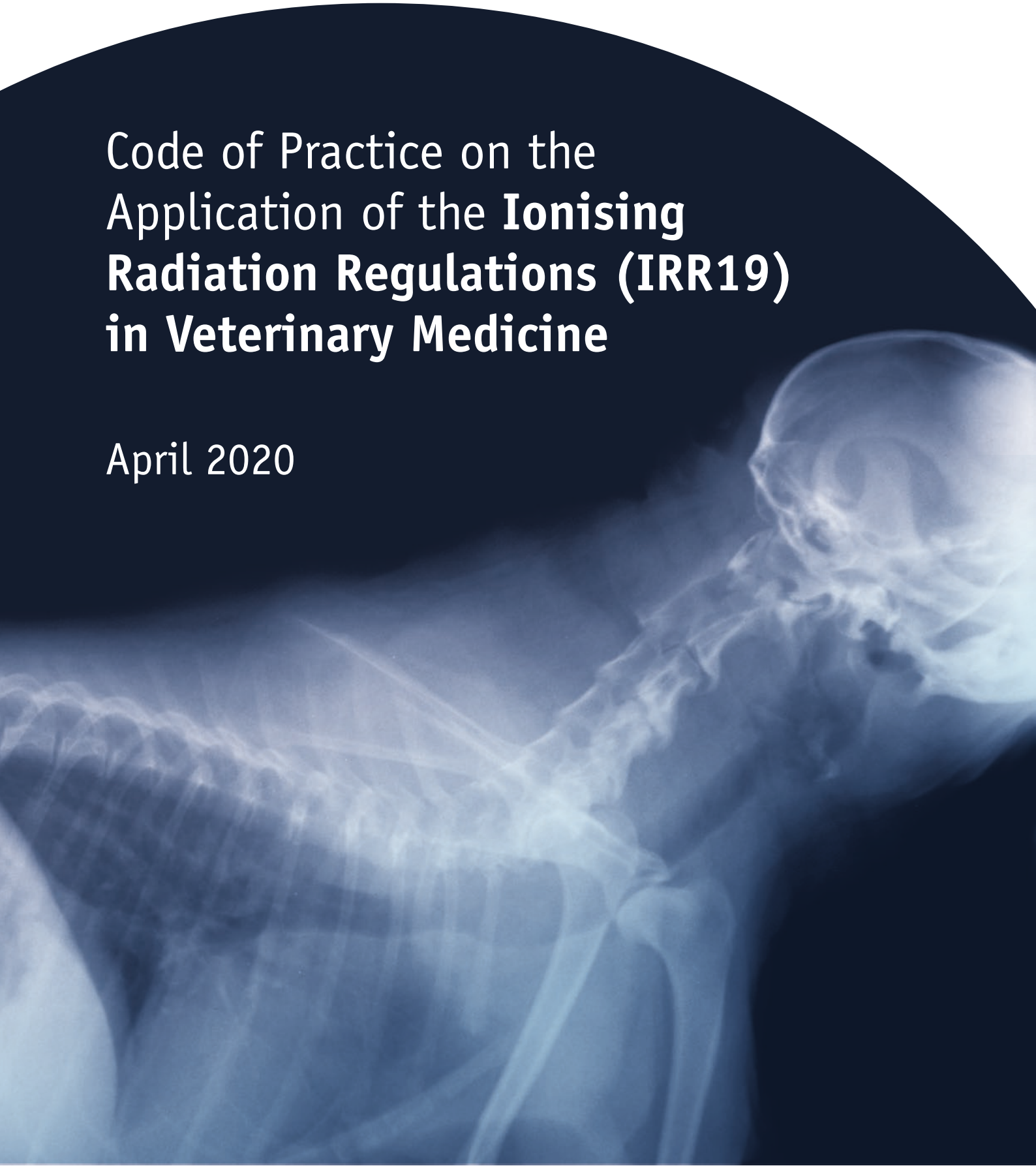
Code of Practice on the Application of the **Ionising Radiation Regulations (IRR19) in Veterinary Medicine**

April 2020



Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Environmental Protection Agency

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

- **Regulation:** We implement effective regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.
- **Knowledge:** We provide high quality, targeted and timely environmental data, information and assessment to inform decision making at all levels.
- **Advocacy:** We work with others to advocate for a clean, productive and well protected environment and for sustainable environmental behaviour.

Our Responsibilities

LICENSING

We regulate the following activities so that they do not endanger human health or harm the environment:

- waste facilities (e.g. landfills, incinerators, waste transfer stations);
- large scale industrial activities (e.g. pharmaceutical, cement manufacturing, power plants);
- intensive agriculture (e.g. pigs, poultry);
- the contained use and controlled release of Genetically Modified Organisms (GMOs);
- sources of ionising radiation (e.g. x-ray and radiotherapy equipment, industrial sources);
- large petrol storage facilities;
- waste water discharges;
- dumping at sea activities.

NATIONAL ENVIRONMENTAL ENFORCEMENT

- Conducting an annual programme of audits and inspections of EPA licensed facilities.
- Overseeing local authorities' environmental protection responsibilities.
- Supervising the supply of drinking water by public water suppliers.
- Working with local authorities and other agencies to tackle environmental crime by coordinating a national enforcement network, targeting offenders and overseeing remediation.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Prosecuting those who flout environmental law and damage the environment.

WATER MANAGEMENT

- Monitoring and reporting on the quality of rivers, lakes, transitional and coastal waters of Ireland and groundwaters; measuring water levels and river flows.
- National coordination and oversight of the Water Framework Directive.
- Monitoring and reporting on Bathing Water Quality.

MONITORING, ANALYSING AND REPORTING ON THE ENVIRONMENT

- Monitoring air quality and implementing the EU Clean Air for Europe (CAFÉ) Directive.
- Independent reporting to inform decision making by national and local government (e.g. periodic reporting on the State of Ireland's Environment and Indicator Reports).

REGULATING IRELAND'S GREENHOUSE GAS EMISSIONS

- Preparing Ireland's greenhouse gas inventories and projections.
- Implementing the Emissions Trading Directive, for over 100 of the largest producers of carbon dioxide in Ireland.

ENVIRONMENTAL RESEARCH AND DEVELOPMENT

- Funding environmental research to identify pressures, inform policy and provide solutions in the areas of climate, water and sustainability.

STRATEGIC ENVIRONMENTAL ASSESSMENT

- Assessing the impact of proposed plans and programmes on the Irish environment (e.g. major development plans).

RADIOLOGICAL PROTECTION

- Monitoring radiation levels, assessing exposure of people in Ireland to ionising radiation.
- Assisting in developing national plans for emergencies arising from nuclear accidents.
- Monitoring developments abroad relating to nuclear installations and radiological safety.
- Providing, or overseeing the provision of, specialist radiation protection services.

GUIDANCE, ACCESSIBLE INFORMATION AND EDUCATION

- Providing advice and guidance to industry and the public on environmental and radiological protection topics.
- Providing timely and easily accessible environmental information to encourage public participation in environmental decision-making (e.g. My Local Environment, Radon Maps).
- Advising Government on matters relating to radiological safety and emergency response.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

AWARENESS RAISING AND BEHAVIOURAL CHANGE

- Generating greater environmental awareness and influencing positive behavioural change by supporting businesses, communities and householders to become more resource efficient.
- Promoting radon testing in homes and workplaces and encouraging remediation where necessary.

MANAGEMENT AND STRUCTURE OF THE EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

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ENVIRONMENTAL PROTECTION AGENCY

An Ghniomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland

Telephone: +353 53 916 0600 Fax: +353 53 916 0699
LoCall: 1890 33 55 99 Email: info@epa.ie
Website: www.epa.ie

Environmental Protection Agency
An Ghniomhaireacht um Chaomhnú Comhshaoil

Interpretation

EDEN (Environmental Data Exchange Network) means the Environmental Protection Agency's (EPA) online portal for licensees and regulatory customers.

Exposed worker means a person who is liable to receive a dose in excess of a public dose limit during the course of their work.

Ionising radiation means energy transferred in the form of particles or electromagnetic waves with sufficient energy to produce ions directly or indirectly.

Local radiation safety procedures mean the procedures specific to an individual veterinary medicine facility setting out practical measures to be followed to optimise the protection and safety of people both during their routine work and in unusual conditions. Local radiation safety procedures should be developed in consultation with a radiation protection adviser (RPA).

PPE means personal protective equipment.

Radiation safety procedures means the measures to be followed to optimise the protection and safety of people both during their routine work and in unusual conditions. The radiation safety procedures comprise the local radiation safety procedures together with the general protective measures set out in this code.

Radiological practice means a human activity that can increase the exposure of individuals to ionising radiation from the use of X-ray equipment or any other radiation source.

Radionuclide means a form of a chemical element that undergoes radioactive decay, resulting in the emission of ionising radiation.

RPA means a radiation protection adviser, an individual or a body that meets the competence requirements set out by the EPA to provide radiation protection advice and whose name appears on the RPA register maintained by the EPA.

RPO means a radiation protection officer, an individual or a unit designated by the undertaking to implement the radiation protection arrangements.

Undertaking means a natural or legal person with legal responsibility for carrying out the radiological practice. This is usually, but not always, the veterinary practitioner in charge.

Veterinary practitioner means a person whose name is on the Register of Veterinary Practitioners maintained by the Veterinary Council under the provisions of the Veterinary Practice Act, 2005.

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Section 1 Introduction

Applications of ionising radiation using either X-rays or radionuclides are an essential part of modern veterinary medicine and bring very significant benefits in the diagnosis and treatment of animals. Any use of ionising radiation, however, carries intrinsic risks and hence its use is regulated to ensure the safety of people.

Irish legislation on the safe use of ionising radiation is based on the European Union Basic Safety Standards (BSS) Directive (Council Directive 2013/59/EURATOM):

- This Directive has been transposed into Irish law through the Ionising Radiation Regulations of 2019 (S.I. No. 30 of 2019), hereafter referred to as IRR19.
- The Environmental Protection Agency (EPA) is the competent authority for IRR19.
- This Code of Practice[1] is intended to support undertakings/veterinary practitioners in complying with IRR19.

Throughout this code the term "undertaking" is used to refer to the person with primary responsibility for compliance with the regulations.

The words "shall", "must" and "should" in this code have been chosen with purpose. The words "shall" or "must" indicate a mandatory requirement, whereas "should" indicates an advisory recommendation.

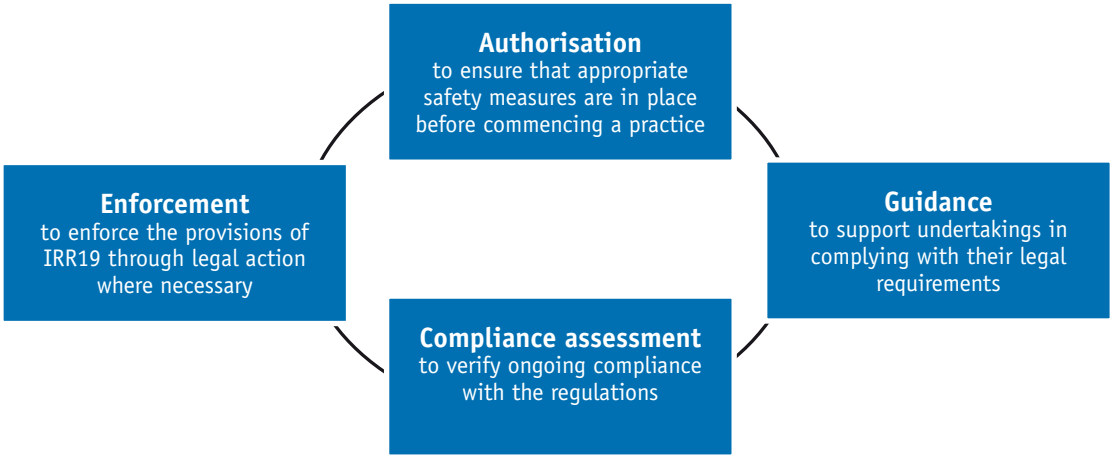
1.1 Regulatory control of the use of ionising radiation

IRR19 sets out the system of regulatory control covering the use of ionising radiation in Ireland. This system is based on the follow principles:

- Any use of ionising radiation liable to result in exposure of people shall be justified (see Appendix 1).
- Arrangements to protect people from the harmful effects of radiation shall be optimised with the aim of keeping doses as low as reasonably achievable, taking into account the current state of technical knowledge and economic and societal factors.
- Doses to people shall be kept below the statutory dose limits (as set out in Appendix 2).
- All justified uses of ionising radiation are subject to regulatory control by the EPA.

Regulatory control is intended to ensure that the risks associated with a radiological practice are effectively managed on an ongoing basis. It comprises four elements, as illustrated in Figure 1. Further details on the system of regulation are set out in Appendix 1.

Figure 1 The system of regulatory control



1 This Code of Practice supersedes the EPA's earlier Code of Practice for Radiation Protection in Veterinary Medicine, RPII-02/3.

Section 2 Licensing and Registration of Radiological Practices

The use of X-rays or radionuclides in Ireland must be authorised in advance by the EPA. Authorisation is intended to ensure that the necessary safety measures are in place before the start-up of a radiological practice.

2.1 Forms of authorisation

IRR19 provides for two forms of authorisation commensurate with risk: registration and licensing. Registration is appropriate to lower risk applications, whereas licensing is necessary for higher risk applications. The details of the two forms of authorisation are set out in Table 1.

Table 1 Forms of authorisation

	Registration	Licensing
Radiological practices	X-ray examination of small animals in a defined X-ray area	▶ Off-site/large animal X-ray examinations ▶ Computerised tomography (CT) ▶ Fluoroscopy ▶ Nuclear medicine (diagnosis or treatment)
Duration of authorisation	Indefinite (unless surrendered or revoked)	10 years (renewable)
Risk assessment	A risk assessment should be completed before bringing any new equipment into service. This should be retained on file by the undertaking	A risk assessment should be completed before bringing any new equipment into service and must be reviewed and updated periodically. It should be submitted with the licence application through EDEN.
Local radiation safety procedures	Not required – compliance with this Code of Practice is sufficient	Required and should be submitted with the licence application through EDEN
Schedule of equipment	An up-to-date schedule of equipment should be retained on file by the undertaking	An up-to-date schedule of equipment should be retained on EDEN
When is it necessary to make an amendment?	▶ Change to a legal entity or address ▶ Change to the senior management contact or the contact for correspondence ▶ Before carrying out a new veterinary radiology procedure not covered by the existing registration	▶ Change to a legal entity or address ▶ Change to the senior management contact, the contact for correspondence, the RPO or the RPA ▶ Change to the schedule of equipment linked to any licensable radiological practice ▶ Before carrying out a new veterinary radiology procedure not covered by the existing licence

2.2 Applying for or amending an authorisation (registration or licence)

All applications for an authorisation shall be made through the EPA's online regulatory portal, the Environmental Data Exchange Network (EDEN). Applications shall be made before commencing any radiological practice.

The information to be provided in an application is as follows:

- the nature of the radiology practices for which authorisation is sought;
- the legal details of the undertaking;
- the address of the undertaking and of the premises at which veterinary radiology will be carried out.

Depending on the practices for which an authorisation is sought, the EDEN system will guide the user through the registration or licensing process as appropriate.

For registration, an undertaking shall complete a self-declaration form confirming that he or she has:

- completed a risk assessment (including room design and shielding) in consultation with an RPA to identify any necessary protective measures (Section 4);
- implemented this code and any additional measures identified in the risk assessment (Section 4);
- designated an RPO (Section 3.4);
- provided staff with the appropriate training (Section 8);
- developed procedures to be followed in the event of an incident liable to have radiation safety implications for workers and members of the public (Section 9).

Undertakings shall retain documentary evidence supporting the self-declaration, including a risk assessment, an equipment schedule and training records. The EPA may at any stage following registration request copies of supporting documents for the purpose of verifying the self-declaration.

For licensing, an undertaking shall:

- complete a schedule of equipment (on EDEN);
- upload the risk assessment;
- upload the local radiation safety procedures;
- upload agreed arrangements with the RPA.

2.3 Selling or transferring a veterinary business

If a veterinary business is sold or transferred, the new undertaking shall apply for registration or a licence as appropriate in his or her own name, as authorisations are non-transferable.

Section 3 Governance and Responsibilities

Knowing who is accountable and where the distinct governance roles and responsibilities sit are essential to ensuring safety. Each undertaking shall therefore put in place clearly defined governance arrangements for radiation protection. In the case of large institutions these arrangements may include a committee or working group to coordinate radiation safety.

3.1 The undertaking

The undertaking has primary legal responsibility for compliance with the regulations. These responsibilities shall include, but not be exclusive to, the following:

- ensuring that risks from all activities involving the use of ionising radiation are adequately assessed;
- completion and maintenance of a risk assessment;
- implementation of protective measures necessary to restrict exposure to radiation;
- designation of an RPO, who shall report directly to the undertaking;
- provision of appropriate resources and training to the RPO (as outlined in Section 8 of this code) to effectively carry out the responsibilities listed in Section 3.4;
- seeking advice from/consulting with an approved RPA or RPAs on a range of matters, including but not limited to those listed below;
- providing the RPA(s) with access, adequate information and facilities for the discharge of his or her functions;
- ensuring that staff are adequately trained;
- delegating clear responsibility for all radiology procedures to a veterinary practitioner;
- ensuring that equipment is appropriately set up/installed, maintained and subject to appropriate quality assurance testing;
- ensuring that documentation relevant to compliance with IRR19 is maintained and accessible, as required by the EPA.
- notify the undertaking of any other workplaces where they are liable to be exposed to ionising radiation (this applies only to staff working in multiple veterinary practices).

Indicative list of matters on which advice should be sought from an RPA[2]

Preparation or update of risk assessments *and development of local radiation safety procedures where relevant.*
Design (including shielding specifications) of any new buildings or facilities.
Safety aspects associated with the acquisition of any new X-ray equipment or sources.
Estimation of potential doses to workers and members of the public.
Classification of areas and categorisation of workers.[2]
Dose monitoring where appropriate.
Radiation protection training of relevant staff.
Acceptance into service of new X-ray equipment.
Modifications to any existing X-ray equipment or facilities.
Changes to the use of any buildings or adjoining buildings where X-rays or sources are in use.
Quality assurance measures.
Preparation and submission of incident reports.

3.2 The veterinary practitioner

The veterinary practitioner with clinical responsibility for an individual radiology procedure shall:

- ensure that there is a definite indication for the procedure;
- ensure that the procedure chosen is the one with the lowest level of risk consistent with clinical indications;
- ensure that the procedure is carried out by a person(s) with the appropriate training and qualifications;
- ensure that measures for the protection of staff and members of the public are in place and adhered to.

3.3 All staff

All staff shall:

- comply with the provisions of this code and any local radiation procedures;
- utilise any PPE provided;

2 For small animal radiography applications, staff are unlikely to be categorised as exposed workers and therefore classification of areas is not normally required. When there are exposed workers (e.g. for large animal radiography and nuclear medicine applications) a risk assessment shall determine the classification of areas. Further information is included in Section 4.

3.4 The RPO

The RPO shall be designated by the undertaking to supervise or implement the radiation protection arrangements. The RPO shall report directly to the undertaking. Typically, in veterinary medicine this role will be filled by one of the veterinary practitioners or veterinary nurses working for the undertaking.

The RPO's responsibilities shall include, but not be exclusive to, the following:

- supervise radiation protection arrangements and implementation of this code;
- oversee the ongoing safe operation of X-ray equipment and radioactive sources, as appropriate;
- facilitate and/or provide training, as appropriate;
- maintain an adequate record of all X-ray equipment and radioactive sources;
- maintain relevant documentation in a manner that is accessible by the EPA;
- ensure that adequate records are maintained to provide assurance that the veterinary facility complies with the requirements outlined in this code;
- consult and liaise with the RPA as required.

3.5 The RPA

An RPA is a qualified expert approved by the EPA to provide radiological protection advice pursuant to IRR19. The EPA publishes a list of approved RPAs on its website. The RPA shall:

- provide advice to the undertaking on the protection of people in line with IRR19;
- advocate for radiation protection.

Section 4 The Risk Assessment

The purpose of the risk assessment is to identify the protective measures necessary to restrict exposure to radiation. A risk assessment shall be carried out by the undertaking in consultation with an RPA before commencing any radiological practice and should take account of:

- the layout of the veterinary surgery and any protective barriers or shielding in place;
- the nature of the veterinary procedures undertaken;
- the equipment in use; and
- reasonably foreseeable incidents.

As appropriate, the risk assessment shall identify:

- design measures necessary to optimise radiation protection (these might include, for example, shielding requirements, building layout, physical security or equipment safety features);
- operational safety measures necessary to optimise radiation protection (see Sections 5 and 6, as appropriate);
- the PPE to be used (see Section 7.1);
- the arrangements for personal dosimetry (see Section 7.2);
- measures necessary to optimise radiation protection in the event of an incident;
- classification of controlled areas,[3] where appropriate;
- categorisation of exposed workers,[4] where appropriate.

The risk assessment shall be reviewed periodically and maintained up to date. The risk assessment shall be updated whenever there is any change to facilities, equipment or work practices liable to impact on radiological safety.

The EPA has set out guidance on the carrying out of risk assessments in the General Code of Practice on the implementation of IRR19.

3 IRR19 specifies that a work area must be classified as a "controlled area" when the risk assessment shows that any person working in it is liable to receive an effective dose greater than 6 mSv per year. Such areas must be subject to special rules to protect people and, where appropriate, to prevent the spread of contamination.

4 In IRR19 an "exposed worker" means a person, either self-employed or working under an employer, who is subject to exposure at work, carried out within a regulated practice, and who is liable to receive doses exceeding one or other of the dose limits for public exposure.

Section 5 Radiation Protection in Veterinary Diagnostic Procedures Using X-rays

This chapter sets out guidance on operational radiation safety for veterinary diagnostic procedures using X-rays, covering:

- the design of facilities and room layout;
- the selection and maintenance of equipment; and
- radiation safety procedures.

The nature and scale of the risk associated with any X-ray procedure will be influenced by factors such as the degree to which access to the examination area can be controlled, the magnitude of exposure, the potential for scattered radiation, the degree to which the animal can be restrained or sedated and the need for assistants to be present. Recognising that these factors will vary for different types of procedure, guidance has been set out separately for:

- X-ray examinations on small animals carried out within a defined X-ray room;
- large animal and off-site[5] X-ray examinations;
- fluoroscopy; and
- computerised tomography (CT) examinations.

5.1 Facilities and room layout

The room design and positioning of equipment are critical to the protection of staff and the public from any hazards associated with the use of ionising radiation. The planning of the room layout shall take place at an early stage and involve all key stakeholders, such as the undertaking, supplier/installer, RPA and architect, if relevant.

5.1.1 Design of a defined X-ray room or area

The room layout and structural shielding shall be designed to offer adequate radiation protection for people both within and outside the area and shall address any issues identified in the risk assessment.

The X-ray equipment shall be installed and used so that the primary beam is not directed towards unshielded floors, ceilings, doors or windows if the space beyond them is occupied. It should be noted that, in general, the need for shielding is reduced by ensuring that the X-ray beam can be directed vertically downwards only, with the animal placed on an examination table or on a concrete or masonry floor. For horizontal X-ray beams, additional shielding may be required.

When an examination table is used for X-ray procedures, it shall be equipped with either protective shielding equivalent to 0.5mm of lead on the sides or protective shielding equivalent to 1mm of lead underneath the table top. The area of this lead shield shall be greater than the maximum field size at the maximum tube focus to table top distance.

The room layout shall be such that the veterinary practitioner can observe the animal and control access while an X-ray is being taken. In designing the layout, care should be taken in situations where there are multiple points of access.

The exposure and isolation switches should be located so that the operator can remain at a distance greater than 2m from the X-ray tube during exposure. When this is not possible, appropriate shielding shall be used. Exposure and isolation switches shall be clearly labelled and positioned to be easily accessible to the operator. If the X-ray equipment is controlled from outside the room, a shielded viewing panel or other appropriate means of observation shall be provided.

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5 In veterinary practice, X-ray examinations may be carried out either within a defined X-ray room or area or outside in a pasture or stables. The latter are considered to be off-site examinations and are commonly carried out when examining horses. Off-site examinations carry additional risks as it will generally be more difficult to control the site and to implement protective measures.

A warning system to indicate when X-rays are about to be produced, and which remains activated throughout the period of the exposure, and/or a device that prevents entry during this period shall be provided.

The room shall be equipped with the protective equipment as indicated by the risk assessment, which will include some or all of:

- the facilities necessary for positioning and immobilising the animal; these may include sand bags, position troughs and restraint bars;
- suitable holder(s) for the cassette/image receptor;
- mobile or portable shielding equipment;
- lead-equivalent protective aprons and gloves.

5.1.2 Additional requirements for CT units

CT units shall be installed in dedicated rooms. The shielding of the walls, floors and ceilings shall be designed in consultation with an RPA to meet the requirements for optimisation of protection and to ensure compliance with the relevant design dose constraints.[6] The shielding design shall take into account the layout of the room, the nature of the procedures to be carried out, the types of animals to be examined, the occupancy in adjacent spaces and other relevant factors.

CT rooms shall be provided with an appropriate shielded operator console area that allows unrestricted views of all room entrances, the animal and the CT unit itself. The room shall have sufficient space to accommodate the animal, equipment to restrain the animal and any necessary protective equipment such as mobile lead screens.

If it is necessary for people to be in the room during exposures, this should be specifically addressed in the risk assessment and appropriate protective measures put in place. Such measures may include mobile screens and additional PPE. The local radiation safety procedures shall address the positioning of people and the use of protective equipment in such situations.

CT rooms shall be equipped with two-stage warning lights that indicate when X-rays are about to be produced (prep stage) and remain activated throughout the period of the exposure (X-ray on).

5.1.3 Additional requirements for fluoroscopy units

The shielding of walls, floors and ceilings shall be designed in consultation with an RPA to meet the requirements for optimisation of protection and to ensure compliance with the relevant design dose constraints[7].

Rooms used for fluoroscopy shall be provided with appropriate operator shielding. The shielding requirements shall be determined through the risk assessment, taking into account the nature of the procedures to be undertaken, the types of animals to be examined, the categories of staff present during procedures, the positioning of staff during procedures, the location of the X-ray tube and other relevant factors.

When the facility is used for teaching or demonstration purposes, a remote television display should be provided.

6 See Appendix 2.

7 See Appendix 2

5.2 Equipment

5.2.1 Equipment requirements

In specifying and acquiring new veterinary imaging equipment, the undertaking shall have regard to the following:

- All equipment shall be CE marked and approved for use.
- Account shall be taken of any relevant advice or guidance issued by the Veterinary Council, the European Commission or other relevant authorities.
- Equipment should meet the guidelines and/or certification of the International Electrotechnical Commission and the International Organization for Standardization.
- Equipment shall be of the appropriate type to carry out the required examinations.

Records shall be maintained of all acquisitions, transfers and disposals of radiology equipment in accordance with Section 10 of this code. X-ray equipment shall be rendered incapable of producing ionising radiation before disposal. All equipment shall be disposed of through appropriate waste streams.

5.2.2 Installation and servicing of X-ray equipment

Installation and servicing of X-ray equipment shall be performed by a competent person who should, when relevant, hold a registration from the EPA for the practice of "installation/servicing of radiological equipment". When installation or servicing is carried out by a person holding such a registration, the installer/maintenance company may take responsibility for radiation protection during the installation or servicing as long as clear written arrangements are in place detailing the handover of responsibility. These arrangements should provide a clear line of sight of responsibility for radiation protection at all stages. Further guidance is provided in the EPA's General Code of Practice on the Implementation of IRR19.

Installation and acceptance

Acceptance tests shall be undertaken by a suitably competent person and completed on all equipment before it is brought into use. The purpose of these tests is to:

- verify the equipment functions appropriately, safely and in accordance with the manufacturer's safety specifications;
- establish baseline values against which the results of routine quality control tests can be compared;
- verify that any safety requirements specified in the risk assessment (e.g. shielding, beam orientation) have been implemented.

For new equipment, acceptance testing will generally be carried out by the supplier. When X-ray equipment is being relocated, has undergone major modifications or has been sold on, it should be retested by a qualified service engineer, an RPA or another suitably competent person before being brought back into use.

For CT and fluoroscopy imaging systems, acceptance tests shall be carried out in consultation with an RPA. Such tests should be carried out independently of the installer.

A record of installation and any acceptance tests carried out shall be retained in accordance with Section 10 of this code, including records of the installer, the date of installation and the results of acceptance tests carried out.

Maintenance and quality assurance of equipment

Radiology equipment shall be maintained in good working condition and maintained in accordance with the manufacturers' instructions.

The performance of all equipment shall be kept under routine surveillance so that any defects or faults can be identified and corrected as soon as possible. The nature of such surveillance should be commensurate with the type of equipment and the conditions of its use.

For X-ray equipment, such surveillance would normally include visual inspection, monitoring of image quality, verification of light field alignment and follow-up in relation to any warnings or error messages produced by the system software (where relevant). In addition, key system parameters, such as voltage, radiation output and exposure time, should be checked by the service engineer as part of preventive or reactive maintenance. Key quality controls for veterinary X-ray equipment are summarised in Table 2.

Table 2 Quality control of veterinary X-ray equipment

Quality control	Control interval not more than
Verify correct voltage	36 months
Verify correct radiation output	36 months
Verify exposure time	36 months
Check radiation field aligns with edge of the light field using a metal marker such as a coin	12 months
Check for any deterioration in image quality since the previous quality control	12 months
Visual check of mechanical functions, emergency switches, warning lights, etc.	12 months
Visual check of radiation shielding	12 months

Equipment deemed to have a fault that may impact on radiation safety shall be taken out of service until the fault is rectified.

Maintenance of equipment shall include not just the equipment and its hardware, but also, as relevant, software, viewing equipment and other supporting systems. In addition to radiological safety, the maintenance shall also address electrical and mechanical safety aspects of the equipment.

Maintenance personnel shall follow, as appropriate, the safety procedures set out in this code and relevant radiation safety procedures.

Records of servicing shall be retained in accordance with Section 10 of this code. Such records shall include, for each piece of equipment, details of servicing, any faults identified and any corrective action taken.

Additional requirements for CT and fluoroscopy equipment

For CT or fluoroscopy equipment, a quality assurance programme (including routine quality control testing) shall be established in consultation with an RPA, taking account of the equipment type, the manufacturer's specifications, international guidance, the nature of use, workloads, the age of the equipment and any relevant factors arising from the risk assessment. The programme shall specify the parameters to be assessed, the acceptable tolerances and the frequency of testing. In general, the parameters assessed as part of the quality control will be similar to those reported for the installation and acceptance testing. Quality control reports shall be retained in accordance with Section 10 of this code.

5.2.3 Safety and security of X-ray equipment

With regard to storage, X-ray units shall be clearly labelled and stored in a secure area and their presence confirmed on a monthly basis. Particular care should be taken in relation to the security of portable or hand-held X-ray equipment.

5.3 Radiation safety procedures

The undertaking shall ensure that radiation safety procedures are in place and available to all staff involved in X-ray diagnostic procedures. The procedures shall take account of the outcome of the risk assessment and set out the necessary operational measures to protect people. The procedures shall be followed by those carrying out and assisting with X-ray examinations.

The *general safety procedures for diagnostic X-ray examinations* set out in Section 5.3.1 will ordinarily suffice as radiation safety procedures for X-ray examinations carried out on small animals in a defined X-ray room. For other types of examination, *local safety procedures* shall be prepared in consultation with an RPA, as set out in Section 5.3.2

5.3.1 General safety procedures for diagnostic X-ray examinations

Deciding when to take an X-ray

- No individual procedure shall be undertaken unless there is a definite indication for the procedure. All procedures shall be undertaken under the clinical responsibility of a veterinary practitioner.
- The procedure chosen shall be the one with the lowest level of risk consistent with clinical indications.
- Appropriate measures shall be implemented to avoid unnecessary repetition of procedures.

Preparing to take the X-ray

- The number of people directly involved in the examination shall be kept to the minimum necessary for the procedure. Anybody not actively participating in the examination shall be excluded from the area.
- The nature of the procedure and the precautions to be observed shall be explained to all participants before the exposures are made.
- No X-ray exposure shall be made until the animal is properly restrained and positioned. Animals should normally be immobilised by mechanical means (such as restraint bars), tranquillisation, anaesthesia or some combination of these.
- During the examination the X-ray tube assembly shall be appropriately supported to prevent blurring of the radiograph.
- All staff directly involved in the examination shall wear appropriate PPE to give sufficient protection from the source of radiation.
- When members of the public (such as an owner) are participating in the examination, care shall be taken to ensure that they understand the radiological risks and safety advice.

Taking the X-ray

- During the exposure, the operator and other staff shall, when practicable, position themselves at least 2 metres from the X-ray tube assembly, the animal and the path of the primary X-ray beam. When this is impractical, the risk assessment shall determine the need for any additional protective measures, such as use of a protective screen or protective aprons, as well as the need for personal dosimetry.
- During the exposure, the operator shall position him- or herself so that he or she can observe both the animal and the X-ray exposure indicator, while controlling access to the area.
- No part of any person shall be exposed to the primary X-ray beam, even if shielded by protective clothing. The primary beam shall not be directed through unshielded doors, floors, windows or ceilings behind which people may be situated.

- The primary beam shall be collimated so that it is restricted to the area to be examined and not wider than the image receptor. Note that an image of the edges of the beam-limiting device should ordinarily be visible on the radiograph.
- Particular attention shall be paid to the protection of personnel when it is necessary for the useful beam to be directed horizontally.

Holding the animal or image receptor

- The animal shall not be held during the exposure unless, for clinical reasons, other means of immobilisation are impractical.
- No person shall hold the X-ray tube assembly or the image receptor during the exposure unless the equipment is specifically designed to be safely held by hand. Situations in which this might be considered necessary include when there would otherwise be significant risk of physical injury to personnel from the animal or when the specific view required is not achievable using other equipment.
- Animals shall not be held by pregnant women or those aged under 18 years.
- When it is necessary for a person or persons to hold the animal or image receptor the following procedures shall be adopted:
  - The animal shall be restrained by the minimum number of persons necessary.
  - All persons shall position themselves as far as practicable from the path of the primary X-ray beam, the animal and the X-ray tube housing. No part of any person shall be in the primary X-ray beam.
  - Adequate measures shall be taken as determined by the risk assessment to protect participants from indirect sources of radiation, such as leakage from the tube housing and radiation scattered from the animal or other objects in the path of the primary beam.
  - Suitable devices shall be used to reduce exposure risks (footrests, foldable stands to hold the device, distance cassette holder, etc.). When the cassette holder/image receptor is not self-supporting, it should be fitted with handles at least 1m long.
  - Persons holding the animal or image receptor shall wear a personal dosimeter and appropriate PPE, as determined by the risk assessment.
  - When practicable, avoid the same person routinely holding animals during examinations. A record should be maintained of persons holding animals.

5.3.2 Local safety procedures

Local safety procedures shall be prepared in consultation with an RPA for the following practices:

- large animal X-ray examinations;
- off-site examinations;
- fluoroscopy;
- CT examination;
- other practices in which the need for local safety procedures is indicated through the risk assessment.

In addition to the general requirements covered in Section 5.3.1, the local safety procedures shall address the additional specific requirements set out below.

Large animal/off-site examinations

- X-ray imaging shall be carried out off-site only when it is impractical to use a dedicated X-ray room.
- The site where the X-ray examination is to be carried out shall be selected carefully to ensure the safety of staff and members of the public. Although noting that each situation must be evaluated individually, the following general principles shall be observed:
  - When practicable use stables rather than an open field.
  - Select a site with minimal traffic. Avoid sites with regular through traffic or that can act as crossing points.
  - Ensure that it is possible to view the entire area during the examination.
  - Make use of architectural features offering radiation shielding.
  - When practicable select a site where access of unauthorised persons can be physically restricted.
- Adequate precautions shall be taken to prevent access of unauthorised persons to the area during the examination using warning signs, bollards, cones or other appropriate means.
- Adequate means shall be used to restrain the animal appropriate to the nature of the site and local conditions.
- Adequate means shall be provided to ensure that the X-ray beam is collimated to an area equal to or less than the image receptor and is correctly aligned. As the illumination of the light beam collimator may be ineffective because of the light levels outdoors, there is a tendency to increase the area of the X-ray beam to an excessive size. From this point of view, it is preferable for outdoor radiography to be carried out in the shade. Ideally, the animal should be radiographed in a stable or barn.
- Adequate means shall be provided to ensure the security of equipment when on-site and when being transported to and from site.
- When carrying out X-ray examinations of the lower limb, attention shall be paid to ensuring that the legs of the assistant are adequately protected.
- When carrying out examinations of regions of the animal other than the lower limbs, it should be noted that the higher exposure factors required may lead to a greater hazard from scattered radiation. Additional measures shall be taken to protect the personnel involved.
- Personal dosimeters shall be worn by all staff directly participating in large animal or other off-site examinations unless the risk assessment has demonstrated that this is unnecessary.

Fluoroscopy

- Fluoroscopy shall not be used as the primary diagnostic tool or as an alternative to X-ray radiology. Fluoroscopy is potentially more hazardous than X-ray radiology because the product of exposure time and X-ray tube current is usually greater in the former and because the operator stands nearer to the primary beam and the animal.
- Fluoroscopy shall be used only in circumstances in which it is essential to study movement or for complex surgical techniques.
- Each operator of fluoroscopic imaging equipment shall have adequate knowledge and training to competently use the equipment and the technique concerned.
- A remote display shall be used for group viewing and teaching purposes.

Computerised tomography (CT)

- The operator shall ensure that all entrances to the CT room are appropriately secured before the commencement of a CT examination.
- Only persons whose presence is necessary may be in the CT room during an examination, for example it may be necessary for an animal handler to be present during a CT examination. Those present shall wear a protective apron, use protective devices such as a mobile shield and minimise their time in the room.
- Persons present in the room shall stand in a location, for example the side of the gantry, so that their radiation dose is optimised. As part of the risk assessment the RPA should take account of the isodose curve of the specific CT unit installed to identify areas in the room where the radiation dose is low.

Section 6 Radiation Protection in Veterinary Nuclear Medicine

This chapter sets out guidance on operational radiation safety for veterinary nuclear medicine, covering:

- the design of facilities and room layout;
- the selection and maintenance of equipment;
- the storage of radioactive sources and radioactive waste;
- radiation safety procedures.

6.1 Design of nuclear medicine facilities

Good design of a facility or clinic is crucial for optimising radiation safety in veterinary nuclear medicine. Planning of a clinic shall take place in consultation with an RPA and all relevant stakeholders should be involved, including, as appropriate, veterinary practitioner(s) with nuclear medicine experience, the supplier/builder and the architect. The design of a building/clinic for nuclear medicine facilities must address a number of specific issues, such as containment of radioactive liquids and animal wastes, waste storage, security of sources, and shielding of both sources and animals after they have been injected.

A typical veterinary nuclear medicine facility has the following designated areas:

- an area for storage and preparation of radiopharmaceuticals (radio-pharmacy, radioisotope laboratory or "hot lab");
- an area for animal holding and administration of radiopharmaceuticals;
- an imaging area.

In designing any nuclear medicine facility, account shall be taken of the following general design considerations.

Layout and siting

- Veterinary nuclear medicine facilities should be located in areas where access by members of the public can be restricted.
- The layout should take account of the workload and the movement of animals, both in the designated nuclear medicine areas and in other areas within a larger facility.
- Consideration should be given to providing easy routes for animals, after examination or treatment has been performed, that minimise their movement through the facility. It is important to consult with an RPA at an early stage in the design process.
- Entrance doors should be wide enough to accommodate the animal to be studied and should be made of a material that is easy to decontaminate. A slot should be provided on the outside for a removable radiation warning sign.
- A dedicated work area should be identified for the manipulation and preparation of radiopharmaceuticals. Ideally, this should be in a room separate from that used for imaging or holding animals.
- Signs should be conspicuous and clear and need to be placed at the entrances to controlled areas to alert members of the public to the possible presence of radioactive material. Signs are also needed to identify areas for the preparation and storage of sources, and rooms where animals are undergoing procedures and are being held.

Shielding

- The shielding of walls, floors and ceilings should be designed to meet the design dose constraints (see Appendix 2) for workers and members of the public and to ensure that the relevant doses limits are not exceeded.
- In designing the shielding, account should be taken of the layout of a facility, the nature of the work carried out and the radionuclides intended to be used and their maximum activity. It is generally more convenient to shield sources than to shield a room or the workers. Shielding (e.g. lead bricks, syringe shields, transport boxes) is also needed for the storage, manipulation and transport of radiopharmaceuticals.

Decontamination

- Floors and other surfaces of rooms designated for animals undergoing nuclear medicine procedures should have a smooth, continuous and waterproof covering extending up the walls to a height of about 10cm to facilitate decontamination. The floor level at the entrance or doorstep should be raised by a few centimetres to provide containment. Floors should be covered with wood shavings or other absorbent materials to absorb contaminated urine.
- A dedicated shower facility for decontamination purposes should be available.

General facilities

- Sinks should be equipped with elbow-operated taps.
- The sink outlet should be directly connected to the main sewer to permit rapid dilution and to minimise the possibility of contamination of other areas should the drain become blocked. All drain traps, where fitted, should be easily accessible for monitoring and should be labelled to indicate that they may contain radioactive contamination.
- Appropriate physical security and control of access with badges or key locks should be provided.
- Adequate facilities shall be provided for the secure storage of radioactive waste.

Specific design considerations relevant to the radio-pharmacy and the area for animal holding/administration of radiopharmaceuticals are set out in Table 3.

Table 3 Indicative design guidance for veterinary nuclear medicine facilities

Area	Design considerations
Area for storage and preparation of radiopharmaceuticals	► Adequate shielding should be provided in areas used for the storage, manipulation and transport of radiopharmaceuticals and radioactive waste ► When no separate room is available, specific measures may be necessary for shielding, prevention of contamination and climate regulation ► Drainpipes from sinks should be routed to allow rapid removal of radioactive materials ► The final plans for the drainage system should be supplied to maintenance personnel, clearly identifying the drains used for collecting radioactive material. Pipelines through which radioactive material flows should be marked to ensure that any maintenance work is preceded by monitoring ► Adequate materials should be available to prevent/remediate contamination ► Consider if specific design measures (such as negative pressurisation) are necessary to prevent the spread of contamination through the ventilation system ► Consider if specific measures (such as a filtration system) are necessary to trap airborne radioactive material in air coming from the radio-pharmacy/laboratory using radioactive material ► If a technetium generator is used, an efficient fume cupboard should be provided. Generators should be installed behind 50mm of lead.
Area for holding animals and/or administration of radiopharmaceuticals	► Appropriate measures should be implemented to prevent uncontrolled access to animals ► The walls of the stable should be sealed to about 2 metres in height, providing a clean surface equivalent to the height of the horse ► Where appropriate, the plumbing should be arranged so that the water for the trough may be turned on from outside the stable (to reduce the stable visit time) ► Where appropriate, hayracks should be installed to facilitate feeding from outside the box and adequate lighting should be provided with an external switch ► The entrance door should be fitted with a slot for an appropriate, removable radiation warning sign ► Consideration should be given to the need for measures to contain drainage from the stable

6.2 Equipment

The performance of equipment used for diagnostic or therapeutic radiology procedures is crucial for both the efficacy of the procedure and the safety of the people involved. Getting the right image quality first time, for example, reduces the need for follow-up imaging and so limits the radiation risk. Procedures for the acquisition, installation, acceptance, maintenance and quality control of all imaging equipment (hardware and software) shall be developed in consultation with an RPA, together with the relevant veterinary professionals.

The need for ancillary protective and measurement equipment shall be determined as part of the risk assessment. Such ancillary equipment may include:

- quality control instruments (such as liquid scintillation counters, well counters, dose calibrators, check sources and phantoms);
- the means necessary to restrain and position animals (such as supports and sandbags);

- properly calibrated radiation monitoring equipment appropriate to the radionuclides in use (survey meters and/or portable contamination monitors);
- mobile or portable shielding equipment for the protection and safety of workers and/or to reduce background radiation in the gamma camera room for optimisation of image quality;
- lead-lined bins, sharps bins or receptacles for contaminated instruments;
- a lead-shielded syringe and syringe carrier;
- disposable gloves, towels, overshoes and gowns;
- suitable material to facilitate a clean-up, such as a bag of sawdust, decon 90/Radiacwash or another agent;
- PPE;
- warning cones or tripods with the appropriate radiation warning signs;
- containers, which are suitable for their purpose, to allow segregation of different types of radioactive waste in areas where radioactive waste is generated.

Equipment such as restraints or shields, which is liable to come into contact with an animal or to become contaminated, should be designed in such a way that they can be decontaminated.

6.3 Storage of radioactive sources and radioactive waste

A nuclear medicine facility may have a range of sources on-site, including radiopharmaceuticals, radionuclide generators and sealed sources used for calibration or quality control tests. In such cases the undertaking shall:

- have suitable security arrangements in place to prevent theft, loss, unauthorised access to and unauthorised removal of radioactive materials;
- maintain an up-to-date inventory of sources;
- establish the procedures covering the receipt, storage and handling of radioactive material, which ensure continuity in the control of and accountability for each source at all times.

Further advice on the security of sources can be found on the EPA website.

It should be noted that, when sources are purchased from a supplier outside the jurisdiction, the undertaking is also responsible for compliance with the relevant regulations covering transport and importation. Further information can be found on the EPA website.

A secure lockable space with restricted access should be provided for the storage of radioactive waste. This space shall be properly marked and ventilated where appropriate.

It is noted that most radioactive waste from veterinary nuclear medicine facilities contains short-lived radionuclides. It is feasible to deal with such waste as conventional (non-radioactive) waste, after a period of time to allow for decay. Waste shall be grouped (segregation) in accordance with the expected period of time necessary for the decay of the radionuclides (depending on the initial activity and the physical half-life) and the physical form of the waste.

Waste may include: vials containing residual radionuclides; biological waste; infectious waste requiring sterilisation; broken glassware; syringes; needles; contaminated gloves or clothing and liquid scintillation solutions.

Records shall be kept that identify the nature, volume and origin of the radioactive waste.

6.4 Radiation safety procedures: nuclear medicine

The undertaking shall ensure that local radiation safety procedures are in place and available to all staff. The procedures shall be developed for each veterinary nuclear medicine facility in consultation with an RPA, taking into account the outcome of the risk assessment. They should set out the operational measures necessary for optimising the protection and safety of people in normal work and in the event of incidents or accidents.

The local radiation safety procedures shall be reviewed periodically and updated whenever there is any change to facilities, equipment or procedures liable to impact on the protection of people. The procedures will be reviewed by the EPA when reviewing a licence application and also during inspections.

Staff shall be given adequate training and periodic refresher training to enable them to comply with the local radiation safety procedures. This shall include training on procedures to be followed in the event of a spill of radioactive material or any incident liable to lead to external or internal contamination. Additional training shall be given when new radiopharmaceuticals or devices are to be used in the veterinary nuclear medicine facility.

Local radiation safety procedures shall encompass the ordering, transport and receipt of radiopharmaceuticals; unpacking, storage, preparation and administration of radiopharmaceuticals to animals; examination or treatment of animals and care of treated animals; and storage and handling of associated radioactive waste.

The local radiation safety procedures shall cover, inter alia:

- measures to ensure that no individual procedure is undertaken without a definite clinical indication;
- measures to ensure that the procedure selected is the one with the lowest level of risk consistent with clinical indications;
- measures to avoid unnecessary repetition of procedures;
- restrictions in relation to those present during procedures;
- instructions to be provided to those participating in procedures;
- the use of protective equipment;
- the wearing of protective clothing;
- the wearing, handling and storage of personal dosimeters;
- arrangements for handling, preparation and dispensing of radiopharmaceuticals, including, as appropriate, the use of lead glass shields, shielded vials/syringes, disposable gloves, drip trays, plastic-backed absorbent pads, etc.;
- arrangements for transporting radioactive substances between different areas of the veterinary facility;
- maintenance of the inventory of all radionuclides used – this should include details of: radionuclide, location of use, quantity used, date of use and methods of disposal, where relevant;
- measures relating to the handling of volatile materials;
- arrangements to restrict to a minimum the number of work areas for the manipulation of unsealed sources;
- requirements in relation to the labelling of radioactive substances;
- arrangements for the secure storage of radioactive substances when not in use;
- the operation (hardware and software) of safety-related equipment, including dose calibrators and contamination monitors;
- the procedures to be followed in the event of a spill of a radioactive material or any incident liable to lead to external or internal contamination;
- measurement of external dose rates and surface contamination and measures to be taken in the event of an elevated dose rate or surface contamination;
- restrictions in relation to the consumption of food and drink or the bringing of personal items into areas where unsealed sources are used.

Section 7 Personal Protective Equipment

7.1 Aprons, gloves and shields

The requirements for protective equipment shall be determined by the risk assessment.

Aprons, gloves and shields suitable for hand and forearm protection shall have a lead-equivalent thickness throughout of not less than 0.25 mm for X-ray energies up to 100 kVp and not less than 0.5mm for energies above 100 kVp. When not in use they should be hung without folds on appropriate hangers.

Testing of personal protective devices should be carried out:

- at regular intervals of no more than 12 months; or
- more frequently if damage is suspected.

If there is an indication of damage to a personal protective device, it should be radiographically examined to ensure that its shielding efficiency has not become impaired by cracks or penetrations in the material. Such damage may be caused, for example, by sharp folds or animal claws or bites. Records of any tests of personal protective devices shall be kept in accordance with Section 10 of this code.

7.2 Personnel dosimeters

Personal dosimeters shall be provided by the undertaking when indicated by the risk assessment. In general, dosimeters will be required by all people involved in large animal X-ray examinations, fluoroscopy or nuclear medicine. The type of dosimeter and the instructions for use shall be determined in consultation with the RPA as part of the risk assessment. Dosimeters shall be of a type approved under the EPA Approval of Dosimetry Services scheme. A list of approved dosimetry services is available on the EPA website.

For each person classified as an exposed worker through the risk assessment, the undertaking shall make arrangements to maintain radiation dose records during the period of the person's working life involving exposure to ionising radiation and afterwards until he or she has or would have attained the age of 75 years, but, in any case, not less than 30 years after termination of the work involving exposure to ionising radiation.

Section 8 Training

Regular and appropriate radiation safety training is essential to effectively manage and minimise the risks associated with the use of ionising radiation. IRR19 sets out the responsibilities of undertakings for the provision of such training.

Veterinary radiology procedures may be carried out in a variety of settings ranging from small animal examinations in defined facilities to large animal procedures carried out in a pasture or a stable. Furthermore, it is often necessary to have additional personnel present to hold or restrain animals. These factors must be addressed in the training provided.

8.1 Radiation protection training for operators

The undertaking shall provide radiation protection training on the following for all staff involved in the use of veterinary X-ray equipment or sources:

- the operational protection measures set out in this Code of Practice;
- the correct operation of equipment and materials, as well as safety features of any equipment that they may use during their work, including any specific procedures or precautions pertinent to their own protection;
- procedures to be followed in the event of an equipment malfunction liable to have radiation safety implications;
- when appropriate, the possible risks to the foetus and any additional relevant protective measures to take during pregnancy.

When the risk assessment indicates that staff should be classified as exposed workers, the following additional topics should be included:

- General principles of radiation protection related to their working environment.
- Health risks created by exposure to ionising radiation.
- The role of the risk assessment in identifying necessary safety measures.
- Staff in nuclear medicine facilities need to understand the documented procedures for their work in the “hot lab”. This also applies, in particular, to the handling of radiopharmaceuticals and to the operation of equipment (e.g. dose calibrator, contamination monitor) that they are using, including its safety features.
- Staff need to be given adequate training, and periodic refresher training, to enable them to comply with the local radiation protection procedures, including procedures that deal with incidents involving spillage or loss of radioactive material. Additional training needs to be given when new radiopharmaceuticals or devices are to be used in the veterinary nuclear medicine facility.

The training should be updated whenever there is a change to equipment, use of different radionuclides or change to working conditions relevant to radiation safety. Training should be repeated at least every 5 years.

A record of any training, including the date of the training, the names of those who attended, who provided the training and the topics covered, shall be maintained by the undertaking and shall be accessible, as required by the EPA.

8.2 Additional training for RPOs

RPOs shall receive the training necessary to allow them to effectively carry out the tasks set out in Section 3.4. The training should be appropriate to the nature of the radiological practices and complexity of the work. This training should ensure that RPOs are fully aware of the role that they are expected to fulfil. Periodic refresher training shall be provided.

In addition to the topics covered in Section 8.1, RPOs shall be provided with training on the following topics:

- legal responsibilities and duties of the RPO, as outlined in Section 3.4 of this code;
- an understanding of relevant legislation and this code;
- an understanding of the conditions attached to the registration or licence.

A record of RPO training shall be maintained by the undertaking and shall be accessible to an EPA inspector.

8.3 Other persons

The undertaking shall provide sufficient information to other persons involved in radiology procedures to ensure their safety. A record of the information provided shall be maintained.

Section 9 Incidents

9.1 What incidents must be reported

The following incidents shall be reported to the EPA:

- any incident involving the exposure of any person arising from a design flaw or incorrect operation of equipment;
- the theft or loss of X-ray equipment or a radioactive source;
- any incident involving a dose, or suspected dose, in excess of any dose limits for staff and members of the public specified in IRR19;
- any inappropriate or unauthorised use of X-ray equipment or a radioactive source;
- significant spillages of unsealed sources in nuclear medicine facilities.

9.2 How they should be reported

Incidents shall be reported by the undertaking to the EPA as soon as possible after they occur. Incidents should be reported to the EPA by telephone or email (RadiationIncidents@epa.ie) and the EPA will advise whether or not formal reporting and incident investigation are required.

9.3 What must be included in an incident investigation

The purpose of an incident investigation is to establish:

- the sequence of events leading to the incident;
- the cause(s) of the incident;
- what remedial action is necessary to prevent a recurrence;
- the estimated dose(s) received by all persons involved in the incident.

Incident investigations shall always involve the undertaking, the exposed person, the operator, the RPO and the RPA. Other persons who may be involved in the investigation include the service engineer and the person who carried out the quality assurance of the X-ray unit.

The incident report shall include the following:

- the key facts concerning the incident;
- the consequences (if any) for the individual(s) exposed;
- recommendations to avoid a recurrence of the incident;
- details of the follow-up action with the exposed individual(s).

This report shall be signed and dated by the undertaking and the person who prepared it and forwarded to the EPA. A copy shall be kept.

9.4 Procedures in the event of an incident

The undertaking shall have procedures to be followed in the event of an incident liable to have radiation safety implications for workers and members of the public. Such incidents could include failure of the X-ray equipment to terminate at the end of exposure, damage to the equipment affecting the shielding of the X-ray tube head, spillage of an unsealed source and contamination of individuals.

Procedures encompassing switching off the X-ray equipment at the isolation switch without approaching the tube head, informing the RPO and prohibiting the use of the X-ray equipment pending further investigation will normally suffice.

Section 10 Maintenance of Radiation Safety Records

The undertaking shall make and fully maintain relevant records to demonstrate compliance with IRR19 and shall have these records accessible when required by the EPA. When appropriate, suggested retention periods have been aligned with Veterinary Council guidelines for similar record types.

The records shall include, but not be limited to:

Parameter	Recommended retention period
Risk assessments	2 years after a risk assessment has been superseded
Local radiation safety procedures	2 years after procedures have been superseded
Details of X-ray equipment including date of acquisition, make/model, serial number and/or other unique identifiers.	2 years after disposal of the equipment
Installation report and user manuals	
Servicing reports	5 years
Quality assurance/quality control reports	
Staff training records	
Incident/accident procedures and reports	
Monthly visual checks as applicable	
Disposal of X-ray equipment	
Dosimetry reports where relevant	Indefinitely

Appendix 1 Regulatory Control

Regulation is risk based, with the greatest regulatory effort being directed towards higher risk activities. This risk-based approach informs each of the four elements of the regulatory system. This means that higher risk activities will be inspected more frequently, will be subject to a more rigorous form of authorisation and will be subject to a greater enforcement focus.

Justification of a radiological practice

The EPA has published on its website a list of radiological practices currently considered to be justified. The EPA may review the justification of existing practices if new information or alternative techniques become available.

When an application is made for authorisation of a radiological practice that is not included on the EPA list of radiological practices currently considered to be justified, the applicant will be required to submit evidence that the practice is justified before the authorisation can proceed. A radiological practice is deemed to be justified if the individual or societal benefit resulting from the practice outweighs the health detriment that it may cause.

Justification decisions are made by the EPA in consultation with relevant stakeholders. The EPA has published further information on the process of justification of radiological practices on its website.

Authorisation

When a certificate of registration or licence is granted this must be displayed publicly within each premises.

Guidance

The EPA, as part of its regulatory function, sets out practical guidance to support undertakings in complying with their legal requirements. This Code of Practice is the primary source of guidance for radiation protection in veterinary radiology.

Compliance assessment

Compliance assessment by the EPA is a key element of the system of regulation. In accordance with IRR19, the EPA will routinely assess whether those authorised to use ionising radiation are compliant with the regulations and any conditions associated with their authorisation. The assessment processes include:

- Self-assessment:
  - The EPA may issue self-assessment questionnaires to undertakings for completion and return within a specified period. An inspector may follow up with an on-site inspection.
- Review of safety documentation:
  - The EPA may at any time request copies of the current risk assessment, evidence of appropriate installation or other relevant documentation for the purpose of reviewing their adequacy.
- On-site inspections:
  - An inspector from the EPA may visit the premises to verify compliance with the legislation and this code. The inspection may be announced or unannounced. The EPA will issue an inspection report online through EDEN.

The inspector may examine documents including:

- risk assessments;
- RPO designation;
- RPA consultation;
- installation/acceptance/quality assurance reports;
- relevant training records;
- inventory of equipment;
- local radiation safety procedures.

Enforcement

The EPA aims to work collaboratively with users of ionising radiation to promote a culture of compliance with the regulations. However, on occasion it will be necessary for the EPA to take legal action to enforce the provisions of IRR19. Such enforcement action may include:

- placing of conditions on the licence or registration to limit or restrict the use of equipment;
- issue of a legal direction to address an immediate risk or danger;
- serving of an enforcement notice requiring specific corrective action to be taken;
- prosecution in the district or circuit court;
- revocation of a licence or registration.

In taking any enforcement action the EPA aims to be:

- **Proportionate** in its approach. The EPA will ensure that any enforcement action taken by it is balanced with the risk posed to staff and/or the public.
- **Consistent** in its decisions. In responding to any breach of the regulations, the EPA will take account of factors such as the scale and nature of the breach, management response to the incident or breach and the history of previous incidents or breaches.
- **Transparent** in its actions. The EPA aims to make it clear to those regulated what is expected of them. It will also aim to be clear as to why it intends to take, or has taken, any enforcement action.

Appendix 2 Dose Limits and Constraints

Dose limits

IRR19 sets out legally binding dose limits for both exposed workers and members of the public. It should be noted that in accordance with the regulations these limits apply to the sum of all occupational exposures received by an individual. A breach of a dose limit is an offence under the regulations. The limits most likely to be relevant in a veterinary setting are set out in Table 4.

Table 4 Dose limits

Dose limit	Value
Effective dose limit for exposed workers	20 mSv in any single year
Equivalent dose for the skin	500 mSv in a year; this limit shall apply to the dose averaged over any area of 1 cm^2, regardless of the area exposed
Effective dose limit for a member of the public	1 mSv in a year

Dose constraint

Dose constraints at the design stage are intended to set a prospective upper bound on exposure from any individual radiation source so that radiation exposure from all occupational sources is optimised and within the dose limits. Dose constraints must be established in accordance with guidelines issued by the EPA, as set out in Table 5.

Table 5 Guideline dose constraint

Dose constraint	Value
Design dose constraint for the design of shielding and building layout in a veterinary facility	Not greater than 0.3 mSv in a year to the most exposed member of the public

Appendix 3 **Bibliography**

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An Ghníomhaireacht um Chaomhnú Comhshaoil

Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ar thionchar díobhálach na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

- **Rialú:** Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.
- **Eolas:** Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.
- **Tacaíocht:** Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.

Ár bhFreagrachtaí

CEADÚNÚ

Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:

- saoráidí dramhaíola (m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola);
- gníomhaíochtaí tionsclaíocha ar scála mór (m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta);
- an diantalmhaíocht (m.sh. muca, éanlaith);
- úsáid ghlanscartha agus scaoileadh rialaithe Orgánach Géinmhodhnaithe (OGanna);
- foinsí radaíochta ianúcháin (m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha);
- áiseanna móra stórála peitril;
- sceitheadh fuíolluisce;
- gníomhaíochtaí dumpála ar farraige.

FORFHEIDHMIÚ NÁISIÚNTA I LEITH CÚRSAÍ COMHSHAOIL

- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus gníomhaireachtaí eile chun dul i ngleic le coireacht chomhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, díriú ar chiontóirí, agus maoirsiú a dhéanamh ar fheabhsúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (WEEE), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

BAINISTÍOCHT UISCE

- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchreasa agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

MONATÓIREACHT, ANAILÍS AGUS TUAIRISCIÚ AR AN GCOMHSHAOL

- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus áitiúil (m.sh. tuairisciú tréimhsiúil ar Staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí).
- Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gás ceaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

TAIGHDE AGUS FORBAIRT COMHSHAOIL

- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

MEASÚNÚ STRAITÉISEACH COMHSHAOIL

- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn (m.sh. mórphleananna forbartha).

COSAINT RAIDEOLAÍOCH

- Monatóireacht a dhéanamh ar leibhéil radaíochta, agus measúnacht a dhéanamh ar a oiread is atá muintir na hÉireann gan chosaint ar an radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

TREOIR, FAISNÉIS INROCHTANA AGUS OIDEACHAS

- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol (m.sh. Timpeall an Tí, Mapaí Radóin).
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

MÚSCAILT FEASACHTA AGUS ATHRÚ IOMPRAÍOCHTA

- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

BAINISTÍOCHT AGUS STRUCHTÚR AN GCC

Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:

- An Oifig um Inbhuanaitheacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fhianaise agus Measúnú
- An Oifig um Chosaint Radaíochta agus Monatóireacht Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

EPA Headquarters
Johnstown Castle Estate
County Wexford
Tel: (053) 916 0600
Fax: (053) 916 0699
Web: www.epa.ie
Email: info@epa.ie