

**APPLICATION OF THE IONISING RADIATIONS REGULATIONS
1985 TO A RESEARCH ESTABLISHMENT IN THE UK**

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Three important reasons for the UK Health and Safety Executive (HSE) to embark on the preparation of the Ionising Radiation Regulations were:

- 1 the International Commission on Radiological Protection (ICRP) Publication 26 revised the basic recommendations for radiation protection on which national provisions are based.
- 2 As members of the European Commission the UK is bound by the Euratom Directives to align its national legislation with other member states. The Directives lay down the basic safety standards for the health protection of the general public and workers against the dangers of ionising radiation.
- 3 The UK Health and Safety at Work etc. Act 1974 allows outdated legislation to be progressively replaced by a system of regulations and approved codes of practice designed to maintain or improve the standards of health, safety and welfare in the workplace.

After a lengthy consultation period with industry, trade unions and independent experts the Regulations were made by the UK Secretary of State for Employment and came into complete operation on 1st January 1986. They are supported by a Code of Practice approved by the Health & Safety Commission (HSC) which provides practical guidance on compliance.

The Regulations extend to almost all places of work in the UK in which ionising radiations are used. The same basic requirements are applied to large industrial sites such as nuclear power stations or to persons using ionising radiations in teaching, research or medical applications. They impose duties on employers to protect employees and other people by keeping exposure as low as reasonably practical. They also impose duties on employees in the conduct of their work. In total there are 41 Regulations divided into nine Parts and supported by ten Schedules. They are enforced by the UK Health and Safety Executive (HSE).

The Wellcome Research Laboratories (WRL) is the major R&D centre of The Wellcome Foundation Ltd in the UK. Its activities are directed towards the discovery and development of new medicines, vaccines and diagnostic materials and it employs 1500 people. About 400 of them, covering many scientific disciplines, use ionising radiations as tools in a variety of biological, biochemical and pharmacological techniques. In the past radiological protection has been of a good standard, thus the major problems with the application of

the new Regulations were the modification of practices and the increased administration required to record compliance.

The administration of the Regulations and integration of radiological protection procedures throughout the Site is controlled by the Company's Health and Safety Services' staff. The key post being the Radiological Protection Safety Officer (RPSO) who is advised by an external consultant Radiation Protection Adviser (RPA). Operational responsibility for safety resides with the line management and individual worker. Within departments daily supervision of radiation work is provided by a Departmental Radiation Protection Supervisor (DRPS). In effect the RPSO and 23 DRPS's undertake the duties of the Radiation Protection Supervisor stipulated by the Regulations. The Parts of the Regulations that affect WRL operations are as follows:

PART I. INTERPRETATION AND GENERAL CONDITIONS

These regulations define the scope of and terms used in the legislation and the notification of work to the HSE.

To ensure tight control at WRL, all persons using ionising radiation have to register with the RPSO, so that the H&S Services are aware of the location and type of all work being undertaken.

PART II. DOSE LIMITATION

Employers are required to restrict as far as is reasonably practicable the doses received by employees and other persons. The means proposed to achieve this are engineering controls and design features including shielding, containment of radioactive substances, ventilation and the provision of safety features and warning signs.

Most work with unsealed sources is carried out in fume cupboards behind appropriate shielding. In addition, safe systems of work in the form of Site and Departmental Local Rules (covering experimental procedures, safe access to, manipulation of and storage of sources, hygiene, decontamination and waste disposal) and appropriate protective equipment are provided. Compliance with these features is monitored by the RPSO and DRPS.

To ensure that dose limits are not exceeded internal and external personal dosimetry is employed. The Regulations specify dose limits for the whole body, for individual organs and tissues, and for the lens of the eye. Lower limits are set for women of reproductive capacity.

PART III. REGULATION OF WORK

Areas in which persons are likely to exceed specified proportions of the dose limits have to be designated by the employer as 'Controlled' or 'Supervised' areas. The detailed criteria to be used are complex and allow for the external

radiation hazard, the internal radiation hazard and the combination of both.

As the use of sources at WRL fluctuates, all areas in which unsealed sources are used are classed as 'Supervised' areas. Only a few areas are designated as 'Controlled'. These are mainly storage areas and work areas in which quantities of isotopes persistently exceed the upper limit for supervised areas, e.g. fume cupboards and laboratories involved in radiochemical synthesis or iodination procedures. Access to controlled areas is restricted to 'Classified' workers and to persons working to a written system of work which can be shown to limit their exposure.

The Site and Departmental Local Rules are designed to enable the employees to carry out work within the dose limits given in the Regulations. This allows the use of $7.5\mu\text{Sv.h}^{-1}$ which relates to three tenths of the whole body limit of 50mSv.y^{-1} as the operational standard for the external radiation dose rate at the boundaries of 'Controlled' areas. To ensure exposure of other people is low, $2.5\mu\text{Sv.h}^{-1}$ is the external radiation dose rate for the boundaries of a 'Supervised' area e.g. a biochemical laboratory.

All registered workers undergo formal training in radiation protection and safe working procedures on courses developed and run by H&S Services, but functional training is carried out by each department.

PART IV. DOSIMETRY AND MEDICAL SURVEILLANCE

These regulations require the monitoring of the doses received by classified persons and certain other employees and the maintenance of dose records (for at least 50 years) by an HSE approved dosimetry service.

On registration each worker is categorised for personal dosimetry based on the type and quantities of sources to be used and the nature of the work. If the employee is likely to exceed three tenths of a set dose limit they are designated as Classified Persons who have to undergo more rigorous dosimetry and medical surveillance.

Less than 10 of our 400 registered workers are classified because most of the work at WRL involves the use of unsealed sources (mainly ^{32}P , ^{125}I , ^{14}C and ^3H) in tracer experiments.

Film badges and extremity TLD straps are used to monitor doses. These are supplied and analysed by the National Radiological Protection Board on a 4 week cycle. Small pocket monitors with pre-set alarms are used for the daily monitoring of operators of large sealed sources or X-ray fluoroscopes. The dosimetry service is administered by the RPSO. Quarterly and annual doses are calculated and the records archived for the statutory period. Termination records are prepared when an employee leaves.

Medical surveillance of registered workers is carried out by the Site Occupational Health Physician. The health record of Classified Persons, which must be kept for 50 years, is updated every 12 months, though a medical examination of the individual is not carried out unless personal dosimetry or other factors suggest that it would be advisable.

PART V. CONTROL OF RADIOACTIVE SUBSTANCES

This Part regulates the use of sealed and unsealed sources and defines the requirements for stock control.

The majority of sources at WRL are unsealed (e.g. labelled compounds or free isotopes). The system of accounting for all sources is administered by the RPSO to ensure that the limits certified for the Site are not exceeded. The system uses an IBM PC and LOTUS software to track all acquisitions, stock levels, movements and disposals collated from monthly returns made by each department. These records are kept for 2 years and loss of stock above certain quantities (e.g. 5×10^4 Bq for ^{125}I) must be reported to the HSE.

PART VI. MONITORING OF IONISING RADIATION

Monitoring of the levels of radiation in each 'Controlled' or 'Supervised' area is required with records being kept for at least two years.

The Site Rules demand that working areas and adjacent areas are monitored after the completion of each experiment and decontaminated if required. Hand held monitors or wipe tests are used. Monthly grid monitoring is carried out in all working areas with emphasis placed on those most likely to be contaminated. All areas external to working areas (e.g. offices and corridors) are monitored on a 3 monthly basis.

All monitoring equipment is tested annually. As WRL is liberally provided with monitors, periodic testing is a significant burden and has been contracted out.

PART VII. ASSESSMENT AND NOTIFICATIONS

Hazard assessment is an important requirement. At WRL it occurs when a person seeks registration as a radiation worker, when new work is introduced and for major changes in existing work or facilities. Contingency plans for dealing with emergencies are developed and incorporated into the Local Rules.

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Although complex and procedurally demanding, The Regulations combine many aspects of good practice that responsible UK establishments have always observed.